89430A Service Guide

Manufacturing Part Number: 89430-90001
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Agilent Technologies

Notice

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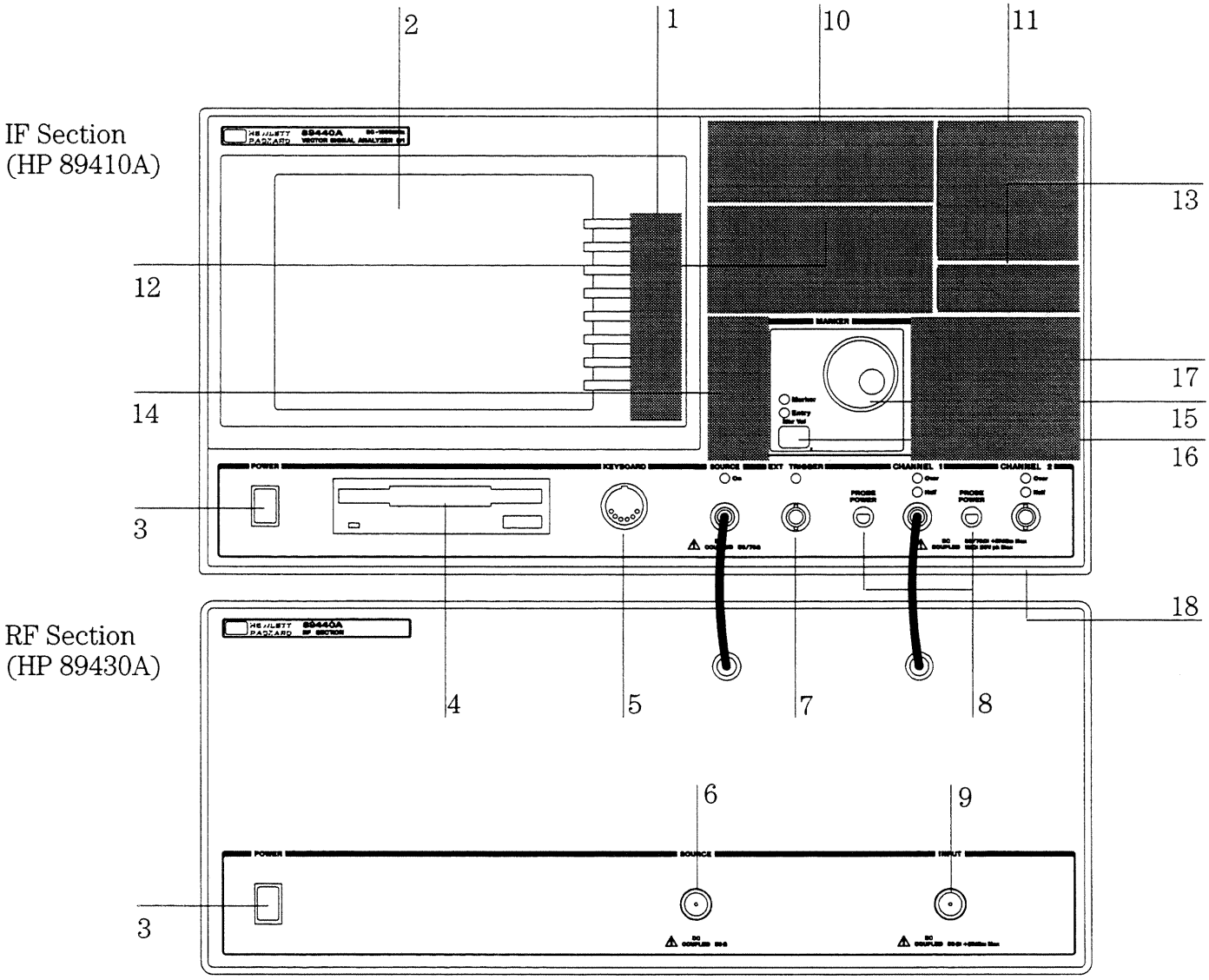
The HP 89440A at a Glance



HP 89440A Front Panel

1-A softkey's function changes as different menus are displayed. Its current function is determined by the video label to its left, on the analyzer's screen.

2-The analyzer's screen is divided into two main areas. The menu area, a narrow column at the screen's right edge, displays softkey labels. The data area, the remaining portion of the screen, displays traces and other data.

3-The POWER switch turns the analyzer on and off.

4-Use a 3.5-inch flexible disk (DS,HD) in this disk drive to save your work.

5-The KEYBOARD connector allows you to attach an optional keyboard to the analyzer. The keyboard is most useful for writing and editing HP Instrument BASIC programs.

6- The SOURCE connector routes the analyzer's source output to your DUT. If option AY8 (internal RF source) is installed, the connector is a type-N. If option AY8 is not installed, the connector is a BNC. Output impedance is 50 ohms or 75 ohms with option 1D7 (minimum loss pads).

7-The EXT TRIGGER connector lets you provide an external trigger for the analyzer.

8-The PROBE POWER connectors provide power for various HP active probes.

9-The INPUT connector routes your test signal or DUT output to the analyzer's receiver. Input impedance is 50 ohms or 75 ohms with option 1D7 (minimum loss pads).

10-Use the DISPLAY hardkeys and their menus to select and manipulate trace data and to select display options for that data.

11-Use the SYSTEM hardkeys and their menus to control various system functions (online help, plotting, presetting, and so on).

12-Use the MEASUREMENT hardkeys and their menus to control the analyzer's receiver and source, and to specify other measurement parameters.

13-The REMOTE OPERATION hardkey and LED indicators allow you to set up and monitor the activity of remote devices.

14-Use the MARKER hardkeys and their menus to control marker positioning and marker functions.

15-The knob's primary purpose is to move a marker along the trace. But you can also use it to change values during numeric entry, move a cursor during text entry, or select a hypertext link in help topics.

16-Use the Marker/Entry key to determine the knob's function. With the Marker indicator illuminated, the knob moves a marker along the trace. With the Entry indicator illuminated, the knob changes numeric entry values.

17-Use the ENTRY hardkeys to change the value of numeric parameters or to enter numeric characters in text strings.

18-The optional CHANNEL 2 input connector routes your test signal or DUT output to the analyzer's receiver. Input impedance is selectable: 50 ohms, 75 ohms, or 1 megohm. For ease of upgrading, the CHANNEL 2 BNC connector is installed even if option AY7 (second input channel) is not installed.

For more details on the HP 89440A front panel, display the online help topic "Front Panel."

Notation Conventions

Before you use this book, it is important to understand the types of keys on the front panel of the analyzer and how they are denoted in this book.

Hardkeys Hardkeys are front-panel buttons whose functions are always the same. Hardkeys have a label printed directly on the key. In this book, they are printed like this: [**Hardkey**].

Softkeys Softkeys are keys whose functions change with the analyzer's current menu selection. A softkey's function is indicated by a video label to the left of the key (at the edge of the analyzer's screen). In this book, softkeys are printed like this: [softkey].

Toggle Softkeys Some softkeys toggle through multiple settings for a parameter. Toggle softkeys have a word highlighted (of a different color) in their label. Repeated presses of a toggle softkey changes which word is highlighted with each press of the softkey. In this book, toggle softkey presses are shown with the requested toggle state in bold type as follows:
"Press [key name **on**]" means "press the softkey [key name] until the selection on is active."

Shift Functions In addition to their normal labels, keys with blue lettering also have a shift function. This is similar to shift keys on a pocket calculator or the shift function on a typewriter or computer keyboard. Using a shift function is a two-step process. First, press the blue [**Shift**] key (at this point, the message "shift" appears on the display). Then press the key with the shift function you want to enable. Shift function are printed as two key presses, like this:
[**Shift**] [**Shift Function**]

Numeric Entries Numeric values may be entered by using the numeric keys in the lower right hand ENTRY area of the analyzer front panel. In this book, values which are to be entered from these keys are indicted only as numerals in the text, like this:
Press 50, [enter]

Ghosted Softkeys A softkey label may be shown in the menu when it is inactive. This occurs when a softkey function is not appropriate for a particular measurement or not available with the current analyzer configuration. To show that a softkey function is not available, the analyzer "ghosts" the inactive softkey label. A ghosted softkey appears less bright than a normal softkey. Settings/values may be changed while they are inactive. If this occurs, the new settings are effective when the configuration changes such that the softkey function becomes active.

In This Book

This guide provides instructions for repairing the RF section (HP 89430A) of the HP 89440A DC-1800 MHz Vector Signal Analyzer. See the *HP 89440A Installation and Verification Guide* to test the analyzer's performance.

Chapter 1, "Troubleshooting the Analyzer," provides step-by-step instructions for isolating most failures to the faulty assembly.

Chapter 2, "Adjusting the Analyzer," provides step-by-step instructions for adjusting the instrument.

Chapter 3, "Replacing Assemblies," provides step-by-step instructions to follow before and after replacing an assembly. This chapter also provides step-by-step instructions for disassembling the instrument.

Chapter 4, "Replaceable Parts," provides ordering information and lists the replaceable parts.

Chapter 5, "Circuit Descriptions," provides the overall instrument description and individual assembly descriptions.

Chapter 6, "Voltages and Signals," shows where the signals and voltages are used and describes each signal.

Chapter 7, "Internal Test Descriptions," describes the power-on test, calibration routine, fault log messages, and self tests.

Chapter 8, "Backdating," provides information necessary to modify this manual for instruments that differ from those currently being produced.

Chapter 9, "Quick Reference," provides all the block diagrams and the "Motherboard Voltages" table.

Table of Contents

4 Replaceable Parts

5 Circuit Descriptions

1

Troubleshooting the Analyzer

Troubleshooting the Analyzer

The HP 89440A Vector Signal Analyzer consists of an HP 89410A (IF section) and an HP 89430A (RF section). This chapter contains troubleshooting tests that can isolate an HP 89440A failure to the HP 89410A or HP 89430A. This chapter also contains troubleshooting tests that can isolate most failures in the HP 89430A to the faulty assembly. The *HP 89410A Service Guide* contains troubleshooting tests that can isolate most failures in the HP 89410A to the faulty assembly.

The section "How to troubleshoot the analyzer" tells you which test to start with based on the failure. The test you start with will either isolate the faulty assembly or send you to another test to continue troubleshooting.

Safety Considerations

The HP 89440A is a Safety Class 1 instrument (provided with a protective earth terminal). Although the instrument has been designed in accordance with international safety standards, this manual contains information, cautions, and warnings that must be followed to ensure safe operation and retain the instrument in safe operating condition.

Warning

Service must be performed by trained service personnel who are aware of the hazards involved (such as fire and electrical shock).

Any interruption of the protective (grounding) conductor inside or outside the instrument, or disconnection of the protective earth terminal can expose operators to potentially dangerous voltages.

Under no circumstances should an operator remove any covers, screws, shields or in any other way access the interior of the instrument. There are no operator controls inside the instrument.

Only fuses with the required current rating and of the specified type should be used for replacement. The use of repaired fuses or short circuiting the fuse holder is not permitted. Whenever it is likely that the protection offered by the fuse has been impaired, the instrument must be made inoperative and secured against any unintended operation.

Caution

Do not connect or disconnect ribbon cables with the power switch set to on (|). Power transients caused by connecting or disconnecting a cable can damage circuit assemblies.

Recommended Test Equipment

The following table lists the equipment needed to troubleshoot and adjust the HP 89430A. Other equipment may be substituted for the recommended model if it meets or exceeds the listed critical specifications. When substitutions are made, you may have to modify the procedures to accommodate the different operating characteristics.

Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model
Vector Signal Analyzer	HP 89430A interface	HP 89440A IF section Alternate HP 89410A
Power Meter	Accuracy ±0.125 dB	HP 438A Alternate HP 436A
Power Sensor	Frequency range 2 to 1800 MHz Compatible with power meter	HP 8482A
RF Spectrum Analyzer	Frequency range 2 MHz to 4 GHz Amplitude range −60 to +15 dBm Dynamic range <−67 dBc Impedance 50 Ω External reference input Amplitude accuracy ± 1dB Frequency accuracy ±125 Hz at 600 MHz	HP 8566B Alternate HP 8566A
Signal Generator	Frequency range 2 MHz to 1.8 GHz Amplitude range −30 to +20 dBm Impedance 50 Ω Spurious <−82 dBc External reference input	HP 8663A
Synthesizer/Level Generator	Frequency range 30 kHz to 74 MHz Amplitude range −56 to +13 dBm Amplitude accuracy ±0.25 dB Impedance 50 Ω Spurious <−70 dBc External reference input	HP 3335A
Digital Multimeter	Accuracy 25 ppm Maximum volts range ≥400 Vdc	HP 3458A Alternate HP 3456A
Frequency Counter	Frequency range 3 to 30 MHz Resolution <1 Hz Frequency accuracy ±0.25 Hz Impedance 1 MΩ	HP 5334B opt 010

Recommended Test Equipment (continued)

Instrument	Critical Specifications	Recommended Model
Network Analyzer	Range 10 kHz to 60 MHz Resolution 10 Hz Input impedance 50 Ω Amplitude range –42 dBm to +10 dBm resolution 0.25 dB dynamic accuracy 0.15 dBp-p, 0.5 degree at –10 dB from 10 kHz to 50 MHz	HP 3577B Alternate HP 4195A HP 3589A with HP 35689A
Logic Probe	TTL/CMOS	HP 545A Alternate HP 5006A HP 5005A/B
Frequency Standard	Frequency accuracy 0.0125 ppm	HP 5061B
Power Splitter	SWR ≤1.10 Impedance 50 Ω Two output ports	HP 11667A
10 dB Step Attenuator (with cal data @ 10 MHz)	Range 0 to 70 dB Accuracy ±0.03 dB	HP 8495G Alternate HP 355D HP 8495A HP 8495B HP 8495H HP 8496A HP 8496B HP 8496G HP 8496H
Oscilloscope Probe	Input R ≥1 MΩ Division Ratio 10:1	HP 10431A
50 Ω Feed-through Termination (2 required for opt AY7)	Accuracy ±0.2%	HP 11048C
50 Ω Termination	±2% at dc	Pomona Model 3840-50 † Alternate HP 11048C with HP 1250-0774
50 Ω SMB Termination	±2% at dc Alternate 50 Ω Termination (BNC) with BNC(f)-to-SMA(m)	Pomona Model 4286 † Alternate Pomona Model 3840-50† with HP 1250-1200

† ITT Pomona Electronics, 1500 East Ninth Street, Pomona, CA 91769 U.S.A. (714) 469-2900
FAX (714) 629-3317

Recommended Test Equipment (continued)

Instrument	Critical Specifications	Recommended Model
Cables	50 Ω BNC (4)	HP 8120-1840
	50 Ω Type-N (2)	HP 15000C (24 inch) or HP 15000D (60 inch)
Adapters	N(m)-to-BNC(f) (3)	HP 1250-0780
	BNC(f)-to-Dual Banana Plug(m)	HP 1251-2277
	BNC(f)-to-BNC(f)	HP 1250-0080
	N(f)-to-BNC(f)	HP 1250-1474
	SMA(f)-to-SMA(f)	HP 1250-1158
	N(m)-to-BNC(f) (2)	HP 1250-0780
	Test clips-to-BNC(f)	Pomona Model 2631 †
	N(f)-to-N(f)	HP 1250-1529
	N(f)-to-BNC(m)	HP 1250-1477
	SMA(f)-to-N(m)	HP 1250-1250
HP 89410 Service Kit		HP 89410-84401
	Includes	Includes
	A10/A35 extender board	HP 89410-B1001‡
	A36/A60 extender board	HP 89410-B1002‡
	A61 extender board	HP 89410-B1008‡
	Motherboard cable extraction tool	HP 8710-2050
	Plastic screw driver	HP 8710-2056
	Flat-edge adjustment tool	HP 8710-1928
	SMB(f)-to-SMB(f) extender cable (2)	HP 03585-61601
	BNC(m)-to-SMB(f) cable (2)	HP 03585-61616
	SMB(m)-to-SMB(m) adapter (2)	HP 1250-0669
HP 89440A Service Kit		HP 89430-84401
	Includes	Includes:
	A82 extender board	HP 89430-66595
	Adjustment disk	HP 89430-19402
	SMA(m)-to-SMA(m) cable	HP 8120-6197
	SMA(m)-to-SMA(f) right angle adapter (2)	HP 1250-1741
	SMA(f)-to-SMB(m) adapter	HP 1250-0674
	N(m)-to-SMA(f) adapter	HP 1250-1250
	Calibrated wrench	HP 89400-65001
	RS-232 interconnect cable	HP 8120-6230

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‡ Individual extender boards cannot be ordered. To order all three extender boards in this kit, order HP 89410-66515.

Troubleshooting Hints

- Check that the instrument has the latest firmware before starting the troubleshooting procedures.
- Incorrect bias supply voltages can cause false diagnostic messages. Most troubleshooting procedures do not check the power supply voltages through the motherboard. If you suspect incorrect supply voltages to an assembly, use the "Motherboard Voltages" table on page 6-15 and an extender board to check the voltages at the assembly.
- The troubleshooting procedures do not isolate failures to cables or connectors. If you suspect a cable or connector failure, check the device for continuity.
- Cables can cause intermittent hardware failures.
- Noise or spikes in the power supply can cause the instrument to fail.
- Measurements in this chapter are only approximate (usually ±1 dB or 10%) unless stated otherwise.
- Use chassis ground for all measurements in this chapter unless stated otherwise.
- Logic levels in this chapter are either TTL-level high or TTL-level low unless stated otherwise. Toggling signal levels continually change from one TTL level to the other.
- Configure a logic probe with an external bias supply for testing digital signals. This instrument does not have easily accessible +5 V supplies.
- If you abort a self test before the self test is finished, the instrument may fail its calibration routine. To prevent this from happening press [**Preset**] or cycle power after you abort the self test.
- The troubleshooting tests in this chapter assume only one independent failure. Multiple failures can cause false results.

How to troubleshoot the analyzer

1 Review "Safety Considerations" and "Troubleshooting Hints."

Warning **Service must be performed by trained service personnel who are aware of the hazards involved (such as fire and electrical shock).**

2 See chapter 3, "Replacing Assemblies," to determine how to disassemble and assemble the HP 89430A.

3 Determine which test to start with by comparing the analyzer's symptoms to the symptoms in the following table.

Symptom	Troubleshooting Test
IF section fails Example failures: Screen blank or defective Keys are defective Fatal system error IF section's fan not turning IF section's port fails HP-IB fails External trigger fails External keyboard does not work NVRAM or battery fails	See "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*
RF section fails †	Initial verification, page 1-9

† The RF source is optional. The source connector is a type-N if the RF source is installed and a BNC if the RF source is not installed.

4 Follow the recommended troubleshooting test until you locate the faulty assembly.

5 Replace the faulty assembly and follow the directions in "What to do after replacing an assembly" in chapter 3, "Replacing Assemblies."

To perform initial verification

Use this test to check the HP 89410A and determine the next troubleshooting test.

❑ Step 1. Disconnect the HP 89430A from the HP 89410A.

1 Set the HP 89410A's power switch to off (O) and the HP 89430A's front panel power switch to standby (⏻) and rear panel line switch to off (O).

2 Disconnect the following cables from the HP 89410A:

Serial interface interconnect cable from the SERIAL 2 port
BNC cable from the EXT REF IN connector
BNC cable from the SOURCE connector
BNC cable from the CHANNEL 1 connector

❑ Step 2. Check for failing functional tests.

1 Set the HP 89410A's power switch to on (I).

2 When the power-up tests are finished, press the following keys:

[**System Utility**]
  [auto cal **off**]
  [more cal setup]
  [auto zero cal **off**]
[**Return**]
  [more]
  [diagnostics]
  [service functions]
  1125
  [enter]
  [test log]
[**Return**]
  [functional tests]
  [ALL]

3 When the functional tests are finished, press the following keys:

[I/O]
[serial port controller]

4 If a self test fails or does not finish (analyzer locks up), go to "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*.

The message `RF section not found` is displayed in the test log under `Additional hardware`. This message is generated if the HP 89430A is disconnected or turned off when the HP 89410A is turned on.

❑ Step 3. Check the HP 89430A's voltage selector switch and fuse.

1 Check that the voltage selector switch on the rear panel is set for the local line voltage.

2 Check that the correct line fuse is installed in the rear panel fuse holder.

For information on the voltage selector switch and line fuse, see chapter 1 in the *HP 89440A Installation and Verification Guide*.

❑ Step 4. Place the HP 89430A in its test position.

1 Disconnect the HP 89410A from the HP 89430A and place the HP 89430A on top of the HP 89410A.

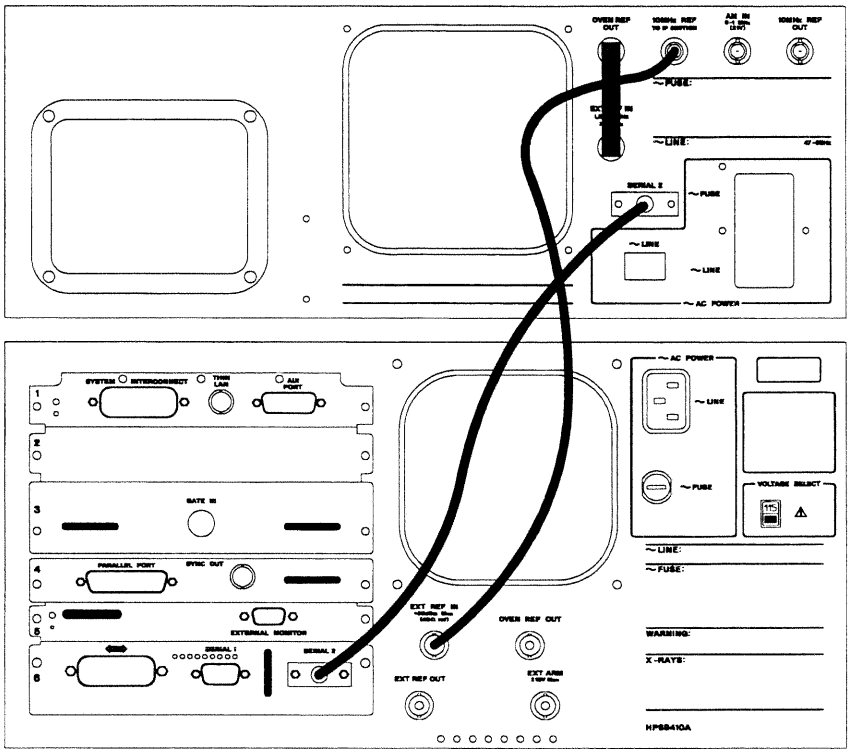
2 Remove the HP 89430A's top cover.

3 Connect the HP 89430A's SERIAL 2 port to the HP 89410A's SERIAL 2 port using the serial interface interconnect cable.

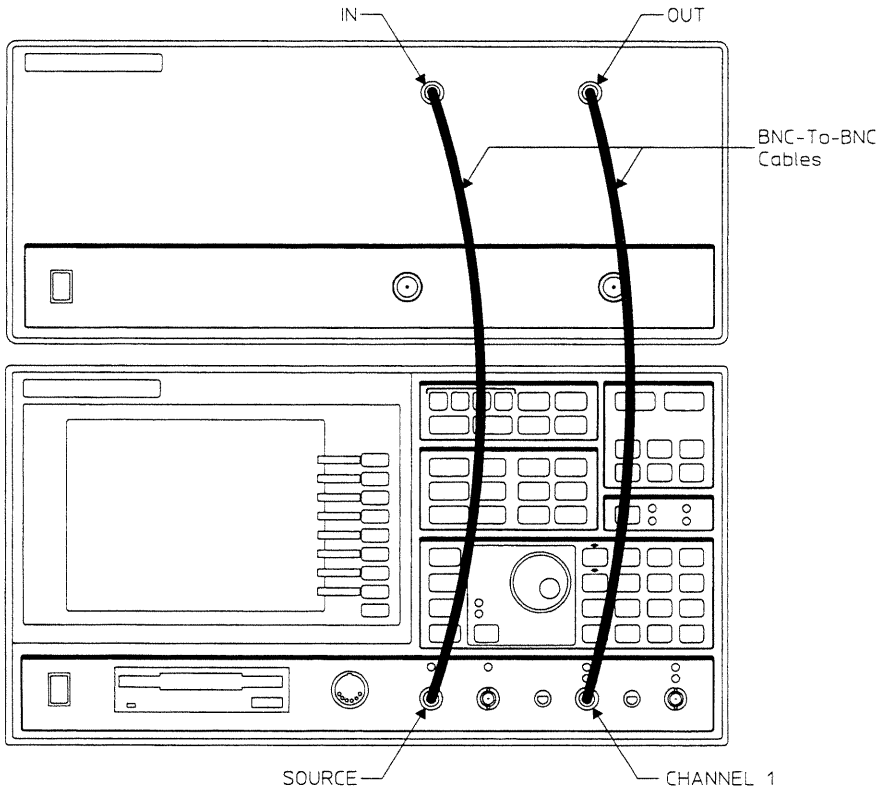
4 Connect the HP 89430A's OVEN REF OUT connector to the EXT REF IN connector using a coax BNC-to-coax BNC connector.

If the HP 89430A does not have the OVEN REF OUT connector, connect a 1 MHz, 2 MHz, 5 MHz, or 10 MHz sine or square wave, with an amplitude greater than 0 dBm to the HP 89430A's EXT REF IN connector.

5 Connect the HP 89430A's 10 MHz REF TO IF SECTION connector to the HP 89410A's EXT REF IN connector using a 24-inch BNC cable.



6 Connect the HP 89410A's SOURCE connector to the HP 89430A's IN connector using a 24-inch BNC cable.
7 Connect the HP 89410A's CHANNEL 1 connector to the HP 89430A's OUT connector using a 24-inch BNC cable.



❑ Step 5. Check the HP 89430A's power supply LEDs and fan.

1 Connect the HP 89430A's power cord and set the front panel power and rear panel line switches to on (|).

2 Check that the green Power Valid LEDs are lit and that the red Over Voltage and Over Current LEDs are off.

3 If a green LED is off or a red LED is lit, go to page 1-14, "To troubleshoot the power supply."

4 Check that the fan is turning.

5 If the fan is not turning, go to page 1-14, "To troubleshoot the power supply."

This quick check does not completely check the power supply. If a power supply failure is still suspected, go to page 1-14, "To troubleshoot the power supply."

❑ Step 6. Check that the HP 89410A can communicate with the HP 89430A.

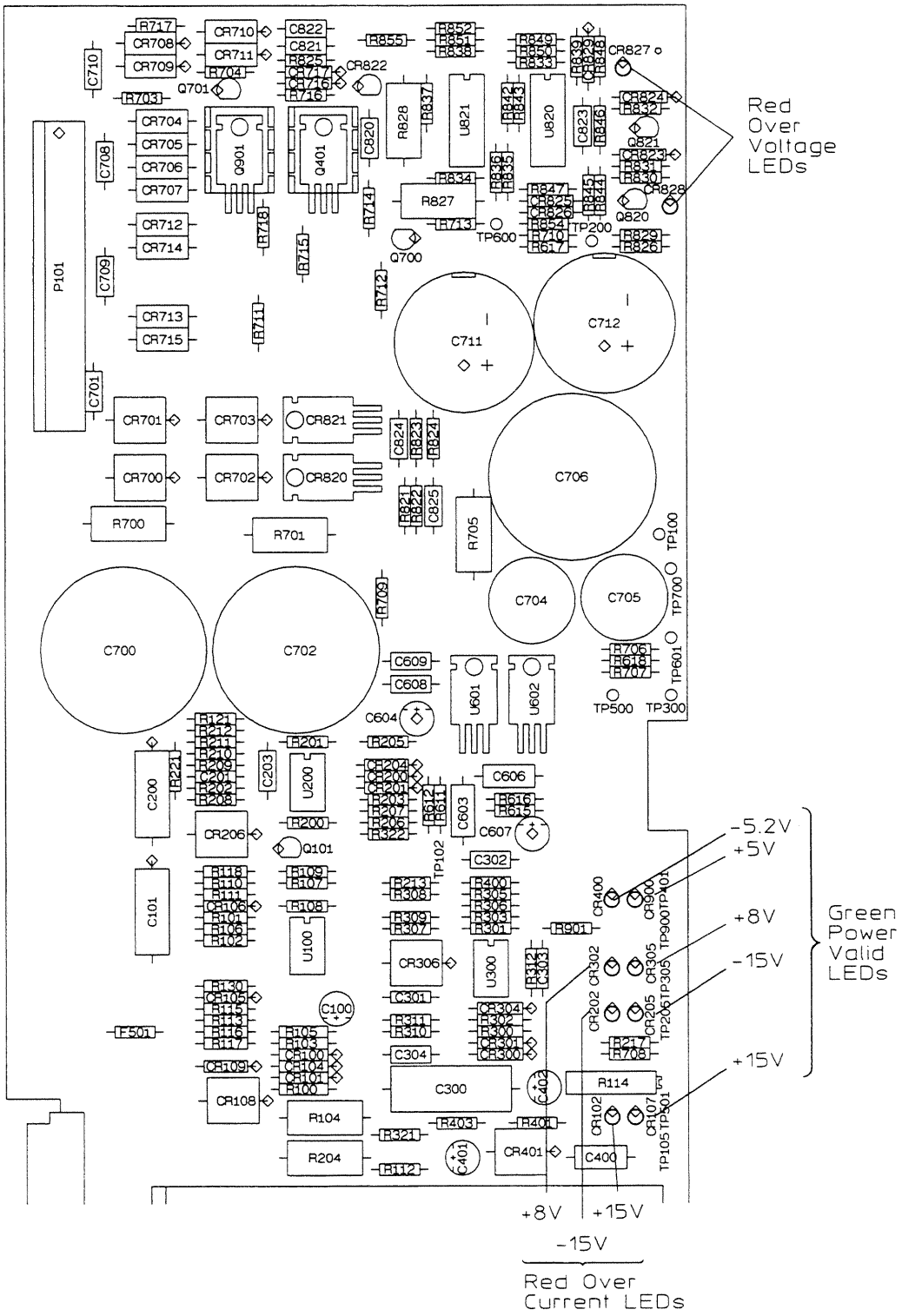
1 Set the HP 89410A's power switch to off (O), then to on (|).

2 When the power-up tests are finished, press the following keys:

[System Utility]
[more]
[diagnostics]
[test log **on**]

3 If the message `RF section not found` is displayed in the test log under `Additional hardware`, go to page 1-21, "To troubleshoot control failures."

4 If the HP 89410A can communicate with the HP 89430A, go to page 1-23, "To troubleshoot frequency reference failures."



To troubleshoot the power supply

Use this test to do a complete check of the A90 Power Supply assembly and to isolate the failure between the A90 Power Supply assembly and the fan. This procedure does not check the transformer.

Warning

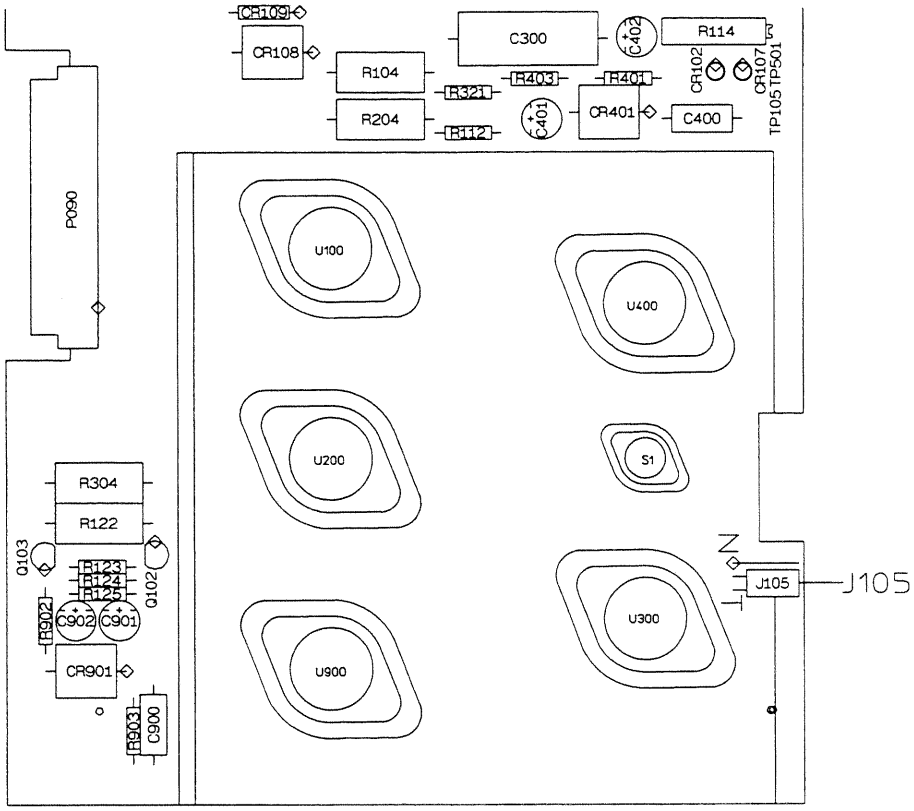
This procedure is performed with protective covers removed and power applied. Energy available at may points can, if contacted, result in personal injury.

The front panel power switch does not disconnect power to the A90 Power Supply assembly. Voltages are present in the Power Supply assembly when the power switch is in the standby (⏻) position.

Even with power removed, there can be sufficient stored energy in some circuits to cause personal injury. These voltages will discharge to a relatively safe level approximately five minutes after the power cord is disconnected.

❑ Step 1. Enable the A90 Power Supply assembly.

1 Set the HP 89410A's power switch to off (O).
2 Set the HP 89430A's front panel power switch to standby (⏻) and rear panel line switch to off (O).
3 Disconnect the power cord from the rear panel.
4 Wait five minutes for the power supply capacitors to discharge. Wait 30 minutes if over heating is suspected.
5 Set A90 J105 to its test position.



❑ Step 2. Check the power supply LEDs and the fan.

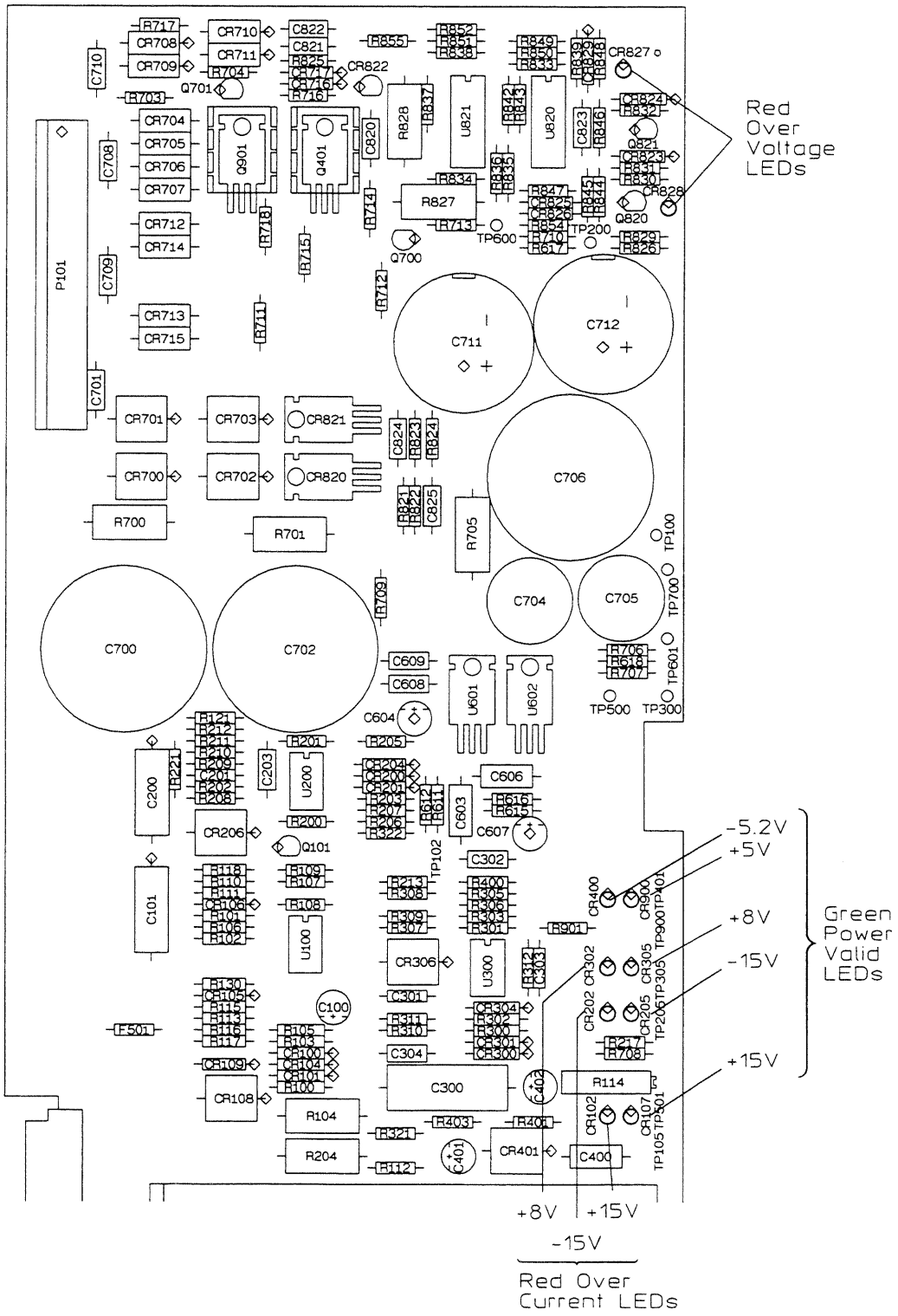
1 Connect the power cord and set the HP 89430A's rear panel line switch to on (I).

2 If a green Power Valid LED is off or a red Over Voltage LED is lit, the A90 Power Supply assembly is probably faulty.

3 If a red Over Current LED is lit, go to Step 5.

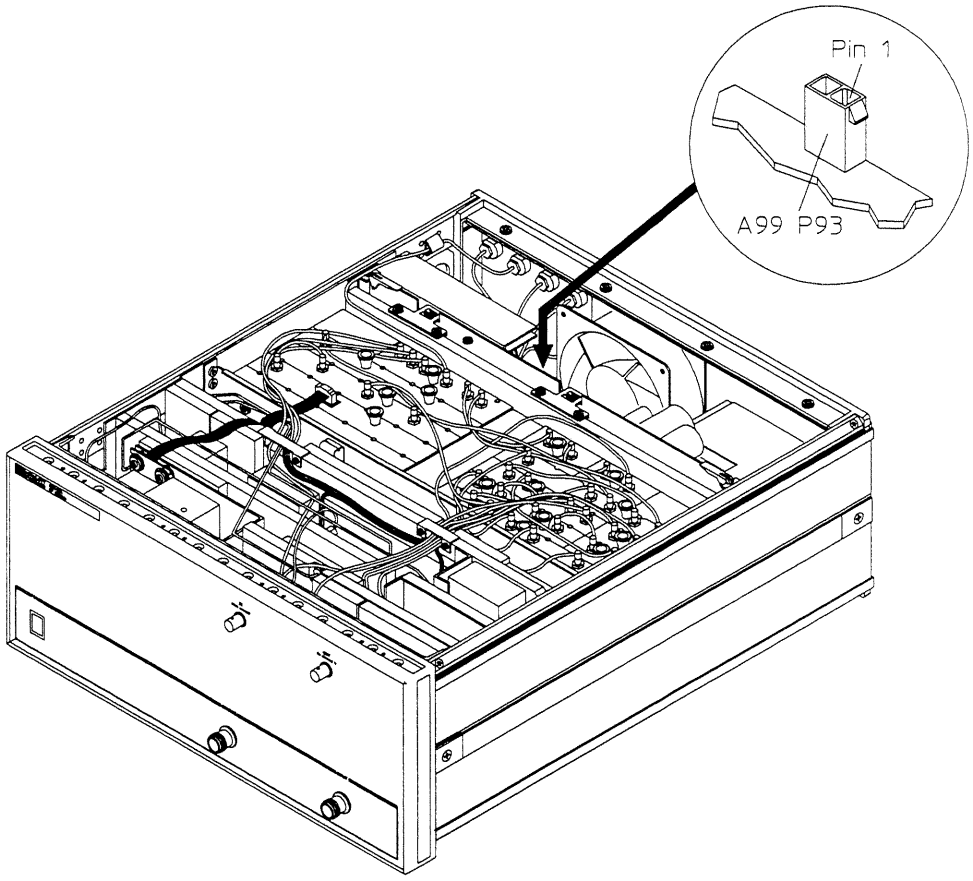
4 If the fan is turning, go to Step 4.

A thermal cutout diode is mounted on a heat sink in the standby line. When the heat sink temperature rises above 100 °C, the thermal cutout opens the standby line, putting the HP 89430A into standby. The fan and the power supply LEDs do not operate when the HP 89430A is in standby.



❑ Step 3. Check the FAN signal (A99 P93 pin 1).

1 Set the rear panel line switch to off (O).
2 Wait five minutes for the power supply capacitors to discharge.
3 Disconnect the fan control cable W19 from A99 P93.



4 Set the rear panel line switch to on (I) .
5 Using a logic probe, check that the signal at A99 P93 pin 1 is TTL-level high. Use A90 TP700 for ground.
6 If the signal is correct, the fan is probably faulty.
7 If the signal is incorrect, the Power Supply assembly is probably faulty.

❑ Step 4. Check the power supply voltages.

1 Set the rear panel line switch to off (O).

2 Reconnect A91 J1 to A82 J5.

3 Set the rear panel line switch to on (I) .

4 Check the following power supply voltages. Use A90 TP700 for ground.

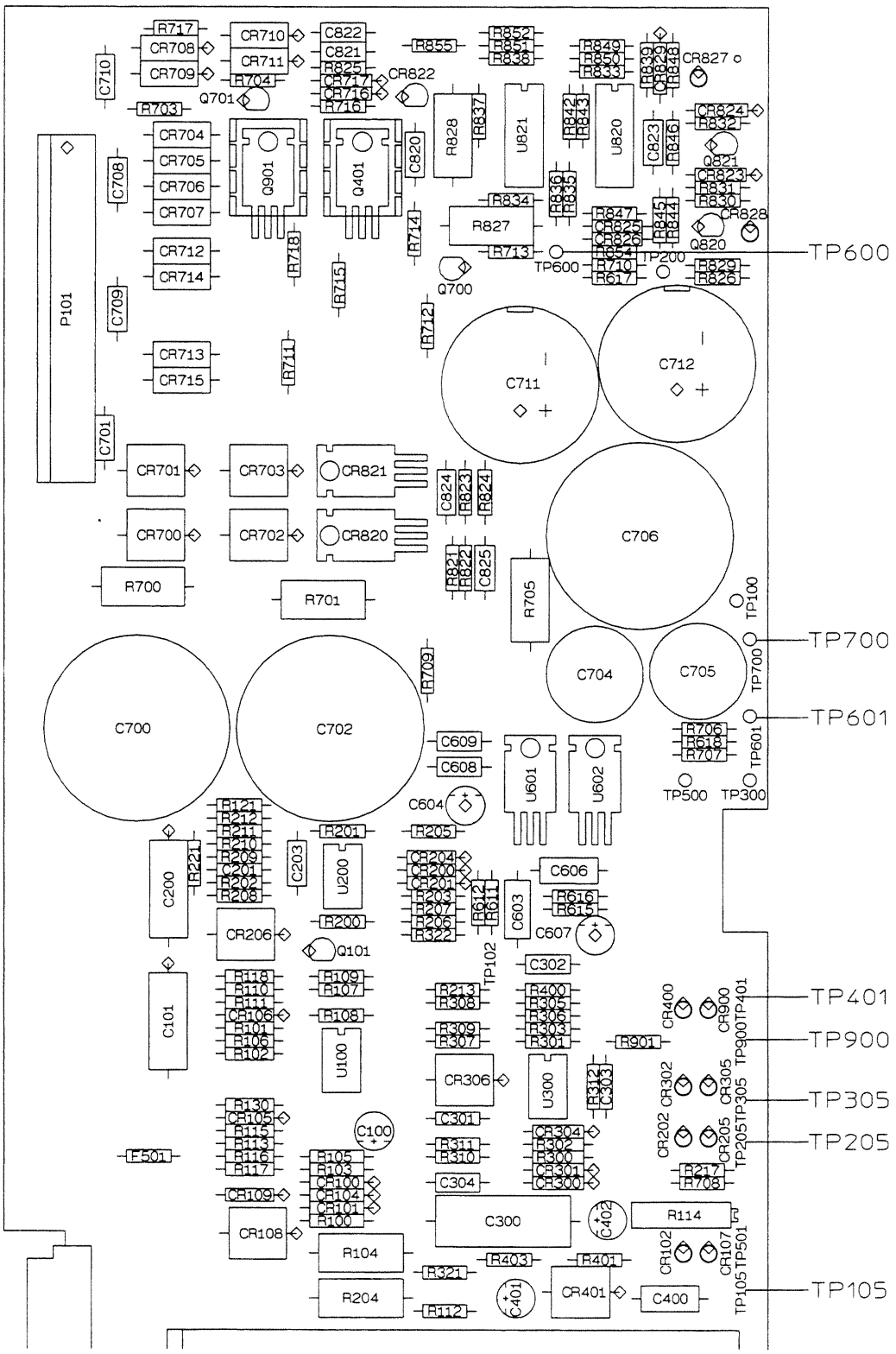
The voltage levels and ripple tolerances are for fully loaded supplies. If the A90 Power Supply assembly is not in the HP 89430A or assemblies are removed, the voltage levels and ripple tolerances will vary.

Test Location	Nominal Voltage	Minimum Voltage	Maximum Voltage	Ripple Tolerance
TP105	+15 V	+14.97 V	+15.03 V	50 μVrms
TP600	–18 V	–18.33 V	–17.67 V	—
TP601	+18 V	+17.67 V	+18.33 V	—
TP401	–5.5 V	–5.30 V	–5.20 V	—
TP900	+5.5 V	+5.20 V	+5.30	—
TP305	+8.7 V	+8.50 V	+8.90 V	75 μVrms
TP205	–15 V	–15.33 V	–14.97 V	50 μVrms

5 If +15 V is present but out of tolerance, set A90 J150 to its normal position and do the power supply adjustment on page 2-17 before replacing the A90 Power Supply assembly.

6 If +15 V will not adjust to within tolerance or any of the other voltages are incorrect, the A90 Power Supply assembly is probably faulty.

7 If the above voltages are correct, the fan is turning, no red LEDs are lit, and the green Power Valid LEDs are lit, the Power Supply assembly is operating correctly. Go to page 1-21, "To troubleshoot control failures."



❑ Step 5. Check for power supply loading.

1 Set the rear panel line switch to off (O).
2 Wait five minutes for the power supply capacitors to discharge.
3 Remove the A90 Power Supply assembly from its card nest keeping A90 P101 connected to the transformer.
4 Place the Power Supply assembly on an insulated surface.

Caution

Be careful not to short the power supplies when troubleshooting. Do not place the Power Supply assembly on the card nest without adequate insulation. Shorting the power supplies may damage components on the Power Supply assembly.

5 Set the rear panel line switch to on (I).
6 If a red Over Current LED is lit, the Power Supply assembly is probably faulty.
7 If the green Power Valid LEDs are lit and the red LEDs are off, the Power Supply assembly is probably not the cause of the failure.

❑ Step 6. Isolate the assembly loading the A90 Power Supply assembly.

1 Set the rear panel line switch to off (O).
2 Wait five minutes for the power supply capacitors to discharge.
3 Set A90 J105 to its normal position.
4 Reinstall the Power Supply assembly in the card nest.
5 Set the rear panel line switch to on (I).
6 Repeat the following steps for each assembly suspected of loading the Power Supply assembly.

   Use the "Power Supply Voltage Distribution" table on page 6-5 and the "Motherboard Voltages" table on page 6-15 to help isolate the failing assembly.

7 Set the front panel power switch to standby (⏻).
8 Remove the suspected assembly.
9 Set the front panel power switch to on (I).
10 If no red LEDs are lit, the assembly just removed is probably faulty.

To troubleshoot control failures

Use this test to isolate control failures between the A91 Digital Control assembly, the A81 40 MHz Reference assembly, the A82 600 MHz Reference assembly, and the HP 89410A's serial port.

❑ Step 1. Check the 40 MHZ REF signal (A81 J2) and 40 MHZ CPU signal (A82 J5).

1 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Coupling	**ac**
Range	**+10 dBm**
Frequency	
Center	**40 MHz**
Span	**10 MHz**

2 Check that A81 J2 is 40 MHz, –2.5 ±2 dBm.

3 If the signal is incorrect, the A81 40 MHz Reference assembly is probably faulty.

4 Reconnect A81 J2 to A82 J5.

5 Change the spectrum analyzer's span to 1 MHz.

6 Check that A82 J5 is 40 MHz, 1.0 ±1 dBm.

7 If the signal is incorrect, the A82 600 MHz Reference assembly is probably faulty.

8 Reconnect A82 J5 to A91 J1.

❑ Step 2. Check the HP 89410A's serial port controller.

1 Disconnect the serial interface interconnect cable from the HP 89410A's SERIAL 2 port.

2 Set the HP 89410A's power switch to off (O), then to on (I).

Power must be cycled after the cable is disconnected from the SERIAL 2 port. The serial port controller test will fail if the HP 89410A is not powered up after the SERIAL 2 port cable is disconnected.

3 When the power-up tests are finished, press the following keys:

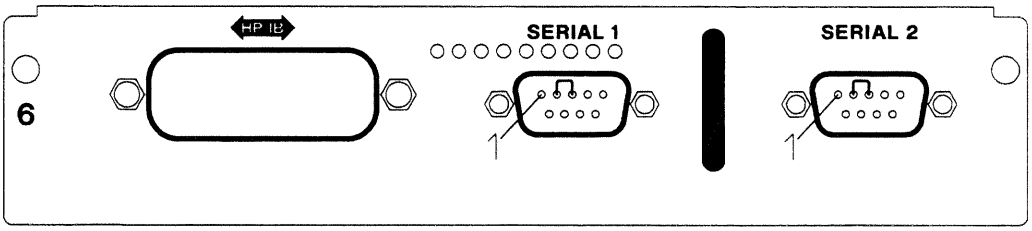
[System Utility]
[more]
[diagnostics]
[service functions]
1125
[enter]
[functional tests]
[I/O]
[serial port controller]

4 If the serial port controller test fails, the HP 89410A's A42 Memory assembly is probably faulty. See the *HP 89410A Service Guide* for replacement information.

❑ Step 3. Check the HP 89410A's serial ports.

1 Connect SERIAL 1 pin 2 to pin 3.

2 Connect SERIAL 2 pin 2 to pin 3.



3 Press the following keys:

[Return]
[Return]
[special test modes]
[I/O]
[serial port loop back]

4 If the serial port test fails, the HP 89410A's A42 Memory assembly is probably faulty. See the *HP 89410A Service Guide* for replacement information.

5 If the self test passes, the HP 89430A's A91 Digital Control assembly is probably faulty.

To troubleshoot frequency reference failures

Use this test to do a complete check of the frequency references.

❑ Step 1. If the message `Ref UNLOCKED to External Ref input` was displayed at power on, check that a BNC cable is connected from the HP 89430A's 10 MHz REF TO IF SECTION connector to the HP 89410A's EXT REF IN connector.

❑ Step 2. If the HP 89430A has an OVEN REF OUT connector, check the HP 89430A's oven reference.

1 Disconnect the coax BNC-to-coax BNC connector from the OVEN REF OUT connector and the EXT REF IN connector.

2 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Coupling	**ac**
Range	**+10 dBm**
Frequency	
Center	**10 MHz**
Span	**1 MHz**
Display	
Reference level	**10 dBm**
Trace 1	**Log magnitude**
Scale	**10 dB/div**

3 Connect the spectrum analyzer to the OVEN REF OUT connector.

4 If the HP 89430A has been on for >10 minutes, check that the measured voltage is 10 MHz, +6 ±2 dBm (the cold oven level is <–70 dBm).

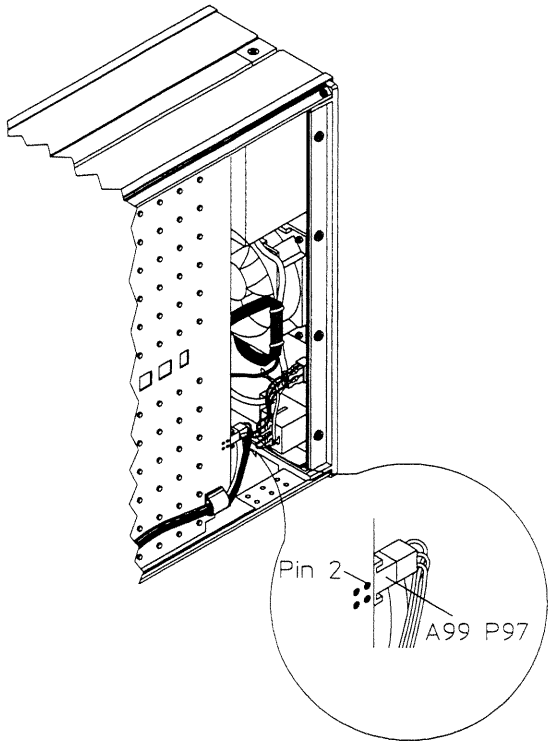
5 If the signal is correct, reconnect the coax BNC-to-coax BNC connector to the OVEN REF OUT connector and the EXT REF IN connector, then go to Step 4.

6 If the signal is present but the frequency is incorrect, do the oven adjustment on page 2-16 before replacing the A80 Oven Oscillator assembly.

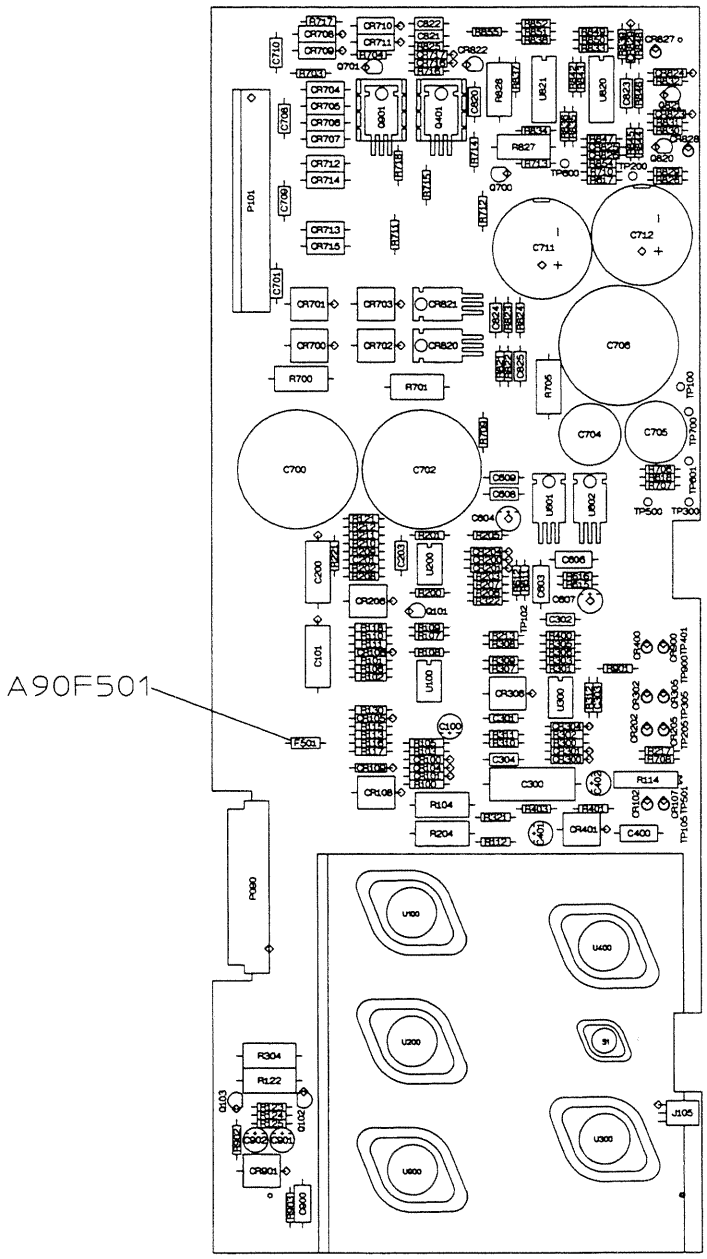
7 Place the HP 89430A on the side closest to the power switch.

8 Remove the bottom cover.

9 Check that the voltage at A99 P97 pin 2 is >20 Vdc.



10 If the voltage is correct, the A80 Oven Oscillator assembly is probably faulty.
11 If the voltage is not correct, replace the A90 F501 fuse.
See page 4-19 for the fuse part number.



❑ Step 3. If the HP 89430A does not have an OVEN REF OUT connector (option AY4, Delete High Precision Frequency Reference), check that the signal to the HP 89430A's EXT REF IN connector is 1 MHz, 2 MHz, 5 MHz, or 10 MHz with an amplitude >0 dBm.

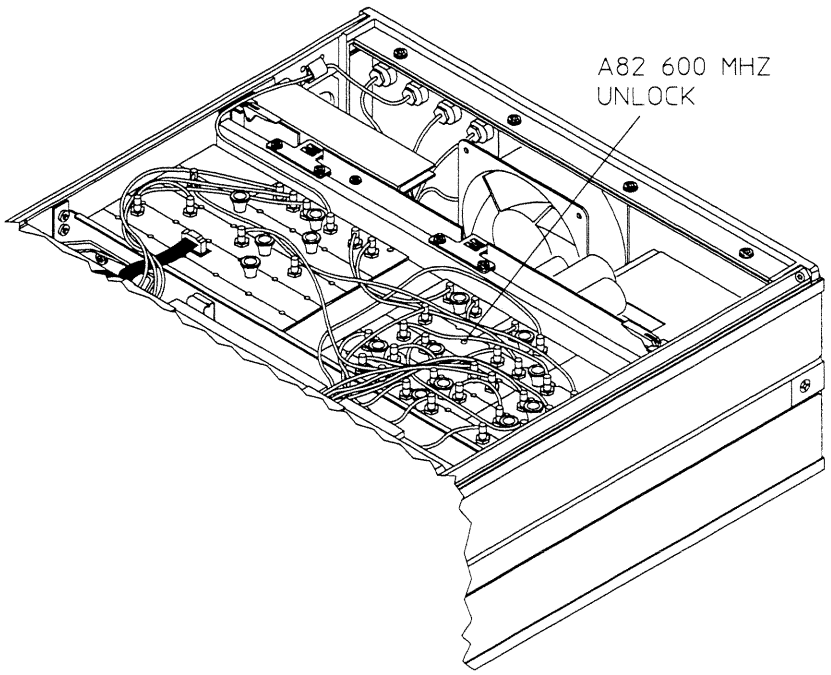
Residual phase noise requires a 10 MHz signal with an amplitude ≥5 dBm.

❑ Step 4. Check the following frequency reference signals using the spectrum analyzer. Reconnect each RF cable before checking the next signal.

Test Location	Signal Name	Frequency	Amplitude	Probable Faulty Assembly
A81 J2	40 MHZ REF	40 MHz	–2.5 ±2 dBm	A81 40 MHz Reference
A81 J3	10 MHZ YIG	10 MHz	–2 ±2 dBm	A81 40 MHz Reference
A81 J4	REF TO IF	10 MHz	–2 ±2 dBm	A81 40 MHz Reference
A81 J5	10 MHZ OUT	10 MHz	+6 ±2 dBm	A81 40 MHz Reference
A82 J3	40 MHZ SRCE	40 MHz	+3 ±1 dBm	A82 600 MHz Reference
A82 J4	40 MHZ RCVR	40 MHz	+3 ±1 dBm	A82 600 MHz Reference
A82 J5	40 MHZ CPU	40 MHz	+1 ±1 dBm	A82 600 MHz Reference

❑ Step 5. If the message `Local oscillator unlocked in RF section` was displayed at power on, check the 600 MHz LO reference signal.

1 Check that the 600 MHz UNLOCK LED is off.



2 If the 600 MHz UNLOCK LED is on, do the reference adjustments on pages 2-6 and 2-7 before replacing the A82 600 MHz Reference assembly.

3 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Coupling	**ac**
Range	**+10 dBm**
Frequency	
Center	**600 MHz**
Span	**200 kHz**
Display	
Reference level	**10 dBm**
Trace 1	**Log magnitude**
Scale	**10 dB/div**

4 Check that A82 J1 (600 MHZ LO) is 600 MHz, +3 dBm to +6 dBm.

5 If the signal is incorrect, do the reference adjustments on pages 2-6 and 2-7 before replacing the A82 600 MHz Reference assembly.

6 Reconnect the SMB cable to A82 J1. Go to page 1-32, "To troubleshoot local oscillator failures."

❑ Step 6. If the frequency reference signals are correct, go to page 1-28, "To troubleshoot using internal tests."

To troubleshoot using internal tests

Use this test when the HP 89410A is communicating with the HP 89430A. This test checks the fault log and test log for failures. For descriptions of the fault log messages, see "Fault Log Messages" starting on page 7-5.

❑ Step 1. Check for failing internal tests.

1 Press the following keys:

[System Utility]
[single cal]
[auto cal **off**]
[more]
[diagnostics]
[fault log **on**]

2 Wait for calibration to finish, then note any failure messages.

3 Press [test log **on**].

4 Determine the probable faulty assemblies and next test by comparing the fault log and test log results to the following table.

If the analyzer's fault log or test log messages match more than one entry in the table, use the entry closest to the beginning of the table. Assemblies are listed in order of probable failure when more than one assembly can cause the failure.

The table lists the probable faulty assembly or assemblies and troubleshooting procedure to do before replacing an assembly. The messages in the table include only the parts of the failure messages that point to the assemblies failing. For example, many of the failure messages give the amplitude (mkr y: amplitude) and frequency (mkr x: frequency) of the failure.

Internal Tests Troubleshooting Guide

Message Displayed	Probable Faulty Assembly	Next Test
RF Section Flash ROM Failure	A91 Digital Control	
RF Section Calibration Table Invalid RF Section Program ROM Corrupt	A91 Digital Control	Calibration factors, page 2-18
Local oscillator unlocked in RF section	A50 YIG Oscillator A61 YIG Loop Phase Detector A62 YIG Driver A60 Local Oscillator	Local oscillator, page 1-32
RF Section LO Calibration Failure	A50 YIG Oscillator A61 YIG Loop Phase Detector A62 YIG Driver A60 Local Oscillator	Local oscillator, page 1-32
Calibration information: No cal path through RF unit.	A10 Receiver A25 3rd Mixer Amplifier A24 Stage 1 Second IF A23 Stage 2 Second IF A22 Stage 3 Second IF A27 LO Feedthrough Control A60 Local Oscillator A33 Source AM/1st Conversion A70 Source	Receiver, page 1-37
Cal Signal Level from RF Section Out of Range	A10 Receiver A25 3rd Mixer Amplifier A24 Stage 1 Second IF A23 Stage 2 Second IF A22 Stage 3 Second IF	Receiver, page 1-37
IF Range Selection Problem during Calibration	A10 Receiver A25 3rd Mixer Amplifier A24 Stage 1 Second IF A23 Stage 2 Second IF A22 Stage 3 Second IF	Receiver, page 1-37
RF Section LO Null Failure	A27 LO Feedthrough Control A10 Receiver	Receiver, page 1-37
Calibration information: RF Source gain low	A33 Source AM/1st Conversion A70 Source A32 Stage 1 First IF Filter A31 Stage 2 First IF Filter A60 Local Oscillator	RF Source, page 1-47

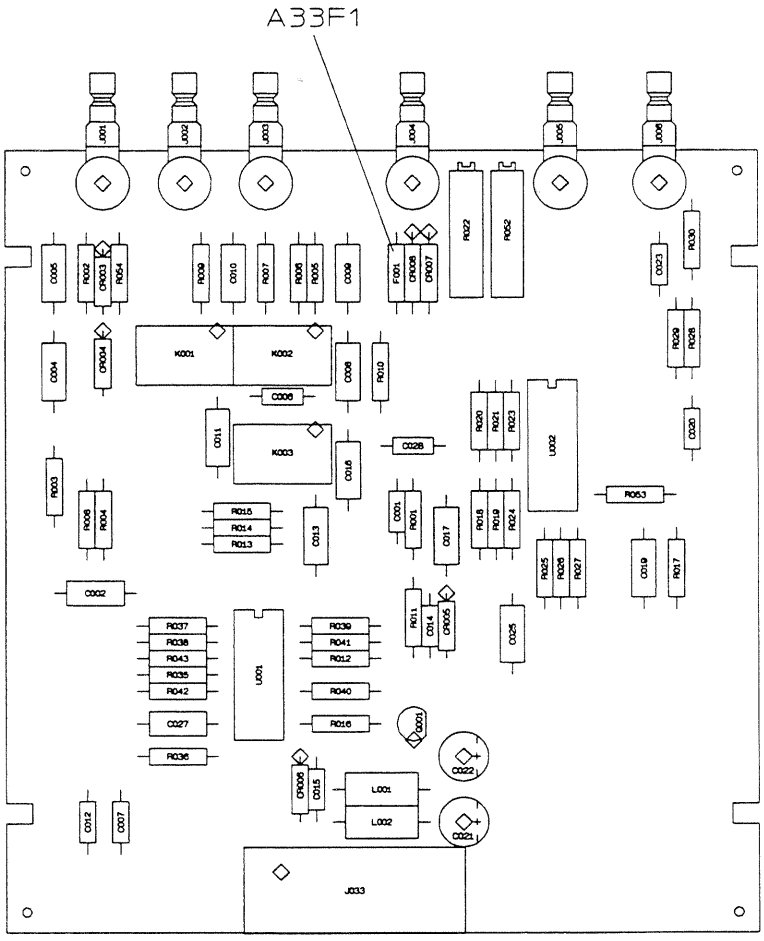
❑ Step 2. If all the internal tests passed, determine the probable faulty assembly and next step or test by comparing the analyzer's symptoms to the following table.

Failure	Probable Faulty Assembly	Next Step or Test
Rear panel oven ref out	A90 F501 fuse A80 Oven Oscillator	Frequency reference, page 1-23
Rear panel 10 MHz ref out	A81 40 MHz Reference	
Source	A33 Source AM/1st Conversion A70 Source (option AY8 installed)	RF source, page 1-47
No input when analyzer is in [RF section (0-10 MHz)] mode	A10 Receiver A25 3rd Mixer Amplifier	Receiver, page 1-37
No source output when analyzer is in [RF section (0-10 MHz)] or [IF section (0-10 MHz)] mode	A33 Source AM/1st Conversion A70 Source (option AY8 installed)	RF source, page 1-47
No source output when analyzer is in [RF section (2-1800 MHz)] mode	RF Source option not installed Analyzer in [Scalar] mode	
AM modulation	A33 F1 fuse A33 Source AM/1st Conversion	Step 3
Performance test		Performance test, page 1-53
Spurious signals		RF distortion and spurs, page 1-59

❑ Step 3. Check the fuse for the AM modulation input.

1 Set the HP 89430A's power switch to standby (⏻).
2 Remove the A33 Source AM/1st Conversion assembly.
3 Measure the resistance across A33 F1 using a multimeter.
4 If the resistance is 0 Ω, the A33 Source AM/1st Conversion assembly is probably faulty.
5 If the resistance is >0 Ω, replace the A33 F1 fuse.

See page 4-19 for the fuse part number.



To troubleshoot local oscillator failures

Use this test to isolate local oscillator failures to one of the following assemblies:

- A50 YIG Oscillator
- A60 Local Oscillator
- A61 YIG Loop Phase Detector
- A62 YIG Driver

To check signals above 1 GHz, use the SMA(m)-to-SMA(m) cable. If an amplitude is within ±5 dB of the correct value, use a power meter to check the signal's amplitude before replacing the assembly. The spectrum analyzer and cables can add considerable error to the measurement.

❑ Step 1. Check the IF OUTPUT signal (A60 J302).

1 Connect a 50Ω termination to A62 J2.

2 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Attenuation	**+20 dB**
Frequency	
Start	**10 MHz**
Stop	**1 GHz**
Resolution BW	**100 kHz**
Display format	**Log magnitude** **Max hold**
Scale	
Reference level	**10 dBm**
dB/division	**1 dB/div**

3 Disconnect the cable from A61 J3. Connect the spectrum analyzer to the disconnected cable using an SMB(m)-to-SMB(m) adapter, an SMB(f)-to-BNC(m) cable, and a BNC(f)-to-N(m) adapter.

4 Press the following keys:

[**System Utility**]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[PRESET]

The [PRESET] key is highlighted when pressed. Wait for the preset function to complete and the highlighting to turn off (about 1 minute). Ignore the displayed messages.

5 Check that the signal is between 10 MHz and 1 GHz with an amplitude >–3 dBm. Note the measurement result.

6 Press the following keys:

[LO debug]
[DAC]
1950
[enter]
[lo offset **3000**]

7 Check that the signal moved but is still be between 10 MHz and 1 GHz with an amplitude >–3 dBm. Note the measurement result.

8 Press the following keys:

[DAC]
2550
[enter]
[lo offset **3600**]

9 Check that the signal moved but is still between 10 MHz and 1 GHz with an amplitude >–3 dBm. Note the measurement result.

10 Reconnect the cable to A61 J3.

11 If there was no signal or a low amplitude signal for all three measurements, the A60 Local Oscillator assembly or A50 YIG Oscillator assembly is probably faulty. Go to Step 2 to check the YIG OUT signal.

12 If at least one measurement was correct but not all, the A60 Local Oscillator assembly or A91 Digital Control assembly is probably faulty. Go to Step 3 to check the control signals.

13 If all three measurements were correct, the A61 YIG Loop Phase Detector assembly or the A62 YIG Driver assembly is probably faulty. Go to Step 4 to check the A62 YIG Driver assembly.

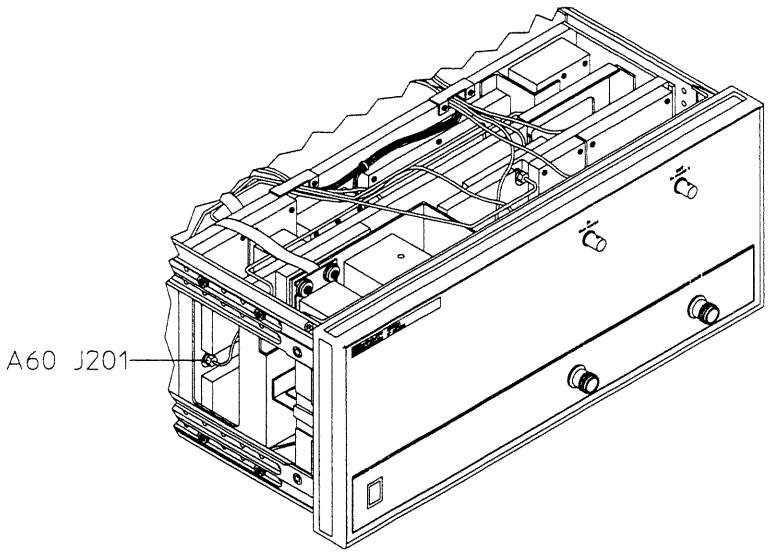
❑ Step 2. Check the YIG OUT signal.

1 Remove the cover from the side closest to the power switch.

2 Set the spectrum analyzer as follows:

Input	
Attenuation	**+ 30 dB**
Frequency	
Start	**2 GHz**
Stop	**3 GHz**
Resolution BW	**1 MHz**
Scale	
Reference level	**20 dBm**
dB/division	**1 dB/div**

3 Disconnect the cable from A60 J201. Connect the spectrum analyzer to the disconnected cable using an SMA(f)-to-SMA(f) adapter, an SMA(m)-to-SMA(m) cable, and an SMA(f)-to-N(m) adapter.



4 Press the following keys:

[DAC]
880
[enter]

5 Check that the signal is between 2 and 3 GHz with an amplitude >13.5 dBm.

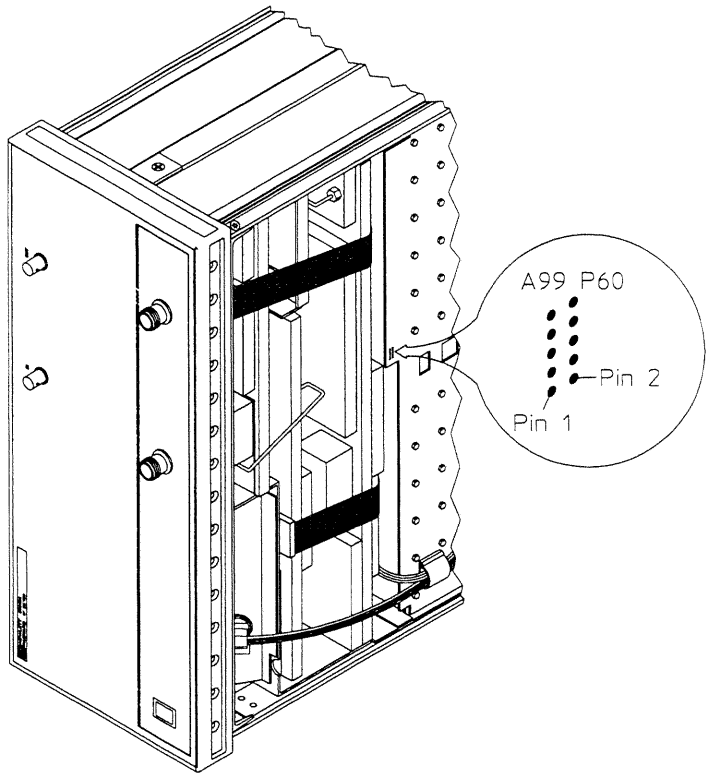
6 If the signal is incorrect, the A50 YIG Oscillator assembly is probably faulty.

7 If the signal is correct, the A60 Local Oscillator assembly is probably faulty.

❑ Step 3. Check the control lines to the A60 Local Oscillator assembly.

1 Disconnect the cables from the HP 89410A's front panel.
2 Keeping the rear panel cables connected, place the HP 89430A on the side closest to the power switch.
3 Remove the bottom cover.
4 Set the LO offset to the values in the following table and check that the signals are the correct TTL-level using a logic probe.

LO offset	LOOFFS0 (A99 P60 pin 1)	LOOFFS1 (A99 P60 pin 2)
2400	Low	Low
3000	High	Low
3600	Low	High



5 If the signals are incorrect, the A91 Digital Control assembly is probably faulty.
6 If the signals are correct, the A60 Local Oscillator assembly is probably faulty.

❑ Step 4. Check the A62 YIG Driver assembly.

1 Remove the cover from the side closest to the power switch.

2 Set the spectrum analyzer as follows:

Input	
Attenuation	**+ 30 dB**
Frequency	
Start	**2 GHz**
Stop	**5 GHz**
Resolution BW	**1 MHz**
Display format	**Max hold**
Scale	
Reference level	**20 dBm**
dB/division	**1 dB/div**

3 Disconnect the cable from A60 J201. Connect the spectrum analyzer to the disconnected cable using an SMA(f)-to-SMA(f) adapter, an SMA(m)-to-SMA(m) cable, and an SMA(f)-to-N(m) adapter.

4 Press the following keys:

[Return]
[PRESET]

Wait for the preset function to complete and the highlighting to turn off (about 1 minute).

5 Press clear display and max hold on the spectrum analyzer.

6 Press the following keys:

[LO debug]
[DAC]
700
[enter]

7 Press and hold the up arrow key.

8 Check that the signal sweeps from at least 2.4 to 4.3 GHz as the value of the DAC increases and that the signal's amplitude is >13.5 dBm.

The signal sweeps from 2.4 to 4.3 GHz in about 6 minutes.

9 If the tuning range is incorrect or if there are drop-out points, the A62 YIG Driver assembly is probably faulty.

10 If the signal is correct, the A61 YIG Loop Phase Detector assembly is probably faulty.

The A91 Digital Control assembly controls the DAC on the A62 YIG Driver assembly and sets the N value for the A61 YIG Phase Loop Detector assembly. The Digital Control assembly is unlikely to cause the failure. However, if replacing the YIG Phase Loop Detector assembly or YIG Driver assembly fails to correct the problem, suspect the Digital Control assembly.

To troubleshoot receiver failures

Use this test to isolate receiver failures to one of the following assemblies:

- A10 Receiver
- A24 Stage 1 Second IF
- A23 Stage 2 Second IF
- A22 Stage 3 Second IF
- A25 3rd Mixer Amplifier
- A33 Source AM/1st Conversion
- A27 LO Feedthrough Control
- A70 Source

❑ Step 1. Check the normal signal path.

1 Connect the synthesizer to the HP 89430A's front panel INPUT connector using a BNC cable and an N(m)-to-BNC(f) adapter.

2 Set the synthesizer to 5 MHz, –6 dBm.

3 Press the following keys:

[Preset]
[System Utility]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[PRESET]
[Shift]
[Marker]

4 Check that the signal is 901 MHz, –6 ±2 dBm.

5 If the signal level is <–60 dBm or the frequency is incorrect, go to Step 5.

6 Change the synthesizer's amplitude to –30 dBm.

7 Press the following keys:

[input]
[attenuator]
0
[enter]
[**Marker/Entry**].

8 Check that the signal level is 0 ±2 dBm.
9 Using the RPG knob, check that the signal level decreases 5 dB for each increase in attenuator value.
10 If the relays are operating correctly but the signal level is not correct, go to Step 5.
11 If the relays are not operating correctly, the A10 Receiver assembly is probably faulty.

❑ Step 2. Check the bypass signal path.

1 Change the synthesizer's frequency to 6 MHz.
2 Press the following keys:

[**Return**]
[PRESET]
[input]
[bypass]
[**Shift**]
[**Marker**]

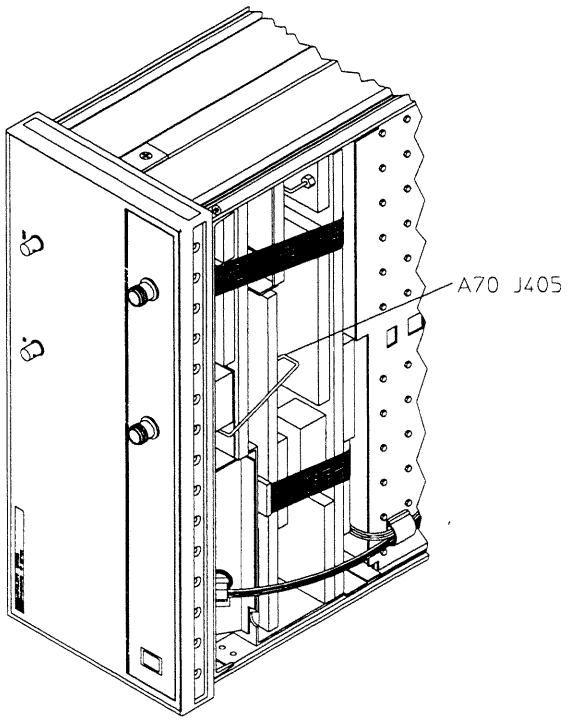
3 Check that the signal is 901 MHz, –18 ±2 dBm signal.
4 If the signal is correct, go to Step 3.
5 Disconnect the cable connected to A25 J4 (RCVR BYPASS). Connect the spectrum analyzer to the disconnected cable using a BNC(m)-to-SMB(f) cable and SMB(m)-to-SMB(m) adapter.
6 Check that the signal is 6 MHz, –30 dBm.
7 If the signal is incorrect, the A10 Receiver assembly is probably faulty.
8 If the signal is correct, the A25 3rd Mixer Amplifier assembly is probably faulty.

❑ Step 3. Check the calibration signal path.

1 Set the synthesizer to 5 MHz, –6 dBm.
2 Connect the synthesizer to the HP 89430A's front panel IN (from source) connector.
3 Press the following keys:

[cal]
[Shift]
[Marker]

4 Check that the signal is 901 MHz, –16 ±2 dBm.
5 If the signal is correct, go to Step 4.
6 Connect the spectrum analyzer to A33 J2 (CAL OUT).
7 Check that the signal is 5 MHz, –6 ±2 dBm.
8 If the signal is incorrect, the A33 Source AM/1st Conversion assembly is probably faulty.
9 If the signal is correct and the optional RF source is not installed, the A10 Receiver assembly is probably faulty.
10 Reconnect the cable to A33 J2.
11 Place the HP 89430A on the side closest to the power switch.
12 Remove the bottom cover.
13 Connect the spectrum analyzer to A70 J405 (SRCE RCVR to A10 J503) using an SMB(f)-to-BNC(m) cable, a right angle SMA(m)-to-SMA(f) adapter, and an SMA(f)-to-SMB(m) adapter.



14 Check that the signal is 5 MHz, –6 ±2 dBm.
15 If the signal is correct, the A10 Receiver assembly is probably faulty.
16 If the signal is incorrect, the A70 Source assembly is probably faulty.

❑ Step 4. Check the local oscillator null.

1 Disconnect the synthesizer from the HP 89430A.
2 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Range	**–20 dBm**
Frequency	
Center	**11 MHz**
Span	**10 MHz**
Display	
Reference level	**–35 dBm**
Trace 1	**Log magnitude**
Scale	**1 dB/div**

doesn't work unless box is operational

3 Press [normal].
4 Connect the spectrum analyzer to the OUT (to channel 1) connector on the HP 89430A's front panel.
5 Adjust the spectrum analyzer's reference level until the signal is visible.

The signal displayed at 11 MHz is the LO feed-through signal for a 5 MHz center frequency.

6 If the signal is < –30 dBm, the LO feed-through cancellation circuits are functioning correctly. Go to Step 5.
7 Increase the [LOI null] setting by 200 while watching the signal.
8 Return the [LOI null] setting to the original number.
9 Reduce the [LOQ null] setting by 200 while watching the signal.
10 Return the [LOQ null] setting to the original number.
11 If the signal is > –30 dBm but changed when LOI and LOQ were changed, the A10 Receiver is probably faulty.
12 If the signal did not change when LOI and LOQ were changed, the A27 LO Feedthrough Control assembly is probably faulty.

❑ Step 5. Check the second and third IF signal path.

1 Connect the synthesizer to the HP 89430A's front panel INPUT connector using a BNC cable and an N(m)-to-BNC(f) adapter.

2 Set the synthesizer to 5 MHz, 0 dBm.

3 Press the following keys:

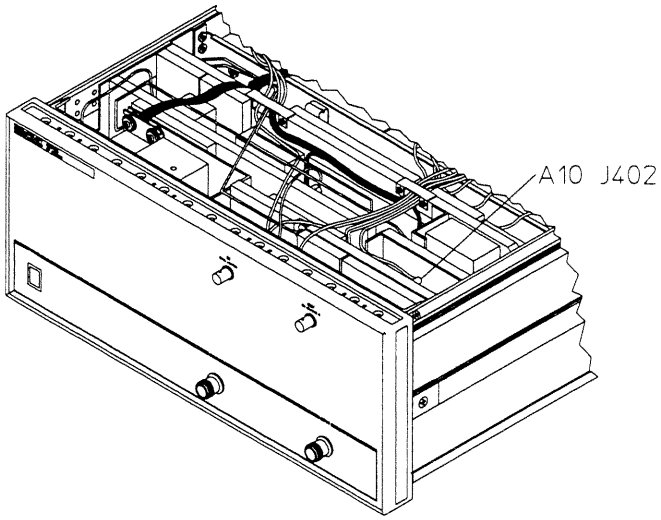
[System Utility]
[more]
[diagnostics]
[service functions]
[special test modes]
[RF section]
[PRESET]

4 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Attenuation	**0 dB**
Frequency	
Center	**46 MHz**
Span	**10 MHz**
Resolution BW	**10 kHz**
Display format	**log magnitude**
Scale	
Reference level	**–20 dBm**
dB/division	**10 dB/div**

5 Check the following signals using a spectrum analyzer, an SMB(f)-to-BNC(m) cable, and a BNC(f)-to-N(m) adapter. Reconnect each cable after measuring the signal.

Test Location	Frequency	Amplitude (±3 dB)	Probable Faulty Assembly or Next Step
A10 J402	46 MHz	–31 dBm	Step 7
A24 J2	46 MHz	–32 dBm	A24 Stage 1 Second IF Filter
A23 J2	46 MHz	–33 dBm	A23 Stage 2 Second IF Filter
A22 J2	46 MHz	–34 dBm	A22 Stage 3 Second IF Filter



6 Set the spectrum analyzer as follows:

Input	
Attenuation	**10 dB**
Frequency	
Center	**6 MHz**
Span	**5 MHz**
Scale	
Reference level	**−10 dBm**

7 Check that A25 J3 is 6 MHz, −13 ±2 dBm.

8 If the signal is incorrect, the A25 3rd Mixer Amplifier assembly is probably faulty.

❑ Step 6. Check the A10 Receiver assembly's signal path.

1 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Attenuation	**10 dB**
Frequency	
Start	**42 MHz**
Stop	**50 MHz**
Sweep time	**40 ms**
Resolution BW	**3 MHz**
Display format	**log magnitude** **Max Hold**
Scale	
Reference level	**–9 dB**
dB/division	**1 dB/div**

2 Set the synthesizer as follows:

Frequency	
Start	**42 MHz**
Stop	**50 MHz**
Amplitude	**–10 dBm**
Sweep	**continuous**
Time	**0.3 s**
Type	**linear frequency**

3 Set the HP 89410A's power switch to off (O), then to on (I).

4 Press the following keys:

[**Frequency**]
[start]
42
[MHz]
[stop]
50
[MHz]
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[input]
[attenuator]
0
[enter]

5 Connect the spectrum analyzer to A10 J402 (2ND IF IN to A24 J1) using an SMB(f)-to-BNC(m) cable.

6 Wait for several sweeps to occur.

7 Check that the signal measures −11 ± 3 dBm from 42 to 50 MHz.

8 If the signal is incorrect, go to Step 7.

9 If the HP 89430A is failing its amplitude or flatness specification, check the A10 Receiver assembly at the failing frequency or attenuator setting.

To check other frequencies, change the synthesizer's frequency to any 8 MHz span between 2 MHz and 1.8 GHz. Set the analyzer's start and stop frequencies for a span less than 7 MHz. Check that the signal at A10 J402 is −10 ±2 dBm from 42 MHz to 50 MHz. When testing above 100 MHz, allow for errors caused by the cables.

To check other attenuator settings, change the analyzer's attenuator setting. The signal at A10 J402 should drop 5 dB for each 5 dB increase in attenuator setting.

10 If the signal is correct, perform the following adjustments starting on page 2-10.

"To adjust receiver gain" to check the A25 3rd Mixer Amplifier assembly
"To adjust calibration factors" to check the calibration

❑ Step 7. Check the 2ND LO RCVR signal (A60 J603) and the 1ST LO RCVR signal (A60 J150).

Use the SMA(m)-to-SMA(m) cable to check the signals. If an amplitude is within ±5 dB of the correct value, use a power meter to check the signal's amplitude before replacing the assembly.

1 Press the following keys:

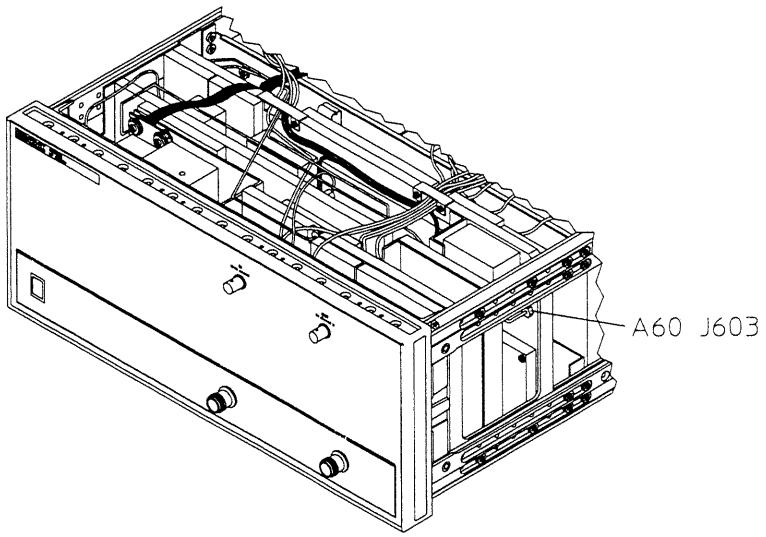
[Preset]
[Instrument Mode]
[Scalar]
[receiver]
[RF section (2-1800 Hz)]

2 Set the spectrum analyzer as follows:

Frequency	
Center	**2.4 GHz**
Span	**800 MHz**
Resolution BW	**30 kHz**

3 Remove the cover from the side closest to the front panel connectors.

4 Check that A60 J603 is 2.4 GHz, ≥–15 dBm.

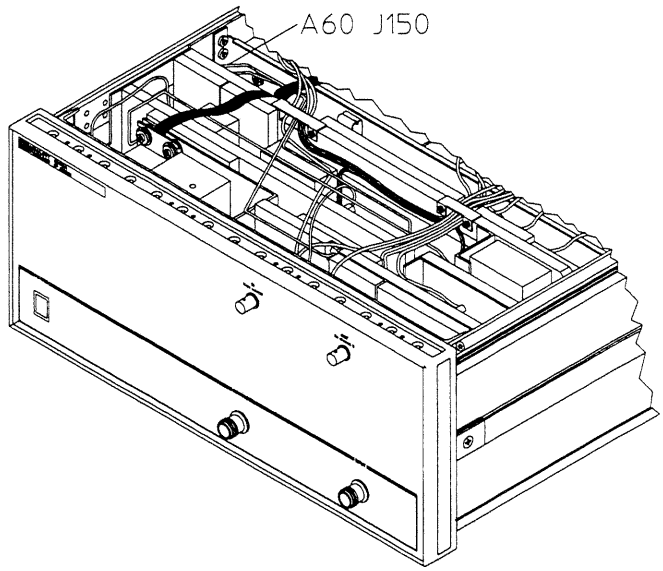


5 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.

6 Set the spectrum analyzer as follows:

Input	
Attenuation	**+40 dB**
Frequency	
Start	**2.3 GHz**
Stop	**4.5 GHz**
Resolution BW	**1 MHz**
Display	**Max hold**
Scale	
Reference level	**25 dBm**
dB/division	**5 dB/div**

7 Check that A60 J150 is sweeping from 2.451 to 4.246 GHz in 1 MHz steps, +20 ±3 dBm.



8 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.
9 Reconnect the cables to A60 J150 and A60 J603.
10 If both signals are correct, the A10 Receiver assembly is probably faulty.

To troubleshoot RF source failures

Use this test to isolate RF source failures to one of the following assemblies:

- A33 Source AM/1st Conversion
- A70 Source
- A32 Stage 1 First IF filter
- A31 Stage 2 First IF Filter
- A60 Local Oscillator

❑ Step 1. Check the source output.

1 Connect the HP 89430A's SOURCE to the HP 89430A's INPUT.

2 Press the following keys:

[**Preset**]
[**Instrument Mode**]
[Vector]
[receiver]
[RF section (2-1800 MHz)]
[**Frequency**]
[center]
6
[MHz]
[**Source**]
[source **on**]
[**Shift**]
[**Marker**]

3 Check that the signal is 6 MHz, –10 ±2 dBm.

4 If the frequency is incorrect or the amplitude is < –60 dBm, go to Step 5.

❑ Step 2. Check the source output attenuators.

1 Press the following keys:

[level]
–27
[dBm]
[**Ref Lvl/Scale**]
[Y ref level]
10
[dBm]
[**System Utility**]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[source]
[**Shift**]
[**Marker** →]
[level]

2 Set the source to the levels in the following table and check the relative measurements.

Level	Relative Measurement (± 3 dB)
–17	+0 dB
–16	+10 dB
–6	+20 dB
4	+30 dB

3 If any of the relative measurements are incorrect, the A70 Source assembly is probably faulty.

❑ Step 3. Check the bypass signal path.

1 Press the following keys:

−17
[enter]
[**Return**]
[input]
[bypass]

2 Check that the relative measurement is +21 ±3 dB.
3 If the measurement is correct, go to Step 4.
4 Connect A33 J3 to the HP 89430A's INPUT connector using an SMB(f)-to-BNC(m) cable and a BNC(f)-to-N(m) adapter.
5 Check that the relative measurement is +23 ±2 dB.
6 If the measurement is correct, the A70 Source assembly is probably faulty.
7 If the measurement is incorrect, the A33 Source AM/1st Conversion assembly is probably faulty.

❑ Step 4. Check the through signal path.

1 Press the [through] softkey.
2 Check that the relative measurement is ~~−10 ±2 dB~~. 0 ± 2dB
3 If the measurement is incorrect, the A70 Source assembly is probably faulty.

❑ Step 5. Check the source signal path.

1 Press the following keys:

[**Preset**]
[**Instrument Mode**]
[vector]
[**Source**]
[source **on**]
[**Shift**]
[**Marker**]

2 If the analyzer displays a 901 MHz, −10 ±4 dBm signal, go to Step 6.

3 Set the spectrum analyzer as follows:

Input	
Input impedance	50 Ω
Attenuation	10 dB
Frequency	
Start	42 MHz
Stop	50 MHz
Sweep time	40 ms
Resolution BW	10 kHz
Display format	log magnitude
Scale	
Reference level	−10 dBm
dB/division	10 dB/div

4 Check the following signals using a spectrum analyzer, an SMB(f)-to-BNC(m) cable, and a BNC(f)-to-N(m) adapter. Reconnect each cable after measuring the signal.

Test Location	Frequency	Amplitude (±4 dB)†	Probable Faulty Assembly
A33 J5	46 MHz	−20 dBm	A33 Source AM/1st Conversion
A32 J2	46 MHz	−21 dBm	A32 Stage 1 First IF Filter
A31 J2	46 MHz	−22 dBm	A31 Stage 2 First IF Filter

† The amplitude at A33 J5 is the HP 89410A's SOURCE output minus 10 ±2 dB.

❑ Step 6. Check the 2ND LO SRCE signal and the 3RD LO SRCE signal.

Use an SMA(m)-to-SMA(m) cable. If an amplitude is within ±5 dB of the correct value, use a power meter to confirm the signal's amplitude.

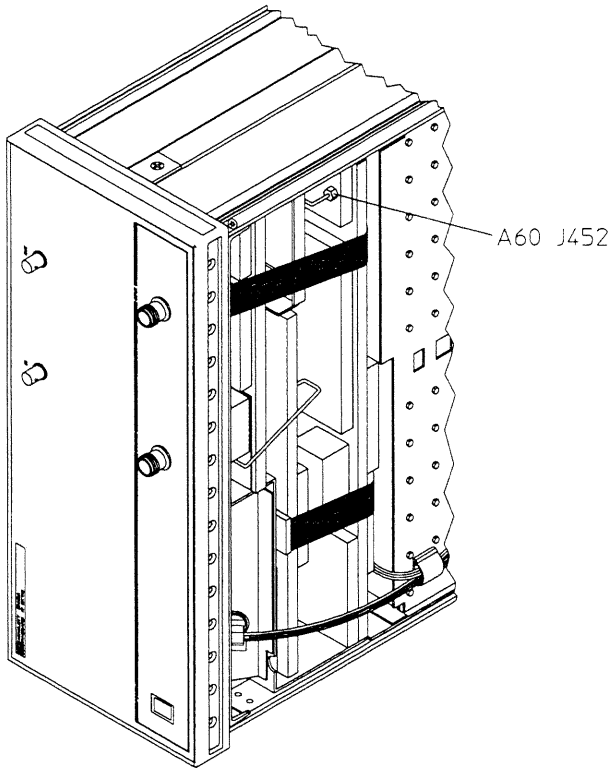
1 Set the spectrum analyzer as follows:

Frequency	
Center	**2.4 GHz**
Span	**800 MHz**
Sweep time	**20 ms**
Resolution BW	**1 MHz**

2 Place the HP 89430A on the side closest to the power switch.

3 Remove the bottom cover.

4 Connect the spectrum analyzer to A60 J452 (2ND LO SRCE to A70 J100) using an SMA(m)-to-SMA(m) cable, right angle SMA(m)-to-SMA(f) adapter, and SMA(f)-to-N(m) adapter.



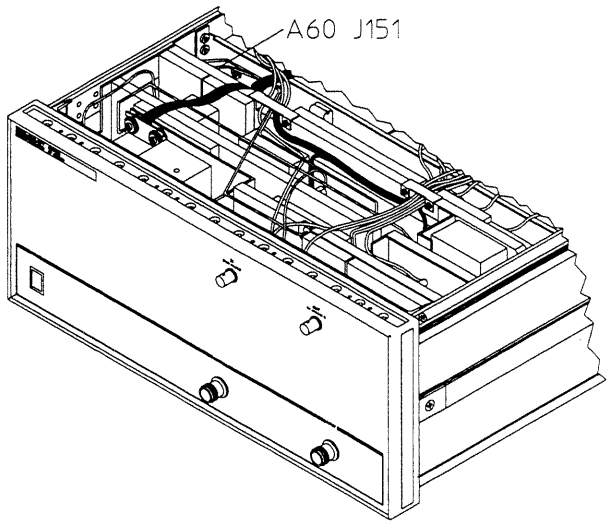
5 Check that the signal is 2.4 GHz, ≥ −13 dBm.
6 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.
7 Press the following keys:

[**Preset**]
[**Instrument Mode**]
[Scalar]
[receiver]
[RF section (2-1800 Hz)]

8 Set the spectrum analyzer as follows:

Input	
Attenuation	**+40 dB**
Frequency	
Start	**2.4 GHz**
Stop	**4.3 GHz**
Sweep time	**55 ms**
Display	**Max hold**
Scale	
Reference level	**5 dBm**
dB/division	**5 dB/div**

9 Connect the spectrum analyzer to A60 J151 (3RD LO SRCE to A70 J701) using an SMA(m)-to-SMA(m) cable, right angle SMA(m)-to-SMA(f) adapter, and SMA(f)-to-N(m) adapter.



10 Check that the signal sweeps from 2.451 to 4.246 GHz in 1 MHz steps, 0 ±3 dBm.
11 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.
12 If both signals are correct, the A70 Source assembly is probably faulty.

To troubleshoot failing performance tests

Use this test when one or more of the following performance tests fail. If a performance test not listed below is failing, see "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*.

- RF-Amplitude Accuracy
- Phase Noise
- LO Spurs
- RF-Spurious Signals
- RF-Harmonic Distortion
- RF-Noise
- RF-Source Amplitude Accuracy
- RF-Source IF-Flatness
- RF-Source Distortion
- RF-Source Noise

❑ Step 1. Determine if an adjustment is causing the HP 89430A to fail a performance test.

1 Do the adjustments in chapter 2, "Adjusting the Analyzer."

If an assembly needs an adjustment, the analyzer may fail a performance test but will probably pass its internal calibration.

2 Repeat the failing performance test.

❑ Step 2. Determine the next step or test by comparing the performance test results to the following table.

If more than one performance test fails, use the entry closest to the beginning of the table. The table lists the assemblies most likely to cause the failure and the next step or test. Probable faulty assemblies are listed in order of probability.

Failing Performance Test	Probable Faulty Assembly (in order of probability)	Next Step or Test
LO Spurs	SMA Cables HP 89410A A90 Power Supply A50 YIG Oscillator mounting Cables to A50 YIG Oscillator Fan A61 YIG Loop Phase Detector A62 YIG Driver A10 Receiver	RF distortion and spurs, page 1-59
Phase Noise	A50 YIG Oscillator A61 YIG Loop Phase Detector A81 40 MHz Reference A62 YIG Driver A82 600 MHz Reference A60 Local Oscillator	Step 3
RF-Noise	A10 Receiver A25 3rd Mixer Amplifier A24 Stage 1 Second IF A23 Stage 2 Second IF A22 Stage 3 Second IF	RF-noise, page 1-56
RF-Spurious Signals	A10 Receiver A25 3rd Mixer Amplifier A62 YIG Driver A60 Local Oscillator	RF distortion and spurs, page 1-59
RF-Harmonic Distortion	A10 Receiver A60 Local Oscillator A50 YIG Oscillator	RF distortion and spurs, page 1-59
RF-Amplitude Accuracy	A25 3rd Mixer Amplifier A10 Receiver A24 Stage 1 Second IF A23 Stage 2 Second IF A22 Stage 3 Second IF	Receiver, page 1-37
RF-Source Amplitude Accuracy	A70 Source	
RF-Source IF-Flatness	A31 Stage 2 First IF Filter A32 Stage 1 First IF Filter A33 Source AM/1st Conversion A70 Source	RF source, page 1-47
RF-Source Distortion	A70 Source	
RF-Source Noise	A31 Stage 2 First IF Filter A32 Stage 1 First IF Filter A33 Source AM/1st Conversion A70 Source	RF source, page 1-47

❑ Step 3. Check the stability and noise level of the frequency references.

1 Starting on page 1-26, check all frequency references in step 4 and the 600 MHZ LO frequency reference in step 5 for stability and a noise floor <–80 dBc/Hz for >100 Hz offset.

2 If the frequency references are stable and the noise floor is <–80 dBc/Hz, the A61 YIG Loop Phase Detector assembly is probably faulty.

To troubleshoot RF-noise failures

Use this test to determine which one of the following assemblies is causing the RF-noise performance test to fail.

- A10 Receiver
- A24 Stage 1 Second IF Filter
- A23 Stage 2 Second IF Filter
- A22 Stage 3 Second IF Filter
- A25 3rd Mixer Amplifier

❑ Step 1. Check the noise generated by the HP 89410A.

1 Load the HP 89440A performance test software (see chapter 2 in the *HP 89440A Installation and Verification Guide*).

2 Press the following keys:

[TEST CONFIG]
[PRINTER ADDRESS]
(*printer address*)
[RETURN]
[ENTER]
[RETURN]
[TEST CONFIG]
[STOP AFTER]
[LIMIT FAILURE]
[PROCEDURE]
[MORE]
[PERFORMAN]
[RETURN]
[START TESTING]
[ONE TEST]
[MORE]
[MORE]
[NOISE]

3 Follow the directions on the display.

4 If the Noise performance test fails, see the *HP 89410A Service Guide*.

❑ Step 2. Check the noise generated by the A10 Receiver assembly.

1 Press the following keys:

[START TESTING]
[ONE TEST]
[MORE]
[MORE]
[MORE]
[RF NOISE]

2 Follow the directions on the display.

3 After the test stops, press the following keys:

[BASIC]
[Shift]
[Marker]
[Shift]
[Marker →]

4 Disconnect the cable from A24 J1.

5 Press **[Meas Restart]** and wait for the averages to finish.

6 Check that the marker reading is ≥ –3 dB.

7 If the reading dropped more than approximately 4 dB, the A10 Receiver assembly is probably faulty.

❑ Step 3. Check the noise generated by the A24 Stage 1 Second IF Filter assembly.

1 Press **[Shift]** **[Marker →]**.

2 Disconnect the cable from A23 J1.

3 Press **[Meas Restart]** and wait for the averages to finish.

4 Check that the marker reading is ≥ –2 dB.

5 If the reading dropped more than approximately 4 dB, the A24 Stage 1 Second IF Filter assembly is probably faulty.

❑ Step 4. Check the noise generated by the A23 Stage 2 Second IF Filter assembly.

1 Press **[Shift]** **[Marker →]**.

2 Disconnect the cable from A22 J1.

3 Press **[Meas Restart]** and wait for the averages to finish.

4 Check that the marker reading is ≥ –2 dB.

5 If the reading dropped more than approximately 4 dB, the A23 Stage 2 Second IF Filter assembly is probably faulty.

❑ Step 5. Check the noise generated by the A22 Stage 3 Second IF Filter assembly.

1 Press [**Shift**] [**Marker** →].
2 Disconnect the cable from A25 J2.
3 Press [**Meas Restart**] and wait for the averages to finish.
4 Check that the marker reading is ≥ –2 dB.
5 If the reading dropped more than approximately 4 dB, the A22 Stage 3 Second IF Filter assembly is probably faulty.
6 If the reading dropped less than approximately 4 dB, the A25 3rd Mixer Amplifier assembly is probably faulty.

To troubleshoot RF distortion and spurs

Use this test to isolate RF harmonic distortion and spurious signal failures.

❑ Step 1. If the failure is RF harmonic distortion, go to Step 6.

❑ Step 2. If the failure is an LO spur, determine the probable faulty assemblies and next step or test by comparing the failing LO spur to the following table.

An LO spur is a spur that follows the input signal. The offset from the input signal is independent of frequency. These spurs almost always come in pairs and are offset from the input signal by an equal amount.

LO Spur	**Probable Faulty Assembly** (in order of probability)	**Next Step or Test**
< 10 kHz offset	SMA cables Fan A50 YIG Oscillator mounting Cables to A50 YIG Oscillator	Step 5
25.51 kHz offset 51.02 kHz offset	HP 89410A A100 Display	See "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*
76.53 kHz offset 100 kHz offset 200 kHz offset 300 kHz offset	HP 89410A A95 Power Supply ‡ HP 89410A RF section A90 Power Supply ‡	See "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*
> 6 MHz with 1 MHz × K offset †	A62 YIG Driver A61 YIG Loop Phase Detector	Local oscillator, page 1-32

† Where K is an integer. For example, 1 MHz × 2 = 2 MHz offset from center frequency.

‡ Use a spectrum analyzer set to 1 M Ω mode and a 10:1 oscilloscope probe to check power supplies.

❑ Step 3. If the failure is an RF spurious signal, determine the probable faulty assembly or next step by comparing the failing RF spurious signal to the following table.

RF spurious signals may be at a constant frequency, however, they often are dependent on the tuned frequency and the input frequency.

RF Spurious Signal	Tuned Frequency	Input Frequency	Probable Faulty Assembly (in order of probability)	Next Step
In 10 kHz span	2 MHz	7 MHz	A25 3rd Mixer Amplifier	
In 10 kHz span	4, 6, or 8 MHz	10 MHz	A25 3rd Mixer Amplifier	
In 10 kHz span	11 MHz	822.6666666 MHz 1641.6666666 MHz 1234 MHz	A10 Receiver A50 YIG Oscillator A60 Local Oscillator	Step 6
In 10 kHz span	199 MHz	948 MHz 1422 MHz	A10 Receiver A50 YIG Oscillator A60 Local Oscillator	Step 6
In 10 kHz span	399 MHz	1081.3333333 MHz 1622 MHz	A10 Receiver A50 YIG Oscillator A60 Local Oscillator	Step 6
5 MHz	Any	Any	A62 YIG Driver	

❑ Step 4. Determine the spur frequencies in HP 89430A's input.

1 Connect a 50 Ω termination to the HP 89430A's INPUT connector.

2 Press the following keys:

[Preset]
[Range]
[ch1 range]
−30
[dBm]
[Instrument Mode]
[Vector]
[receiver]
[RF section (2-1800 MHz)]
[Frequency]
[center]
(set to spur frequency)
[full span]

3 If the spur is not displayed, connect the input signal and set the analyzer's center frequency and range to the failing signal. The input signal must be ≤ the range setting.

4 Move the marker to the center frequency and press the following keys:

[Shift]
[Marker →]

5 Move the marker to the spur frequency and note the frequency offset reading.

6 Calculate the A10 and A25 spur frequency as follows:

Fspur = Spur frequency

Fcenter = Center frequency

Foffset = Offset frequency

Frfc = 6 MHz or center frequency rounded to nearest 1 MHz, whichever is greater.

FTuned = 46 MHz – (Fcenter – Frfc)

A10 Spur frequency = FTuned – Foffset

A25 Spur frequency = A10 Spur frequency –40 MHz

For example, the following shows the calculations if the spur frequency is 9.8 MHz, the center frequency is 9.3 MHz, and the offset is 0.5 MHz.

Fspur = 9.8 MHz
Fcenter = 9.3 MHz
Foffset = 0.5 MHz
Frfc = 9 MHz
FTuned = 46 – (9.3 – 9) = 45.7 MHz
A10 Spur frequency = 45.7 – 0.5 = 45.2 MHz
A25 Spur frequency = 45.2 – 40 = 5.2 MHz

The following example shows the calculations if the spur frequency is 2.5 MHz, the center frequency is 3 MHz, and the offset is –0.5 MHz.

Fspur = 2.5 MHz
Fcenter = 3 MHz
Foffset = –0.5 MHz
Frfc = 6 MHz
FTuned = 46 – (3 – 6) = 49 MHz
A10 Spur frequency = 49 – (– 0.5) = 49.5 MHz
A25 Spur frequency = 49.5 – 40 = 9.5 MHz

7 While doing the following steps, check the A10 Spur frequency and the A25 Spur frequency for the spurious signal.

❑ Step 5. Check for loose or cracked SMA cables and tight connections.

The semi-rigid SMA cables can be damaged near the connector when moved. A 1-inch RF loop antenna (HP 08640-60501) is helpful to isolate this type of failures.

❑ Step 6. Check the 2ND LO RCVR signal (A60 J603) and the 1ST LO RCVR signal (A60 J150).

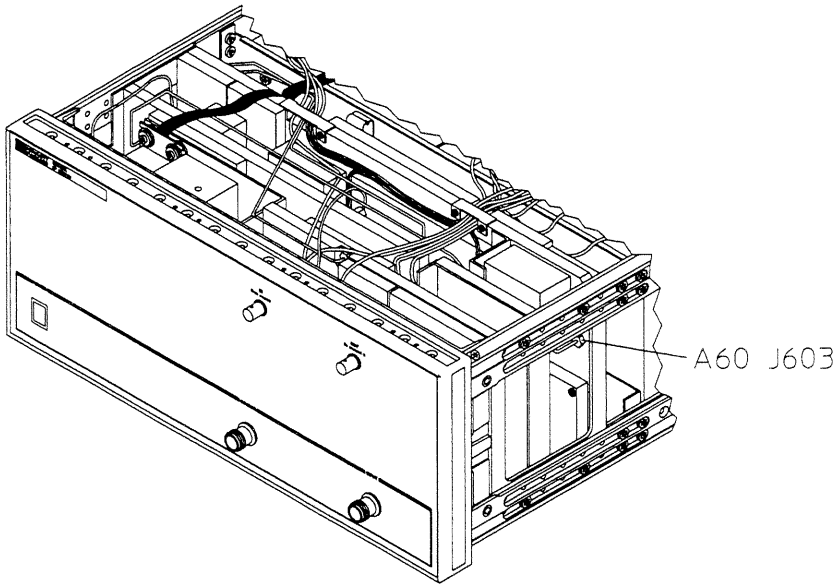
Use the SMA(m)-to-SMA(m) cable to check the signals. If an amplitude is within ±5 dB of the correct value, use a power meter to check the signal's amplitude before replacing the assembly.

1 Set the spectrum analyzer as follows:

Frequency	
Center	**2.4 GHz**
Span	**800 MHz**
Resolution BW	**30 kHz**

2 Remove the cover from the side closest to the front panel connectors.

3 Check that A60 J603 is 2.4 GHz, ≥–15 dBm.



4 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.

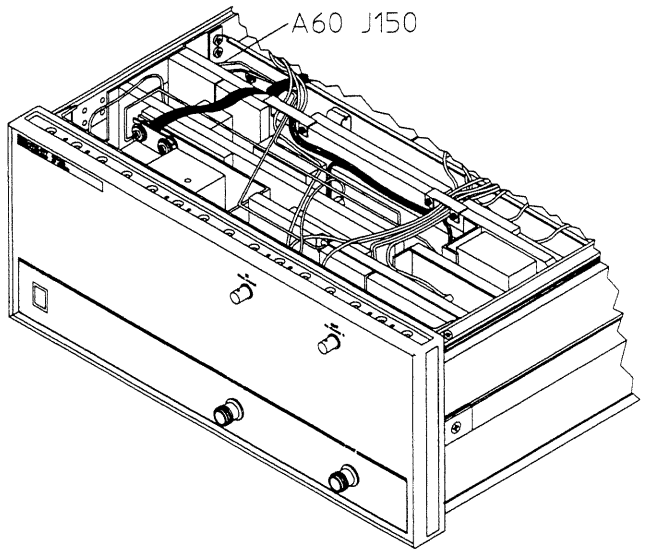
5 Press the following keys:

[Preset]
[Instrument Mode]
[Scalar]
[receiver]
[RF section (2-1800 Hz)]

6 Set the spectrum analyzer as follows:

Input	
Attenuation	**+40 dB**
Frequency	
Start	**2.3 GHz**
Stop	**4.5 GHz**
Resolution BW	**1 MHz**
Display	**Max hold**
Scale	
Reference level	**25 dBm**
dB/division	**5 dB/div**

7 Check that A60 J150 is sweeping from 2.451 to 4.246 GHz in 1 MHz steps, +20 ±3 dBm.



8 If the signal is incorrect, the A60 Local Oscillator assembly is probably faulty.

9 Reconnect the cables to A60 J150 and A60 J603.

10 If both signals are correct and the failure is harmonic distortion or the spur frequency is listed in steps 1 or 2, the A10 Receiver assembly is probably faulty.

❑ Step 7. Check the input signal path for the spur.

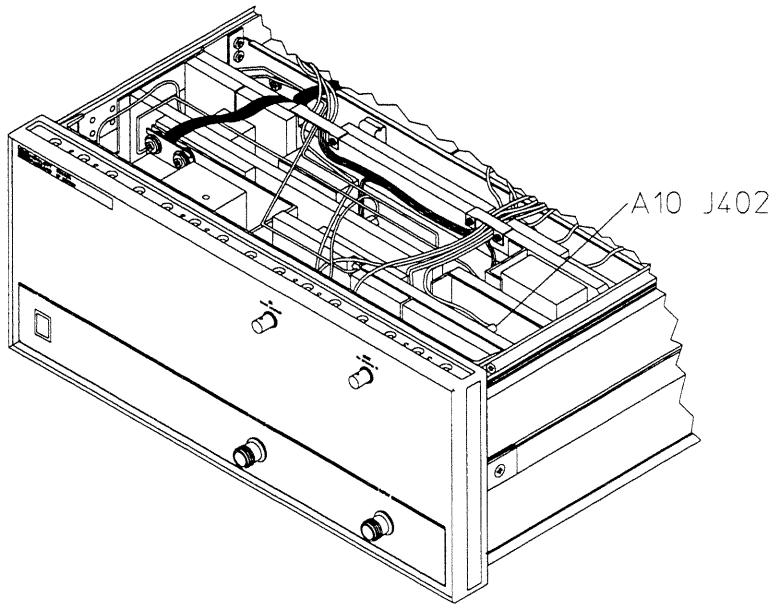
1 Set the spectrum analyzer as follows:

Input	
Input impedance	**50 Ω**
Range	**–30 dBm**
Attenuation	**0 dB**
Frequency	
Center	**A10 Spur frequency**
Span	**≤ 1 MHz**
Resolution BW	**10 kHz**
Display format	**log magnitude**
Scale	
Reference level	**–30 dB**
dB/division	**10 dB/div**

2 Check the following signals using a spectrum analyzer, an SMB(f)-to-BNC(m) cable, and a BNC(f)-to-N(m) adapter. Reconnect each cable after measuring the signal.

The amplitude at the spur frequency should be <–110 dBm for residual spurs (50 Ω termination on input) and <–100 dBm for other spur types.

Test Location	Frequency	Probable Faulty Assembly
A10 J402	A10 Spur	A10 Receiver
A24 J2	A10 Spur	A24 Stage 1 Second IF Filter
A23 J2	A10 Spur	A23 Stage 2 Second IF Filter
A22 J2	A10 Spur	A22 Stage 3 Second IF Filter



3 Set the spectrum analyzer's center frequency to the A25 Spur frequency.

4 Check that A25 J3 is <–90 dBm for residual spurs (50 Ω termination on input) and <–80 dBm for other spur types.

5 If the signal is incorrect, the A25 3rd Mixer Amplifier assembly is probably faulty.

6 If the spur has not been isolated, check the HP 89410A and the cables from A25 J3 to the HP 89410A's CHANNEL 1 input.

When checking the HP 89410A, set the analyzer to the IF section mode and check the A25 Spur frequency. See "How to troubleshoot the analyzer" in the *HP 89410A Service Guide*.

2

Adjusting the Analyzer

Adjusting the Analyzer

This chapter contains the adjustment procedures for the HP 89430A. Follow these procedures if the analyzer does not meet its specifications or if instructed in chapter 1, "Troubleshooting the Analyzer," or chapter 3, "Replacing Assemblies," to perform these adjustments. These adjustments are not required for routine maintenance.

Before starting the adjustments, allow the HP 89430A to warm up for at least an hour. Perform the adjustments for the HP 89410A before performing the adjustments for the HP 89430A. Except for the calibration factors adjustment, do the "To set up for adjustments" procedure before starting an adjustment.

The following table shows the assembly and components adjusted during each adjustment procedure.

Adjustment	Assembly	Component
40 MHz reference	A81 40 MHz Reference	R6
600 MHz reference	A82 600 MHz Reference	C14
Receiver gain	A25 3rd Mixer Amplifier	R36
Source 40 MHz null	A33 Source AM/1st Conversion	R22
Source conversion gain	A33 Source AM/1st Conversion	R52
Oven	A80 Oven Oscillator	U50
Power supply	A90 Power Supply	R114
Calibration factors	software	

Safety Considerations

Although the HP 89430A is designed in accordance with international safety standards, this guide contains information, cautions, and warnings that must be followed to ensure safe operation and to keep the unit in safe condition. Adjustments in this chapter are performed with power applied and protective covers removed.

Warning

These adjustments must be performed by trained service personnel who are aware of the hazards involved (such as fire and electrical shock).

Any interruption of the protective (grounding) conductor inside or outside the unit, or disconnection of the protective earth terminal can expose operators to potentially dangerous voltages.

Under no circumstances should an operator remove any covers, screws, shields or in any other way access the interior of the instrument. There are no operator controls inside the instrument.

Equipment Required

See chapter 1, "Troubleshooting the Analyzer," for tables listing recommended test equipment. Any equipment which meets the critical specifications given in the tables may be substituted for the recommended model.

To set up for adjustments

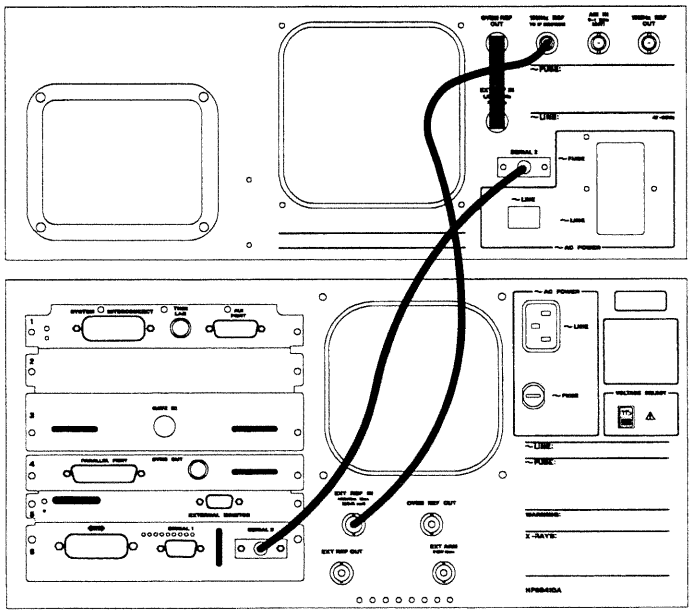
This procedure places the HP 89430A in its adjustment position. Do this procedure before adjusting any component in the HP 89430A. This procedure should not be done before the calibration factors adjustment. The calibration factors adjustment is a software adjustment and no components are adjusted.

Equipment Required: Serial interface interconnect cable
Coax BNC-to-Coax BNC connector
(3) 24-inch BNC cables

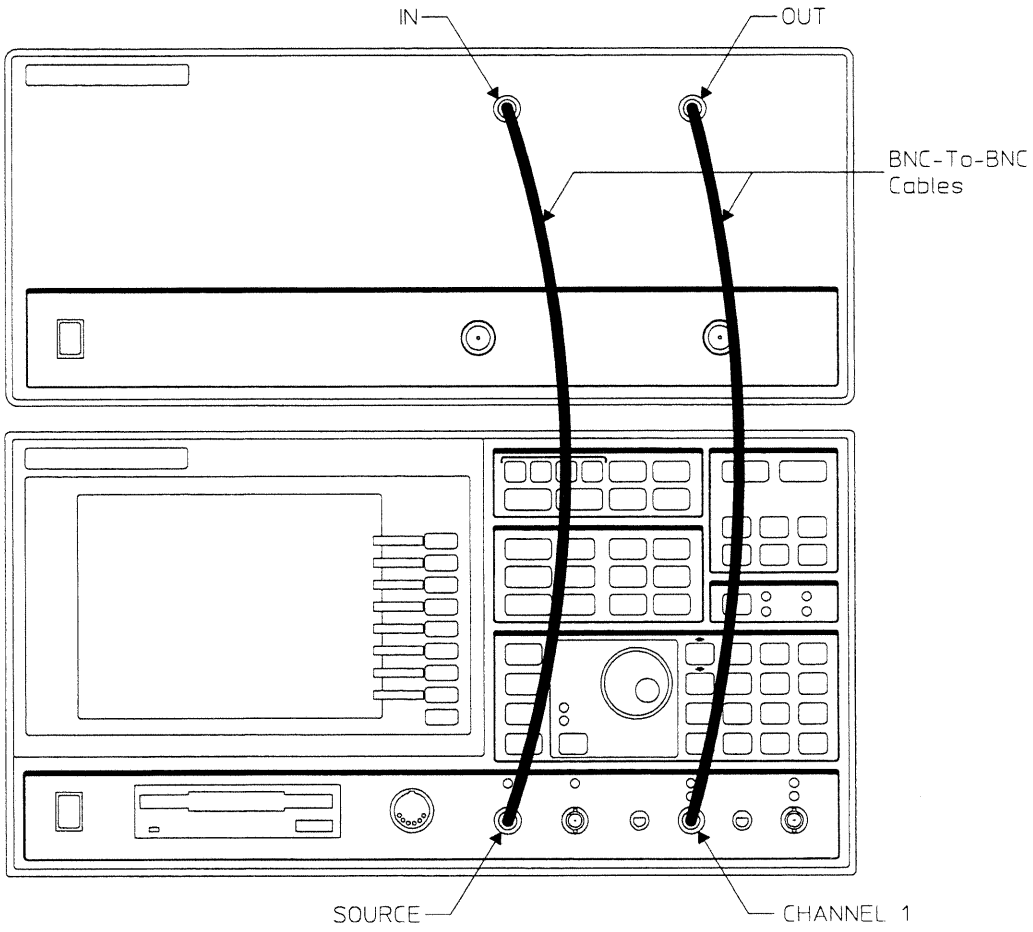
1 Disconnect the HP 89410A from the HP 89430A and place the HP 89430A on top of the HP 89410A.
2 Remove the HP 89430A's top cover.
3 Connect the HP 89430A's SERIAL 2 port to the HP 89410A's SERIAL 2 port using the serial interface interconnect cable.
4 Connect the HP 89430A's OVEN REF OUT connector to the EXT REF IN connector using a coax BNC-to-coax BNC connector.

   If the HP 89430A does not have the OVEN REF OUT connector, connect a 1 MHz, 2 MHz, 5 MHz, or 10 MHz sine or square wave, with an amplitude greater than 0 dBm to the HP 89430A's EXT REF IN connector.

5 Connect the HP 89430A's 10 MHz REF TO IF SECTION connector to the HP 89410A's EXT REF IN connector using a 24-inch BNC cable.



6 Connect the HP 89410A's SOURCE connector to the HP 89430A's IN connector using a 24-inch BNC cable.
7 Connect the HP 89410A's CHANNEL 1 connector to the HP 89430A's OUT connector using a 24-inch BNC cable.



To adjust 40 MHz reference

This procedure adjusts the 40 MHz oscillator on the A81 40 MHz Reference assembly. This assembly along with the A82 600 MHz Reference assembly provide the reference frequencies for the analyzer. The analyzer must be on (|) for at least one hour before doing this adjustment.

Equipment Required: Frequency counter
Frequency standard
BNC cable
SMB(f)-to-BNC(m) cable
Flat-edge adjustment tool, HP part number 8710-1928

1 Set the HP 89430A's power switch to on (|).
2 Connect the frequency standard to the frequency counter's 10 MHz external reference in connector.
3 Disconnect A81 J6.
4 Connect the frequency counter input to A81 J5 using a SMB(f)-to-BNC(m) cable.
5 Adjust A81 R6 for 10 MHz ±3 Hz.

   A81 R6 is labeled "Freq Adj" on the A81 assembly's top cover.

6 Leaving the frequency counter connected to A81 J5, set the top cover on top of the analyzer.
7 Wait for the frequency to settle and readjust A81 R6 if necessary.
8 Set the HP 89430A's power switch to standby (⏻).
9 Reconnect the following using original cables:

   A81 J5 to 10 MHz Reference Out (black cable)
   A81 J6 to External Reference In (white cable)

To continue the reference adjustments, go to the next adjustment.

To adjust 600 MHz reference

This procedure adjusts the 600 MHz oscillator on the A82 600 MHz Reference assembly. This assembly along with the A81 40 MHz Reference assembly provide the reference frequencies for the analyzer.

Perform the previous adjustment before doing this adjustment.

Equipment Required: Frequency standard
Spectrum analyzer
Extender board, HP part number 89430-66595
BNC cable
SMB(f)-to-BNC(m) cable
N(f)-to-BNC(f) adapter
Flat-edge adjustment tool, HP part number 8710-1928

❑ Step 1. Set up spectrum analyzer.

1 Connect the frequency standard to the spectrum analyzer's 10 MHz external reference in connector.

2 Set the spectrum analyzer as follows:

Frequency	
Center	**599.85 MHz**
Span	**1 MHz**
Reference level	**+10 dBm**

❑ Step 2. Set up the HP 89430A.

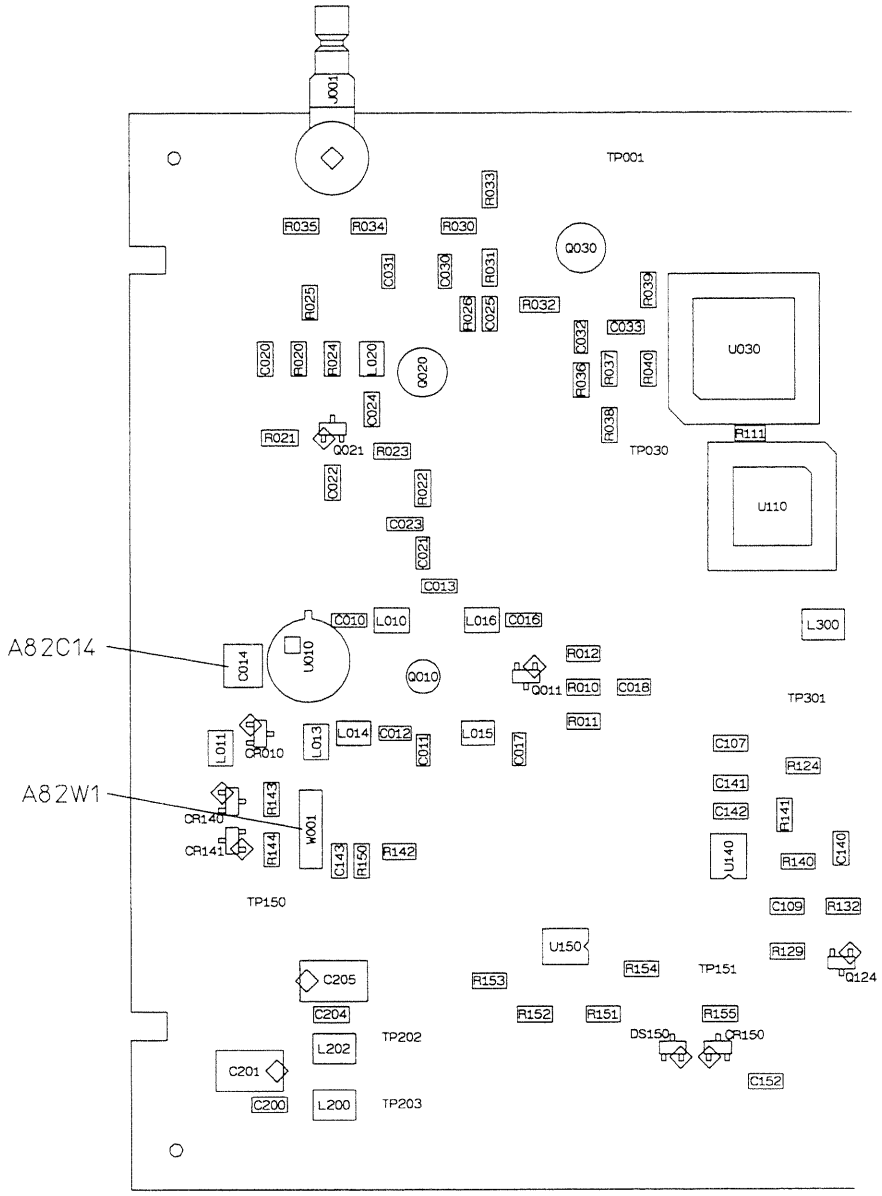
1 Set the HP 89430A's power switch to standby (⏻).

2 Remove screws holding the A82 600 MHz Reference assembly in the card nest.

3 Place the assembly on an extender board.

4 Move A82 W1 to its test position.

5 Set the HP 89430A's power switch to on (|).



❑ Step 3. Adjust A82 C14.

1 Connect the spectrum analyzer to A82 J1 using an N(f)-to-BNC(f) adapter and SMB(f)-to-BNC(m) cable.

2 Set the spectrum analyzer's marker to 599.85 MHz.

3 Adjust A82 C14 for 599.85 MHz ±0.01 MHz using the flat-edge adjustment tool.

❑ Step 4. Reinstall the A82 600 MHz Reference assembly.

1 Set the HP 89430A's power switch to standby (⏻).

2 Return A82 W1 to its normal position.

The signal at A82 C14 is ≥600.2 MHz when A82 W1 is in its normal position.

3 Place the A82 assembly in the card nest.

4 Reconnect the following using original cables:

A82 J1 to A60 J801 (green cable)
A82 J2 to A81 J2 (orange cable)
A82 J3 to A33 J6 (gray cable)
A82 J4 to A25 J1 (orange cable)
A82 J5 to A91 J1 (blue cable)

This completes the reference adjustments.

To adjust receiver gain

This procedure adjusts gain of the A25 3rd Mixer Amplifier assembly. This sets the receiver gain when the instrument is in the 2-1800 MHz mode.

Equipment Required: Synthesizer
BNC cables
N(m)-to-BNC(f) adapters
Flat-edge adjustment tool, HP part number 8710-1928

❑ Step 1. Set up the analyzer.

1 Set the HP 89430A's power switch to on (|) .
2 Set the HP 89410A's power switch to on (|).
3 Press the following keys:

[Preset]
[Instrument Mode]
[receiver RF section (0-10 MHz)]
[Range]
[ch1 range]
–20
[dBm]
[Frequency]
[center]
6
[MHz]
[span]
1
[kHz]

❑ Step 2. Set up the synthesizer.

1 Set the synthesizer for a 6 MHz, –20 dBm sine wave.
2 Connect the synthesizer to the HP 89430A's INPUT connector.

❑ Step 3. Adjust A25 R36.

1 Press the following keys:

[Auto Scale]
[Shift]
[Marker]

2 Set the synthesizer's amplitude for a marker reading of –20 dBm ±0.2 dBm.

3 Press the following keys:

[Range]
–12
[dBm]
[System Utility]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[LO frequency]
6
[enter]
[input]
[normal]
[attenuator]
10
[enter]

4 Adjust A25 R36 for a marker reading of –13 ±0.2 dBm using the flat-edge adjustment tool.

A25 R36 is labeled "Gain" on the top cover.

This completes the A25 3rd Mixer Amplifier assembly adjustments.

To adjust source 40 MHz null

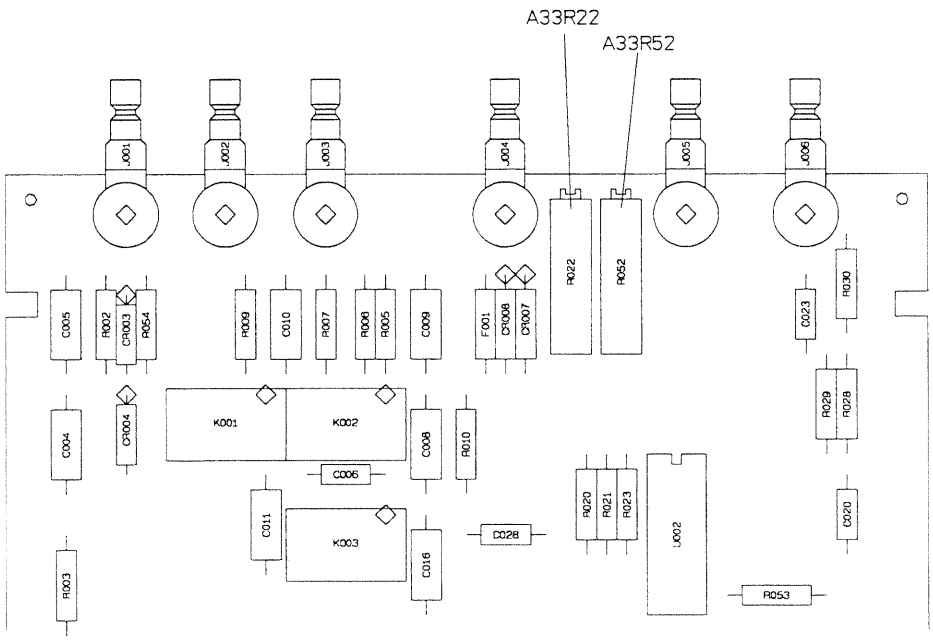
This procedure minimizes the 40 MHz carrier frequency on the A33 Source AM/1st Conversion assembly. This adjustment is only for analyzers with the internal RF source, option AY8.

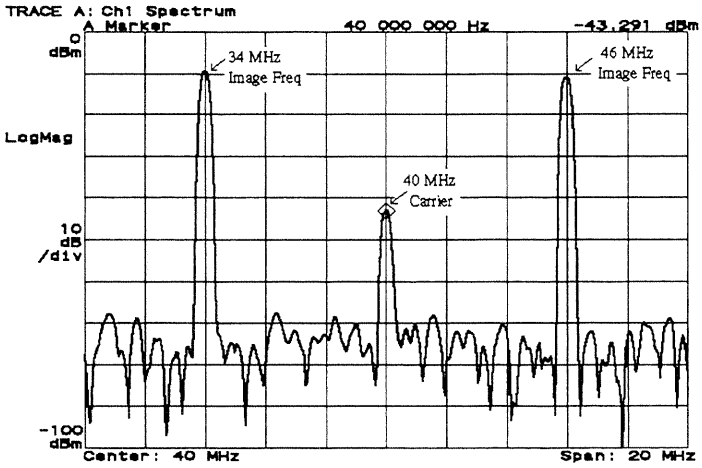
Equipment Required: Spectrum analyzer
Synthesizer
(2) SMB(f)-to-BNC(m) cable
N(m)-to-BNC(f) adapters
Flat-edge adjustment tool, HP part number 8710-1928

1 Set the HP 89430A's power switch to on (|).
2 Set the synthesizer for a 6 MHz, –8 dBm sine wave.
3 Connect the synthesizer to A33 J1 using a SMB(f)-to-BNC(m) cable.
4 Set the spectrum analyzer as follows:

Frequency	
Center	**40 MHz**
Span	**20 MHz**
Amplitude Range	**–10 dBm**
Reference Level	**0 dBm**

5 Connect the spectrum analyzer to A33 J5 using a SMB(f)-to-BNC(m) cable.
6 Adjust A33 R22 for minimum value (<–40 dBm).





7 Set the HP 89430A's power switch to standby (⏻).

8 Reconnect the following using original cables:

A33 J1 to front panel IN (red cable)
A33 J5 to A32 J1 (orange cable)

To continue the A33 Source AM/1st Conversion assembly adjustments, go to the next adjustment.

To adjust source conversion gain

This procedure adjusts the gain of the A33 Source AM/1st Conversion assembly at 6 MHz. This becomes the amplitude reference for the source. This adjustment is only for analyzers with the internal RF source, option AY8.

Equipment Required: Synthesizer
BNC cable
N(m)-to-BNC(f) adapter
Power meter
Power sensor
Flat-edge adjustment tool, HP part number 8710-1928

❑ Step 1. Set up the analyzer.

1 Set the HP 89430A's power switch to on (|).
2 Set the HP 89410A's power switch to on (|).
3 Press the following keys:

[Preset]
[Instrument Mode]
[Vector]
[receiver RF section (2-1800 MHz)]
[Frequency]
[center]
6
[MHz]
[Range]
[ch1 range]
−15
[dBm]

❑ Step 2. Set up the synthesizer.

1 Set the synthesizer for a 6 MHz, −18 dBm sine wave.
2 Connect the synthesizer to the HP 89430A's INPUT connector.
3 Press the following keys:

[Auto Scale]
[Shift]
[Marker]

4 Set the synthesizer's amplitude for a marker reading of −18 ± 0.1 dBm.
5 Disconnect the HP 89410A's source cable from the HP 89430A's IN (from source) connector.
6 Connect the synthesizer to the HP 89430A's IN (from source) connector.

❑ Step 3. Adjust A33 R52.

1 Press the following keys:

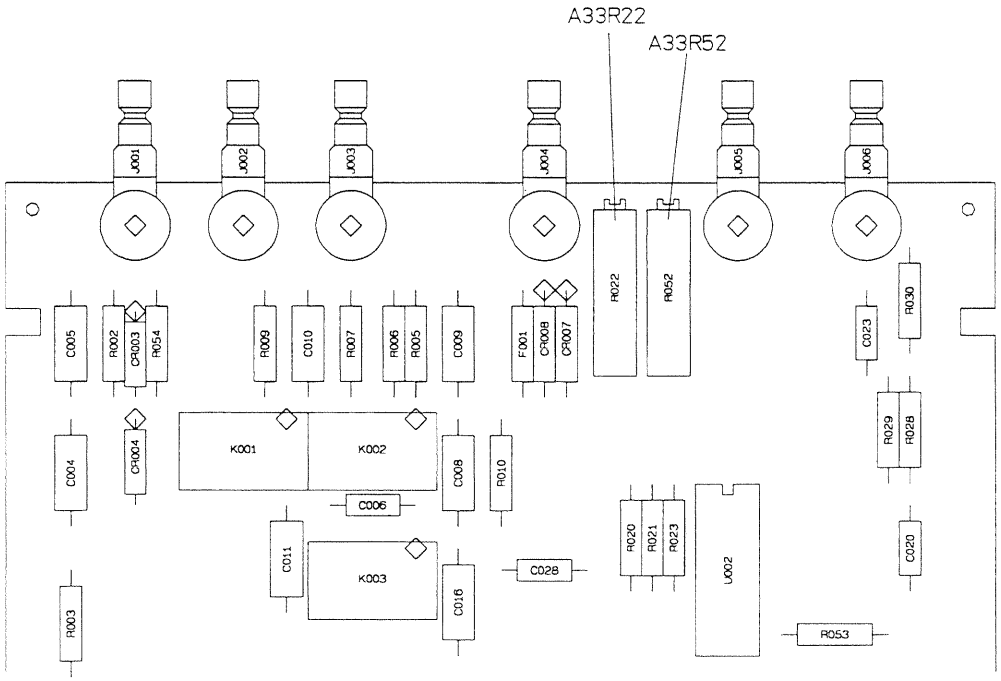
[**Source**]
[source **on**]
[source type [fixed sine]]
[source (2-1800MHz)]
[**System Utility**]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[source]
[level]
13
[enter]

2 Set the calibration factor on the power meter to 6 MHz.

3 Connect the power meter to the HP 89430A's SOURCE connector.

4 Adjust A33 R52 for a power meter reading of 3 ±0.1 dBm.

This completes the A33 Source AM/1st Conversion adjustments.



To adjust oven

This procedure adjusts the A80 Oven Oscillator assembly's 10 MHz oscillator. The analyzer must be on (|) for at least one hour before doing this adjustment.

Equipment Required: Frequency counter
Frequency standard
(2) BNC cable
Flat-edge adjustment tool, HP part number 8710-1928

1 Set the HP 89430A's power switch to on (|).
2 Connect the frequency standard to the frequency counter's 10 MHz external reference in connector.
3 Connect the counter to the HP 89430A's OVEN REF OUT connector (rear panel).
4 Adjust the oven for 10 MHz ±0.5 Hz using the flat-edge adjustment tool.

   The A80 Oven Oscillator assembly is in the front of the analyzer, behind the model number label.

5 Reconnect the OVEN REF OUT connector to the EXT REF IN connector.

This completes the A80 Oven Oscillator assembly adjustment.

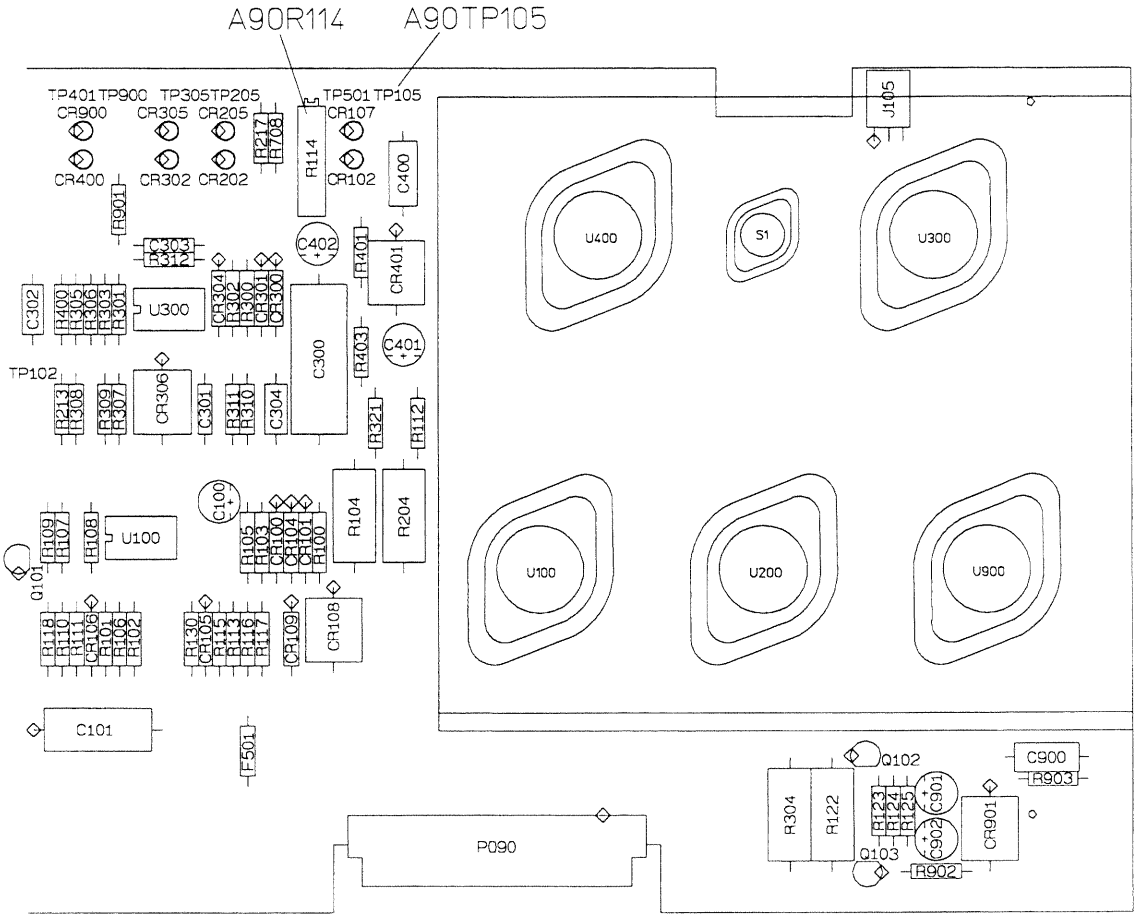
To adjust power supply

This procedure adjusts the A90 Power Supply assembly's +15 Vdc.

Equipment Required: Digital multimeter
Flat-edge adjustment tool, HP part number 8710-1928

1 Set the HP 89430A's power switch to on (|).
2 Connect the digital multimeter to A90 TP105 and ground to chassis.
3 Adjust A90 R114 for 15 ±0.03 Vdc.

This completes the A90 Power Supply assembly adjustment.



To adjust calibration factors

This procedure measures the input's scalar frequency response from 12 MHz to 1800 MHz relative to the 6 MHz calibration signal. The measurement is repeated for all attenuator settings in the A10 Receiver assembly. The resulting calibration factors are stored in the A91 Digital Control assembly. The calibration factors are used during the analyzer's calibration routine. This procedure takes approximately 2 1/2 hours to complete and may run unattended after the first measurement result is displayed.

The ambient temperature must be 25° C and the analyzer must have been on (|) for at least one hour before doing this adjustment. The analyzer may fail its RF-amplitude accuracy performance test if not properly warmed up before this adjustment.

Equipment Required: RF adjustment disk
(dual or 2) Power meter
(2) Power sensors
Power splitter
Signal generator
(2) Type-N cable
BNC cable
(3) 12-inch BNC cable
Serial interface interconnect cable
N(f)-to-N(f) adapter
N(f)-to-BNC(m) adapter
10 dB step attenuator

❑ Step 1. Determine if new calibration factors are needed.

1 If the A10 Receiver, A25 3rd Mixer Amplifier or A91 Digital Control assemblies have been replaced, new calibration factors are needed. Go to Step 2.

2 Perform the RF-amplitude accuracy performance test in the *HP 89440A Installation and Verification Guide*.

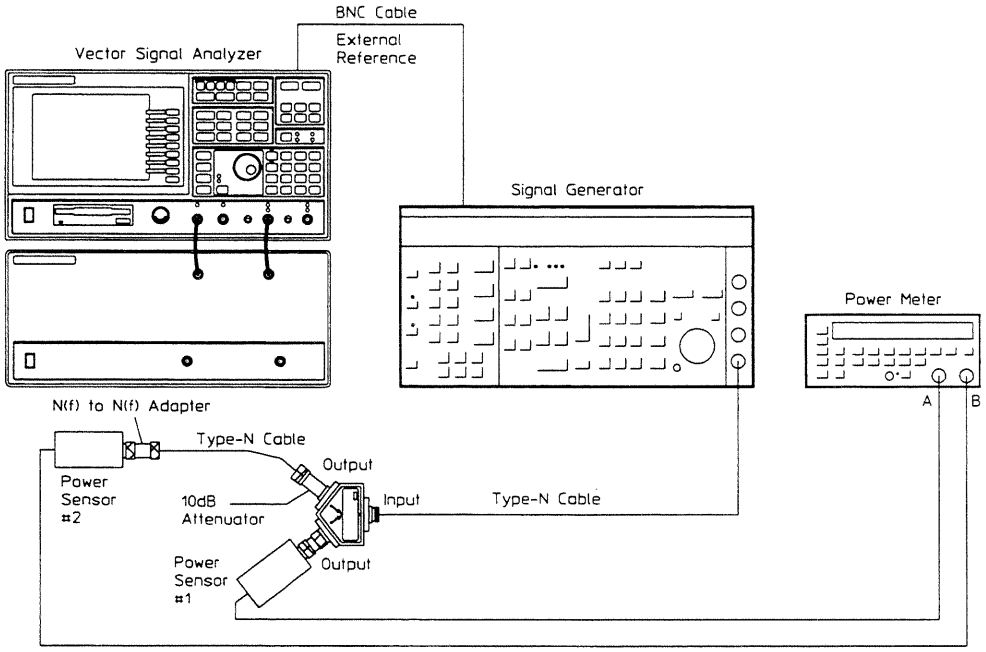
3 If the measured values for the RF-amplitude accuracy test are ≤ ±0.6 dB, new calibration factors are NOT needed. Continue this adjustment procedure only if new calibration factors are needed.

❑ Step 2. Set up the analyzer and test equipment as shown below.

The analyzer must be connected in its normal position using the 12-inch BNC cables and the serial interface interconnect cable. See chapter 1 in the *HP 89440A Installation and Verification Guide*.

Caution

This procedure changes the calibration factors stored in the A91 Digital Control assembly. Make certain all the connectors are connected properly and tight. If this procedure is done with loose or incorrect connections, the analyzer could appear to have a variety of hardware failures.



Setup 1

❑ Step 3. Load the RF calibration program.

1 Set the HP 89430A's power switch to on (|).

2 Set the HP 89410A's power switch to on (|).

3 Insert the adjustment disk into the HP 89410A's disk drive.

4 Press the following keys:

[Local/Setup]
[system controller]
[System Utility]
[single cal]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]
[RF section calibration]

If you get an insufficient memory message, the analyzer may have A.00.03 (or earlier) firmware. To access the firmware revision code, press the following keys:

[System Utility]
[more]
[firmware version]

If the revision code is A.00.03 or less, the analyzer needs a firmware update. See page 4-19 for the firmware update kit part number.

❑ Step 4. Run the RF calibration program.

1 Press the following keys and when the program prompts you, type in the equipment configuration information:

[EQUIP CONFIG]
[SIGNAL GENERATOR]
[POWER METER #1]
[POWER METER #2] (if needed)
[POWER SENSOR #1]
[POWER SENSOR #2]
[RETURN]

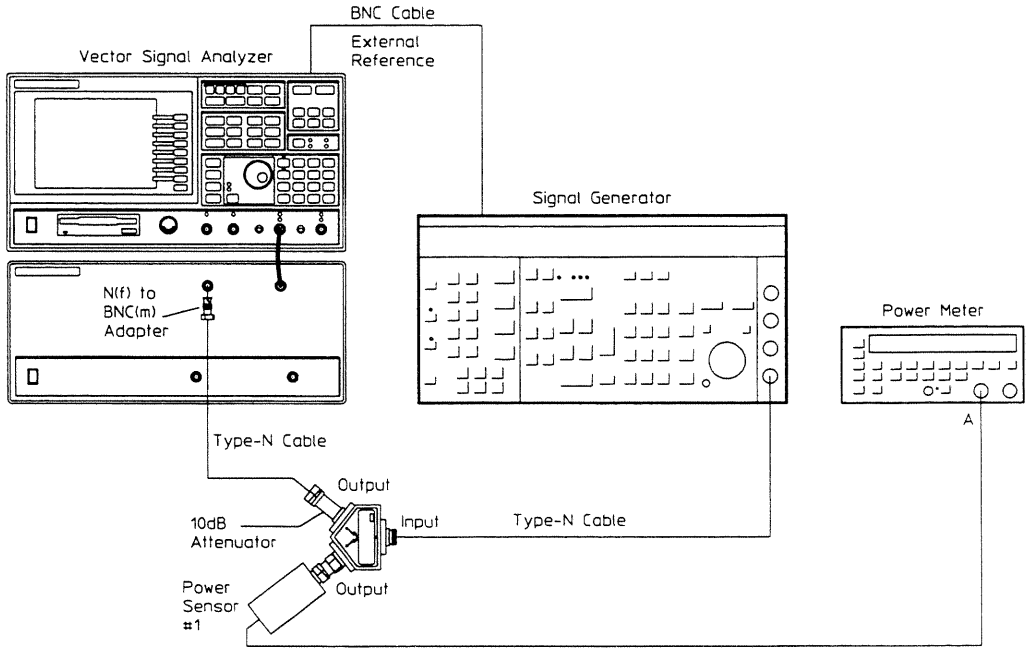
The HP-IB address is 100 x (interface select code) + (primary address). The interface select code for the test equipment is 7 (for example, if the primary address is 8, the HP-IB address is 708).

When entering the calibration due date, only four characters are displayed on the screen.

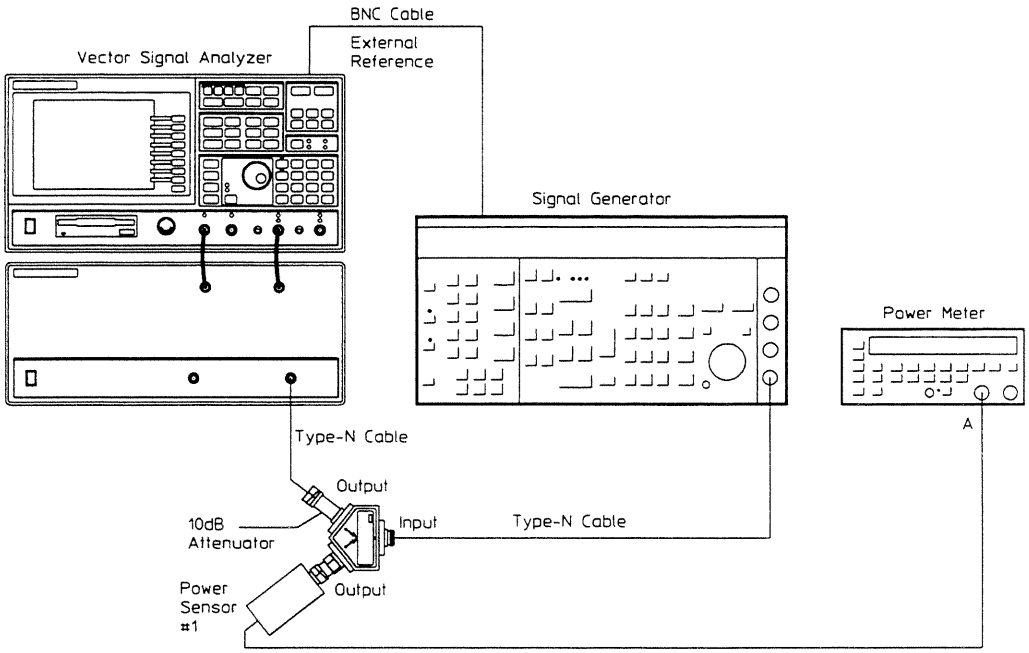
2 Press [START CAL] to start the calibration program.

3 Follow the directions on the display.

The directions on the display briefly tell you how to connect test equipment. For detailed illustrations of equipment setup, see the following setup illustrations.



Setup 2



Setup 3

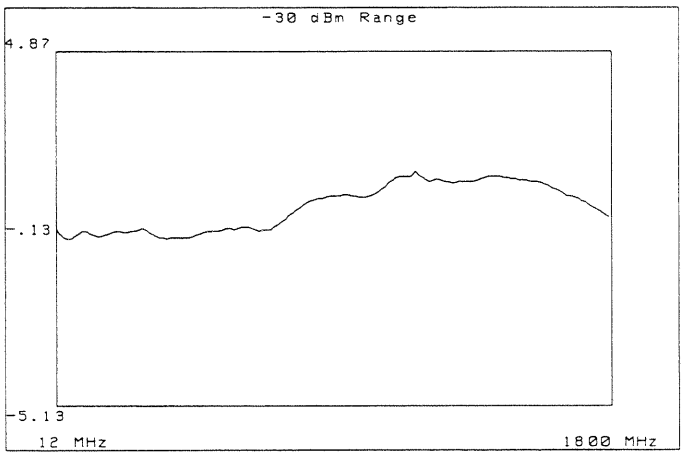
If you want to pause the program and return the analyzer to front panel control, press **[BASIC]**. To continue the program, press **[Display]** [BASIC display format] [lower] **[BASIC]** [continue].

Two error messages may be displayed while running this procedure. The calibration gain path is nominally –10 dB. If the gain varies more than ±1.2 dB, the message `ERROR! Measured cal path gain of n dB` is displayed. If the difference between two data points is > 0.75 dB, the message `ERROR! The difference between two data points has exceeded .75 dB. Max found= n` is displayed. If either of these two error messages are displayed, the analyzer is failing.

4 Press [PAUSE] when the first measurement range is displayed.

The first measurement range is displayed 10 minutes after the Setup 3 equipment connections are made.

5 Verify proper cable connections by comparing the measurement on the display to the following example.



The analyzer's flatness must be within ±2.5 dB and have the same basic shape as the example.

6 Press [CONTINUE].

Each of the twelve ranges take about 10 minutes to measure. This procedure may now be left unattended.

7 After the program is finished, set the HP 89410A's power switch off (O) then back on (I).

The HP 89410A loads the calibration factors stored in the A91 Digital Control assembly at power up.

8 Optionally, perform the RF-amplitude accuracy performance test in the *HP 89440A Installation and Verification Guide*.

The RF-amplitude accuracy performance test is recommended but not required after this adjustment.

This completes the RF calibration adjustment.

3

Replacing Assemblies

Replacing Assemblies

This chapter tells you what to do after you replace an assembly and shows you how to disassemble the HP 89430A.

Warning

Disconnect the power cord from the rear panel before disassembly or assembly of the HP 89430A.

Even with power removed, there can be sufficient stored energy in some circuits to cause personal injury. These voltages will discharge to a relatively safe level approximately five minutes after the power cord is disconnected.

Caution

Do not connect or disconnect cables from circuit assemblies with the line power turned on (|).

To protect circuits from static discharge, remove or replace assemblies only at static-protected work stations.

What to do after replacing an assembly

Note

If you are replacing the A60 Local Oscillator and the optional source is not installed, verify that A60 J151 and A60 J452 are terminated with a 50Ω termination.

1. Reinstall all assemblies and cables that were removed during troubleshooting.
2. Do the required adjustments listed in the following table.
3. Replace the covers and reconnect the sections. See chapter 1 in the *HP 89440A Installation and Verification Guide* to reconnect the sections.

4 Press the following keys to run the self tests:

[**System Utility**]
  [auto cal **off**]
  [more cal setup]
  [auto zero cal **off**]
[**Return**]
  [more]
  [diagnostics]
  [service functions]
  1125
  [enter]
  [test log]
[**Return**]
  [functional tests]
  [all]

5 If the A91 Digital Control assembly was replaced, store the serial number and the option configuration.

Caution

The serial number can NOT be changed after it is stored in memory. Check the serial number before you enter it.

Press the following keys, then use the alpha numeric keys to enter the serial number.

[**System Utility**]
  [diagnostics]
  [service functions]
  [define serial number]
(*serial number*)

If the analyzer has the Internal RF Source (option AY8), press the following keys:

[**System Utility**]
  [options setup]
  1125
  [enter]
  [RF source **in**]

6 Do the required performance tests listed in the following table.
The performance test procedures are in the *HP 89440A Installation and Verification Guide*.

Required Adjustments and Performance Tests

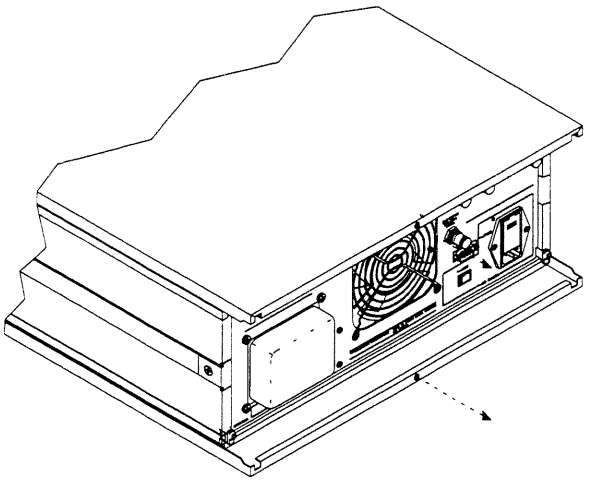
Assembly Replaced	Adjustment	Performance Test
A10 Receiver	Receiver gain, page 2-10 Calibration factors, page 2-18	RF-amplitude accuracy LO spurs RF-spurious signals RF-harmonic distortion RF-noise
A22 Stage 3 Second IF Filter	Receiver gain, page 2-10	RF-amplitude accuracy LO spurs RF-spurious signals RF-harmonic distortion RF-noise
A23 Stage 2 Second IF Filter	Receiver gain, page 2-10	RF-amplitude accuracy LO spurs RF-spurious signals RF-harmonic distortion RF-noise
A24 Stage 1 Second IF Filter	Receiver gain, page 2-10	RF-amplitude accuracy LO spurs RF-spurious signals RF-harmonic distortion RF-noise
A25 3rd Mixer Amplifier	Receiver gain, page 2-10 Calibration factors, page 2-29	RF-amplitude accuracy LO spurs RF-spurious signals RF-harmonic distortion RF-noise
A27 LO Feedthrough Control		LO spurs RF-spurious signals
A31 Stage 2 First IF Filter		RF-source amplitude accuracy RF-source IF flatness RF-source distortion RF-source noise
A32 Stage 1 First IF Filter		RF-source amplitude accuracy RF-source IF flatness RF-source distortion RF-source noise
A33 Source AM/1st Conversion	Source 40 MHz null, page 2-12 Calibration factors, page 2-18	RF-source amplitude accuracy RF-source IF flatness RF-source distortion RF-source noise

Required Adjustments and Performance Tests (continued)

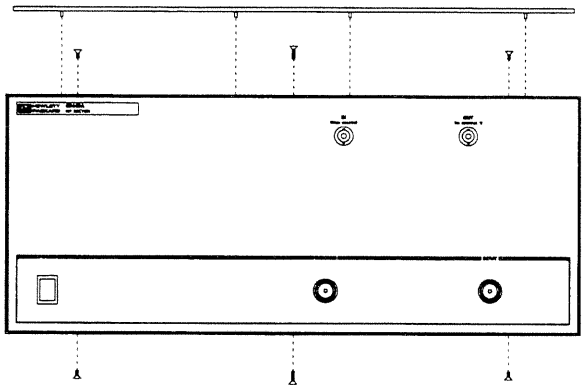
Assembly Replaced	Adjustment	Performance Test
A50 YIG Oscillator		RF-amplitude accuracy Phase noise LO spurs RF-spurious signals
A60 Local Oscillator		RF-amplitude accuracy Phase noise LO spurs Frequency accuracy
A61 YIG Loop Phase Detector		RF-amplitude accuracy Phase noise LO spurs Frequency accuracy
A62 YIG Driver		RF-amplitude accuracy Phase noise LO spurs Frequency accuracy
A70 Source	Calibration factors, page 2-18	RF-amplitude accuracy RF-source amplitude accuracy RF-source IF flatness RF-source distortion RF-source noise
A80 Oven Oscillator	Oven, page 2-16	RF-amplitude accuracy Phase noise LO spurs Frequency accuracy
A81 40 MHz Reference	40 MHz reference, page 2-6 600 MHz reference, page 2-7 Source 40 MHz null, page 2-12	Phase noise LO spurs
A82 600 MHz Reference	40 MHz reference, page 2-6 600 MHz reference, page 2-7	Phase noise
A90 Power Supply	Power supply, page 2-17	RF-amplitude accuracy LO spurs RF-spurious signals
A91 Digital Control	Calibration factors, page 2-18	RF-amplitude accuracy
A99 Motherboard		

To remove front panel

1 Using a T-15 torx driver, remove the screw from the back of the top and bottom covers. Slide the covers off.

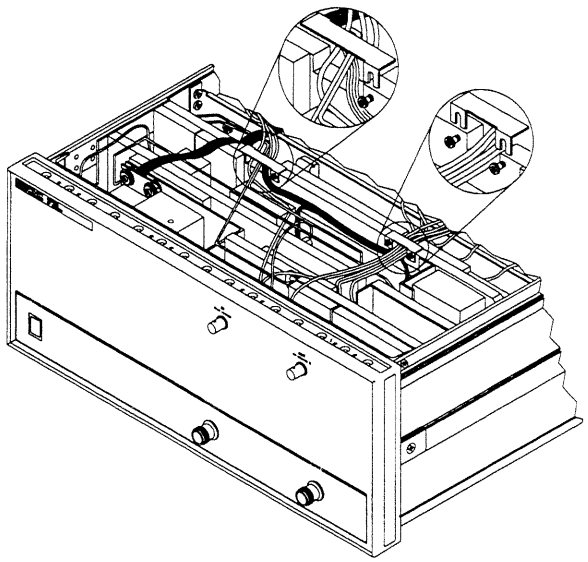


2 Remove the trim strip from top of front frame. Using a T-10 torx driver, remove three screws from top and bottom of front frame.

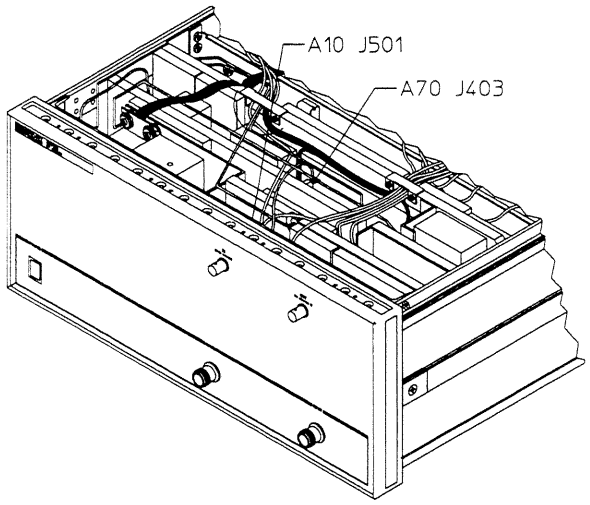


3 Disconnect the cables from A33 J1 and A25 J3. On analyzers without the optional RF source (option AY8), disconnect the cable from A33 J3.

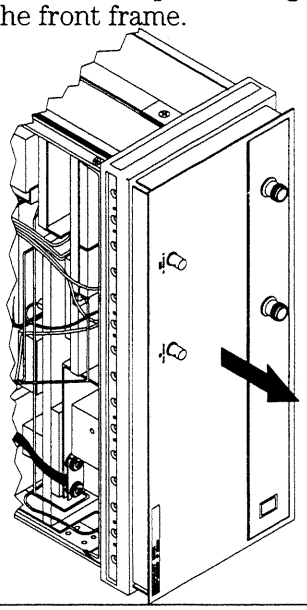
4 Using a T-10 torx driver, loosen the screws that fasten the cable retainer brackets. Remove the brackets and route the disconnected cables to the front panel.



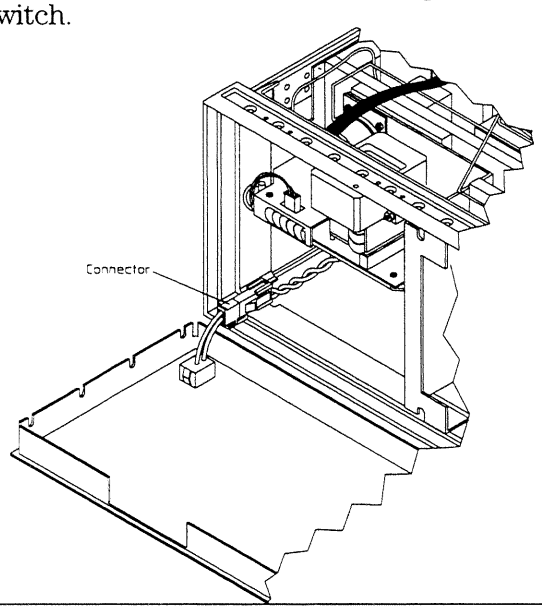
5 Using a 5/16 inch open-end wrench, disconnect the cable from A10 J501. On analyzers with the optional RF source (option AY8), disconnect the cable from A70 J403. Route the cables to the front panel.



6 Place the analyzer on its side. From behind, push the front panel straight out until free from the front frame.



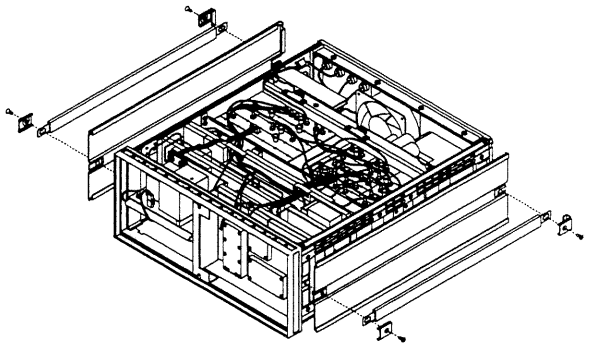
7 Disconnect the cable from the power switch.



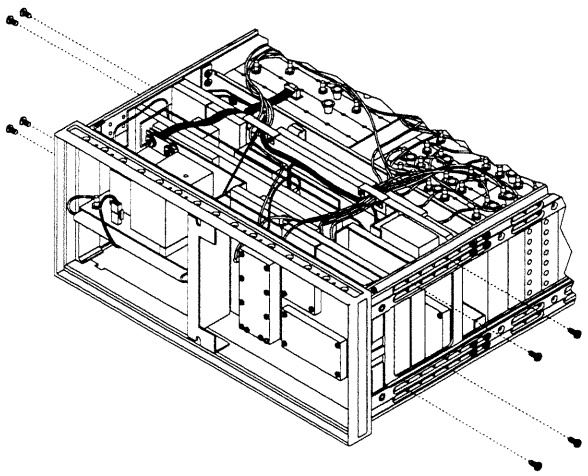
To remove A10, A60 and A70

1 Remove the front panel (see "To remove the front panel").

2 Using a 2 point pozidriv, remove the screw from each end cap of both strap handles. Remove the strap handles and side covers.



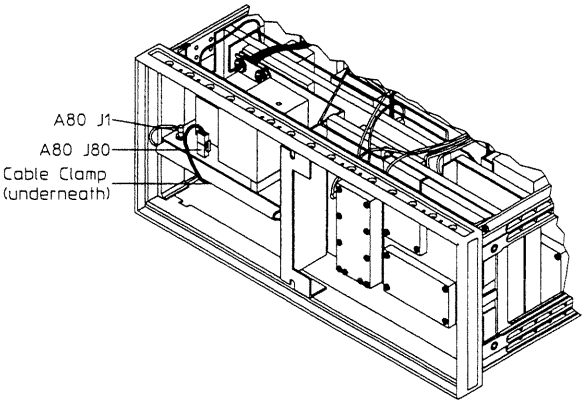
3 Using a T-15 torx driver, remove the four screws on each side that hold the assembly brackets.



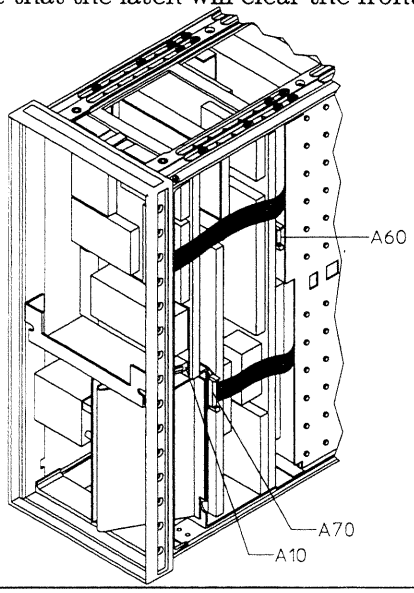
4 Check for protruding screws that may interfere with sliding the assemblies out the front. Turn protruding screws counter-clockwise until flush with sliding surface.

5 Disconnect the cables connected to:
A33 J2
A33 J3
A61 J3
A62 J3
A31 J2
A82 J1
A25 J4
A27 J1
A27 J2
A24 J1

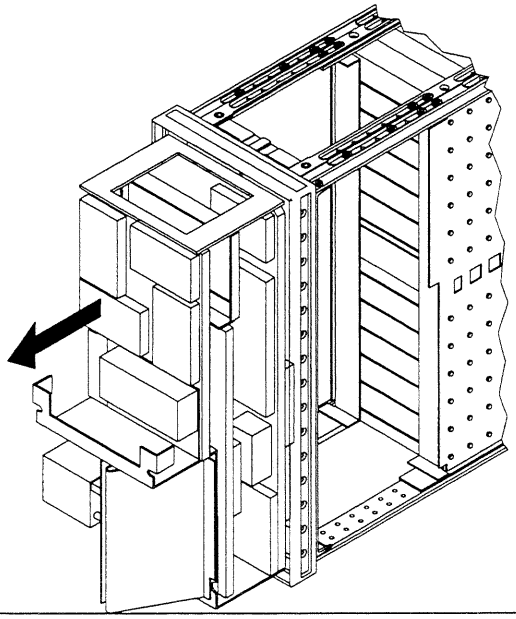
6 Disconnect the cables connected to A80 J1 and A80 J80. Remove the cables from the cable clamp.



7 Place the instrument on its side. Disconnect the ribbon cables from A10, A60, and A70. Close the A10 connector latch to ensure that the latch will clear the front frame.

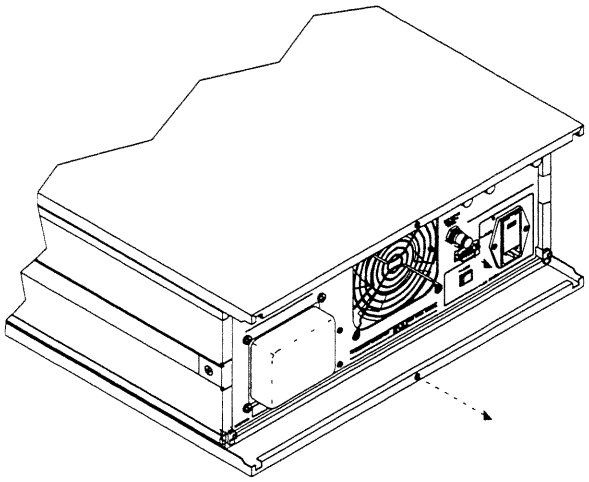


8 Slide the assemblies out the front being careful not to pinch cables.

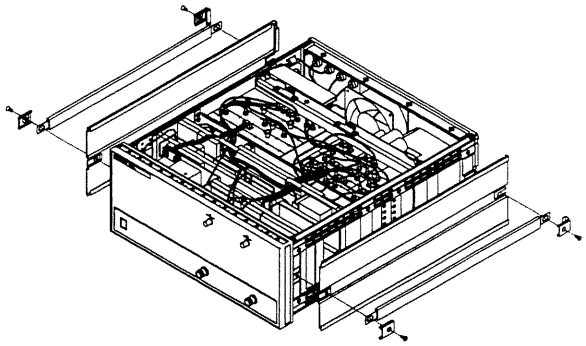


To remove rear panel

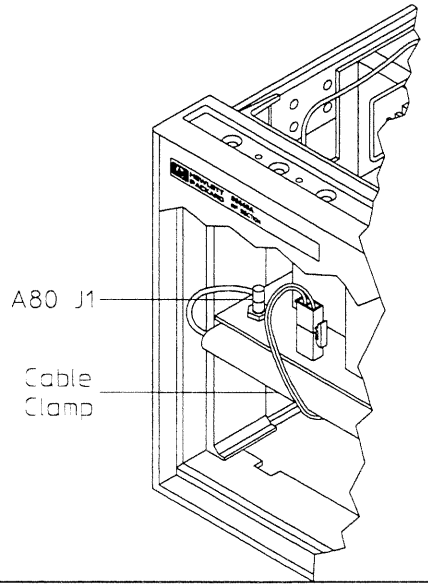
1 Using a T-15 torx driver, remove the screw from the back of the top and bottom covers. Slide the covers off.



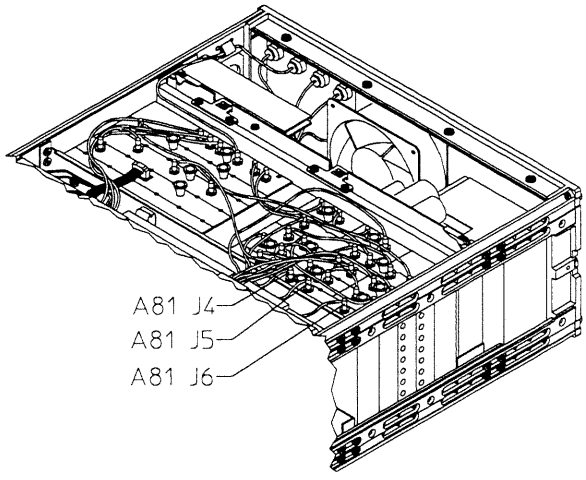
2 Using a 2 point pozidriv, remove the screw from each end cap of both strap handles. Remove the strap handles and side covers.



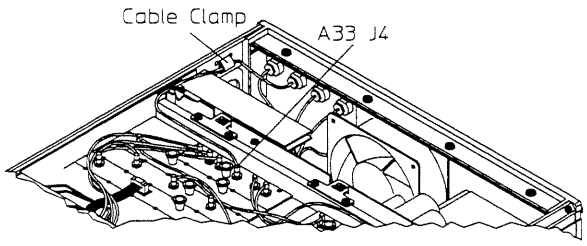
3 Disconnect the cable connected to A80 J1 and remove from cable clamp.



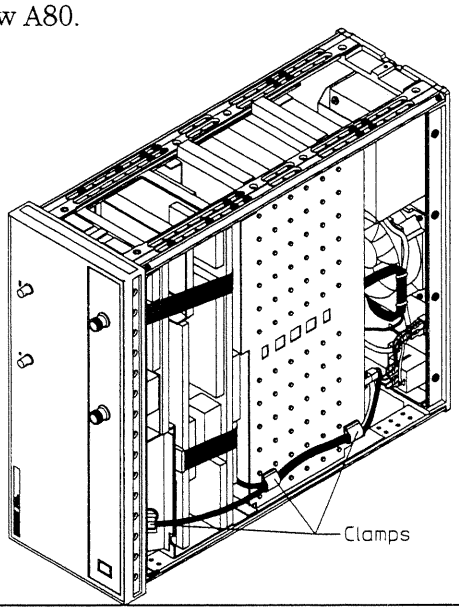
4 Disconnect the cables connected to A81 J4, J5, and J6.



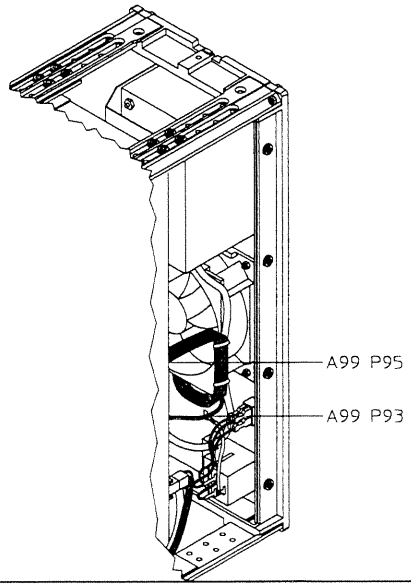
5 Disconnect the cable connected to A33 J4 and remove from cable clamp.



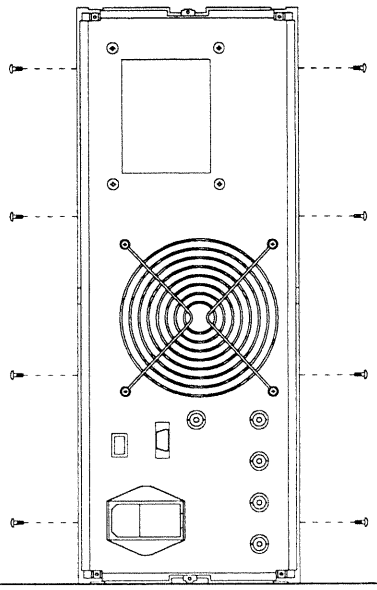
6 Place the instrument on the side closest to the power switch. Remove the previously disconnected cables from the cable clamps on the A99 Motherboard and on the sheet metal below A80.



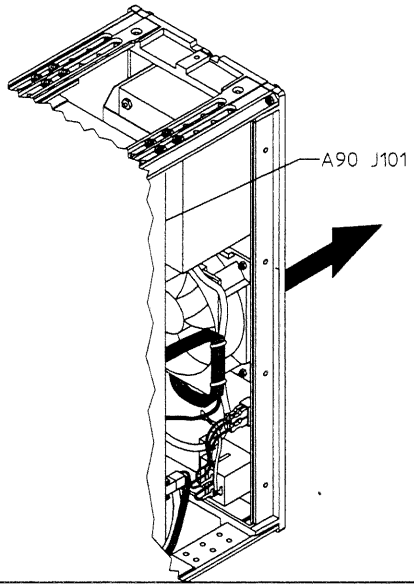
7 Disconnect the cables connected to A99 P93 and P95.



8 Using a T-10 torx driver, remove the four screws from the top and the four screws from the bottom of the rear frame.

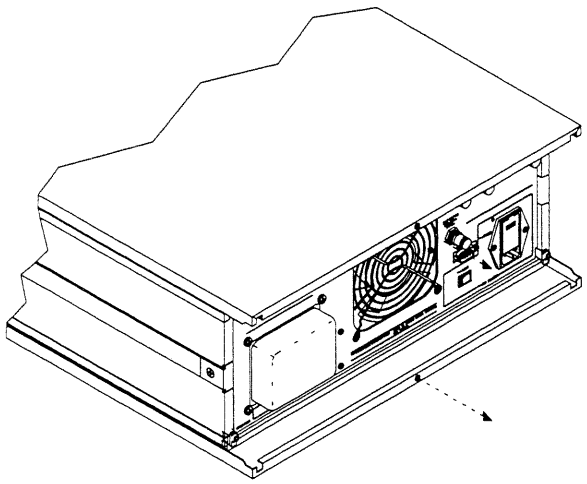


9 Slide the rear panel out a couple of inches, then disconnect A90 J101.

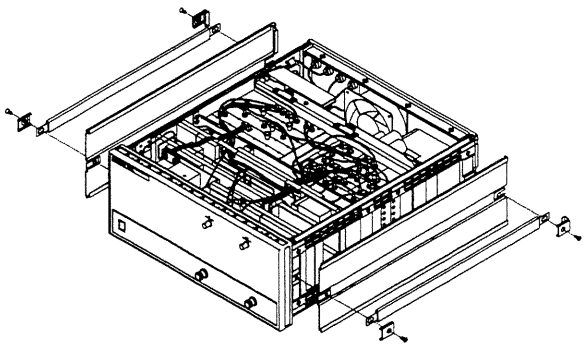


To remove card nest

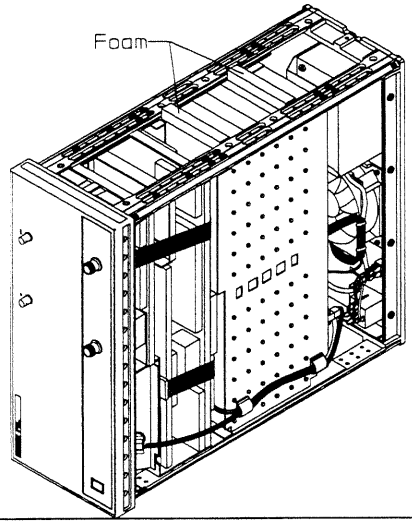
1 Using a T-15 torx driver, remove the screw from the back of the top and bottom covers. Slide the covers off.



2 Using a 2 point pozidriv, remove the screw from each end cap of both strap handles. Remove the strap handles and side covers.

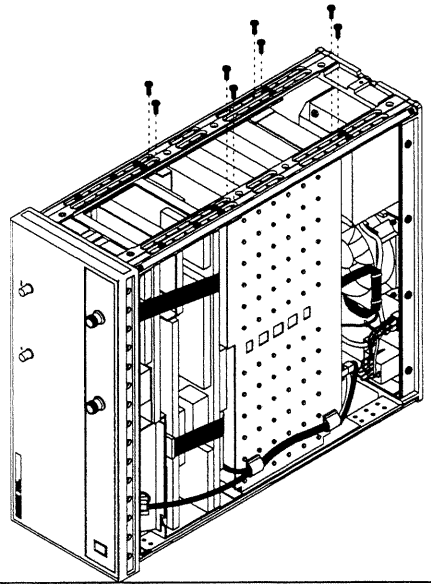


3 Remove the 2 pieces of foam on each side of the card nest.

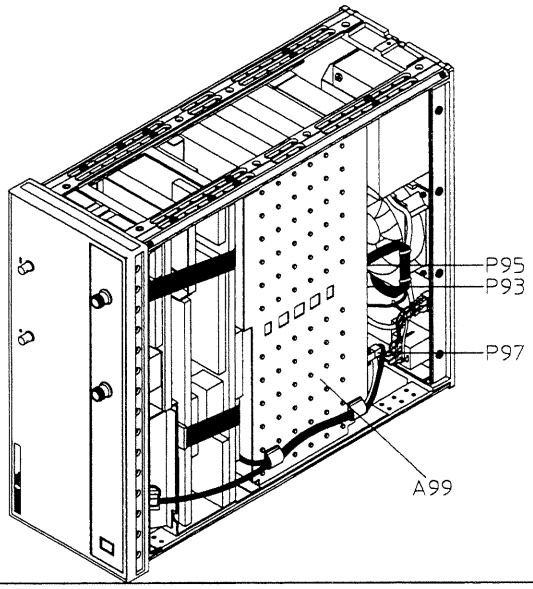


4 Disconnect the cables that are routed from assemblies in the card nest to the front or rear panel and to assemblies outside the card nest.

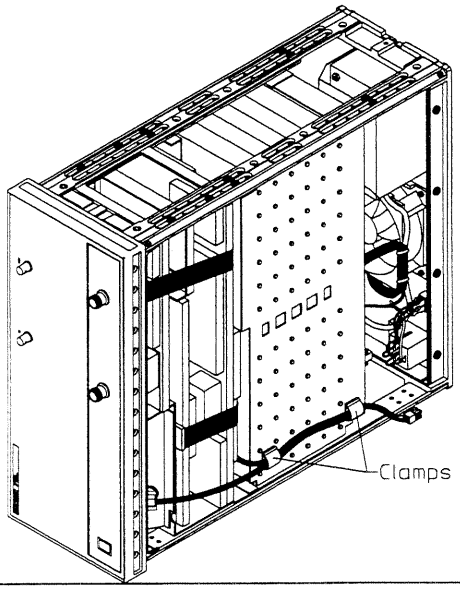
5 Using a T-15 torx driver, remove the 8 screws from each side that hold the card nest.



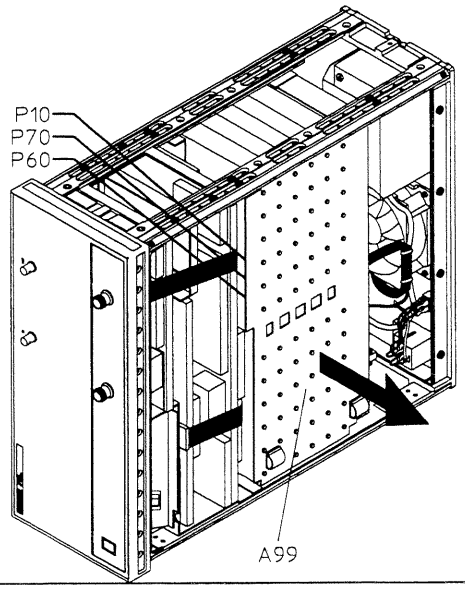
6 Keeping the card nest in position, place the instrument on its side. Disconnect A99 P97, P93, and P95.



7 Disconnect the cables from the cable clamps on A99 Motherboard. Position the cables out of the way.

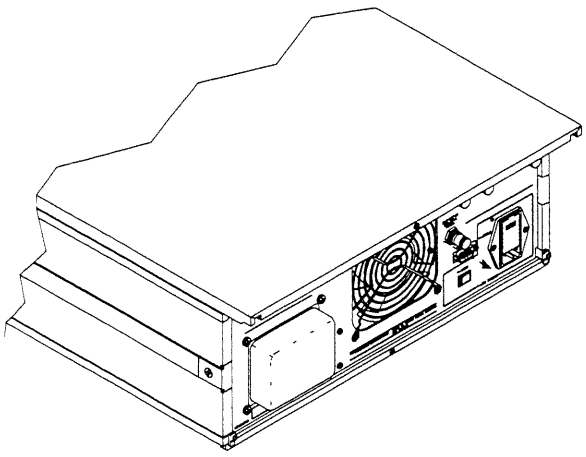


8 Slide the card nest part way out and disconnect the ribbon cables connected to A99 P60, P70, and P10.

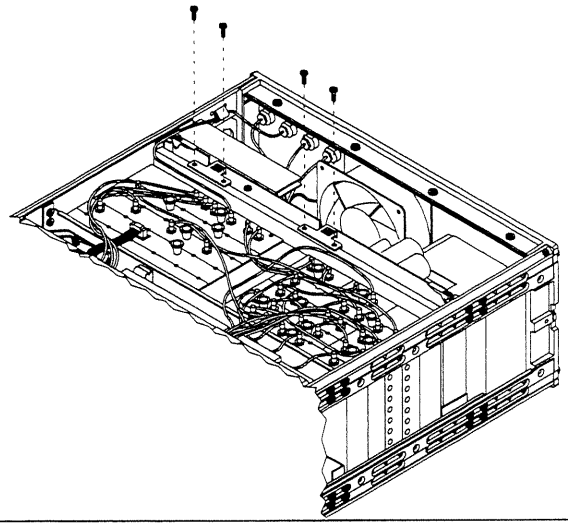


To remove power supply

1 Using a T-15 torx driver, remove the screw from the back of the top cover. Slide the top cover off.



2 Using a T-10 torx driver, remove both screws from each retainer bracket. Remove both retainer brackets.



3 Pull up with the plastic tabs and place the assembly on top of the card nest.

4 Disconnect the cable connected to A90 J101.

4

Replaceable Parts

Replaceable Parts

This chapter contains information for ordering replacement parts for the HP 89430A.

Ordering Information

Replacement parts are listed in the following nine tables:

- Assemblies
- Cables
- Instrument Covers and Handles
- Assembly Covers and Brackets
- Front Panel Parts
- Rear Panel Parts
- Chassis Parts
- Screws, Washers, and Nuts
- Miscellaneous Parts

To order a part listed in one of the tables, quote the Hewlett-Packard part number (HP Part Number), the check digit (CD), indicate the quantity required, and address the order to the nearest Hewlett-Packard sales and service office (see the inside back cover of this guide). The check digit verifies that an order has been transmitted correctly, ensuring accurate and timely processing of the order. The first time a part is listed in the table, the quantity column (Qty) lists the total quantity of the part used in the analyzer. For the corresponding name and address of the manufacturers' codes shown in the tables, see "Code Numbers."

Caution

Many of the parts listed in this chapter are static sensitive. Use the appropriate precautions when removing, handling, and installing all parts to avoid unnecessary damage.

Non-Listed Parts

To order a part that is NOT listed in the replaceable parts tables, indicate the instrument model number, instrument serial number, description and function of the part, and the quantity of the part required. Address the order to the nearest Hewlett-Packard sales and service office (see the inside back cover of this guide).

Direct Mail Order System

Within the U.S.A., Hewlett-Packard can supply parts through a direct mail order system. Advantages of the Direct Mail Order System are:

- Direct ordering and shipment from the HP Parts Center.
- No maximum or minimum on any mail order. There is a minimum order for parts ordered through a local HP sales and service office when the orders require billing and invoicing.
- Transportation charges are prepaid. A small handling charge is added to each order.
- No invoicing. A check or money order must accompany each order.
- Mail order forms and specific ordering information are available through your local Hewlett-Packard sales and service office. See the inside back cover of this guide for a list of Hewlett-Packard sales and service office locations and addresses.

Code Numbers

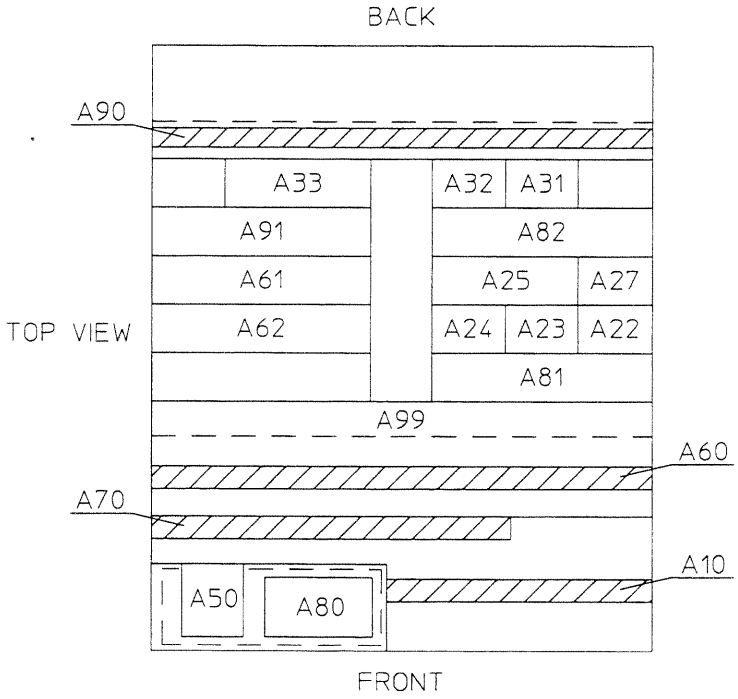
The following table provides the name and address for the manufacturers' code numbers (Mfr Code) listed in the replaceable parts tables.

Mfr No.	Mfr Name	Address
02081	Phoenix Transformer Co.	Post Falls, ID 83854 U.S.A.
02145	Raychem Corp.	Menlo Park, CA 94025 U.S.A.
02788	M/A-Com Inc	Burlington, MA 01803 U.S.A.
03480	Heyco Molded Products	Kentworth, NJ 07033 U.S.A.
03827	Fair Rite Products Corp.	Wallkill, NY 12589 U.S.A.
03934	E-A-R Corporation	Indianapolis, IN 46268 U.S.A.
05791	Lyn-Tron Inc.	Burbank, CA 91505 U.S.A.
06860	Huber & Suhner, Inc.	Williston, VT 05495 U.S.A.
06915	Richco Plastic Co.	Chicago, IL 60646 U.S.A.
09328	Dreefs Switch Inc.	Waukegan, IL 60087 U.S.A.
10938	Qualtek Electronics	Cleveland, OH 44194 U.S.A.
12260	Quality Microwave Interconnects, Inc.	Boston, MA 02212 U.S.A.
12339	NMB Technologies, Inc.	Los Angeles, CA 90051 U.S.A.
12830	Ketema-Rodan	Anaheim, CA 92806 U.S.A.
24931	Specialty Connector Co.	Franklin, IN 46131 U.S.A.
28480	Hewlett-Packard Company	Palo Alto, CA 94304 U.S.A.
34785	Dek Inc.	St Charles, IL 60174 U.S.A.
51506	Accurate Screw Machine Co.	Nutley, NJ 07110 U.S.A.
56501	Thomas & Betts Corp.	Bridgewater, NJ 08807 U.S.A
57003	Chomerics Shielding Technology	Carson, CA 90745 U.S.A.
61529	Aromat Corp US Div. of Matsushita Elec.	San Jose, CA 95134 U.S.A.
71400	Cooper Industries Inc	St Louis, MO 63178 U.S.A.
75915	Littelfuse Inc.	Des Plaines, IL 60016 U.S.A.
98291	ITT Sealectro	New Britain, CT 06051 U.S.A.
S4307	Schaffner Ag	Union, NJ 07083 U.S.A.

Assemblies

After replacing an assembly, see "What to do after replacing an assembly" in chapter 3 for required adjustments and performance tests.

The reference designator for the screws that fasten the A99 Motherboard assembly to the card nests is MP609. The reference designator for the screws that fasten the assembly covers to the card nest is MP616. The reference designators for the screws that fasten the A80 Oven Oscillator assembly to its bracket are MP605 and MP619.



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A10	89430-69510	3	1	RECEIVER ASSEMBLY	28480	89430-69510
A22	89400-84401	2	5	IF FILTER ASSEMBLY †	28480	89430-66523
A23	89400-84401	2		IF FILTER ASSEMBLY †	28480	89430-66523
A24	89400-84401	2		IF FILTER ASSEMBLY †	28480	89430-66523
A25	89430-66525	4	1	3RD MIXER AMPLIFIER ASSEMBLY †	28480	89430-66525
A27	89430-66527	6	1	LO FEEDTHROUGH CONTROL ASSEMBLY	28480	89430-66527
A31	89400-84401	2		IF FILTER ASSEMBLY †	28480	89430-66523
A32	89400-84401	2		IF FILTER ASSEMBLY †	28480	89430-66523
A33	89430-66533	4	1	SOURCE AM/1ST CONVERSION ASSEMBLY †	28480	89430-66533
A50	89430-67550	7	1	YIG OSCILLATOR ASSEMBLY	28480	89430-69550
A60	89430-69560	3	1	LOCAL OSCILLATOR ASSEMBLY	28480	89430-69560
A61	89430-66561	8	1	YIG LOOP PHASE DETECTOR ASSEMBLY	28480	89430-66561
A62	89430-66562	9	1	YIG DRIVER ASSEMBLY	28480	89430-66562
A70	89430-69570	5	1	SOURCE ASSEMBLY	28480	89430-69570
A80	89430-66580	1	1	OVEN OSCILLATOR ASSEMBLY	28480	89430-66580
A81	89430-66581	2	1	40 MHZ REFERENCE ASSEMBLY	28480	89430-66581
A82	89430-69582	9	1	600 MHZ REFERENCE ASSEMBLY	28480	89430-69582
A90	89430-66590	3	1	POWER SUPPLY ASSEMBLY	28480	89430-66590
A91	89430-66591	4	1	DIGITAL CONTROL ASSEMBLY	28480	89430-66591
A99	89430-66599	2	1	MOTHERBOARD ASSEMBLY	28480	89430-66599

† Cover not included.

Cables

The following table lists the reference designator and assembly connections for each cable.

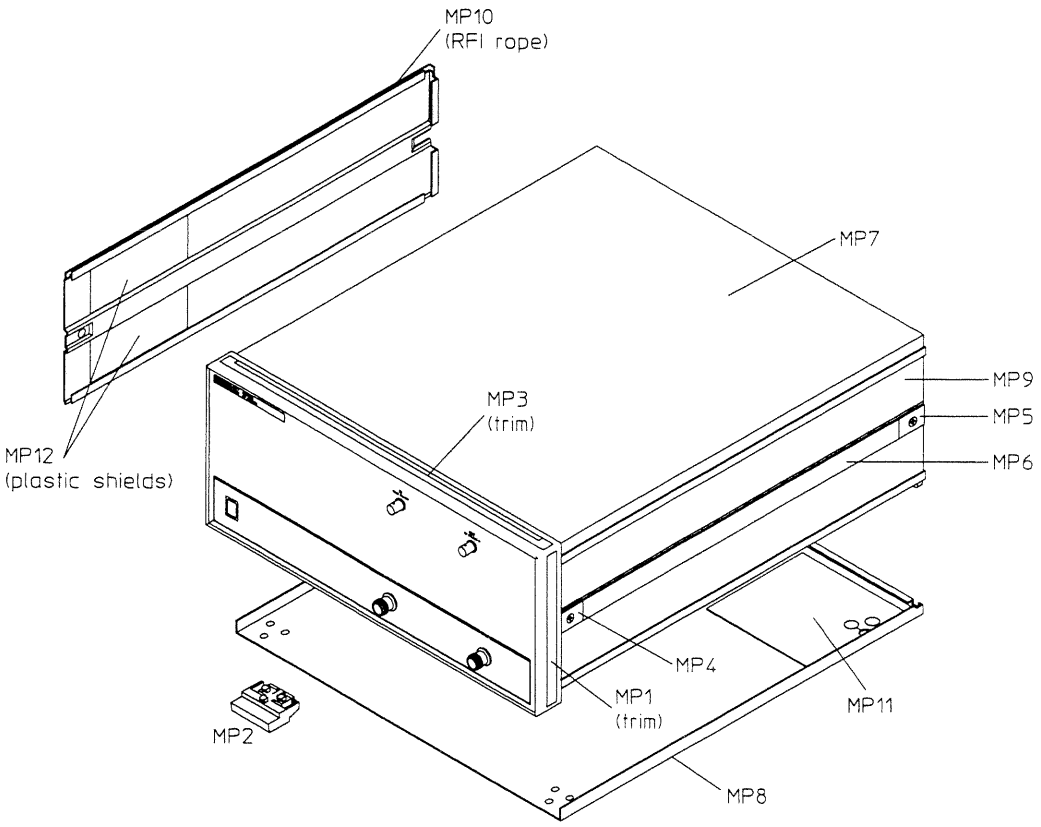
Ref Des	Assembly and Connector																			
	A10	A22	A23	A24	A25	A27	A31	A32	A33	A50	A60	A61	A62	A70	A80	A81	A82	A91	A99	Front Panel	Rear Panel
W1																J5					10 MHz OUT
W2									J4												AM IN
W3																J4					10 MHz REF TO IF
W4															J1						OVEN REF OUT
W5																J6					EXT REF IN
W6																			P95		SERIAL 2
W7									J1											IN	
					J3															OUT	
W8											J302	J3									
W9																	J5	J1			
									J2					J406							
	J502				J4																
	J302					J2															
W10								J1	J5												
					J1												J4				
		J2			J2																
W11												J1	J2								
							J1	J2													
			J1	J2																	
		J1	J2																		
W12																J2	J2				
W13											J801						J1				
									J3					J404							
	J402			J1																	
	J301					J1															
W14									J3											SOURCE (BNC)	
W15												J2				J3					
									J6								J3				
W16	J1										J150										
W17	J100										J603										
W18															P80				P97	POWER	
W19																			P93		fan
W20	P510																		P10		
														P70					P70		

Ref Des	Assembly and Connector																			
	A10	A22	A23	A24	A25	A27	A31	A32	A33	A50	A60	A61	A62	A70	A80	A81	A82	A91	A99	Front Panel	Rear Panel
W21											P60								P60		
W22														J403						SOURCE (type-N)	
										J2	J201										
	J501																			INPUT	
W23	J503								J2												
W25							J2							J200							
W26											J151			J701							
W27											J452			J100							
W28	J503													J405							

Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
W1	03585-61615	9	1	CBL-ASM CXL FSMB/FBNC 863MM BK	28480	03585-61615
W2	03562-61608	3	1	CBL-ASM CXL FSMB/FBNC 320MM BL	28480	03562-61608
W3	03562-61607	2	1	CBL-ASM CXL FSMB/FBNC 800MM VI	28480	03562-61607
W4	03585-61612	6	1	CBL-ASM CXL FSMB/FBNC 762MM GY	28480	03585-61612
W5	03585-61614	8	1	CBL-ASM CXL FSMB/FBNC 863MM WH	28480	03585-61614
W6	8120-6233	7	1	CBL-RBBN RS232	28480	8120-6233
W7	03585-61608	0	2	CBL-ASM CXL FSMB/FBNC 450MM RD	28480	03585-61608
W8	03577-61622	8	1	CBL-ASM CXL FSMB/FSMB 160MM YL	28480	03577-61622
W9	03577-61624	0	4	CBL-ASM CXL FSMB/FSMB 384MM BL	28480	03577-61624
W10	03577-61641	1	3	CBL-ASM CXL FSMB/FSMB 135MM OR	28480	03577-61641
W11	03585-61602	4	4	CBL-ASM CXL FSMB/FSMB 76MM RD	28480	03585-61602
W12	03585-61603	5	1	CBL-ASM CXL FSMB/FSMB 100MM OR	28480	03585-61603
W13	03585-61605	7	4	CBL-ASM CXL FSMB/FSMB 330MM GN	28480	03585-61605
W14	03585-61611	5	1	CBL-ASM CXL FSMB/FBNC 730MM GY	28480	03585-61611
W15	03586-61678	5	2	CBL-ASM CXL FSMB/FSMB 205MM GY	28480	03586-61678
W16	89430-61601	7	1	CBL-ASM RGD ASMA/ASMA	28480	89430-61601
W17	89430-61604	0	1	CBL-ASM RGD	28480	89430-61604
W18	8120-6494	2	1	CBL-	28480	8120-6494
W19	8120-6231	5	1	CBL-ASM JMPR RLY	28480	8120-6231
W20	8120-6224	6	2	CBL-RBBN SOURCE	28480	8120-6224
W21	8120-6232	6	1	CBL-ASM LO	28480	8120-6232
W22	8120-6190	5	3	CBL-SEMI-FLEX	12260	1-3636-6005112
W23	8120-6251	9	1	CBL-ASSY SMA-SMB	28480	8120-6251
W25	03585-61617	1	1	CBL-ASM CXL FSMB/FSMB 838MM OR	28480	03585-61617
W26	89430-61602	8	1	CBL-ASM RGD	28480	89430-61602
W27	89430-61603	9	1	CBL-ASM RDG	28480	89430-61603
W28	89430-61608	4	1	CBL-ASM RGD	28480	89430-61608

Instrument Covers and Handles

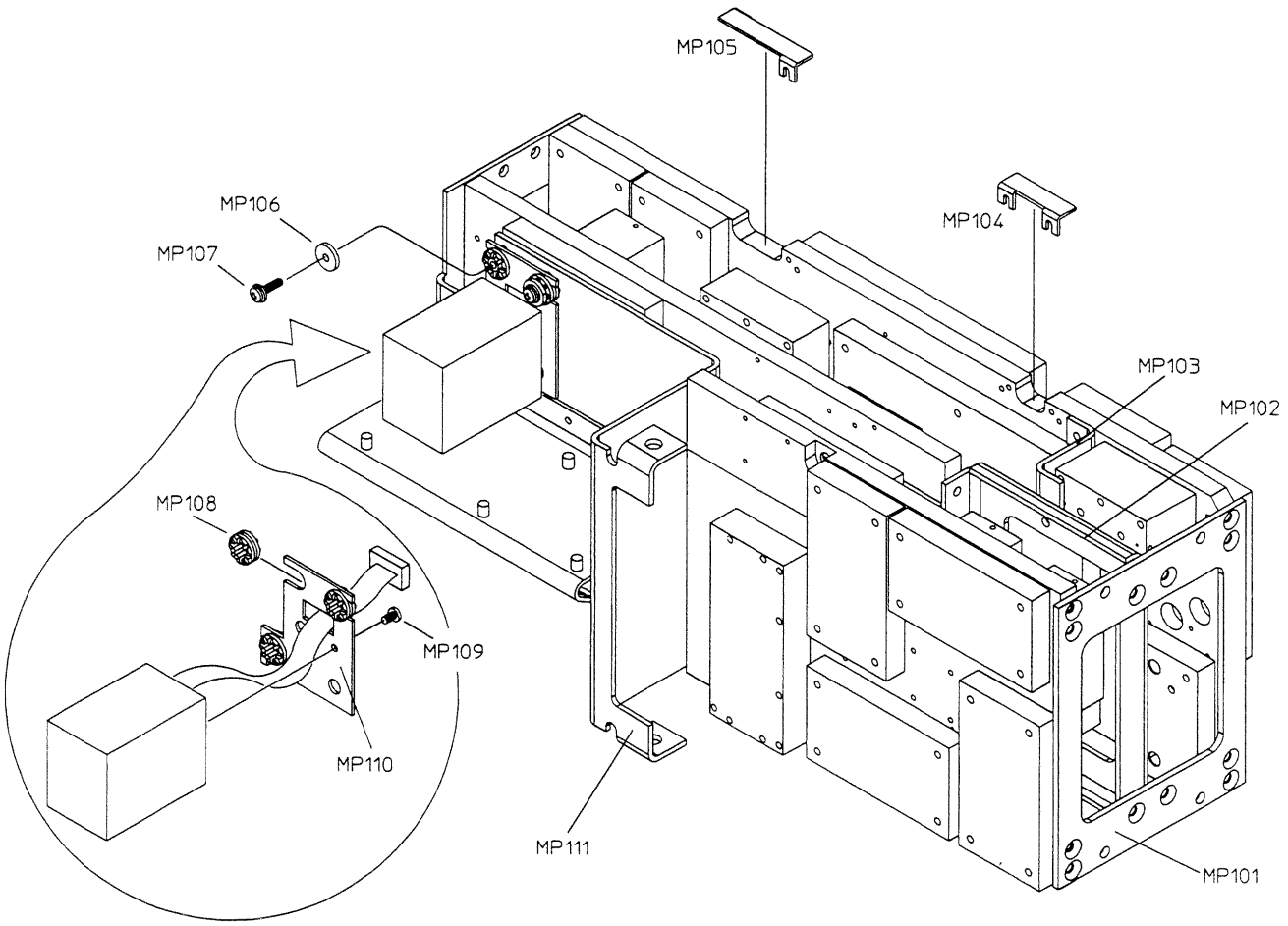
The reference designator for the screws that fasten MP4 and MP5 to the analyzer is MP608.

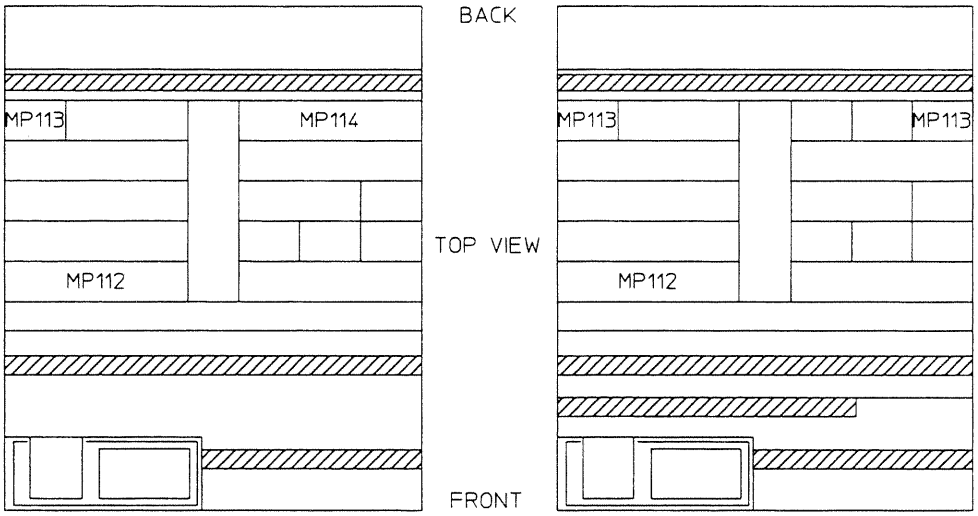


Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP1	5001-0540	2	2	TRIM-FRT FRM SD 177.0H II+VYNL	28480	5001-0540
MP2	5041-8801	8	4	MOLD FOOT II+	28480	5041-8801
MP3	5041-8802	9	1	MOLD TRM-TOP FM II+	28480	5041-8802
MP4	5041-8819	8	2	MOLD STRP HDL CAP FRT II+	28480	5041-8819
MP5	5041-8820	1	2	MOLD STRP HDL CAP RR II+	28480	5041-8820
MP6	5062-3704	4	2	SHTF ASSY-SD HNDL 497D II+SSTP	28480	5062-3704
MP7	5062-3735	1	1	SHTF CVR-TOP FM 497D II+ALV	28480	5062-3735
MP8	5062-3747	5	1	SHTF CVR-BTM FM 497D II+ALV	28480	5062-3747
MP9	5062-3842	1	2	SHTF CVR-SD RS177H497D II+ALVP	28480	5062-3842
MP10	8160-0360	3	4	RFI ROUND STRIP STL MSH/SIL RBR SN-PL	57003	02-0101-0053-05
MP11	89430-01209	5	1	SHTF COVER-SHIELD MU	28480	89430-01209
MP12	89430-01210	8	2	SHTF COVER-VENT PLCR	28480	89430-01210

Assembly Covers and Brackets

The reference designators for the screws and nuts that fasten MP122 (bracket) to the assembly covers are MP611 and MP615. The reference designator for the screws that fasten MP122 to the assemblies is MP622. The reference designators for the nuts and washers that attach the covers to the assemblies' SMB connectors are MP620 and MP617. The reference designator for the screws that fasten MP104 and MP105 to A60 is MP605. The reference designators for the screws that fasten MP111 and MP101 to the assemblies are MP613 and MP606. The reference designator for the screws that fasten MP111 and MP101 to the side struts is MP606.





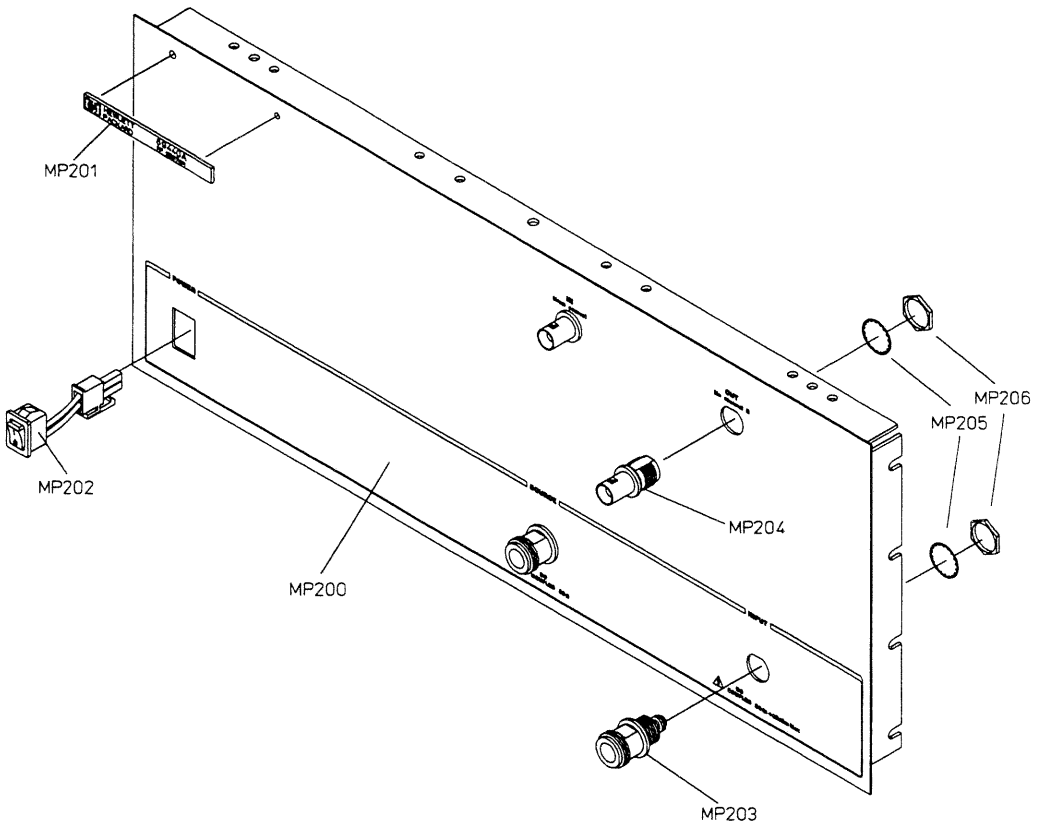
Without Source Option AY8

With Source Option AY8

Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP101	89430-01203	9	1	SHTF BKT-RF RIGHT AL	28480	89430-01203
MP102	89430-01208	4	1	SHTF BKT-SOURCE AL	28480	89430-01208
MP103	89430-01207	3	1	SHTF BKT-SOURCE TOP AL	28480	89430-01207
MP104	89430-01212	0	1	SHTF CLMP-#2 CABLE AL	28480	89430-01212
MP105	89430-01211	9	1	SHTF CLMP-#1 CABLE AL	28480	89430-01211
MP106	3050-0596	9	3	WASHER-FL MTLC NO. 6 .156-IN-ID .5-IN-OD	51506	X71382
MP107	0515-2011	0	3	SCR-MCH M3.5 12MMLG PHTX SSTSC	28480	0515-2011
MP108	0400-0356	9	3	GRMT-ISOLATION.191D	03934	G-411-1
MP109	2200-0105	4	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
MP110	89430-01213	1	1	SHTF BKT-YIG AL	28480	89430-01213
MP111	89430-01202	8	1	SHTF BRKT-RF LEFT AL	28480	89430-01202
MP112	89430-04101	2	1	SHTF CVR-#1 BLNK AL	28480	89430-04101
MP113	89430-04102	3	1	SHTF CVR-#2 BLNK AL	28480	89430-04102
MP114	89430-04103	4	1	SHTF CVR-#3 BLNK AL	28480	89430-04103
MP115	89430-04122	7	1	SHTF CVR-22 BD ALSK	28480	89430-04122
MP116	89430-04123	8	1	SHTF CVR-23 BD ALSK	28480	89430-04123
MP117	89430-04124	9	1	SHTF CVR-24 BD ALSK	28480	89430-04124
MP118	89430-04125	0	1	SHTF CVR-25 BD ALSK	28480	89430-04125
MP119	89430-04131	8	1	SHTF CVR-31 BD ALSK	28480	89430-04131
MP120	89430-04132	9	1	SHTF CVR-32 BD ALSK	28480	89430-04132
MP121	89430-04333	2	1	LBL-INFO CVR-33 BOARD	28480	89430-04333
MP122	1400-0964	6	3	BRACKET-RTANG STL ZINC/CLEAR CHROMATE	28480	1400-0964

Front Panel Parts

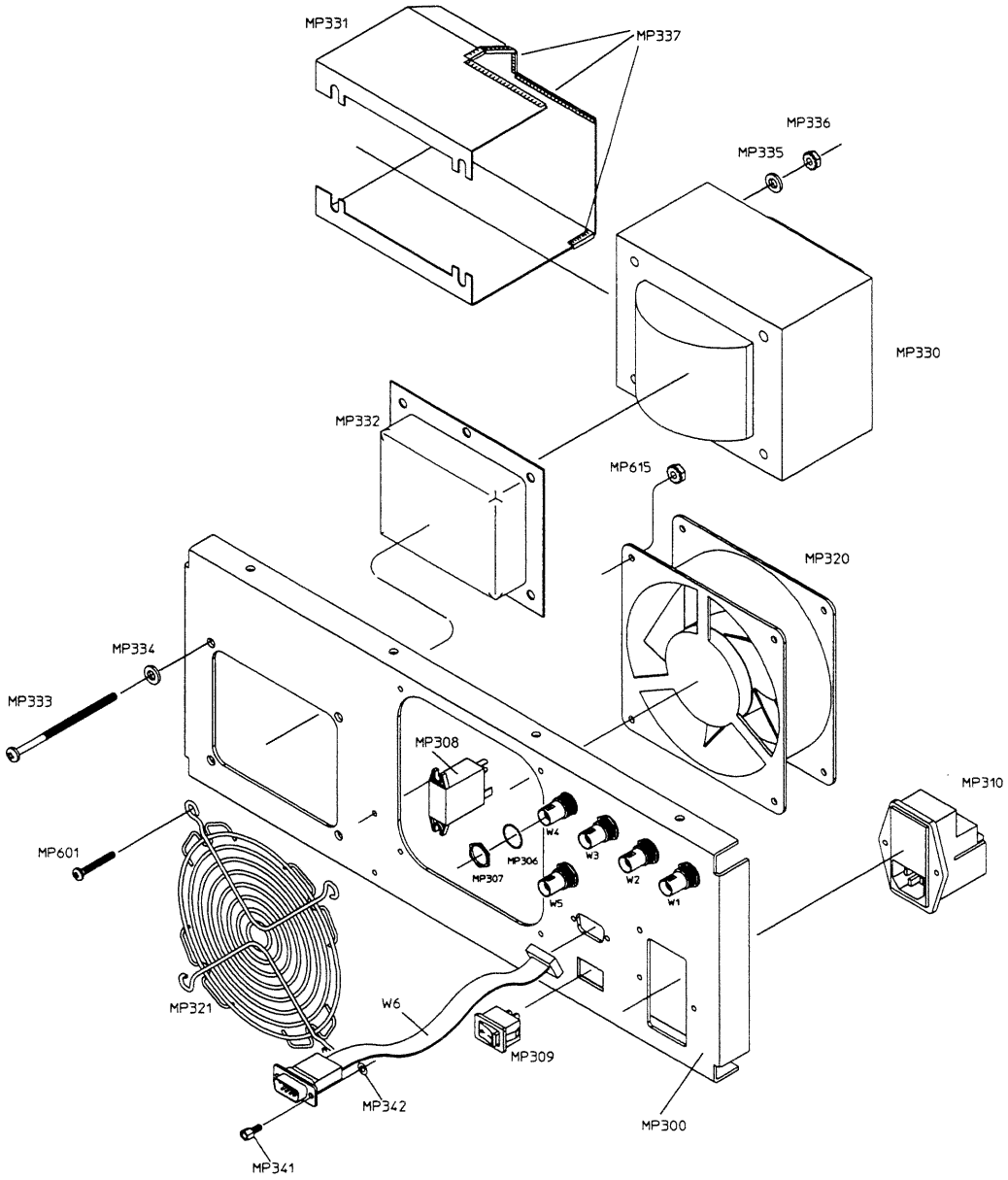
The reference designator for the screws that fasten MP200 to the front frame is MP610.



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP200	89430-64311	2	1	PNL-FRT DRS"89430A" ALPT	28480	89430-64311
MP201	89440-34302	0	1	PLT-NAME BOTTOM BOX	28480	89440-34302
MP202	8120-6495	3	1	SWITCH-RKR SIG-SW DPST .1A 24VDC Q CONN	09328	8120-6495
MP203	1250-1811	5	1	ADAPTER-COAX STR F-N F-SMA	06860	34N-SMA-50-2
MP204	1250-0102	5	3	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	24931	28JS109-1
MP205	2190-0068	5	3	WASHER-LK INTL T 1/2 IN .505-IN-ID	28480	2190-0068
MP206	2950-0054	1	3	NUT-HEX-DBL-CHAM 1/2-28-THD .125-IN-THK	28480	2950-0054

Rear Panel Parts

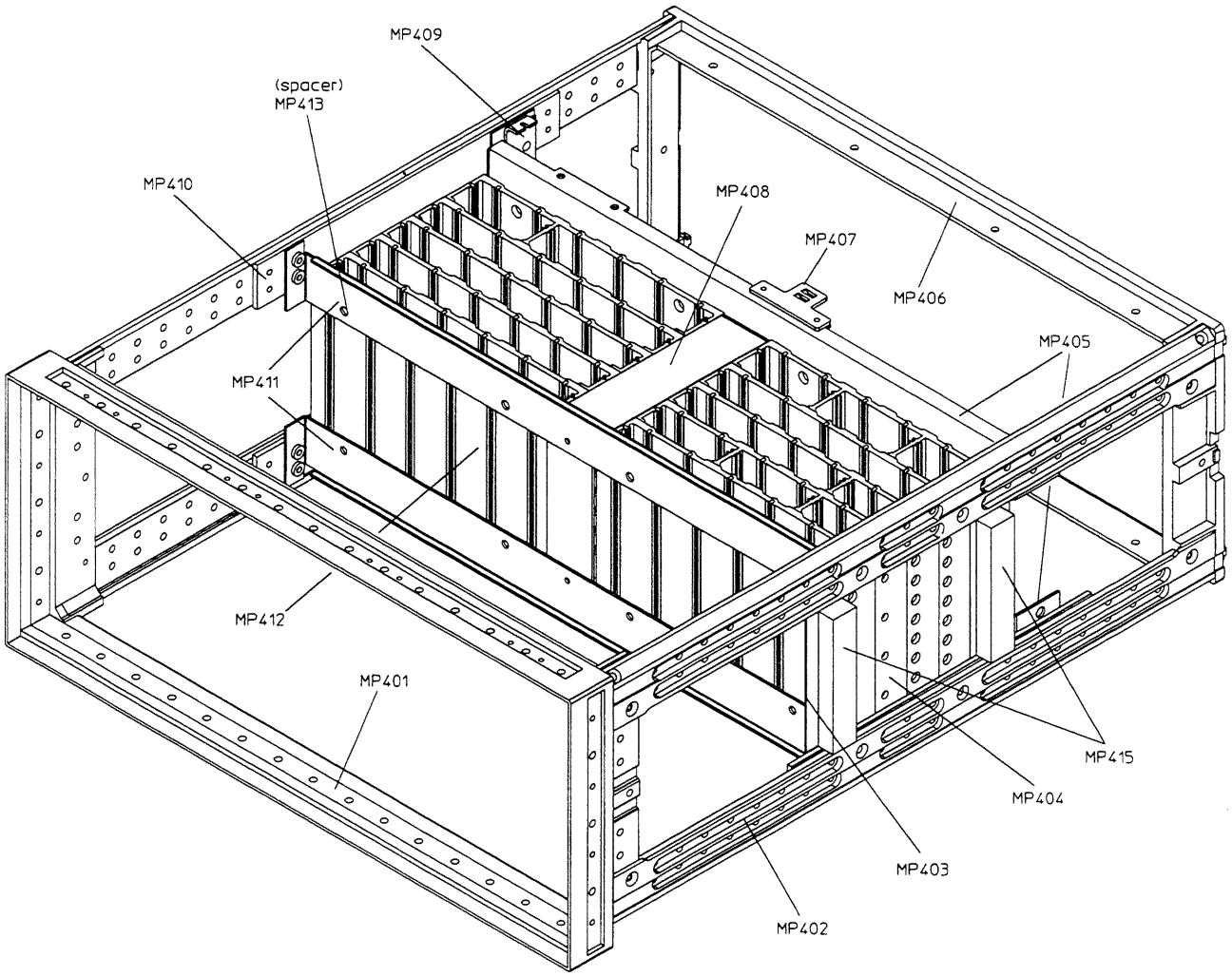
The reference designator for the screws that fasten MP300 to the rear frame is MP607. The reference designators for the screws and nuts that fasten MP310 to MP300 are MP610 and MP615. The reference designators for the screws, washers, and nuts that fasten MP308 to MP300 are MP602, MP621, and MP615. The reference designator for the nuts that fasten W6 to MP300 is MP615.



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP300	89430-00102	5	1	SHTF PANEL-REAR ALSK	28480	89430-00102
MP306	2190-0099	2	4	WASHER-LK INTL T 7/16 IN .472-IN-ID	28480	2190-0099
MP307	2950-0035	8	4	NUT-HEX-DBL-CHAM 15/32-32-THD	28480	2950-0035
MP308	0490-1735	9	1	REL EMR JR1AF	61529	JR1AF-TM-DC12V
MP309	3101-3008	3	1	SW--RKR	09328	WI32/177
MP310	9135-0243	9	1	LINE FILTER/POWER MODULE	S4307	FN 376-4/22
MP320	3160-0634	9	1	FAN-TBAX 115VAC	12339	4715FS-12T-B20
MP321	3160-0562	2	1	FAN-GUARD	10938	08128
MP330	9100-5048	9	1	XFM-POWER	02081	PX5019
MP331	89430-00601	9	1	SHTF SHIELD-TRANSFORMER MU	28480	89430-00601
MP332	7100-0109	1	1	STMP CVR-XFM STLPT	28480	7100-0109
MP333	2510-0138	0	4	SCREW-MACH 8-32 3-IN-LG PAN-HD-POZI	28480	2510-0138
MP334	3050-0027	1	4	WASHER-FL MTLC NO. 10 .203-IN-ID	28480	3050-0027
MP335	3050-0027	1	4	WASHER-FL MTLC NO. 10 .203-IN-ID	28480	3050-0027
MP336	2580-0003	5	4	NUT-HEX-W/LKWR 8-32-THD .125-IN-THK	28480	2580-0003
MP337	0400-0225	1	0	GROMMET-CHAN SERR .031-IN-GRV-WD	06915	SNGS-1
MP341	0380-1689	9	2	STANDOFF-HEX 4.75-MM-LG M3.0 X 0.5-THD	28480	0380-1689
MP342	3050-0891	7	2	WASHER-FL MTLC 3.0 MM 3.3-MM-ID	28480	3050-0891
MP343	0837-0215	4	1	THERMISTOR-SURGE PTCTR USED AS SURGE	12830	SG-220S
MP344	0890-0100	8	0	TUBING-HS .093-D/.046-RCVD .02-WALL	02145	VERSAFIT-3/32-WHT
MP345	0890-0708	2	1	TUBING-HS .375-D/.187-RCVD .025-WALL	02145	VERSAFIT-3/8-WHT
MP346	0890-0765	1	1	TUBING-HS .187-D/.093-RCVD .02-WALL	02145	VERSAFIT-3/16-WHT
MP347	0890-0930	2	0	TUBING-HS .75-D/.375-RCVD .03-WALL POLYO	02145	VERSAFIT-3/4
MP348	6960-0041	1	1	PLUG-HOLE FL-HD FOR .5-D-HOLE NYL	03480	2643 (BLACK)
MP349	8150-4383	7	1	JMPR 22GA YEL 300MM 8x8	28480	8150-4383
MP349	8150-0038	1	0	WIRE 22AWG Y 300V PVC 7X30 105C	28480	8150-0038
MP350	8150-4504	4	1	JMPR 22GA WHT 300MM 8x8	28480	8150-4504
MP351	8150-4536	2	1	JMPR 22GA WHTGRNGRA 150MM 8x8	28480	8150-4536
MP352	8150-4556	6	1	JMPR 18GA GRNYEL 100MM 8x8	28480	8150-4556
MP353	8120-6225	7	1	LJPR 22GA WTBNGY FASTON PVC	28480	8120-6225
MP354	8120-6226	8	1	LJPR 22GA GY FASTON PVC	28480	8120-6226
MP355	8120-6227	9	1	LJPR 22GA WTGY FASTON PVC	28480	8120-6227
MP356	8120-6228	0	1	LJPR 22GA WTRDGY FASTON PVC	28480	8120-6228

Chassis Parts

The reference designators for the screws that fasten MP402 to MP401 and MP406 are MP613 and MP614 (corner). The reference designator for the screws that fasten MP407 to MP405 and MP408 to MP411 is MP605. The reference designator for the screws that fasten MP410 to MP402 is MP606. The reference designator for the screws that fasten MP411 and MP405 to MP412 and MP404 is MP603. The reference designator for the screws that fasten MP411 and MP405 to MP402 is MP604.



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP401	5021-4716	4	1	CSTG FRM-FRT FM 177.0H II+ALPT	28480	5021-4716
MP402	5021-5837	2	4	CSTG STRT-CRNR 497.8D II AL	28480	5021-5837
MP403	89430-01214	2	2	SHTF BRKT-GASKET AL	28480	89430-01214
MP404	89430-60602	6	1	MCHD-XTRU RT ASSY	28480	89430-60602
MP405	89430-01204	0	2	SHTF BKT-CARDNEST REAR STLZ	28480	89430-01204
MP406	5021-5806	5	1	CSTG FRM-RR FM 177.0H II AL	28480	5021-5806
MP407	89430-01205	1	2	SHTF POWER SUPPLY HOLD-DN AL	28480	89430-01205
MP408	89430-01206	2	1	SHTF AIRDAM-CARDNEST AL	28480	89430-01206
MP409	89430-61201	3	2	SHTF GD-PWR SPPLY BD AL	28480	89430-61201
MP410	89430-21202	0	4	SHTF BKT-SPACER SUPPORT AL	28480	89430-21202
MP411	89430-01201	7	2	SHTF BRKT-FRONT CARDNEST STLZ	28480	89430-01201
MP412	89431-60601	6	1	MCHD-XTRS LEFT ASSY	28480	89431-60601
MP413	0380-3006	8	16	SPCR -RD .166X.312X.125L SST	05791	SS6342-08-0.125-00
MP415	89430-26701	4	4	GSKT AIR-DAM FOAM W/ADH	28480	89430-26701

Screws, Washers, and Nuts

Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP601	0515-0667	8	4	SCREW-MACH M3 X 0.5 25MM-LG PAN-HD	28480	0515-0667
MP602	0515-0374	4	2	SCREW-MACHINE ASSEMPLY M3 X 0.5 10MM-LG	28480	0515-0374
MP603	0515-0380	2	16	SCREW-MACHINE ASSEMPLY M4 X 0.7 10MM-LG	28480	0515-0380
MP604	0515-0382	4	16	SCREW-MACHINE ASSEMPLY M4 X 0.7 12MM-LG	28480	0515-0382
MP605	0515-0430	3	17	SCREW-MACHINE ASSEMPLY M3 X 0.5 6MM-LG	28480	0515-0430
MP606	0515-0433	6	26	SCREW-MACHINE ASSEMPLY M4 X 0.7 8MM-LG	28480	0515-0433
MP607	0515-0458	5	8	SCREW-MACHINE ASSEMPLY M3.5 X 0.6 8MM-LG	28480	0515-0458
MP608	0515-1132	4	8	SCREW-MACH M5 X 0.8 10MM-LG	28480	0515-1132
MP609	0515-1821	8	72	SCR-TPG M3.0 11MMLG HH STZN	28480	0515-1821
MP610	0515-2033	6	8	SCR-MCH M3.0 10MMLG FHTX SST	28480	0515-2033
MP611	0515-2035	8	3	SCR-MCH M3.0 16MMLG FHTX SST *	28480	0515-2035
MP612	0515-2042	7	8	SCR-MCH M4.0 6MMLG FHTX SSTPL	28480	0515-2042
MP613	0515-2043	8	14	SCR-MCH M4.0 8MMLG FHTX SST *	28480	0515-2043
MP614	0515-2086	9	8	SCR-SPC M4.0 7MMLG FHTX SST	28480	0515-2086
MP615	0535-0031	2	13	NUT-HEX W/LKWR M3 X 0.5 2.4MM-THK	28480	0535-0031
MP616	0624-0653	3	72	SCR-TPG 4-40 .50LG PHTX STZN	28480	0624-0653
MP617	2190-0124	4	10	WASHER-LK INTL T NO. 10 .195-IN-ID	98291	3002-26
MP618	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
MP619	2360-0123	4	2	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	28480	2360-0123
MP620	2950-0078	9	10	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	98291	40001-18-030-156
MP621	3050-0010	2	3	WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0010
MP622	0515-2411	4	5	SCR-MCH M2.5 5MMLG PHTX SST +	28480	0515-2411

Miscellaneous Parts

Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP701	1250-0780	5	1	ADAPTER-COAX F-BNC M-N	24931	29JP104-2
MP702	1250-1499	5	1	ADAPTER-COAX RTANG M-BNC F-BNC	24931	28AU100-1
MP703	1400-0249	0	3	CABLE TIE .062-.625-DIA .091-WD NYL	56501	TY-23M-8
MP704	1400-0031	8	4	CLAMP-CABLE .375-DIA .5-WD NYL	03480	3326
MP705	1400-1122	0	2	CLAMP-CABLE .187-DIA .735-WD NYL	34785	021-0188
MP706	1400-1229	8	1	CLAMP-CABLE .375-DIA 1-WD NYL	34785	021-0375
MP707	1400-1513	3	15	CBL-TIE .75D 4.25LG TAG NYLNA	28480	1400-1513
MP710	5062-3999	9	1	KIT-RR PNL LK FT II+	28480	5062-3999
MP711	8120-1838	8	1	CABLE ASSY-COAX 50-OHM 12-IN-LG JGK	28480	8120-1838
MP712	8120-2682	2	2	CABLE ASSY-COAX 50-OHM 8.5-IN-LG 30PF/FT	28480	8120-2682
MP713	9170-1521	2	1	IND -CORE SHLD BEAD OTHER	03827	0443164251
MP714	8120-6230	4	1	CBL-ASM 1.5FT (2)9D FEMALE	28480	8120-6230
A33F1	2110-0671	8	1	FUSE .125A 125V NTD .28X.096	75915	R251.125T1
A90F501	2110-0684	3	1	FUSE 2A 125V NTD .3X.103 UL	75915	R251002T1
	89440-84402	6	1	FIRMWARE UPDATE KIT	28480	89440-84402
	2110-0003	0	1	FUSE 3A 250V NTD 1.25X.25 UL	75915	312 003
	2110-0304	4	1	FUSE 1.5A 250V TD 1.25X.25 UL	75915	313 015
	1250-2121	2	1	50 OHM COAXIAL TERMINATION (for A60J151 and A60J452)	02788	2001-6500-00

5

Circuit Descriptions

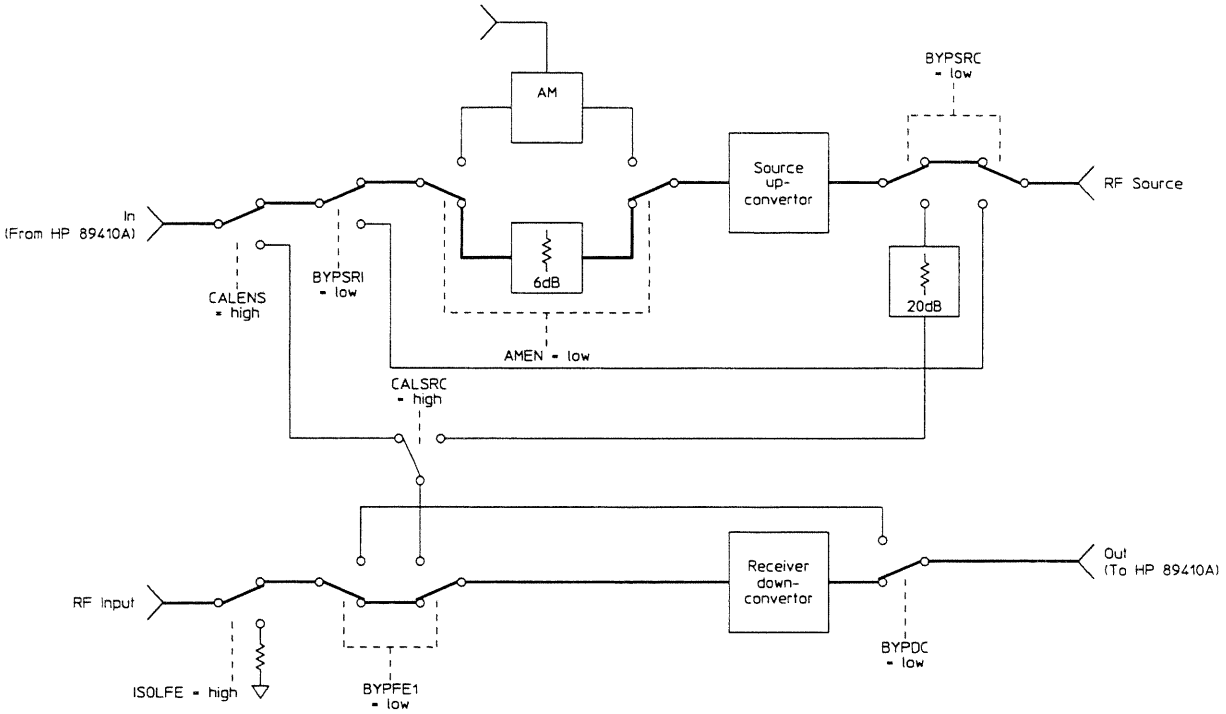
Circuit Descriptions

This chapter contains the overall instrument description and individual assembly descriptions for the HP 89430A. The overall instrument description contains signal flow diagrams and an overall block diagram. For signal descriptions and information on voltage and signal distribution, see chapter 6, "Voltages and Signals."

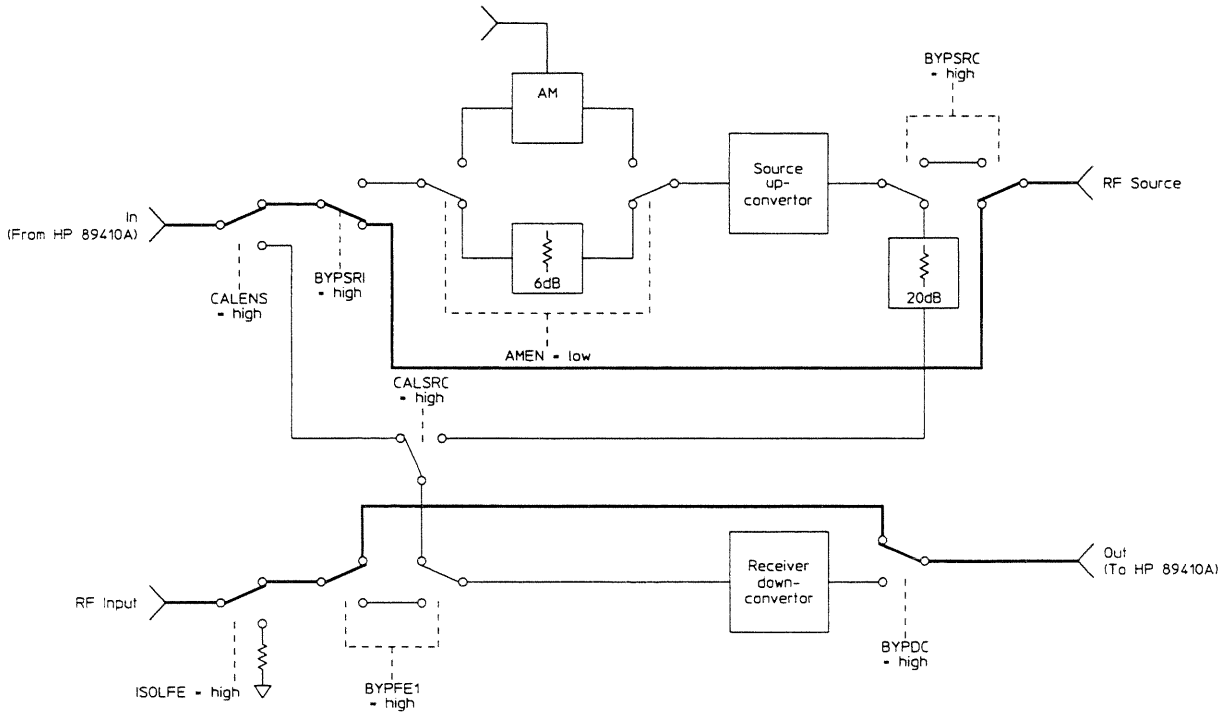
Overall Instrument Description

The HP 89430A is the RF section of the HP 89440A DC-1800 MHz Vector Signal Analyzer. The HP 89410A is the IF section of the analyzer. The analyzer uses analog and digital circuits to make spectrum measurements. For frequency domain measurements, the analyzer uses the Fast Fourier Transform (FFT) algorithm. The HP 89410A performs all measurement control, setup, and computations. The HP 89410A provides the control lines to the HP 89430A over the external serial bus. The HP 89430A converts input signals up to 1.8 GHz down to the bandwidth of the HP 89410A. For analyzers with the optional source, the HP 89430A can convert the HP 89410A's source signal up to 1.8 GHz.

The following illustration shows the signal path through the HP 89430A when the signals are converted.



The following illustration shows the signal path through the HP 89430A when the signals are not converted.



HP 89430A Block Diagram

The following figures shows the overall block diagram for the HP 89430A. Each block in the diagram represents a function performed by the HP 89430A. The assembly or assemblies that perform the function are listed in the block.

Receiver

Converts up to a 7 MHz wide frequency block between 2 MHz and 1800 MHz to between 2 MHz and 10 MHz. Input signals between 0 Hz and 10 MHz can bypass the Receiver. A BNC cable connects the converted or bypassed signals to the HP 89410A. The block diagram on page 5-6 shows the signal flow to and from each assembly in the receiver.

Source

Converts the HP 89410A's 2 MHz to 10 MHz source output to a frequency block up to 7 MHz wide between 2 MHz and 1800 MHz. Source signals between 0 Hz and 10 MHz can bypass the Source. The source block diagram on page 5-6 shows the signal flow to and from each assembly in the optional source. In HP 89430As without the optional source, the A33 Source AM/1st Conversion assembly routes the HP 89410A's source output to the SOURCE connector or to the Receiver during calibration. The SOURCE connector is a type-N in HP 89430As with the optional source and a BNC in HP 89430As without the optional source. A BNC cable connects the HP 89410A's source output to the HP 89430A's source input.

Local Oscillator

Generates the first and second LO for the receiver and the second and third LO for the source. The first and third LO can step from 2.451 GHz to 4.246 GHz in 1 MHz steps. The second LO is a 2.4 GHz signal. The local oscillator block diagram on page 5-7 shows the signal flow to and from each assembly in the local oscillator.

Frequency Reference

Generates the 10 MHz, 40 MHz and 600 MHz frequency references. The frequency reference block diagram on page 5-7 shows the signal flow to and from each assembly in the frequency reference.

Digital Control

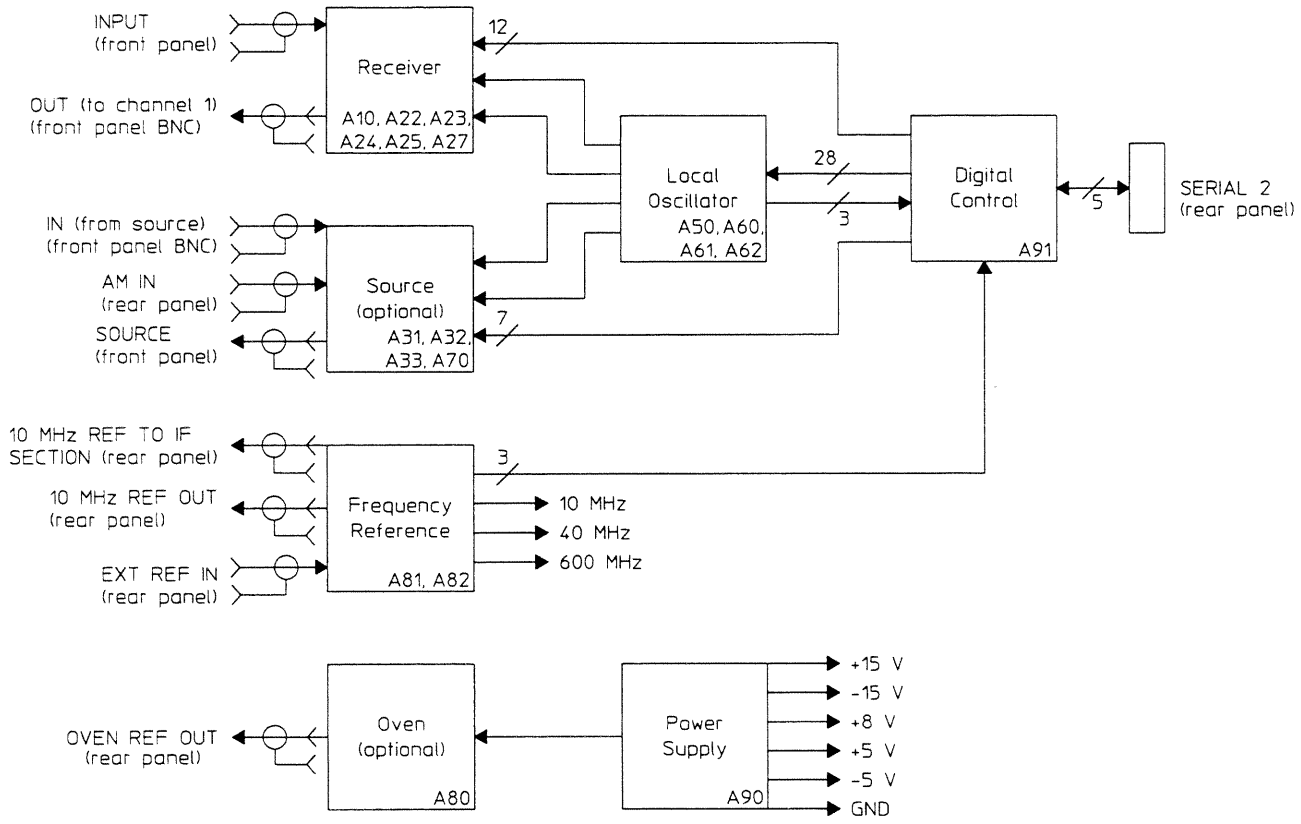
Interfaces with the HP 89410A via the serial port and provides the control lines for the HP 89430A.

Oven

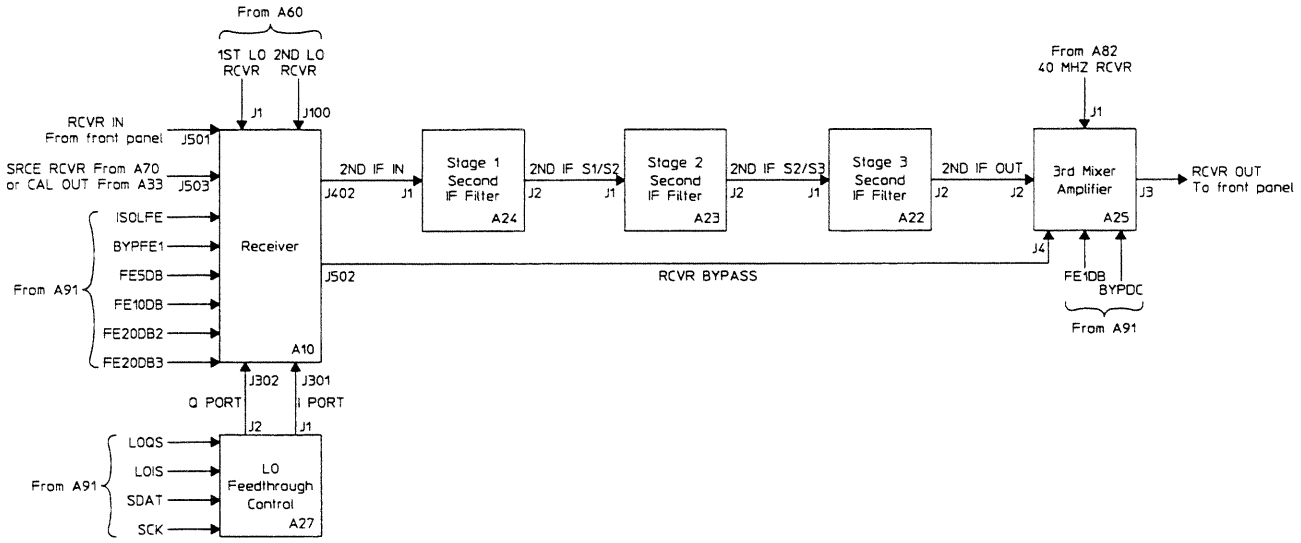
Provides a stable 10 MHz frequency reference. A BNC-to-BNC jumper from OVEN REF OUT to EXT REF IN (on the rear panel) connects this signal to the Frequency Reference block. The Oven is optional.

Power Supply

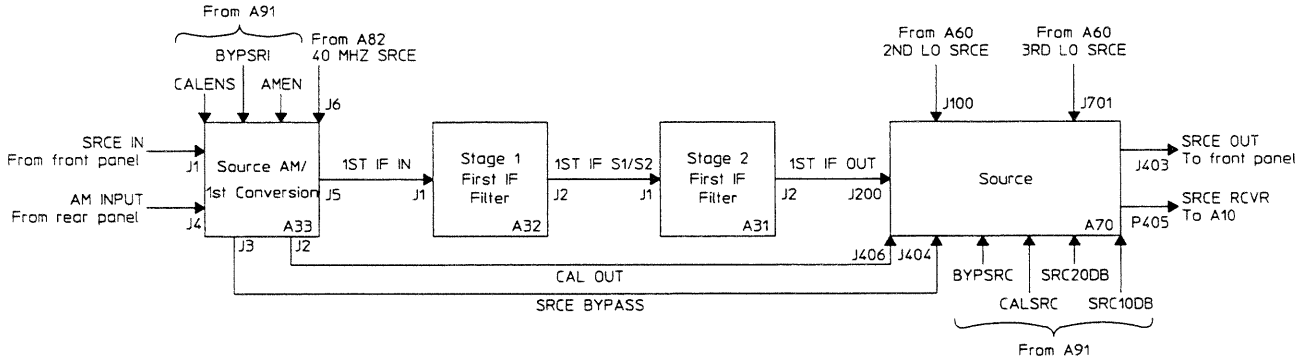
Provides the dc voltages shown in the overall block diagram. See "Power Supply Voltage Distribution" in chapter 6 for further information.



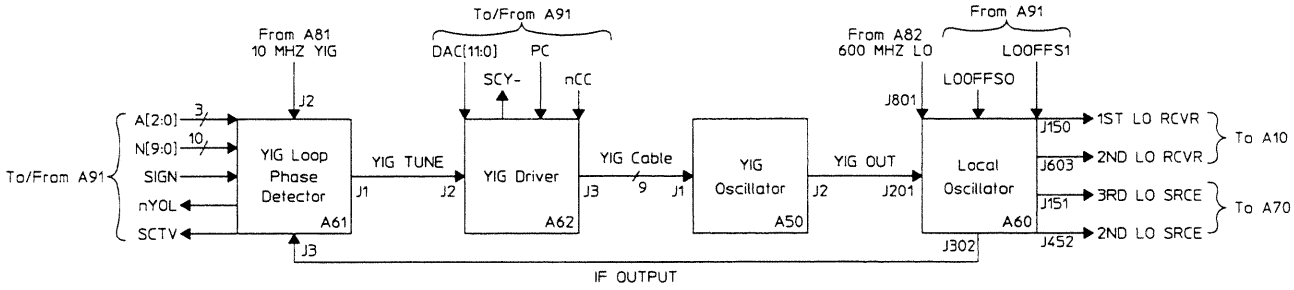
Overall Block Diagram



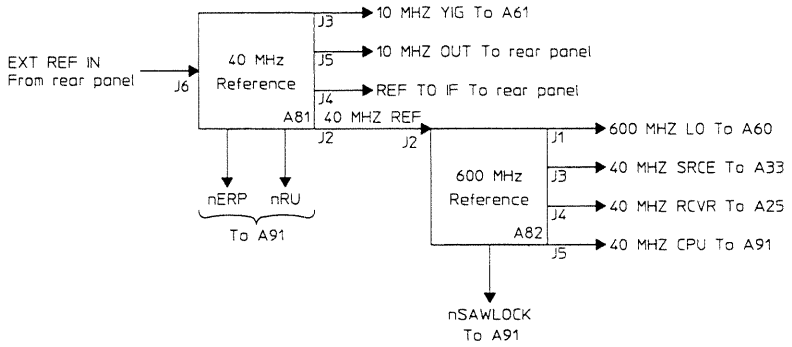
Receiver Block Diagram



Source Block Diagram



Local Oscillator Block Diagram



Frequency Reference Block Diagram

A10 Receiver

The Receiver assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly is the first assembly to condition the input signal. The input signal is the signal connected to the front-panel INPUT connector or a signal from the A70 Source assembly. The input signal can range from 0 Hz to 1.8 GHz.

Input Switch

Routes input signals below 2 MHz to the A25 3rd Mixer Amplifier assembly. This circuit routes input signals above 2 MHz or the signal from the A33 Source AM/First Conversion assembly or optional A70 Source assembly to the 55 dB Attenuator circuit. The relays are shown in their de-energized position.

55 dB Attenuator

Provides from 0 to 55 dB of attenuation, in 5 dB steps.

Input Mixer

Mixes the first LO signal with the input signal. The result of this mixing is the first IF signal centered at 2.446 GHz. This circuit then reduces LO feedthrough by adding the LO feedthrough cancellation signal to the first IF signal. At the output of this circuit, a bandpass diplexer centered at the IF frequency provides 50 ohm output impedance at all frequencies.

LO Feedthrough Cancellation

Monitors the LO feedthrough at the output of the mixer. It then generates a signal that is 180 degrees out of phase with the LO feedthrough.

1st IF Amplifier/Filter

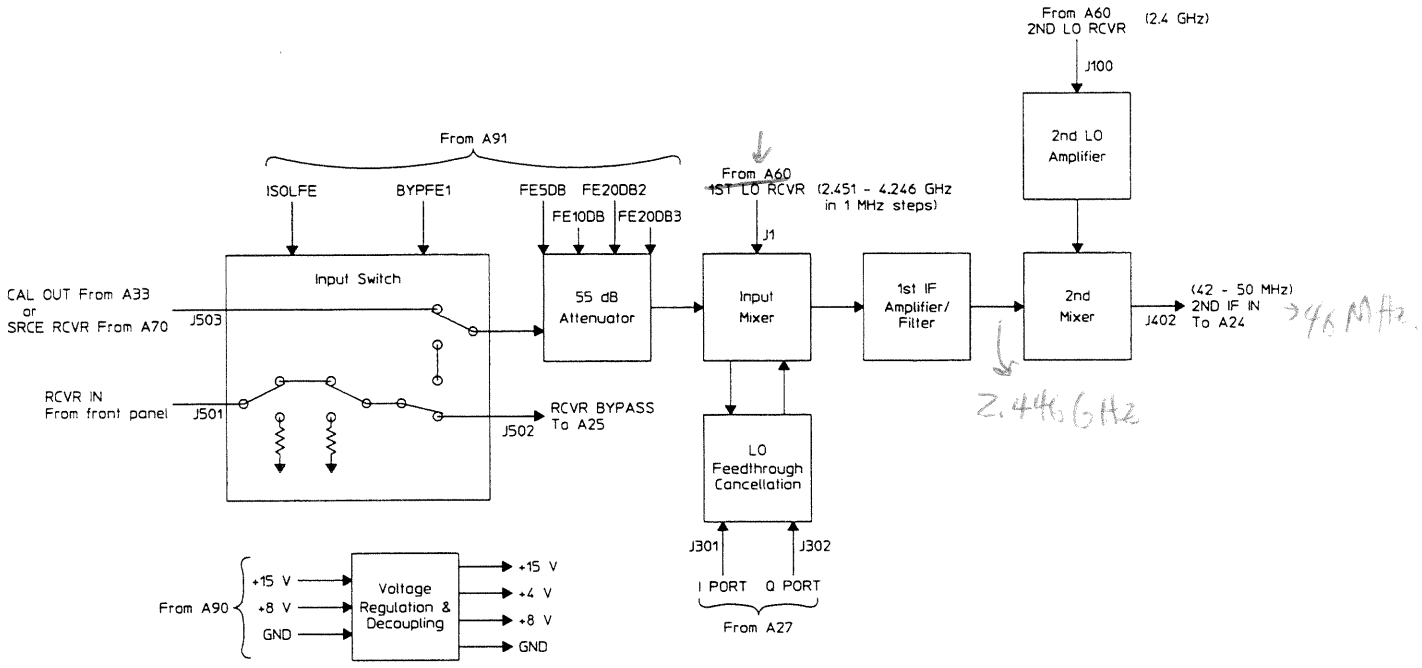
Increases the amplitude of the first IF signal by approximately 12 dB. A helical resonator filter attenuates signals out of the passband centered at 2.446 GHz.

2nd LO Amplifier

Increases the amplitude of the 2.4 GHz second LO signal and provides isolation.

2nd Mixer

Mixes the second LO signal with the first IF signal. The result of this mixing is the second IF signal centered at 46 MHz.



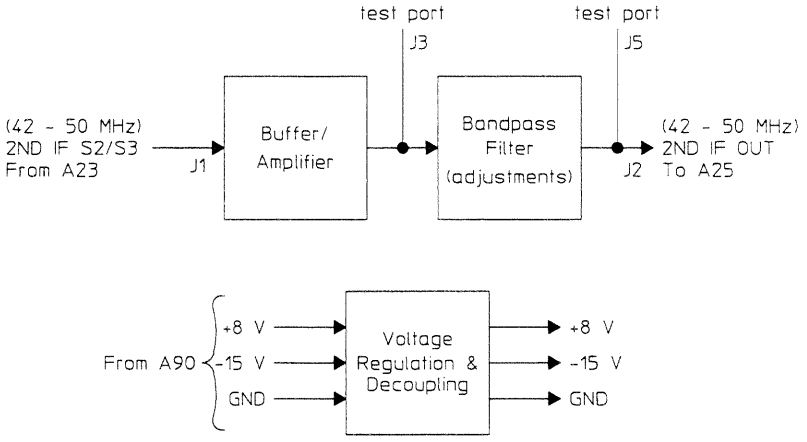
A10 Receiver Block Diagram

A22 Stage 3 Second IF Filter

The Stage 3 Second IF Filter assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly along with the A24 Stage 1 and A23 Stage 2 Second IF Filter assemblies provide bandpass filtering for the receiver's 42 to 50 MHz second IF signal.

Buffer/Amplifier Provides impedance buffering and amplification.

Bandpass Filter Attenuates signals outside the 42 to 50 MHz passband. This circuit contains service adjustments.



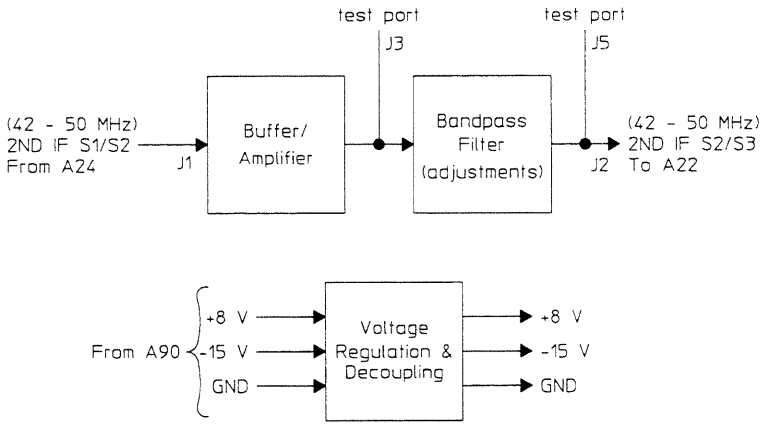
A22 Stage 3 Second IF Block Diagram

A23 Stage 2 Second IF Filter

The Stage 2 Second IF Filter assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly along with the A24 Stage 1 and A22 Stage 3 Second IF Filter assemblies provide bandpass filtering for the receiver's 42 to 50 MHz second IF signal.

Buffer/Amplifier Provides impedance buffering and amplification.

Bandpass Filter Attenuates signals outside the 42 to 50 MHz passband. This circuit contains service adjustments.



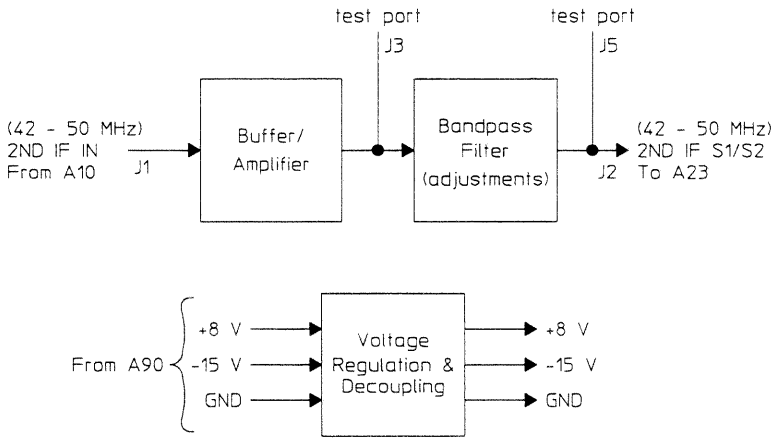
A23 Stage 2 Second IF Block Diagram

A24 Stage 1 Second IF Filter

The Stage 1 Second IF Filter assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly along with the A23 Stage 2 and A22 Stage 3 Second IF Filter assemblies provide bandpass filtering for the receiver's 42 to 50 MHz second IF signal.

Buffer/Amplifier Provides impedance buffering and amplification.

Bandpass Filter Attenuates signals outside the 42 to 50 MHz passband. This circuit contains service adjustments.



A24 Stage 1 Second IF Block Diagram

A25 3rd Mixer Amplifier

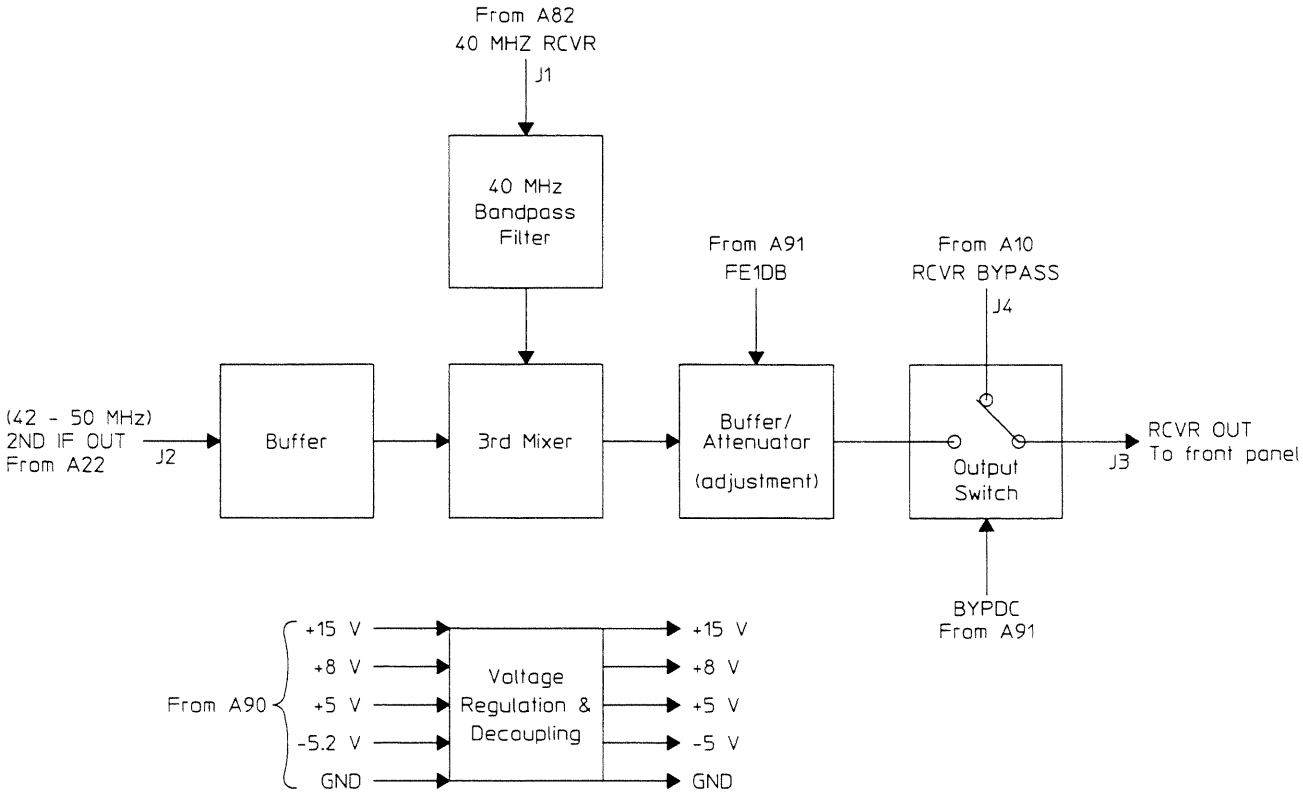
The 3rd Mixer Amplifier assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly is the last assembly that conditions the input signal before it is routed to the front-panel OUT (to channel 1) connector. A BNC cable connects the OUT connector to the HP 89410A's CHANNEL 1 connector.

Buffer — Buffers the second IF signal.

3rd Mixer — Mixes the 42 - 50 MHz second IF signal with 40 MHz third LO signal. The result of this mixing is the third IF signal centered at 6 MHz.

Buffer/Attenuator — Provides a 1 dB attenuator pad that can be bypassed. This circuit contains a service adjustment.

Output Switch — Routes either the third IF signal or the input bypass signal to the front-panel OUT (to channel 1) connector. The relay is shown in its de-energized position.



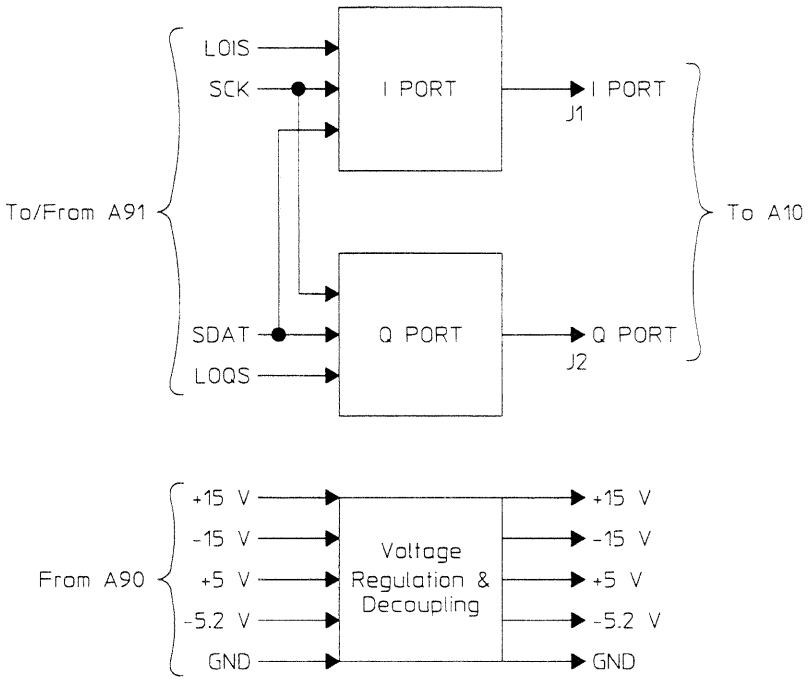
A25 3rd Mixer Amplifier Block Diagram

A27 LO Feedthrough Control

The LO Feedthrough Control assembly is one of six assemblies that together function as the HP 89430A's receiver. This assembly provides the control currents that null LO feedthrough on the A10 Receiver assembly.

I Port and Q Port

Convert digital data from the A91 Digital Control assembly to ±20 mA current sources. The HP 89410A's receiver measures the LO feedthrough. The HP 89410A then determines the control currents needed to null the LO feedthrough. This information is sent to the Digital Control assembly.



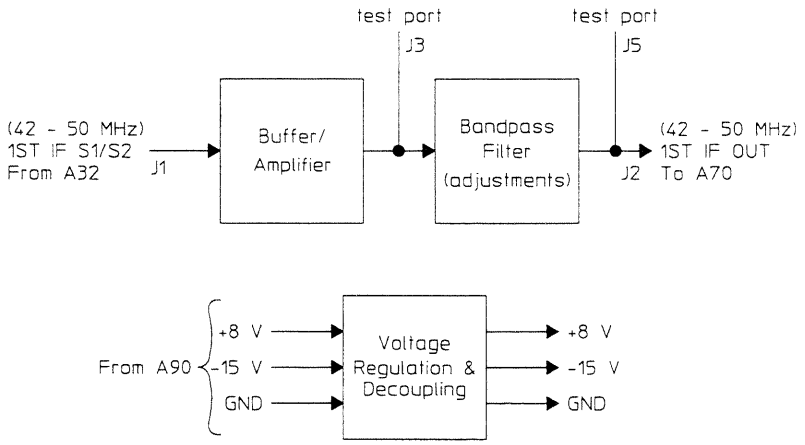
A27 LO Feedthrough Control Block Diagram

A31 Stage 2 First IF Filter

The Stage 2 First IF Filter assembly is one of four assemblies that together function as the HP 89430A's optional source. This assembly along with the A32 Stage 1 First IF assembly provide bandpass filtering for the source's 42 - 50 MHz first IF signal.

Buffer/Amplifier Provides impedance buffering and amplification.

Bandpass Filter Attenuates signals outside the 42 to 50 MHz passband. This circuit contains service adjustments.



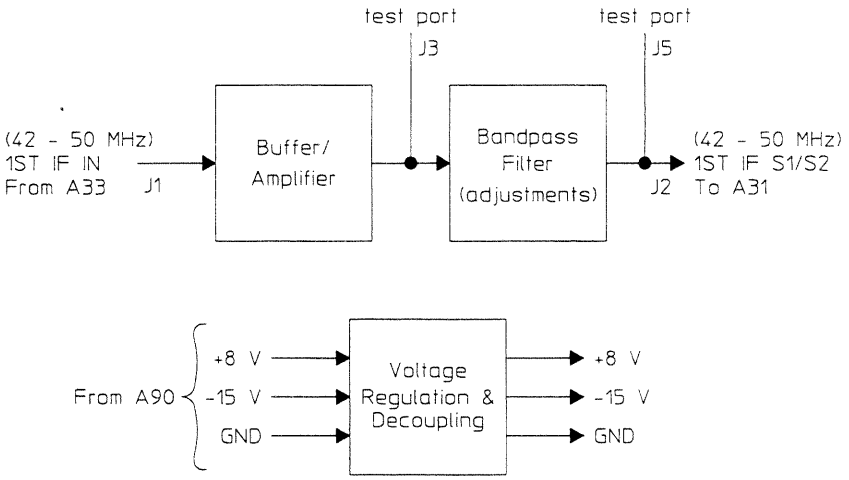
A31 Stage 2 First IF Filter Block Diagram

A32 Stage 1 First IF Filter

The Stage 1 First IF Filter assembly is one of four assemblies that together function as the HP 89430A's optional source. This assembly along with the A31 Stage 2 First IF assembly provide bandpass filtering for the source's 42 - 50 MHz first IF signal.

Buffer/Amplifier Provides impedance buffering and amplification.

Bandpass Filter Attenuates signals outside the 42 to 50 MHz passband. This circuit contains service adjustments.



A32 Stage 1 First IF Filter Block Diagram

A33 Source AM/1st Conversion

The Source AM/1st Conversion assembly is used in HP 89430As with and without the optional source. In HP 89430As without the optional source, this assembly routes the HP 89410A's source to the front panel SOURCE connector or to the A10 Receiver assembly as a calibration signal. In HP 89430As with the optional source, this assembly is the first of four assemblies that together convert the HP 89410A's source up to 1.8 GHz. This assembly's primary function is to frequency shift the HP 89410A's source output by 40 MHz. This assembly also can reroute the HP 89410A's source to bypass the frequency conversion section or to provide a calibration signal for the HP 89430A's receiver. In addition, this assembly can amplitude modulate the source output at rates up to 1 MHz.

Input Switch

Routes the input from the HP 89410A's source to the HP 89430A's receiver calibration path, source bypass path, or to either the Input Buffer or the Amplitude Modulator. The relays are shown in their de-energized position. In HP 89430As without the optional source, CAL OUT is connected to the A10 Receiver assembly and SRCE BYPASS is connected to the front panel SOURCE connector. The front panel SOURCE connector is a type-N connector on HP 89430As with the optional source and a BNC connector on HP 89430As without the optional source.

Input Buffer

This fixed attenuator matches the loss of the Amplitude Modulator at 100% modulation.

AM Buffer

Bandlimits and attenuates the AM input signal. An AM input signal of 1 Vac peak with no offset results in 100% modulation.

Amplitude Modulator

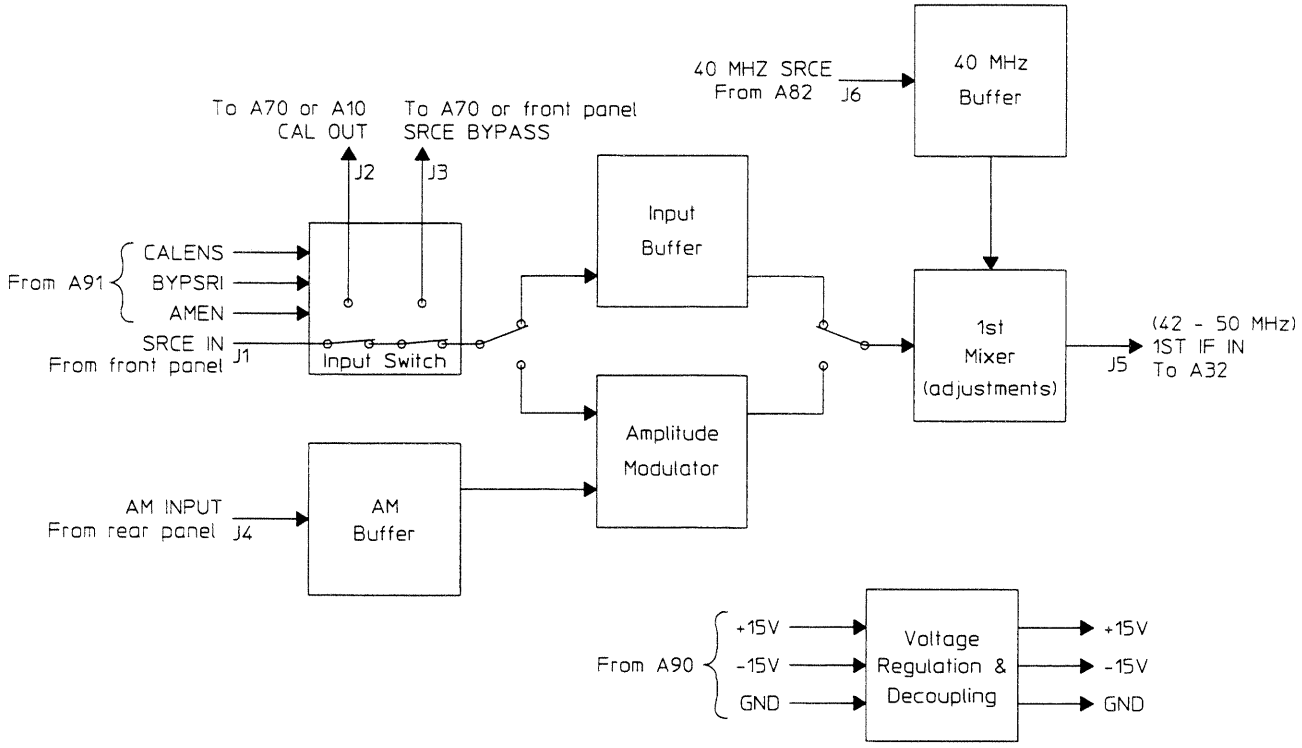
This doubly-balanced multiplier amplitude modulates the source signal.

40 MHz Buffer

Attenuates the 40 MHz local oscillator signal to the level needed by the 1st Mixer.

1st Mixer

Frequency shifts the source signal from its input bandwidth of 2 to 10 MHz to the first IF bandwidth of 42 to 50 MHz.



A33 Source AM/1st Conversion Block Diagram

A50 YIG Oscillator

The YIG (Yyttrium-Iron-Garnet) Oscillator assembly is one of four assemblies that function as the HP 89430A's local oscillator. This is a tuned magnetic device controlled by the A62 YIG Driver assembly. The output of this assembly steps from 2.451 to 4.246 GHz in 1 MHz steps (YIG OUT). For a description of the control lines for this assembly, see "YIG Cable" in chapter 6.

A60 Local Oscillator

The Local Oscillator assembly is one of four assemblies that together function as the HP 89430A's local oscillator. This assembly provides the first and second LO signals for the A10 Receiver assembly and the second and third LO signals for the A70 Source assembly. The first and third LO signals can step from 2.451 GHz to 4.246 GHz, in 1 MHz steps. The second LO signals are fixed 2.4 GHz signals. This assembly also provides a feedback signal to close the local oscillator phase locked loop. The feedback signal can step from 25 MHz to 625 MHz, in 1 MHz steps.

600 MHz Amplifier — Buffers and amplifies the 600 MHz reference signal. This circuit then routes the signal to the 2nd LO Multiplier and to either the 6 X Multiplier, 4 X Multiplier, or the 5 X Multiplier. The relays are shown in their de-energized position.

6 X Multiplier — Triples the 600 MHz signal then doubles the resulting 1.8 GHz signal.

3.6 GHz Filter — Attenuates signals out of the passband centered at 3.6 GHz.

4 X Multiplier — Doubles the 600 MHz signal then doubles the resulting 1.2 GHz signal.

2.4 GHz Filter — Attenuates signals out of the passband centered at 2.4 GHz.

5 X Multiplier — Amplifies the 600 MHz signal's 5th harmonic.

3 GHz Filter — Attenuates signals out of the passband centered at 3 GHz.

2nd LO Multiplier — Doubles the 600 MHz signal then doubles the resulting 1.2 GHz signal.

2.4 GHz Filter — Attenuates signals out of the passband centered at 2.4 GHz.

2nd LO Power Splitter — Routes the 2.4 GHz second LO signal to the A10 Receiver assembly and to the 2nd LO Isolation Amplifier.

2nd LO Isolation Amplifier — Buffers the 2.4 GHz second LO signal providing isolation from the A70 Source assembly. This circuit is included with the optional source.

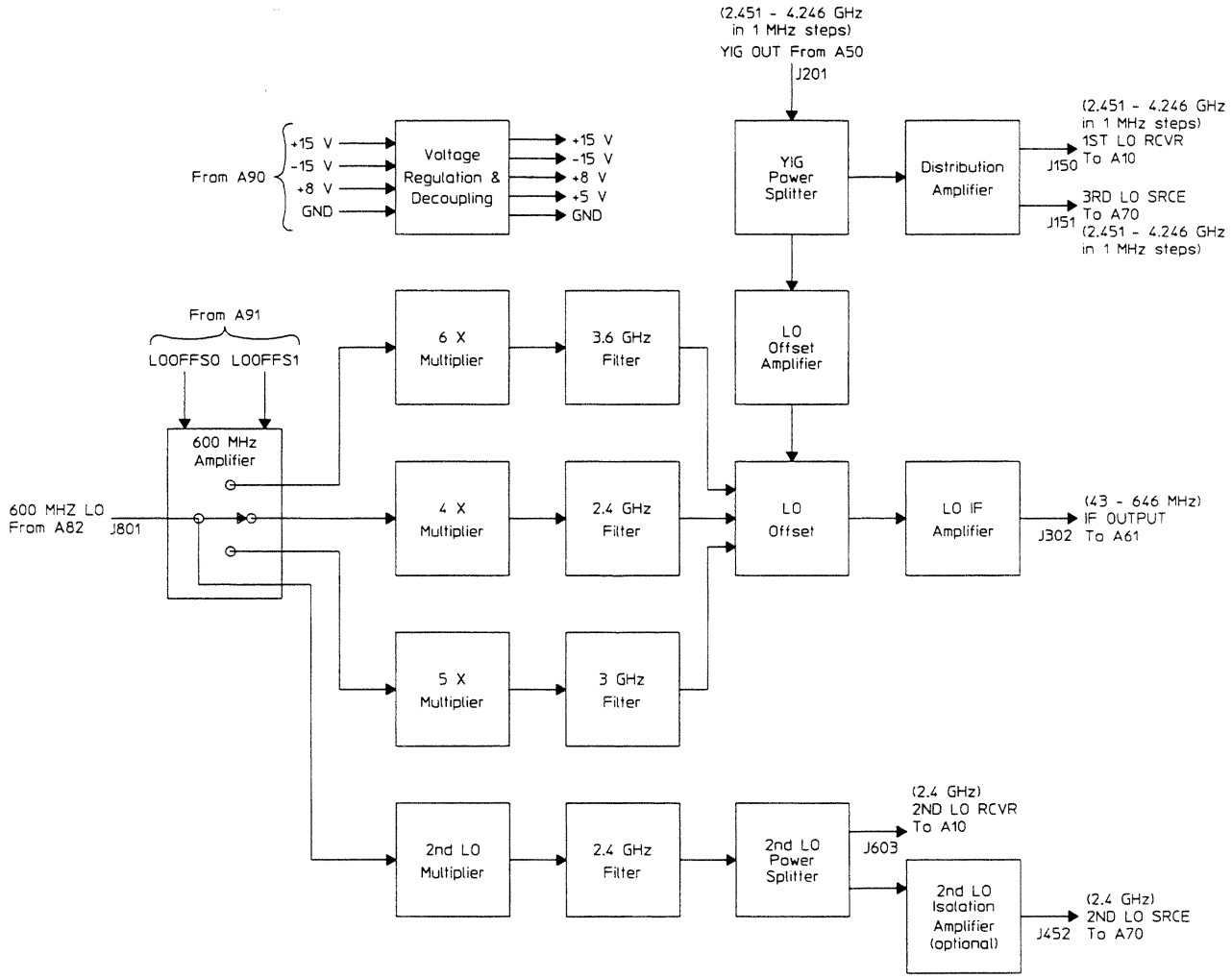
YIG Power Splitter — Routes the 2.451 - 4.246 GHz YIG signal to the LO Offset Amplifier and the Distribution Amplifier.

Distribution Amplifier — Routes the 2.451 - 4.246 GHz YIG signal to the A10 Receiver assembly and the A70 Source assembly.

LO Offset Amplifier — Amplifies the 2.451 - 4.246 GHz YIG signal.

LO Offset — Mixes the 2.451 - 4.246 GHz YIG signal with either the 3.6 GHz, 2.4 GHz, or 3 GHz signal.

LO IF Amplifier — Filters and amplifies the 43 MHz to 646 MHz signal.



A60 Local Oscillator Block Diagram

A61 YIG Loop Phase Detector

The YIG Loop Phase Detector assembly is one of four assemblies that together function as the HP 89430A's local oscillator. This assembly generates a voltage that fine tunes the frequency of the A50 YIG Oscillator assembly.

Divide-by-10 Divides the 10 MHz signal down to 1 MHz.

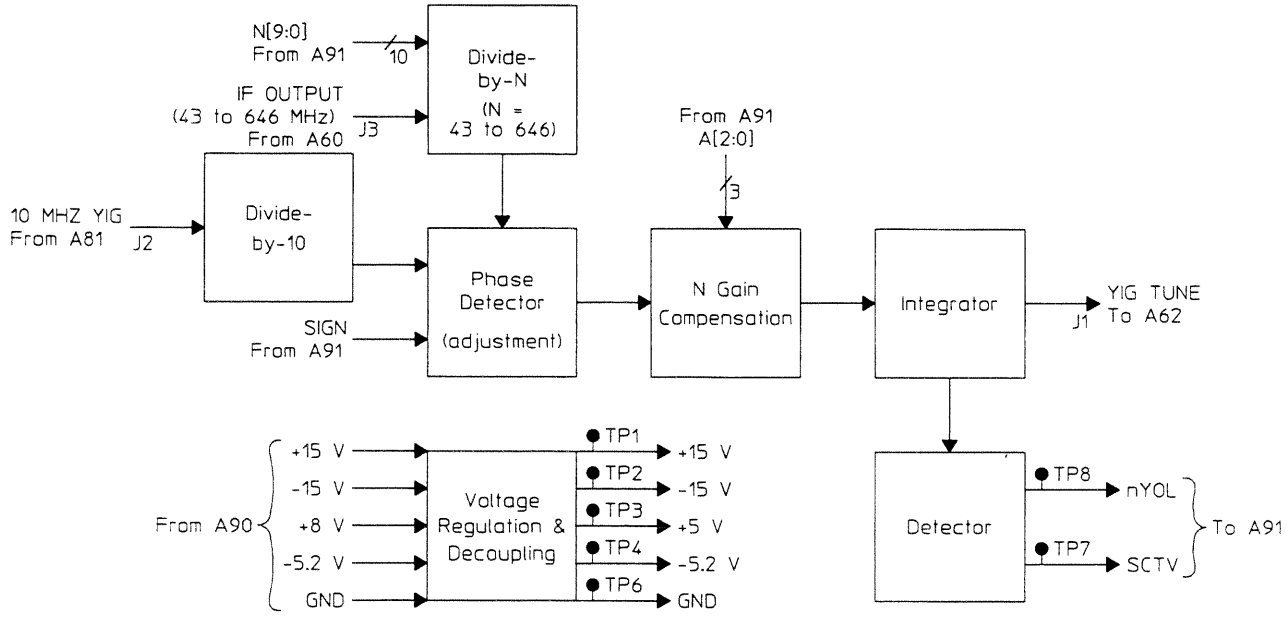
Divide-by-N Divides the IF OUTPUT by a number that will provide a 1 MHz signal to the Phase Detector.

Phase Detector Compares the phase of the signal from the Divide-by-10 with the phase of the signal from the Divide-by-N and generates a voltage relative to the phase difference.

N Gain Compensation Adjusts the gain of the Integrator circuit to compensate for the variation of N.

Integrator Amplifies and integrates the phase difference voltage, creating the control voltage for the A50 YIG Driver assembly.

Detector Monitors the control voltage from the Integrator. If the voltage is too high or too low, this circuit tells the A91 Digital Control assembly that the PLL may be unlocked. The Detector also provides the Digital Control assembly with a scaled version of the control voltage for diagnostics.



A61 YIG Loop Phase Detector Block Diagram

A62 YIG Driver

The YIG Driver assembly is one of four assemblies that function as the HP 89430A's local oscillator. This assembly converts signals from the A91 Digital Control assembly and the A61 YIG Loop Phase Detector assembly to currents that control the frequency of the A50 YIG Oscillator assembly.

DAC

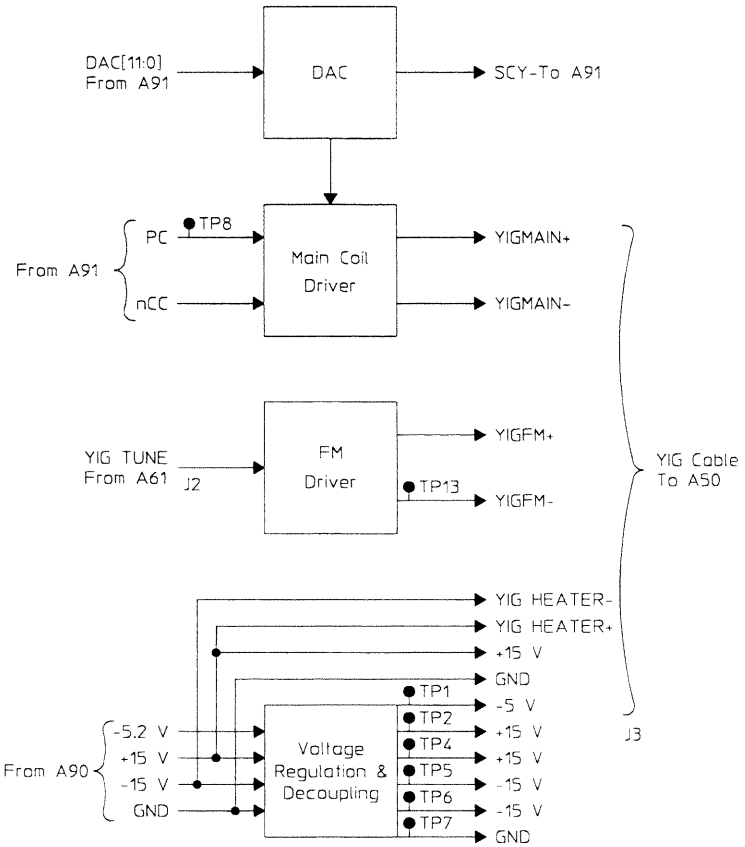
Converts digital data from the A91 Digital Control assembly to a voltage. The DAC also provides the Digital Control assembly with a scaled version of the voltage for diagnostics.

Main Coil Driver

Converts the voltage from the DAC to a current that coarsely tunes the frequency of the A50 YIG Oscillator assembly. This circuit can operate in two modes: fast switching or precharge switching. In fast switching mode, the filter capacitor is disconnected. In precharge switching, the filter capacitor is disconnected, precharged, then reconnected. Precharge switching is used during low noise measurements.

FM Driver

Converts the voltage from the A61 YIG Loop Phase Detector assembly to a current that finely tunes the frequency of the A50 YIG Oscillator assembly.



A62 YIG Driver Block Diagram

A70 Source

The Source assembly is one of four assemblies that together function as the HP 89430A's optional source. This assembly is the last assembly that conditions the source signal before it is routed to the front-panel SOURCE connector.

2nd LO Amplifier — Increases the amplitude of the second LO signal by 25 dB.

2nd Mixer — Mixes the 2.4 GHz second LO signal with the first IF signal centered at 46 MHz. The result of this mixing is the second IF signal centered at 2.446 GHz.

2nd IF Filter — Attenuates signals away from the second IF signal.

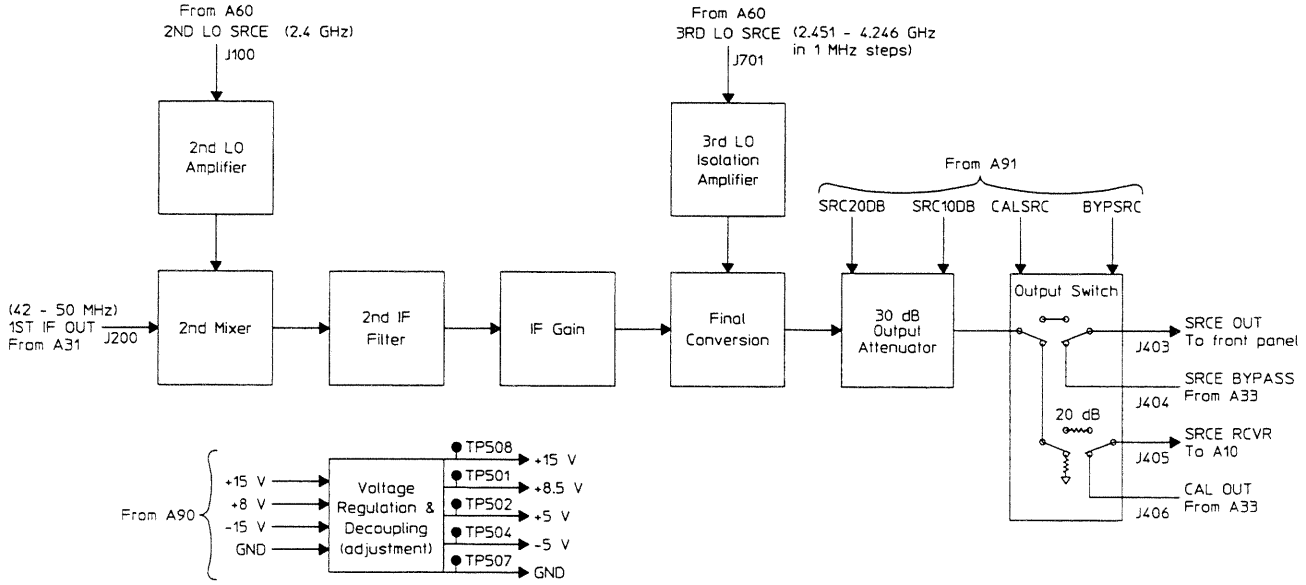
IF Gain — Amplifies the second IF signal.

3rd LO Isolation Amplifier — Buffers the third LO signal providing additional isolation for the A60 Local Oscillator assembly.

Final Conversion — Mixes the 2.451 - 4.246 GHz third LO signal with the 2.442 to 2.450 GHz second IF signal. The result of this mixing is the 2 MHz to 1.8 GHz source signal.

30 dB Output Attenuator — Provides from 0 to 30 dB of attenuation, in 10 dB increments.

Output Switch — Can route the source signal or the source bypass signal (SRCE BYPASS) to the front-panel SOURCE connector. This circuit can also route the source signal or the calibration signal to the A10 Receiver assembly. The relays are shown in their de-energized position.



A70 Source Block Diagram

A80 Oven Oscillator

The optional Oven Oscillator assembly provides a stable 10 MHz frequency reference to the A81 40 MHz Reference assembly. During the oven warm-up cycle, the oven reference output is disabled and the HP 89430A uses its internal crystal reference. When the oven reaches the proper operating temperature (about 10 minutes after power-up), the oven reference output is automatically enabled. A BNC-to-BNC jumper connects the OVEN REF OUT connector to the EXT REF IN connector on the rear panel.

A81 40 MHz Reference

The 40 MHz Reference assembly is one of two assemblies that together function as the HP 89430A's frequency reference. This assembly provides 40 MHz to the A82 600 MHz Reference assembly and 10 MHz to the A61 YIG Loop Phase Detector assembly and rear panel.

Input Protection/Signal Conditioning

Limits and conditions the external frequency reference. The optional A80 Oven Oscillator assembly can supply the external frequency reference if a rear panel BNC-to-BNC jumper connects the oven output to the external frequency reference input.

External Reference Detector

Detects the presence of the external reference and tells the A91 Digital Control assembly.

Phase Detector

Compares the phase of the signal from the Divide-by-4 with the phase of the external reference and generates a voltage relative to the phase difference. This circuit can phase lock to a 1, 2, 5, or 10 MHz external frequency reference.

Loop Filter/Integrator

Filters and integrates the phase difference voltage, creating the control voltage for the 40 MHz VCO.

PLL Unlock Detector

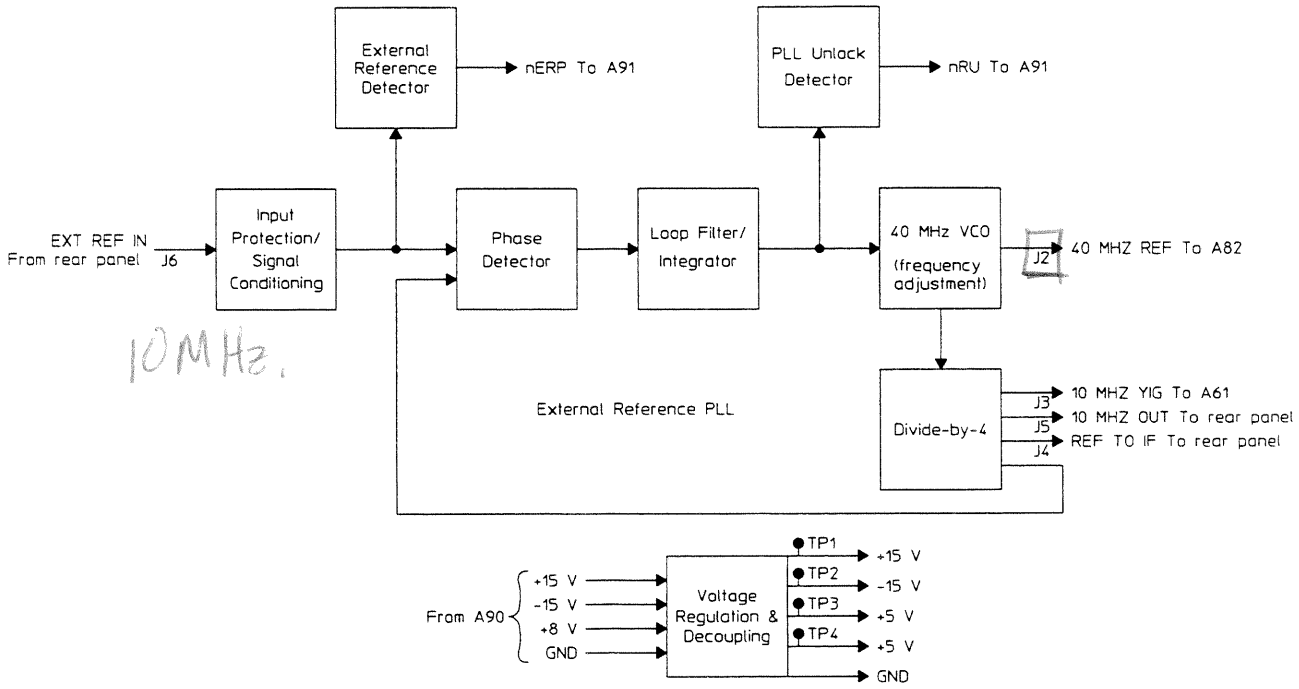
Monitors the voltage from the Loop Filter/Integrator. If the voltage goes too high or too low, this circuit tells the A91 Digital Control assembly that the phase locked loop may be unlocked.

40 MHz VCO

Generates a 40 MHz signal, which is the frequency reference for the A82 600 MHz Reference assembly. When an external frequency reference is present, feedback phase-locks the 40 MHz VCO to the external reference.

Divide-by-4

Divides the 40 MHz signal down to 10 MHz. The 10 MHz signal is buffered and distributed to four signal paths.



A81 40 MHz Reference Block Diagram

$$W(f) = \int_{-\infty}^{\infty} [w(t)]\, e^{-j2\pi f t}\, dt$$

A82 600 MHz Reference

The 600 MHz Reference assembly is one of two assemblies that together function as the HP 89430A's frequency reference. This assembly provides 600 MHz to the A60 Local Oscillator assembly and 40 MHz to the A91 Digital Control, A25 3rd Mixer Amplifier, and A33 Source AM/1st Conversion assemblies. These frequency references are phase locked to 40 MHz from the A81 40 MHz Reference assembly.

External Reference/Signal Conditioning — Conditions the 40 MHz reference signal.

Phase Detector — Compares the phase of the 40 MHz feedback signal to the 40 MHz reference signal and generates a voltage relative to the phase difference.

Loop Filter/Integrator — Filters and integrates the phase difference voltage, creating the control voltage for the 600 MHz VCO.

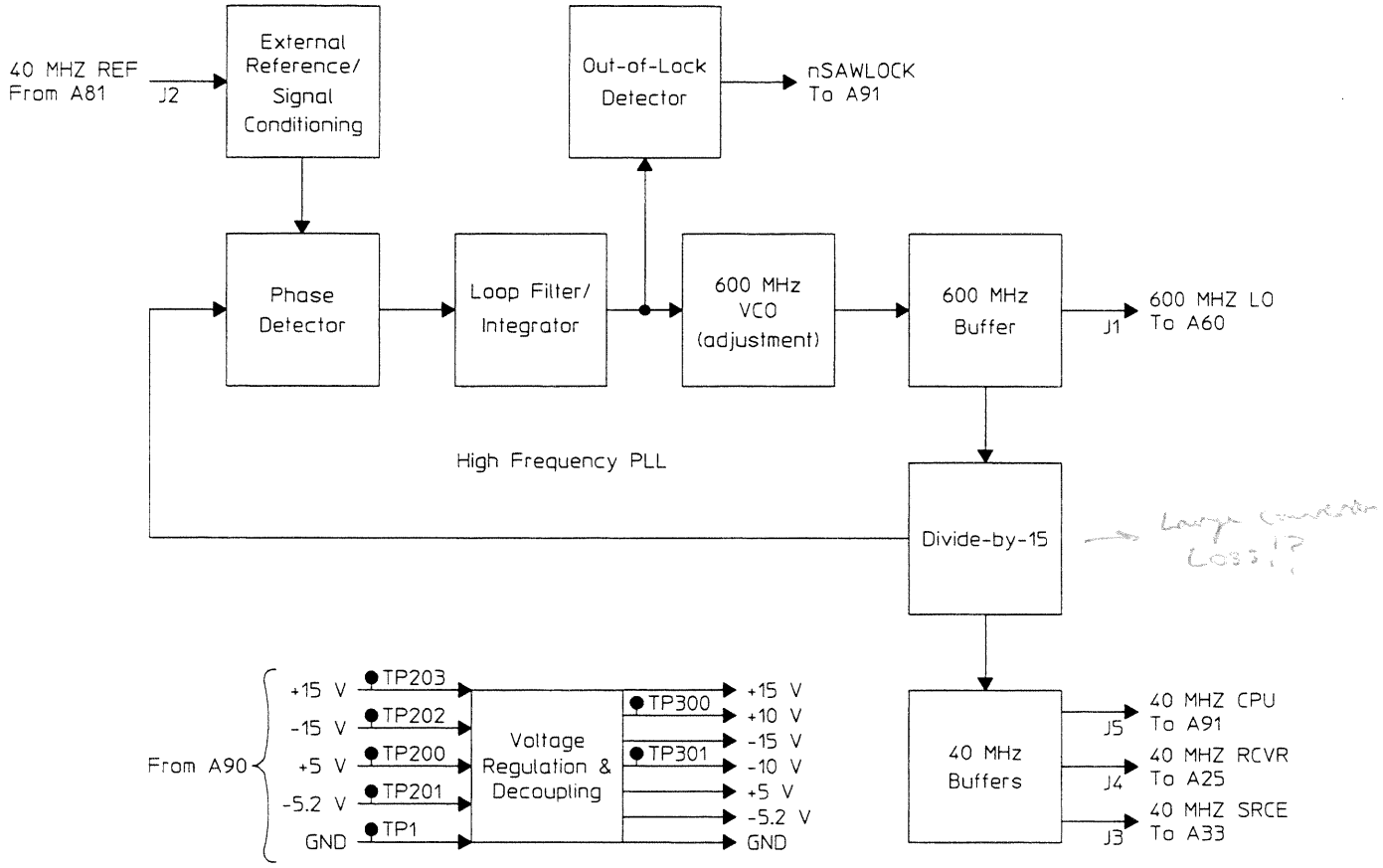
Out-of-Lock Detector — Monitors the voltage from the Integrator. If the voltage is too high or too low, this circuit tells the A91 Digital Control assembly that the phase locked loop may be unlocked.

600 MHz VCO — Generates a 600 MHz signal. Feedback from the Integrator adjusts the frequency to keep this VCO phase locked with the 40 MHz reference signal.

600 MHz Buffer — The buffers the 600 MHz signal.

Divide-by-15 — Divides the 600 MHz signal down to 40 MHz.

40 MHz Buffers — Buffer the 40 MHz signal and route the signal to three signal paths.



A82 600 MHz Reference Block Diagram

A90 Power Supply

The Power Supply assembly provides power at several different voltages to all the assemblies in the HP 89430A. See "Power Supply Voltage Distribution" in chapter 6 for a list of the assemblies that use each voltage. The Power Supply assembly is a multiple-output linear supply. The rear panel transformer provides each rectifier with a peak ac voltage larger than the desired dc voltage. The rectifiers filter and rectify the ac voltage producing a dc voltage with a small amount of ac ripple. This voltage is always present when the rear panel switch is on. The regulators sense their own output voltage and allow sufficient current to pass to keep their output voltage at the specified level. Other circuits provide voltage reference, fault protection, and control.

+/-5 V Rectifier Provides rectified, filtered dc to the +5 V Regulator and -5.2 V Regulator.

+5 V Regulator and -5.2 V Regulator Outputs +5.5 V and -5.5 V. The additional voltage compensates for voltage drops between the Power Supply assembly and the assemblies that use these supplies. When the +15 V supply is off, a series switch transistor disconnects the filtered dc from the +5 V Regulator. When the -15 V supply is off, a series switch transistor disconnects the filtered dc from the -5.2 V Regulator.

Voltage Reference Provides a precisely known voltage reference to the +15 V Regulator. The +15 V Regulator provides a voltage reference to the -15 V and +8 V Regulators. The other regulators have internal references. The front-panel power switch turns the Voltage Reference output on and off, which turns the +15 V Regulator output on and off. The -15 V, +8 V, and +5 V Regulators are turned off when the +15 V Regulator is off, and the -5.2 V Regulator is off when the -15 V Regulator is off.

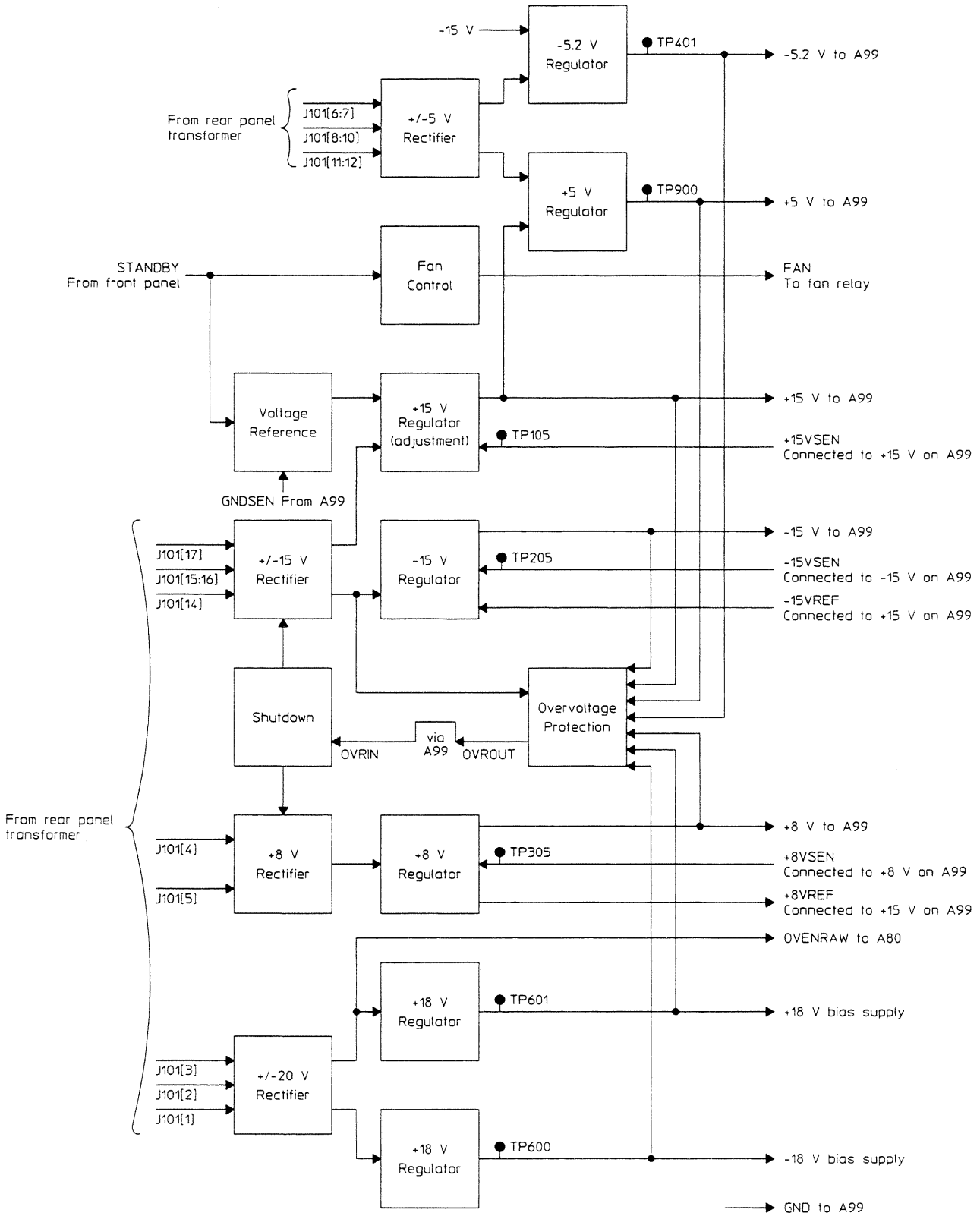
Fan Control Turns the fan on when the front-panel switch is set to on (|).

+/-15 V Rectifier Provides rectified, filtered dc to the +15 V and -15 V Regulator.

+15 V Regulator and -15 V Regulator Sense their output voltages on the A99 Motherboard and adjust their outputs to +15 V and -15 V. The +15 V Regulator provides the reference voltage (-15VREF) for the -15 V Regulator. Therefore, turning off the +15 V Regulator turns off the -15 V Regulator.

+8 V Rectifier Provides rectified, filtered dc to the +8 V Regulator.

+8 V Regulator Senses its output voltage on the A99 Motherboard and adjusts its output to +8.7 V. The +15 V Regulator provides the reference voltage for the +8 V Regulator. Therefore, turning off the +15 V Regulator turns off the +8 V Regulator.



A90 Power Supply Block Diagram

+/-20 V Rectifier

Provides rectified, filtered dc to the A80 Oven Oscillator assembly, the +18 V Regulator and -18 V Regulator.

+18 V Regulator and -18 V Regulator

Outputs the bias supplies (+18 V and -18 V) for the Power Supply assembly and are present even when the front-panel switch is set to standby (⏻).

Overvoltage Protection

Monitors all regulated voltages and the -15 V Rectifier output. When any voltage exceeds a set point, the Overvoltage Protection triggers the Shutdown circuit.

Shutdown

Shorts the +15 and +8 rectifier outputs to ground when triggered by the Overvoltage Protection circuit. This causes a large current to be drawn by the power transformer primary, which blows the fuse on the rear panel.

A91 Digital Control

The Digital Control assembly interfaces with the HP 89410A and provides the control lines for the HP 89430A.

Clock Divider/Driver Divides the 40 MHz clock signal down to 8 MHz.

AB2 is 600MHz.

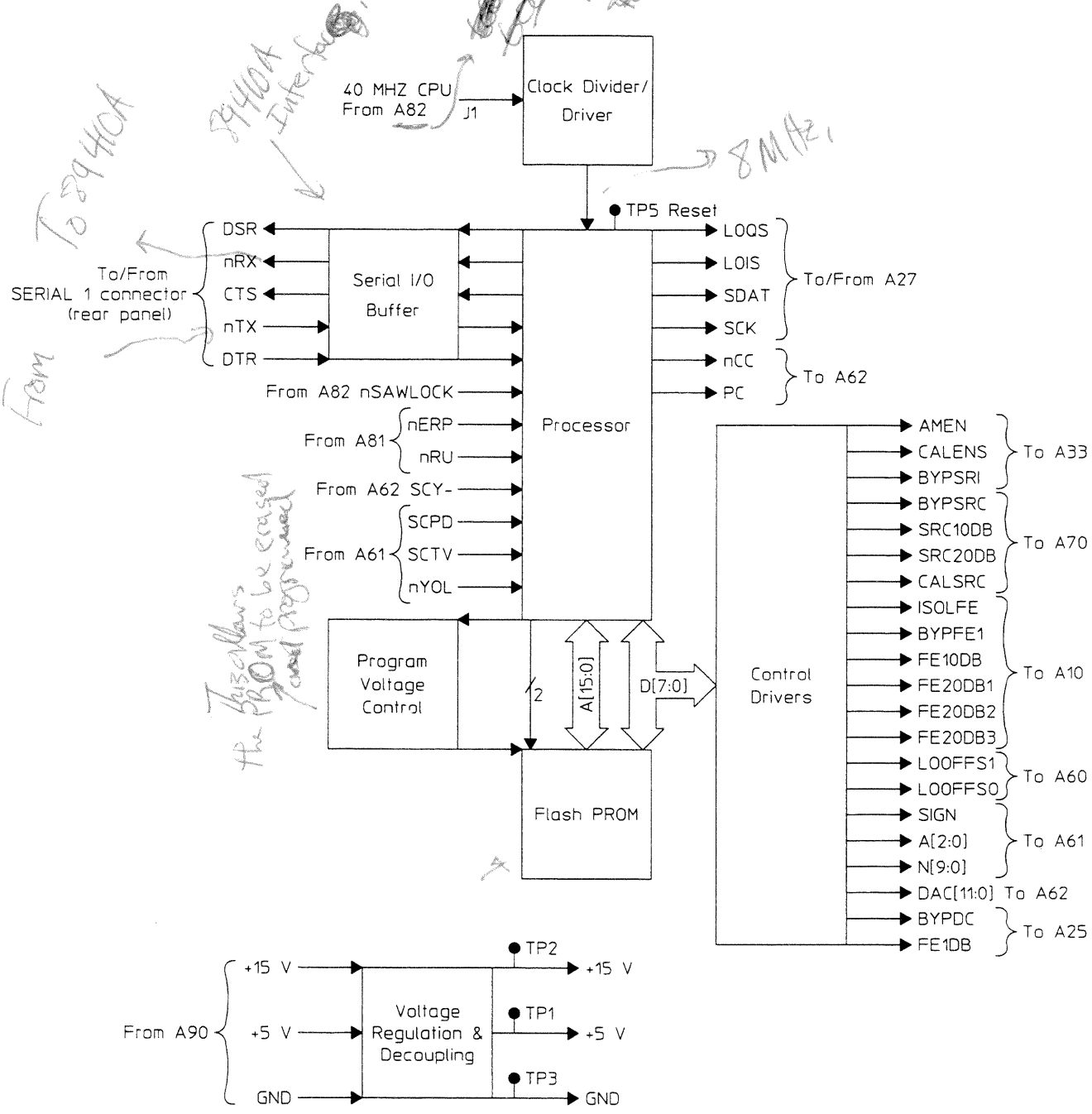
Serial I/O Buffer Provides the interface between the HP 89410A and the Processor. This circuit converts between the voltage levels required by the serial port and those required by the Processor. The HP 89410A passes serial instructions and data to the Processor via nTX, and the Processor responds via nRX. DSR, CTS, and DTR provide status and control functions.

Processor Interprets instructions from the HP 89410A and provides control of the HP 89430A. It also monitors HP 89430A status and reports this back to the HP 89410A. The HP 89430A is controlled by the Control Drivers or by direct connections to dedicated Processor output lines. All status lines connect directly to Processor input lines. The Processor communicates with the Control Drivers and Flash PROM using 16 address lines, 8 data lines, and a few control lines.

Flash PROM Stores the programming for the Processor. A small, non-volatile memory within the Processor contains a program capable of erasing and reprogramming the Flash PROM with data received over the serial port. This allows the firmware to be easily updated.

Program Voltage Control Provides the voltage that allows the Flash PROM to be erased and programmed.

Control Drivers Provide all signals needed to control the functions of the HP 89430A. The outputs are either TTL logic signals or open-collector relay drivers.



A91 Digital Control Block Diagram

A99 Motherboard

The Motherboard provides a common point of contact for voltage and signal distribution. The Motherboard filters some voltages and signals, and provides voltage feedback to the A90 Power Supply assembly. See "Motherboard" in chapter 6 for a list of all signals that are distributed via the Motherboard.

6

Voltages and Signals

Voltages and Signals

This chapter shows where the signals and voltages are used in the HP 89430A and describes each signal. The signals are grouped as shown in the following table.

Section Title	Describes signals routed ...
RF Cables	through RF cables
YIG Cable	from YIG Driver to YIG Oscillator
Motherboard	through A99 Motherboard

Assembly Locations and Connections

The following figures show the assembly locations and assembly connections to the A99 Motherboard.

A10 Receiver

A22 Stage 3 Second IF Filter

A23 Stage 2 Second IF Filter

A24 Stage 1 Second IF Filter

A25 3rd Mixer Amplifier

A27 LO Feedthrough Control

A31 Stage 2 First IF Filter (optional)

A32 Stage 1 First IF Filter (optional)

A33 Source AM/1st Conversion

A50 YIG Oscillator

A60 Local Oscillator

A61 YIG Loop Phase Detector

A62 YIG Driver

A70 Source (optional)

A80 Oven Oscillator

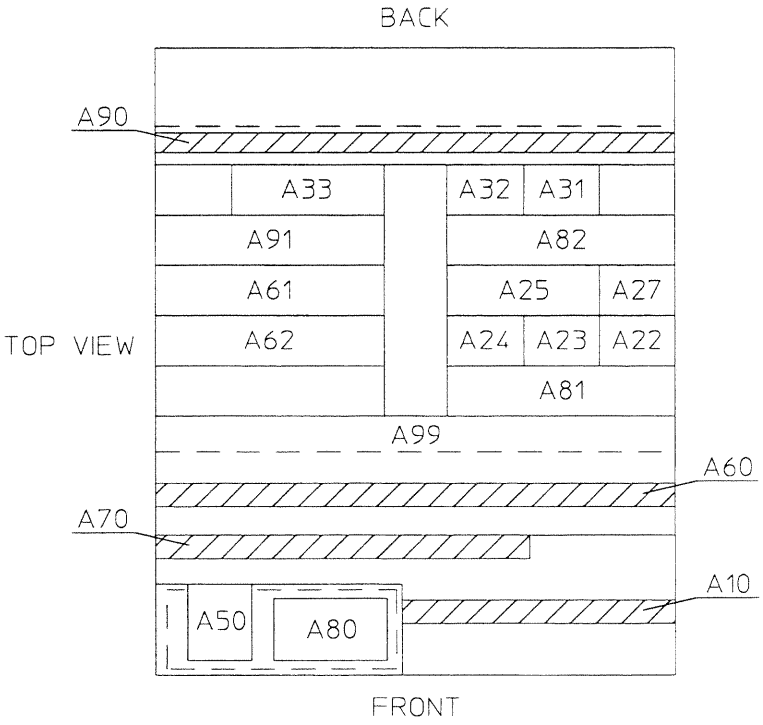
A81 40 MHz Reference

A82 600 MHz Reference

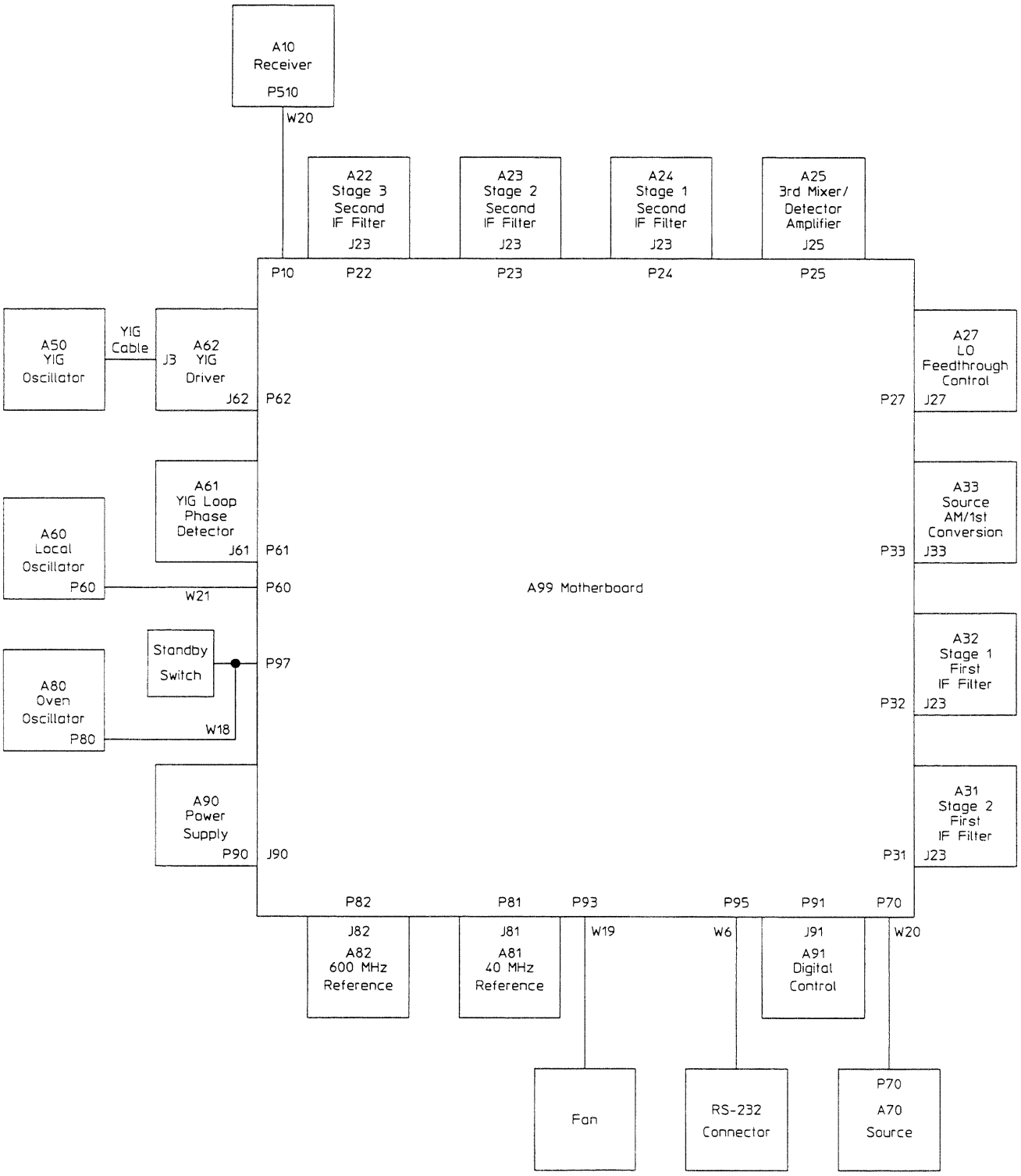
A90 Power Supply

A91 Digital Control

A99 Motherboard



Assembly Locations



Connections to A99 Motherboard

Power Supply Voltage Distribution

The following table shows the power supply voltages used by each assembly in the HP 89430A. In addition, the table shows the path taken by these voltages. Most assemblies use the power supply voltages as supplied by the A90 Power Supply assembly. However, some assemblies contain additional voltage regulation. Also, most assemblies provide high frequency decoupling circuits at their power supply inputs.

Power Supply Voltage Distribution

From	Path	To	Voltages						
			+5	−5.2	+8	+15	−15	+20	GND
Pwr Supply	A99/W20	A10			X	X			X
	A99	A22			X		X		X
	A99	A23			X		X		X
	A99	A24			X		X		X
	A99	A25	X	X	X	X			X
	A99	A27	X	X		X	X		X
	A99	A31			X		X		X
	A99	A32			X		X		X
	A99	A33				X	X		X
	A99/A62	A50				X	X		X
	A99/W21	A60			X	X	X		X
	A99	A61	X	X		X	X		X
	A99	A62				X	X		X
	A99/W20	A70			X	X	X		X
	A99/W18	A80						X	X
	A99	A81	X			X	X		X
	A99	A82	X	X		X	X		X
	A99	A91	X			X			X

RF Cables

Signals routed through RF cables are shown in the following two tables. The first table shows signals routed to the connectors on the front and rear panels. The second table shows signals routed from one assembly to another. The tables show where the cables are connected and use bold face type to show where the signal is generated.

Note

Measurements given in dBm are terminated in 50 ohms unless stated otherwise.

RF Cables To External Connectors

Signal Name	Assembly and Connector							
	A10	A25	A33	A70	A80	A81	Front Panel	Rear Panel
10 MHZ OUT						**J5**		10 MHz OUT
AM INPUT			J4					**AM IN**
EXT REF IN						J6		**EXT REF IN**
OVEN OUT					**J1**			OVEN REF OUT
RCVR IN	J501						**INPUT**	
RCVR OUT		**J3**					OUT	
REF TO IF						**J4**		10 MHz REF TO IF SECTION
SRCE BYPASS			**J3**				SOURCE (BNC)	
SRCE IN			J1				**IN**	
SRCE OUT				**J403**			SOURCE (type-N)	

The source of the signal is shown in boldface type.

10 MHZ OUT

10 MHz Out — This is a 10 MHz, 50% duty cycle, >3 dBm, ac-coupled sine wave.

AM INPUT

AM Input — This is the amplitude modulation input signal for the source. An AM input signal of 1 Vac peak with no offset results in 100% modulation. Adding a –1 V offset to the AM input results in a double-sideband suppressed carrier (DSB/SC). Adding a –2 V offset to the AM input results in inverted AM.

EXT REF IN — External Reference Input — This is the external reference input from the optional A80 Oven Oscillator assembly or an external source. The signal can be a 1 MHz, 2 MHz, 5 MHz, or 10 MHz sine or square wave with an amplitude between 0 dBm and +10 dBm.

OVEN OUT — Oven Output — This is a stable 10 MHz frequency reference. Its amplitude is approximately +6 dBm. A BNC-to-BNC jumper connects the OVEN REF OUT connector to the EXT REF IN connector.

RCVR IN — Receiver Input — This is the input to the HP 89430A's receiver. The input signal can range from dc to 1.8 GHz.

RCVR OUT — Receiver Output — This is the HP 89430A's receiver output. The HP 89430A's receiver output is bypassed or converted RCVR IN signals. RCVR_IN signals below 2 MHz bypass the frequency conversion and are routed unchanged to the HP 89430A's reciever output. RCVR IN signals up to 1800 MHz are converted to a 7 MHz wide frequency block between 2 MHz and 10 MHz.

REF TO IF — Reference to IF Section — This is a 10 MHz, 50% duty cycle, >3 dBm, ac-coupled sine wave. This signal is the external reference input for the HP 89410A. A BNC cable connects the 10 MHz REF TO IF SECTION connector to the HP 89410A's EXT REF IN connector.

SRCE BYPASS — Source Bypass — This is SRCE IN routed to the front panel SOURCE connector. HP 89430As without the optional source route the SRCE IN signal to the front panel without changing the signal. See page 6-10 for the description of SRCE BYPASS in HP 89430As with the optional source.

SRCE IN — Source Input — This is the input signal for the HP 89430A's source. A BNC cable connects the HP 89410A's SOURCE connector to the HP 89430A's IN connector.

SRCE OUT — Source Output — This is the HP 89430A's source output. The HP 89430A's source output is bypassed or converted SRCE IN signals. SRCE IN signals between 0 Hz and 10 MHz can bypass the frequency conversion and be routed unchanged to the HP 89430A's source output. SRCE IN signals between 2 MHz and 10 MHz can be converted to a 7 MHz wide frequency block between 2 MHz and 1800 MHz. The nominal full scale amplitude of the source output is +15 dBm.

RF Cables Between Assemblies

Signal Name	Assembly and Connector																	Cable Color
	A10	A22	A23	A24	A25	A27	A31	A32	A33	A50	A60	A61	A62	A70	A81	A82	A91	
10 MHZ YIG												J2			**J3**			gray
1ST IF IN								J1	**J5**									orange
1ST IF OUT							**J2**							J200				orange
1ST IF S1/S2							J1	**J2**										red
1ST LO RCVR	J1										**J150**							silver
2ND IF IN	**J402**			J1														green
2ND IF OUT		**J2**			J2													orange
2ND IF S1/S2			J1	**J2**														red
2ND IF S2/S3		J1	**J2**															red
2ND LO RCVR	J100										**J603**							silver
2ND LO SRCE											**J452**			J100				silver
3RD LO SRCE											**J151**			J701				silver
40 MHZ CPU																**J5**	J1	blue
40 MHZ RCVR					J1											**J4**		orange
40 MHZ REF															**J2**	J2		orange
40 MHZ SRCE									J6							**J3**		gray
600 MHZ LO											J801					**J1**		green
CAL OUT †	J503								**J2** **J2**					J406				blue orange
I PORT	J301					**J1**												green
IF OUTPUT											**J302**	J3						yellow
Q PORT	J302					**J2**												blue
RCVR BYPASS	**J502**				J4													blue
SRCE BYPASS									**J3**					J404				green
SRCE RCVR	J503													**J405**				silver
YIG OUT										**J2**	J201							silver
YIG TUNE												**J1**	J2					red

The source of the signal is shown in boldface type.
† This signal is routed to A70 in HP 89430As with the optional source or to A10 in HP 89430As without the optional source.

10 MHZ YIG — 10 MHz to YIG — This is a 10 MHz, 50% duty cycle, 0 dBm, ac-coupled square wave. This signal is the frequency reference for the A61 YIG Loop Phase Detector assembly.

1ST IF IN — 1st IF Input — This is a 42 to 50 MHz signal with a nominal full-scale amplitude of –20 dBm. This signal is the input for the source's A32 Stage 1 First IF Filter assembly.

1ST IF OUT — 1st IF Output — This is a 42 to 50 MHz signal with a nominal full-scale amplitude of –20 dBm. This signal is the input for the A70 Source assembly.

1ST IF S1/S2 — 1st IF Stage1/Stage2 — This is a 42 to 50 MHz signal with a nominal full-scale amplitude of –20 dBm. This signal is the input for the source's A31 Stage 2 First IF Filter assembly.

1ST LO RCVR — 1st LO to Receiver — This signal can step from 2.451 GHz to 4.242 GHz in 1 MHz steps. This signal's amplitude is typically 20 dBm. The A10 Receiver assembly mixes this signal with the input signal.

2ND IF IN — 2nd IF Input — This is a 42 MHz to 50 MHz signal with a nominal full-scale amplitude of –30 dBm. This signal is the input signal for the receiver's A22 Stage 1 Second IF Filter assembly.

2ND IF OUT — 2nd IF Output — This is a 42 MHz to 50 MHz signal with a nominal full-scale amplitude of –30 dBm. This signal is the input signal for the receiver's A25 3rd Mixer Amplifier assembly.

2ND IF S1/S2 — 2nd IF Stage1/Stage2 — This is a 42 MHz to 50 MHz signal with a nominal full-scale amplitude of –30 dBm. This signal is the input signal for the receiver's A23 Stage 2 Second IF Filter assembly.

2ND IF S2/S3 — 2nd IF Stage2/Stage3 — This is a 42 MHz to 50 MHz signal with a nominal full-scale amplitude of –30 dBm. This signal is the input signal for the receiver's A24 Stage 3 Second IF Filter assembly.

2ND LO RCVR — 2nd LO to Receiver — This is a 2.4 GHz, –15 dBm, ac-coupled signal. The A10 Receiver assembly mixes this signal with the receiver's first IF.

2ND LO SRCE — 2nd LO to Source — This is a 2.4 GHz, –15 dBm, ac-coupled signal. The A70 Source assembly mixes this signal with 1ST IF OUT.

3RD LO SRCE — 3rd LO to Source — This signal can step from 2.451 GHz to 4.242 GHz in 1 MHz steps. This signal's amplitude is typically 0 dBm. The A70 Source assembly mixes this signal with the source's 2.442 GHz to 2.451 GHz second IF signal.

40 MHZ CPU — 40 MHz to CPU — This is a 40 MHz, >0 dBm, ac-coupled sine wave. This signal is the clock for the A91 Digital Control assembly.

40 MHZ RCVR — 40 MHz to Receiver — This is a 40 MHz, +3 dBm, ac-coupled sine wave. The A25 3rd Mixer Amplifier assembly mixes this signal with 2ND IF OUT.

40 MHZ REF — 40 MHz Reference — This is a 40 MHz, ac-coupled ECL signal. This signal is the external reference for the A82 600 MHz Reference assembly.

40 MHZ SRCE — 40 MHz to Source — This is a 40 MHz, +3 dBm, ac-coupled sine wave. The A33 Source AM/1st Conversion assembly mixes this signal with the source input signal.

600 MHZ LO — 600 MHz to LO — This is a 600 MHz, +5 dBm, ac-coupled sine wave. This signal is the fundamental frequency for generating the offsets in the A60 Local Oscillator assembly.

CAL OUT — Calibrator Output — At various times during the calibration routine and self-test routine, the HP 89410A's source is routed to this line. The HP 89410A's source outputs various signals during the calibration routine. HP 89430As without the optional source route the calibration signal to the A10 Receiver assembly. HP 89430As with the optional source route the signal to the A70 Source assembly. Relays on the Source assembly route the signal to the SRCE RCVR line.

I PORT — I Port — This is a ±20 mA current source to null LO feedthrough on the A10 Receiver assembly.

IF OUTPUTZ — IF Output — This signal can step from 43 MHz to 646 MHz, in 1 MHz steps. Its amplitude is typically +4 dBm. The A61 YIG Loop Phase Detector assembly divides this signal down to 1 MHz, then phase compares it with a reference signal to generate the control voltage for the A50 YIG Oscillator assembly.

Q PORT — Q Port — This is a ±20 mA current source to null LO feedthrough on the A10 Receiver assembly.

RCVR BYPASS — Receiver Bypass — This line can route input signals between 0 Hz and 10 MHz from the front panel INPUT connector to the front panel OUT connector without changing the signals. When receiver bypass is selected, the input signal is routed from the INPUT connector through relays on the A10 Receiver assembly to this line and from this line through relays on the A25 3rd Mixer Amplifier assembly to the OUT connector.

SRCE BYPASS — Source Bypass — This line can route source signals between 0 Hz and 10 MHz from the front panel IN connector to the front panel SOURCE connector without changing the signals. When source bypass is selected, the source signal is routed from the IN connector through relays on the A33 Source AM/1st Conversion assembly to this line and from this line through relays on the A70 Source assembly to the SOURCE connector. See page 6-7 for the description of SRCE BYPASS in HP 89430As without the optional source.

SRCE RCVR Source to Receiver — At various times during the calibration routine and self-test routine, this line routes the HP 89430A's source output or the calibration signal to the A10 Receiver assembly.

YIG OUT YIG Output — This +17 dBm signal steps from 2.451 to 4.246 GHz, in 1 MHz steps. The A62 YIG Driver assembly controls the frequency of this signal. This signal is the source for 1ST LO RCVR and 3RD LO SRCE.

YIG TUNE YIG Tune — This is the control voltage for the A50 YIG Oscillator assembly. The A61 YIG Loop Phase Detector assembly clamps this voltage to between –2 V and +2 V.

YIG Cable

The following table lists signals and voltages routed through the YIG cable. The table shows if the assembly generates or uses the signal or voltage. A description of each signal follows the table.

YIG Cable Signals	Pin(s)	A62 J3	A50 J1
YIGFM–	5	S	•
YIGFM+	6	S	•
YIGMAIN–	7	S	•
YIGMAIN+	8	S	•
YIG HEATER+	9	S	•
YIG HEATER–	10	S	•
+15 V	1	•	•
–5.2 V	2	•	•
GND	3-4	•	•

YIGFM+ & YIGFM– YIG FM — These lines provide the control current for the A50 YIG Oscillator assembly's FM coil. The control current is nominally –40 to +40 mA.

YIGMAIN+ & YIGMAIN– YIG Main — These lines provide the control current for the A50 YIG Oscillator assembly's main coil. The control current is nominally 80 to 250 mA.

YIG HEATER+ YIG Heater+ — This is a +15 V supply for the A50 YIG Oscillator assembly.

YIG HEATER– YIG Heater– — This is a –15 V supply for the A50 YIG Oscillator assembly.

Motherboard

The following table lists all signals routed through the A99 Motherboard. The table uses bold face type to show which assembly can generate the signal. A description of each signal follows the "Motherboard Voltages" table.

Note

Signals with a mnemonic that start with a lower case "n" are active low.

Measurements given in dBm are terminated in 50 ohms unless stated otherwise.

Motherboard Signals

Signal	Assembly Using Signal															
	A10	**A25**	**A27**	**A33**	**A60**	**A61**	**A62**	**A70**	**A80**	**A81**	**A82**	**A90**	**A91**	**Fan**	**FP**	**RP**
	Motherboard Connector															
	P10	**P25**	**P27**	**P33**	**P60**	**P61**	**P62**	**P70**	**P97**	**P81**	**P82**	**J90**	**P91**	**P93**	**P97**	**P95**
	Connector Pin Number															
−15VREF												25				
−15VSEN												39				
+15VSEN												9				
+8VSEN												3				
+8VREF												41				
A00						19							**45**			
A01						18							**44**			
A02						17							**43**			
AMEN				2									**13**			
BYPDC		19											**28**			
BYPFE1	10												**59**			
BYPSRC								10					**31**			
BYPSRI				1									**14**			
CALENS				3									**15**			
CALSRC								12					**32**			
COM													**69**			9
CTS													**71**			6
DAC0							30						**88**			
DAC1							28						**86**			
DAC2							26						**84**			
DAC3							24						**82**			
DAC4							22						**80**			
DAC5							20						**78**			
DAC6							29						**87**			
DAC7							27						**85**			
DAC8							25						**83**			
DAC9							23						**81**			
DAC10							21						**79**			
DAC11							19						**77**			
DSR													**73**			2
DTR													70			7

The source of the signal is shown in boldface type.

Motherboard Signals, continued

Signal	Assembly Using Signal															
	A10	A25	A27	A33	A60	A61	A62	A70	A80	A81	A82	A90	A91	Fan	FP	RP
	Motherboard Connector															
	P10	P25	P27	P33	P60	P61	P62	P70	P97	P81	P82	J90	P91	P93	P97	P95
	Connector Pin Number															
FAN												7		1		
FE1DB		16											**35**			
FE10DB	14												**61**			
FE5DB	16												**62**			
FE20DB2	18												**63**			
FE20DB3	20												**64**			
GNDSEN												**19**				
ISOLFE	12												**60**			
LOIS			**9**										**26**			
LOOFFS0					**1**								**92**			
LOOFFS1					**2**								**91**			
LOQS			**10**										**27**			
N0						**21**							**47**			
N1						**23**							**49**			
N2						**25**							**51**			
N3						**27**							**53**			
N4						**29**							**55**			
N5						**22**							**48**			
N6						**24**							**50**			
N7						**26**							**52**			
N8						**28**							**54**			
N9						**30**							**56**			
nCC							**7**						**67**			
nERP										**6**			94			
nRU										**4**			93			
nRX													**74**			**3**
nSAWLOCK											**4**		100			
nTX													72			**5**
nYOL						**13**							39			
OVENRAW									2			**43** **44**				
OVRIN												37				
OVROUT												36				
PC							**4**						**68**			
SCK			5-6										**23**			
SCTV						**15**							41			
SCPD						**10**							38			
SCY–							**1**						66			
SDAT			7-8										**24**			
SIGN						20							**46**			
SRC10DB								14					**33**			
SRC20DB								16					**34**			
STANDBY												35			**4**	

The source of the signal is shown in boldface type.

The following table lists the voltages routed through the A99 Motherboard.

Motherboard Voltages

Voltage	Assembly Using Voltage																		
	A10	A22	A23	A24	A25	A27	A31	A32	A33	A60	A61	A62	A70	A80	A81	A82	A90	A91	FP
	Motherboard Connector																		
	P10	P22	P23	P24	P25	P27	P31	P32	P33	P60	P61	P62	P70	P97	P81	P82	J90	P91	P97
	Connector Pin Number																		
+15 V	3-4	1-2	1-2	1-2	1-2	11-12	1-2	1-2	11-12	6	11-12	3-4	3-5		1	1	8 24 40	9-10	
–15 V	1-2	15-16	15-16	15-16	9-10	15-16	15-16	15-16	7-8	8	7-8	13-14	1-2		9	9	6 22 38		
+8 V	7-8	19-20	19-20	19-20	5-6		19-20	19-20		10	10		6-8		13		1-2 17-18 33-34		
+5 V					17-18	3-4				5						17	11-12 27	1-4	
–5.2 V					13-14	1-2				3	1-2	5-6				13	4-5 20-21		
GND	9 11 13 15 17 19	3-14 17-18	3-14 17-18	3-14 17-18	3-4 7-8 11-12 15 20	13-14 17-18	3-14 17-18	3-14 17-18	4-6 9-10 13-20	4 7 9	5-6 9 14	3 8 11-12 15-18	9 11 13 15 17 19	1	2-3 5 7-8 10-12 14-16 18-20	2-3 5 7 10-12 14-16 18-20	13-16 23 28-32 45-48	5-8 11-12 29-30 37 40 42 57-58 65 75-76 89-90 95-96	3

–15VREF –15 V Reference — This line provides the reference voltage for the A90 Power Supply assembly's –15 V regulator. This line is connected to +15 V on the A99 Motherboard.

–15VSEN –15 V Sense — This line is connected to –15 V on the A99 Motherboard. This allows the A90 Power Supply assembly to regulate the –15 V supply to –15 V on the A99 Motherboard.

+15VSEN +15 V Sense — This line is connected to +15 V on the A99 Motherboard. This allows the A90 Power Supply assembly to regulate the +15 V supply to +15 V on the Motherboard.

+8VSEN +8 V Sense — This line is connected to +8 V on the A99 Motherboard. This allows the A90 Power Supply assembly to regulate the +8 V supply to +8.7 V on the Motherboard.

+8VREF — +8 V Reference — This line provides the reference voltage for the A90 Power Supply assembly's +8 V regulator. This line is connected to +15 V on the A99 Motherboard.

A00 — A02 — A Data Lines — These TTL data lines adjust the A61 YIG Loop Phase Detector assembly's integrator gain to compensate for the variation of N.

AMEN — AM Enabled — A TTL high on this line routes the source input through the amplitude modulator. This enables amplitude modulation of the source. CALENS must be high (+15 V) and BYPSRI must be low (0 V).

BYPDC — Bypass DC — This line selects which signal is connected to the OUT (to channel 1) connector. A high (+15 V) connects the receiver bypass signal (RCVR BYPASS) and a low (0 V) connects the receiver signal.

BYPFE1 — Bypass Front End — This line selects the input signal and the path for the input signal. A high (+15 V) on this line routes SRCE RCVR to the receiver path and the input signal (if ISOLFE is high) to the receiver bypass path. A low (0 V) on this line (and a high on ISOLFE) routes the input signal to the receiver path.

BYPSRC — Bypass Source — This line selects which signal is connected to the SOURCE connector. A high (+15 V) connects the source bypass signal (SRCE BYPASS) and a low (0 V) connects the source signal.

BYPSRI — Bypass Source Input — A high (+15 V) on this line and on CALENS routes the source input to the source bypass path (SRCE BYPASS).

CALENS — Calibration Enabled Source — A low (0 V) on this line routes the source input to the calibration path (CAL OUT). A high (+15 V) allows the source input to proceed along the normal path.

CALSRC — Calibration Source — This line selects which signal is connected to SRCE RCVR. A high (+15 V) connects the CAL OUT signal. A low (0 V) on this line and a high (+15 V) on BYPSRC connects the source signal.

COM — Common — Logic ground for the external serial port connector.

CTS — Clear To Send — This external serial port control line goes high (>+3 V) when the HP 89430A is ready to receive control data.

DAC0 — DAC11 — DAC Data — These TTL data lines are converted to a signal by the A62 YIG Driver assembly. The signal then controls the drive for the A50 YIG Oscillator assembly's main coil.

DSR — Data Set Ready — This external serial port control line is tied high (>+3 V). This line is not used by the HP 89410A.

DTR — Data Terminal Ready — This external serial port control line is normally high (>+3 V). The HP 89410A pulls this line low (<–3 V) to initiate a fast frequency change.

FAN — Fan — When the front-panel switch is set to on (I), this line activates the fan relay, which turns the fan on.

FE1DB — Front End 1 dB — A high (+15 V) on this line routes the receiver input through the 1 dB attenuator. A low (0 V) on this line bypasses the 1 dB attenuator.

FE5DB — Front End 5 dB — A high (+15 V) on this line routes the receiver input through the 5 dB attenuator. A low (0 V) on this line bypasses the 5 dB attenuator.

FE10DB — Front End 10 dB — A high (+15 V) on this line routes the receiver input through the 10 dB attenuator. A low (0 V) on this line bypasses the 10 dB attenuator.

FE20DB2 — FE20DB3 — Front End 20 dB — A high (+15 V) on one of these lines route the receiver input through a 20 dB attenuator. These lines can select up to 40 dB of signal attenuation.

GNDSEN — Ground Sense — This line connects the 0 V reference node on the A99 Motherboard to the A90 Power Supply assembly. The +15 V, –15 V, and +8 V supplies use this reference.

ISOLFE — Isolate Front End — A low (0 V) on this line terminates the input signal in a 50 ohm load. A high (+15 V) on this line and on BYPFE1 routes the input signal to the receiver bypass path. A high on this line and a low on BYPFE1 routes the input signal to the receiver path.

LOIS — LO In-Phase Strobe — This is a TTL latch enable strobe for the I Port DAC on the A27 LO Feedthrough Control assembly. A high-to-low transition on this line latches the last 16 bits transmitted on SDAT into the I Port DAC.

LOOFFS0 — LOOFFS1 — Local Oscillator Offset — These TTL lines select the multiple of the 600 MHz reference signal used as an offset by the A60 Local Oscillator assembly. A low on LOOFFS0 and a low on LOOFFS1 select 2.4 GHz. A high on LOOFFS0 and a low on LOOFFS1 selects 3 GHz. A low on LOOFFS0 and a high on LOOFFS1 selects 3.6 GHz.

LOQS — LO Quadrature Strobe — This is a TTL latch enable strobe for the Q Port DAC on the A27 LO Feedthrough Control assembly. A high-to-low transition on this line latches the last 16 bits transmitted on SDAT into the Q Port DAC.

N0 — N9 — Number — These TTL data lines set the divide-by number for the IF OUTPUT signal. The divide-by number is between 43 and 646.

nCC — Connect Capacitor — A TTL low on this line tells the A62 YIG Driver assembly to connect its main coil filter capacitor. During low noise measurements, the capacitor is disconnected, precharged, then reconnected using this line and PC.

nERP — External Reference Present — A TTL low on this line informs the A91 Digital Control assembly that a valid external reference signal is connected to the rear panel EXT REF IN connector.

nRU — Reference Unlocked — A TTL low on this line informs the A91 Digital Control assembly that the A81 40 MHz Reference assembly's phase locked loop may be unlocked.

nRX — Receive Data — This is the external serial port receive data line for the HP 89410A. This line transmits data from the HP 89430A using RS-232 levels.

nSAWLOCK — Saw Oscillator Out of Lock — A TTL low on this line informs the A91 Digital Control assembly that the A82 600 MHz Reference assembly's phase locked loop may be unlocked.

nTX — Transmit Data — This is the external serial port transmit data line for the HP 89410A. This line transmits data to the HP 89430A using RS-232 levels.

nYOL — YIG Out of Lock — A TTL low on this line informs the A91 Digital Control assembly that the local oscillator's phase locked loop may be unlocked. The local oscillator's phase locked loop consists of the A61 YIG Loop Phase Detector, A62 YIG Driver, A50 YIG Oscillator, and A60 Local Oscillator assemblies.

OVENRAW — Oven Raw — This is unregulated +22 V for the A80 Oven Oscillator assembly.

OVRIN — Overvoltage In — A high (approx. 3 V) on this line causes the A90 Power Supply assembly's shutdown circuit to blow the fuse on the rear panel. This line is connected to OVROUT on the A99 Motherboard.

OVROUT — Overvoltage Out — This line goes high (approx. 3 V) when the A90 Power Supply assembly's overvoltage protection circuit detects an overvoltage condition. This line is connected to OVRIN on the A99 Motherboard.

PC — Precharge Capacitor — A TTL high on this line tells the A62 YIG Driver assembly to precharge its main coil filter capacitor. During low noise measurements, the capacitor is disconnected, precharged, then reconnected using this line and nCC.

SCK — Serial Clock — This is a TTL serial clock for SDAT. The processor on the A91 Digital Control assembly generates this clock. This clock synchronizes the transfer of data over the SDAT line.

SCPD — Scaled Phase Detector Output — This line is not used.

SCTV Scaled Tune Voltage — This is a scaled version of the voltage that drives the A50 YIG Oscillator assembly's FM coil. This voltage is scaled to 0.25 V to 4.75 V for a YIG FM coil voltage of –2 V to +2 V. This signal is used during calibration.

SCY– Scaled YIG Main Coil Voltage — This is a scaled version of the voltage that drives A50 YIG Oscillator assembly's main coil. This voltage is scaled to 0.25 V to 4.75 V for a YIG main coil voltage of 5 V to 14 V. This signal is only used during diagnostics.

SDAT Serial Data — This is a TTL serial data line. This line transmits data from the A91 Digital Control assembly to the A27 LO Feedthrough Control assembly in 16-bit frames. The processor on the A91 Digital Control assembly controls data transfers on this line.

SIGN Sign — This TTL line sets the polarity of the phase detector in the A61 YIG Loop Phase Detector assembly.

SRC10DB Source 10 dB — A high (+15 V) on this line routes the source signal through the 10 dB attenuator. A low (0 V) on this line bypasses the 10 dB attenuator.

SRC20DB Source 20 dB — A high (+15 V) on this line routes the source signal through the 20 dB attenuator. A low (0 V) on this line bypasses the 20 dB attenuator.

STANDBY Standby — When this line is connected to ground, the A90 Power Supply assembly's output voltages are turned on. When this line is not connected to ground, the Power Supply assembly's output voltages are turned off except for the voltage to the A80 Oven Oscillator assembly. This line is connected to ground when the front-panel switch is set to on (|) and disconnected when the switch is set to standby (⏻).

7

Internal Test Descriptions

Internal Test Descriptions

This chapter describes the calibration routine, fault log messages, and special test modes for the HP 89430A.

Calibration Routine

The calibration routine measures the characteristics of the hardware, adjusts the hardware, and corrects measurement results when hardware adjustments are not possible. The entire analyzer (the HP 89410A and HP 89430A) is characterized with each calibration. This allows changes to the instrument configuration without performing a recalibration. The calibration routine occurs immediately following the power-on tests and periodically afterwards to compensate for any drift. Except for the RF calibration factors and the auto-zero calibration data, all calibration results are stored in NVRAM on the HP 89410A's A42 Memory assembly. The RF calibration factors are stored in NVRAM on the HP 89430A's A91 Digital Control assembly during the calibration factors adjustment on page 2-18. The calibration factors adjustment measures the scalar frequency response of all attenuator setting in the A10 Receiver assembly. At power on, only auto-zero calibrations are necessary.

To manually start the calibration routine, press [**System Utility**] [single cal]. To prevent the calibration routine from automatically occurring, press [**System Utility**] [auto cal **off**]. Preventing the calibration routine from occurring does not prevent auto-zero calibrations from occurring. To prevent auto-zero calibrations from automatically occurring, press [**System Utility**] [more cal setup] [auto zero cal **off**]. The calibration routine will not occur until manually enabled. However, auto-zero calibrations are enabled at power on or preset.

If calibration fails because of a hardware failure, the calibration data in NVRAM is not updated and the calibration routine is repeated up to two more times. Each time calibration fails, a calibration failure message is added to the fault log. To view the fault log, press [**System Utility**] [more] [diagnostics] [service functions] 1125 [enter] [fault log]. If calibration fails all three times, a calibration failure error message is displayed on the screen for approximately 5 seconds.

If you abort a self test before the self test is finished, the analyzer may fail its calibration routine. To prevent this from happening, press [**Preset**] or cycle power after you abort a self test.

The calibration routine performs the following calibrations on the HP 89430A:

- LO Feedthrough
- Best Range
- IF Primary
- RF Attenuator
- RF Source

The LO feedthrough calibration determines the optimum settings for the I Port and Q Port circuits on the A27 LO Feedthrough Control assembly. The I Port and Q Port circuits provide control currents that null LO feedthrough on the A10 Receiver assembly. With the HP 89430A's center frequency set to 6 MHz, the LO feedthrough signal appears at 12 MHz. The HP 89410A's anti-alias filter is bypassed and its input range is set to −10 dBm or −30 dBm depending on the level of the LO feedthrough signal. The routine adjusts the settings for the I Port and Q Port circuits until the LO feedthrough measured by the HP 89410A is less than −55 dBm or until the best minimum is found. Calibration fails if the best minimum is greater than −49 dBm.

The best range calibration measures the gain of the HP 89430A, selects an appropriate range for the HP 89410A, and selects the appropriate setting for the HP 89430A's 1 dB attenuator on the A25 3rd Mixer Amplifier assembly. The measurement starts with the HP 89410A set to the −12 dBm range and the HP 89430A's 55 dB attenuator on the A10 Receiver assembly set to 10 dB. The HP 89410A's calibrator generates a −11 dBm, 6.4 MHz square wave. The Cal Signal Path illustration on page 7-8 shows the signal path through the HP 89430A during this calibration. The HP 89410A measures the amplitude of the square wave's fundamental frequency component to determine the gain of the HP 89430A. The optimal settings are then selected. If the selected range for the HP 89410A is outside the allowed range of −14 dBm to −22 dBm, calibration fails. If the measured signal is very small, or nonexistent, calibration aborts and displays a message to check the connections for both front-panel cables. Once the appropriate settings have been determined, the settings will not change until the next calibration.

The IF primary calibration computes the correction vector for the frequency response (magnitude and phase) of the input at the range selected by the best range calibration. The HP 89410A generates a calibration signal with a comb spectrum. Each component of the comb spectrum has a known amplitude and phase relative to the source trigger. The HP 89430A's center frequency is set to 6 MHz. The Cal Signal Path illustration on page 7-8 shows the signal path through the HP 89430A during this calibration. An auto-zero calibration is performed. Source triggering is then enabled and time averaged measurements of the calibration signal are made. The calibration signal is inverted and measured again.

The RF attenuator calibration measures the relative gain errors introduced by the 5 dB, 10 dB, and two 20 dB attenuators in the HP 89430A's A10 Receiver assembly. The HP 89410A's calibrator generates a 6.4 MHz square wave. The Cal Signal Path illustration on page 7-8 shows the signal path through the HP 89430A during this calibration. The HP 89410A measures the signal to determine the gain adjustment for the primary calibrations. Five measurements are made to characterize the twelve attenuator settings.

The RF source calibration measures the gain of the RF source at twenty-nine frequencies between 6 MHz and 1.8 GHz. The attenuator on the A70 Source assembly is set to 20 dB during the measurements. The Through Signal Path illustration on page 7-7 shows the signal path through the HP 89430A during this calibration.

Fault Log Messages

RF Section Program ROM Corrupt This error message occurs if the HP 89430A's program ROM is corrupt. The program ROM is stored in Flash PROM on the A91 Digital Control assembly.

RF Section Flash ROM Failure This error message occurs if the HP 89410A could not write to the HP 89430A's Flash PROM. The Flash PROM is located on the A91 Digital Control assembly.

RF Section Calibration Table Invalid This error message occurs if the calibration factors stored in the A91 Digital Control assembly are invalid. The calibration factors are stored during the calibration factors adjustment on page 2-18.

RF Section LO Null Failure This error message occurs if the LO feedthrough calibration is unable to adjust the HP 89430A's LO feedthrough to ≤–49 dBm.

RF Section LO Calibration Failure This error message occurs if the local oscillator fails its YIG tuning curve calibration.

Cal Signal Level from RF Section Out of Range This error message occurs if the calibration signal generated by the HP 89410A is too large or too small after being routed through the HP 89430A.

IF Range Selection Problem during Calibration This error message occurs if the best range calibration determined that the HP 89430A's gain is too large or too small for one of the valid IF range settings.

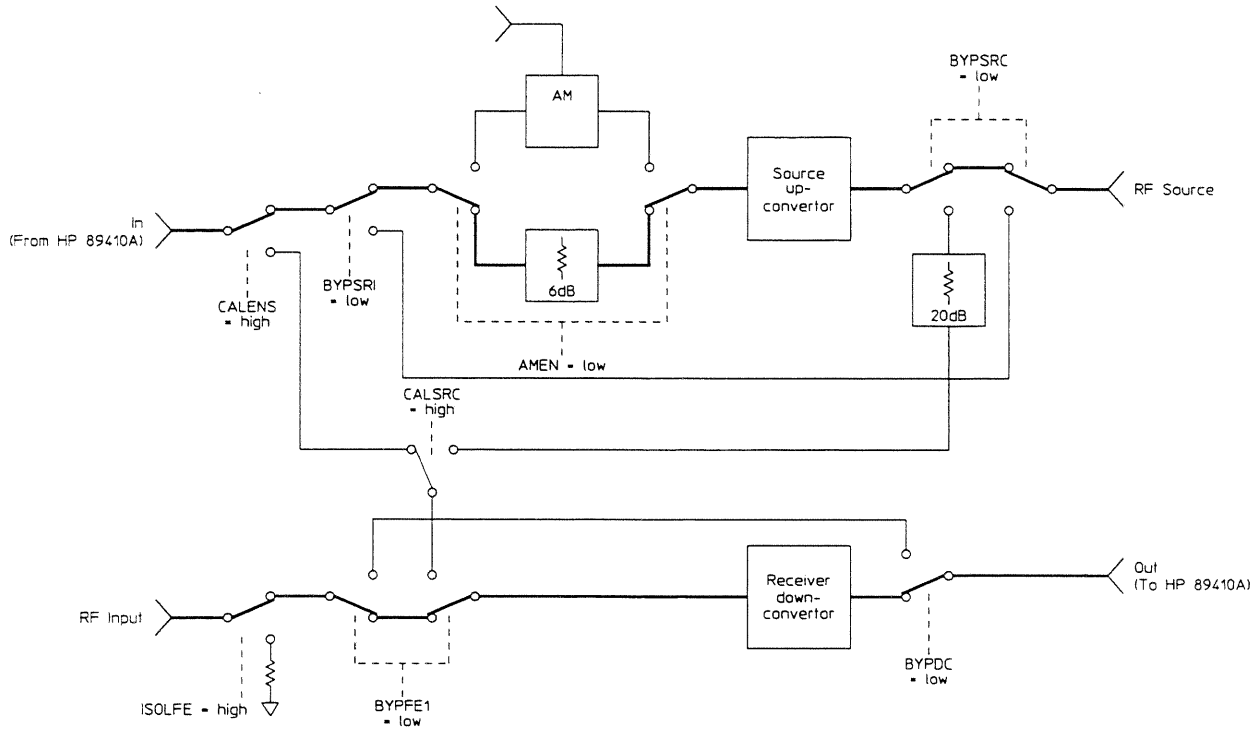
Special Test Modes

The special test modes are used in the troubleshooting and adjustment procedures. To access the special test modes, press the following keys:

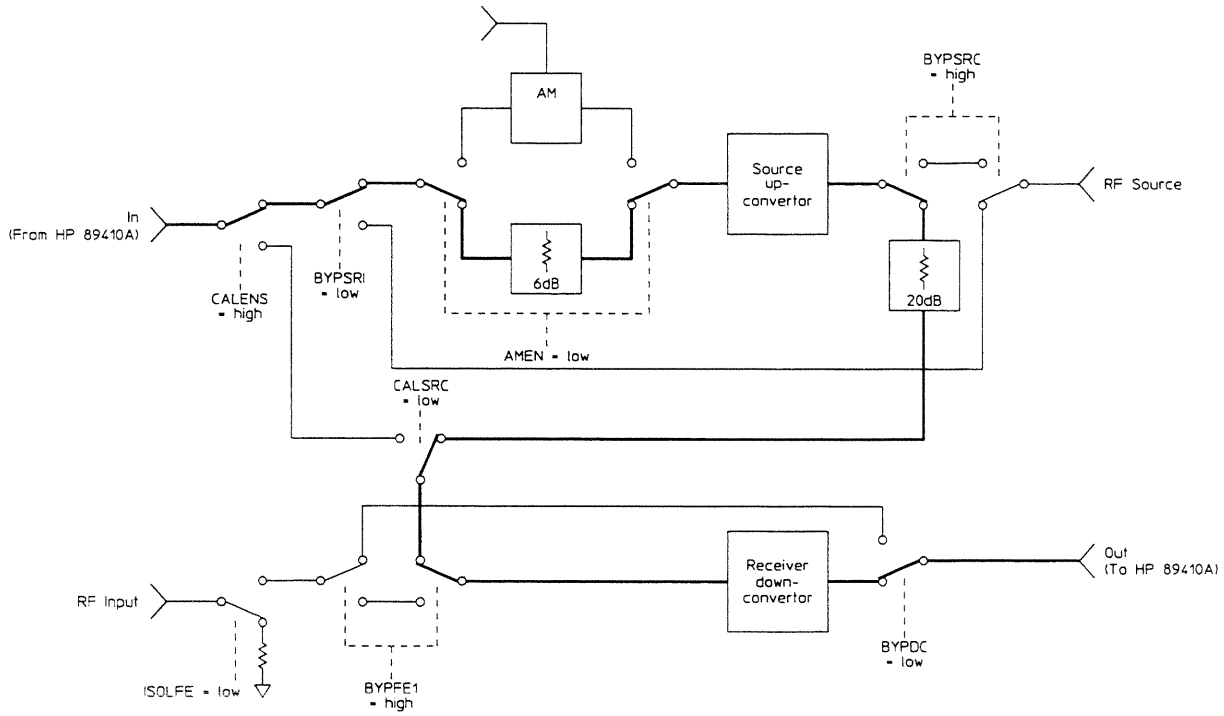
[System Utility]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[RF section]

[PRESET] This softkey places the analyzer in vector mode and sets the local oscillator's center frequency to 5 MHz. Press this softkey to ensure the accuracy of the values displayed in the LO debug menu. Changing the LO frequency changes the values in the LO debug menu but does not update the values displayed in the LO debug menu.

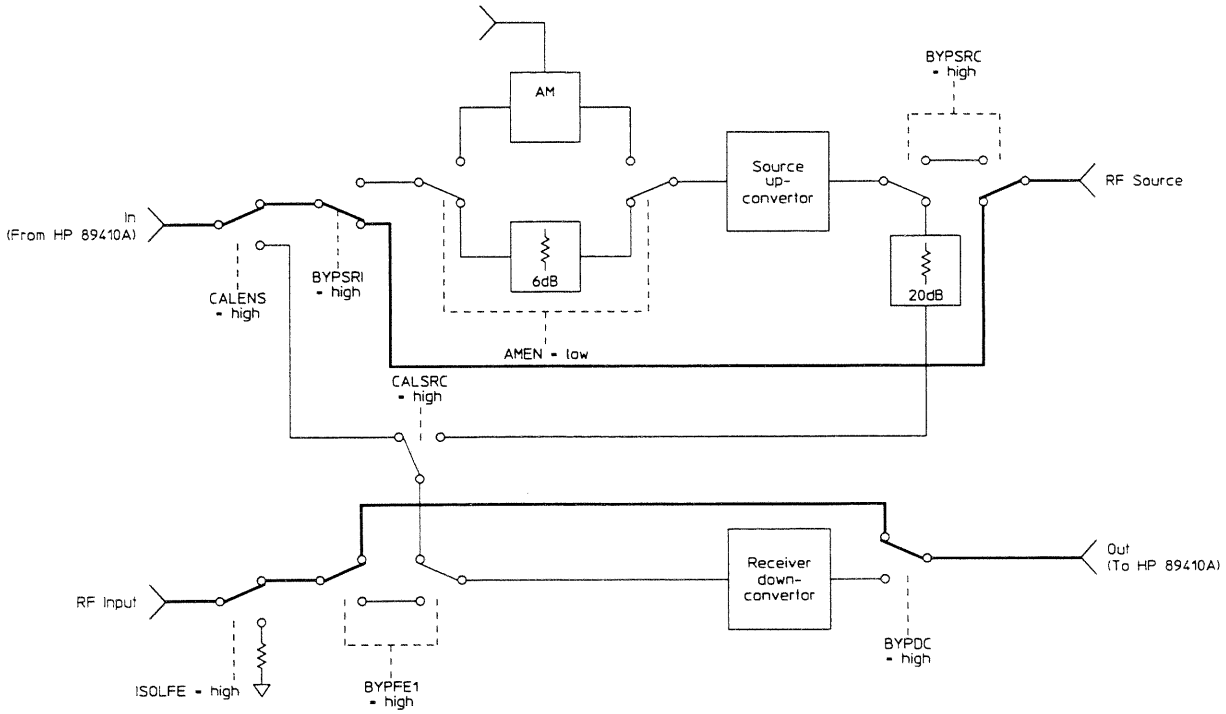
[input] This softkey brings up a menu that allows you to select the signal path, set the attenuator level, and adjust the LO feedthrough cancellation signals. The signal path can be set to normal, through, bypass, and cal (see the following illustrations). The attenuator level can be set from 0 to 55 dB in 5 dB steps. The LO feedthrough cancellation signals are adjusted by setting the value for LOI null and LOQ null from –32767 to 32767.



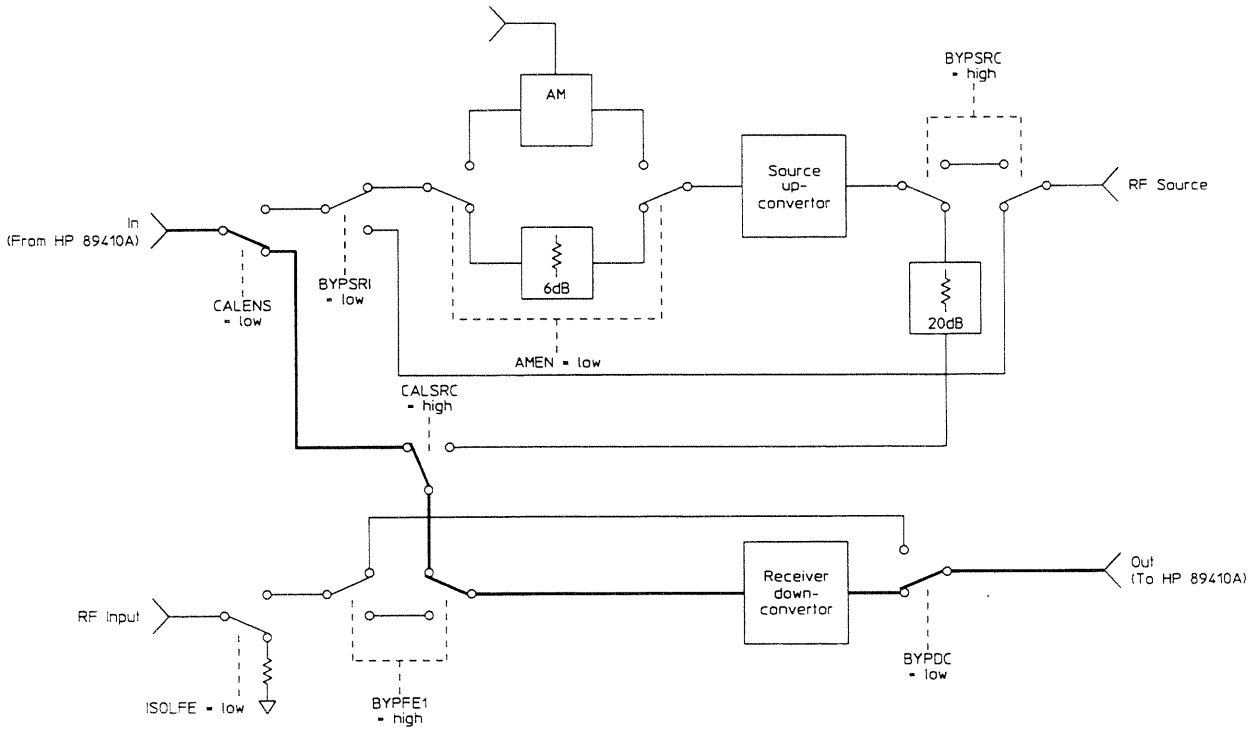
Normal Signal Path



Through Signal Path



Bypass Signal Path



Cal Signal Path

[LO setup freq debug] This softkey displays the current LO setup mode. The LO debug mode allows the local oscillator's DAC, offset, N divider, N gain, and phase compensation to be individually set. The LO frequency mode allows the local oscillator's frequency to be set. Setting the local oscillator's frequency changes the values in the LO debug menu to the correct values for the selected frequency but does not update the values displayed in the LO debug menu.

[LO debug] This softkey brings up a menu that allows the local oscillator's DAC, offset, N divider, N gain, and phase compensation to be individually set. Before pressing this softkey, press [PRESET] to ensure the accuracy of the values displayed. Setting the LO frequency with the [LO frequency] softkey changes the values in this menu but does not update the values displayed in this menu. On the A62 YIG Driver assembly, the DAC can be set from 0 to 4095. On the A60 Local Oscillator assembly, LO offset can be set to 2400 MHz, 3000 MHz, or 3600 MHz. On the A61 YIG Loop Phase Detector assembly, N (divider) can be set from 0 to 1023, komp (N gain) can be set from 0 to 7, and phase compensation can be set to positive or negative.

[LO frequency] This softkey allows the local oscillator's frequency to be set. Setting the local oscillator's frequency changes the values in the LO debug menu to the correct values for the selected frequency but does not update the values displayed in the LO debug menu.

[source] This softkey brings up a menu that allows you to set the source level and to turn amplitude modulation on and off. The source level can be set to –17 to 13 dBm.

[ADC] This softkey brings up a menu that allows you to select an ADC line from 0 to 7 and to read the selected line.

[RF section calibration] This softkey loads the RF calibration program. The RF calibration program is used during the calibration factors adjustment on page 2-18.

Special Test Modes Menu Map and HP-IB Commands

The HP 89430A's special test modes can be set from the front panel or from a controller via HP-IB. To set a test mode from the front panel, press **[System Utility]** [more] [diagnostics] [service functions] 1125 [enter] [special test modes] followed by the appropriate softkeys shown in the following table. To set a test mode via HP-IB, send the equivalent HP-IB command shown in the table.

Self Test	HP-IB Command
[diagnostics]	–
[quick conf self test]	SYST:TEST:QCON
[long conf self test]	SYST:TEST:LCON
[fault log]	DIAG:FLOG ON | OFF
[test log]	DIAG:TLOG ON | OFF
[clear test log]	SYST:TLOG:CLE
[service functions]	–
[special test modes]	–
[RF section]	–
[PRESET]	DIAG:RF:MODE:PRES
[input]	–
[normal]	DIAG:RF:MODE:PATH NORM
[through]	DIAG:RF:MODE:PATH THRU
[bypass]	DIAG:RF:MODE:PATH BYP
[cal]	DIAG:RF:MODE:PATH CAL
[attenuator]	DIAG:RF:MODE:ATT (0 to 55)
[LOI null]	DIAG:RF:MODE:NULL:INPH (–32767 to 32767)
[LOQ null]	DIAG:RF:MODE:NULL:QUAD (–32767 to 32767)
[LO setup]	DIAG:RF:MODE:LO:SET FREQ | DEBUG
[LO debug]	–
[DAC]	DIAG:RF:MODE:LO:DAC (0 to 4095)
[lo offset]	DIAG:RF:MODE:LO:OFFS 2400 | 3000 | 3600
[N (divider)]	DIAG:RF:MODE:LO:N (0 to 1023)
[komp (N gain)]	DIAG:RF:MODE:LO:KOMP (0 to 7)
[phase comp]	DIAG:RF:MODE:LO:PHAS POS | NEG
[LO frequency]	DIAG:RF:MODE:LO:FREQ (–20 to 1820)
[source]	–
[level]	DIAG:RF:MODE:LEV (–17 to 13)
[am]	DIAG:RF:MODE:AM ON | OFF
[ADC]	–
[select line]	–
[read ADC]	–
[RF section calibration]	DIAG:RF:MODE:CAL

8

Backdating

Backdating

This chapter provides information necessary to modify this manual for instruments that differ from those currently being produced. The information in this chapter documents earlier instrument configurations and associated servicing procedures.

With the information provided in this chapter, this manual can be corrected so that it applies to any earlier version or configuration of the instrument.

For instruments with serial numbers ≤3337A00440, make change A.

Change A

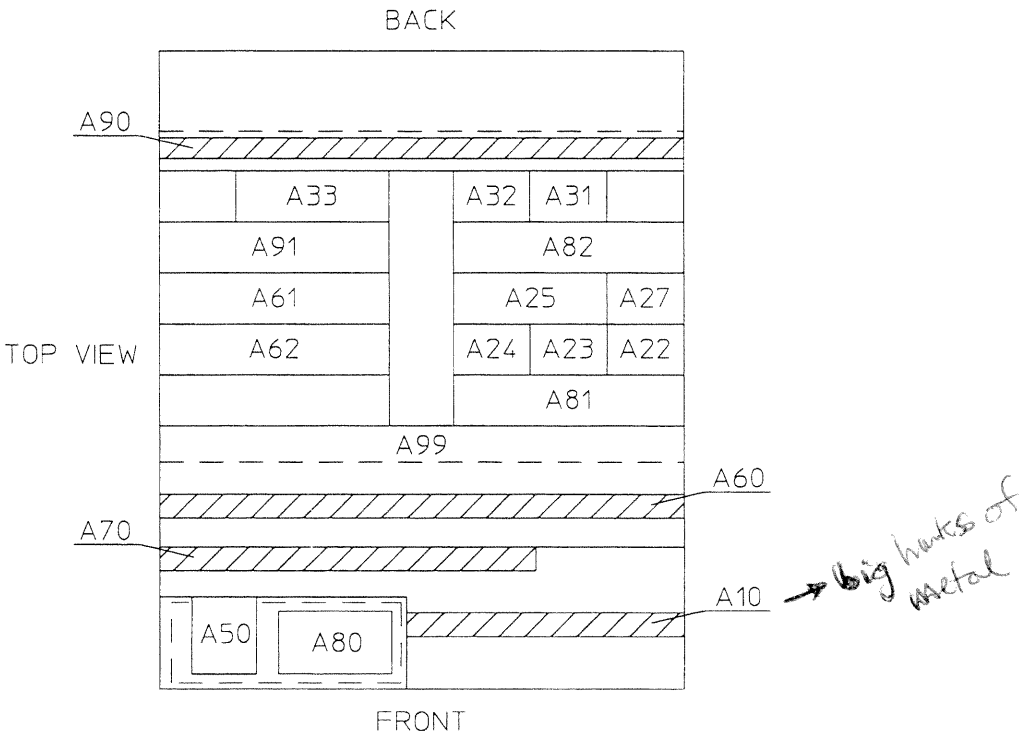
If MP202 or W18 needs to be replaced, replace both. The new MP202 has a short cable attached.

9

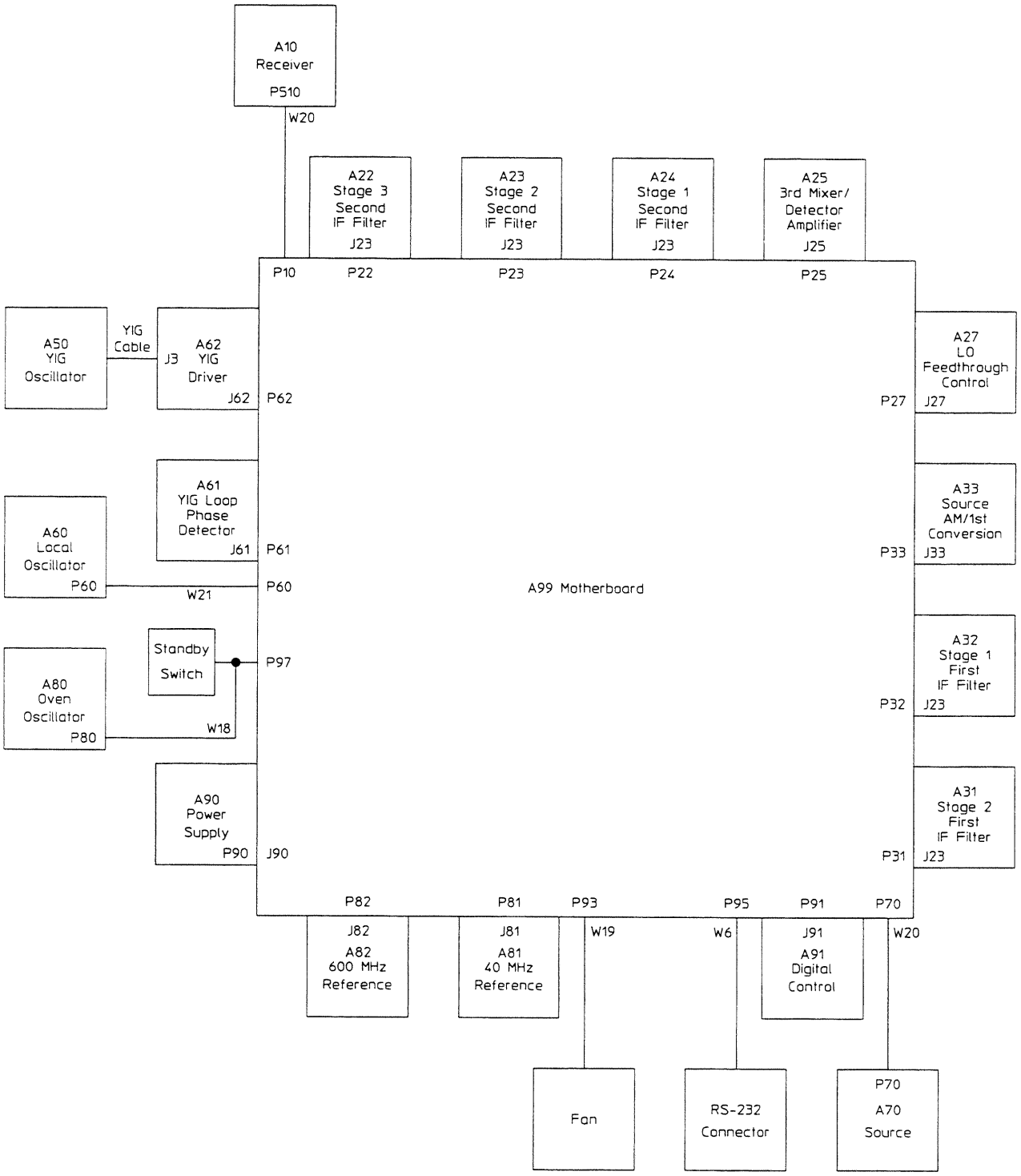
Quick Reference

Quick Reference

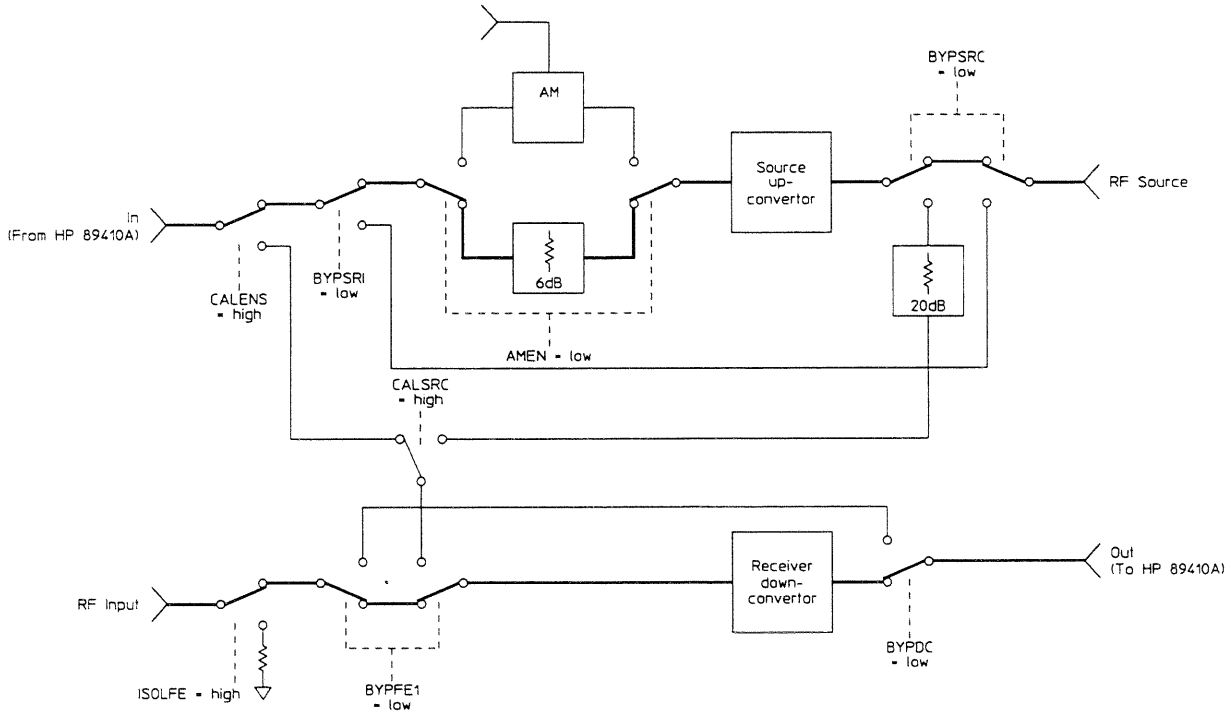
This chapter contains all the block diagrams and the "A90/A91 Motherboard Voltages" table for the HP 89430A. All block diagrams, except the overall block diagrams, show the connector numbers for signals routed through RF cables. The block diagrams do not show connector numbers for signals routed through the Motherboard assemblies.



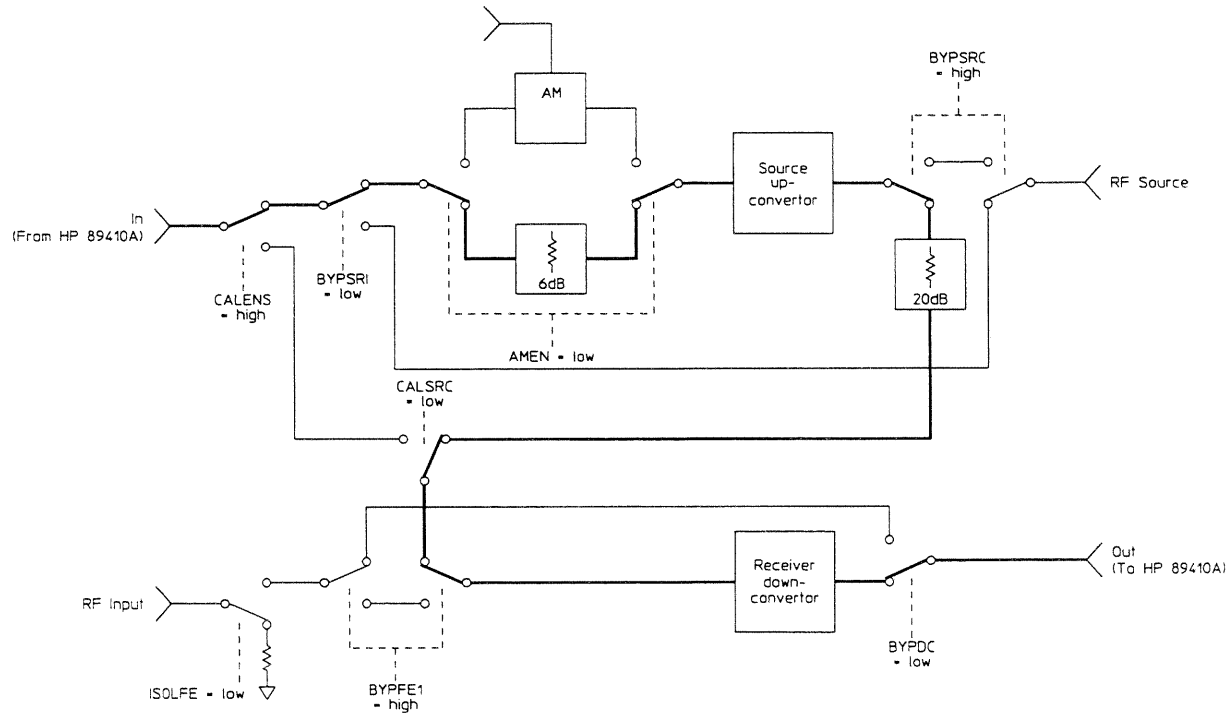
Assembly Locations



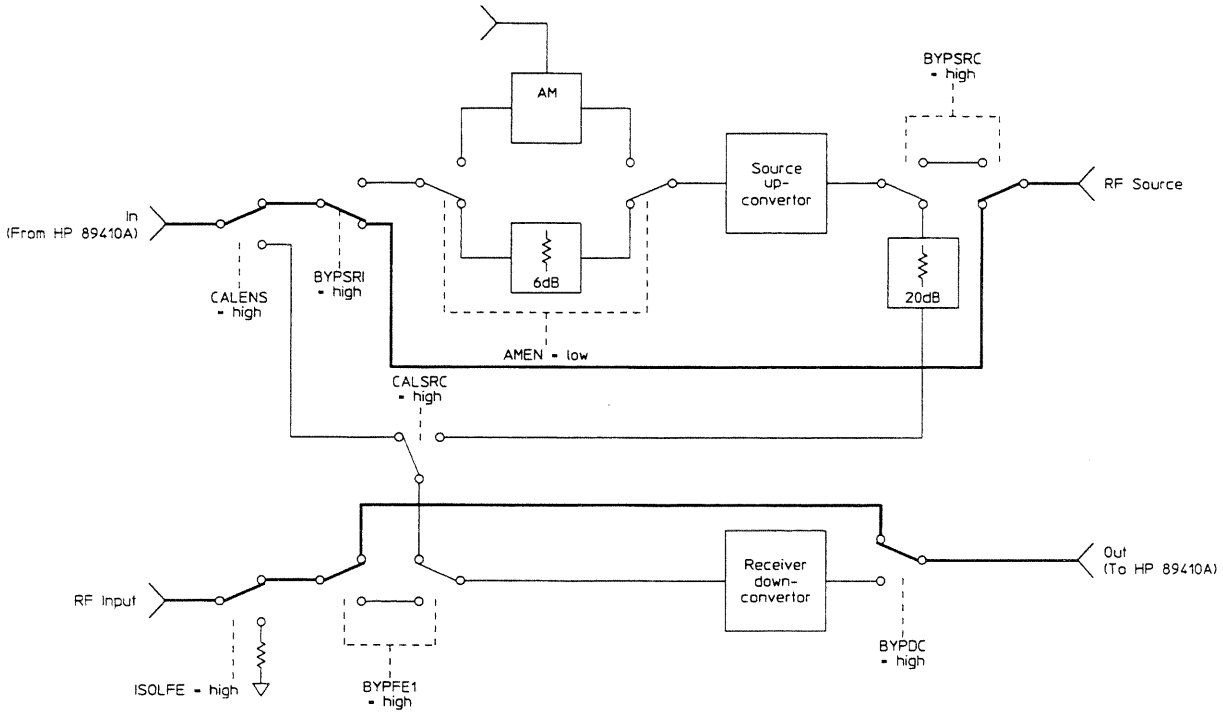
Connections to A99 Motherboard



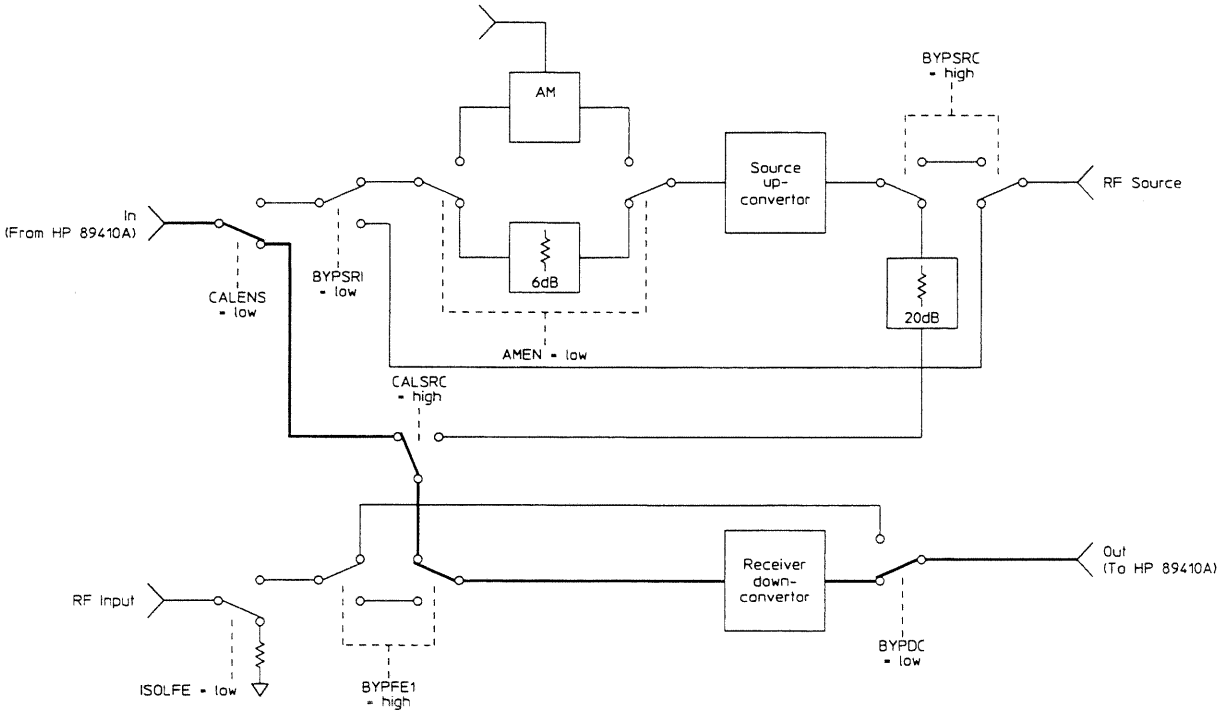
Normal Signal Path



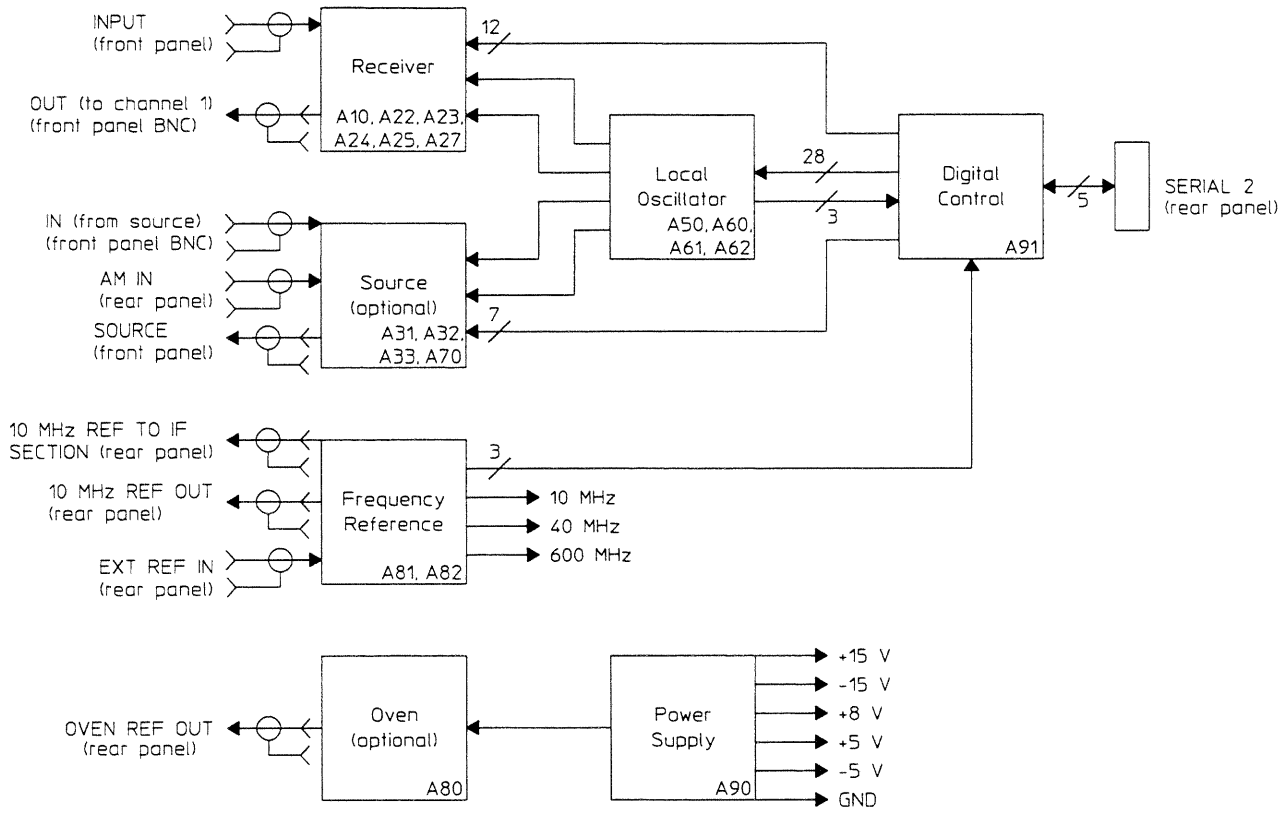
Through Signal Path



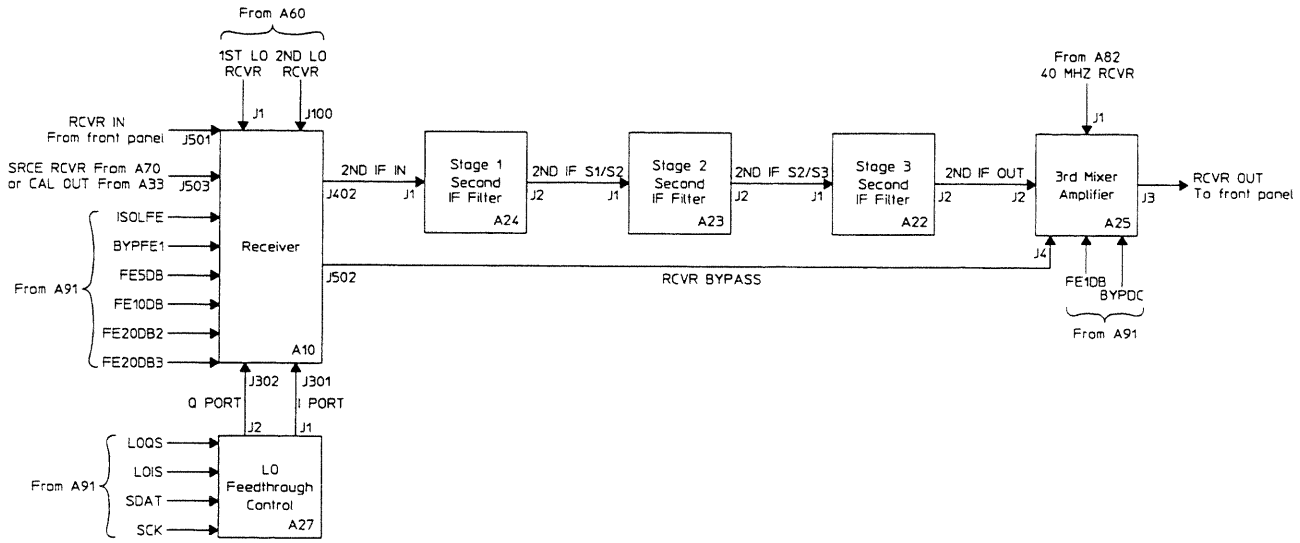
Bypass Signal Path



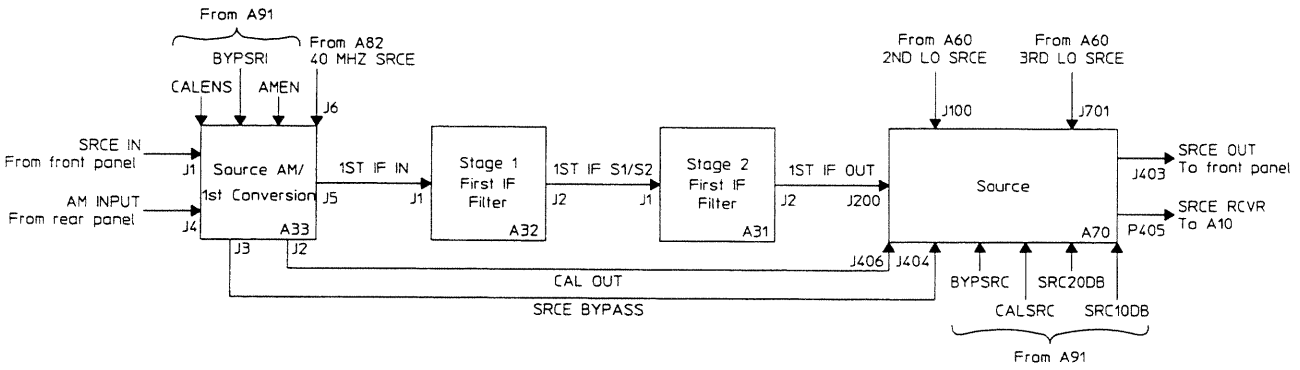
Calibration Signal Path



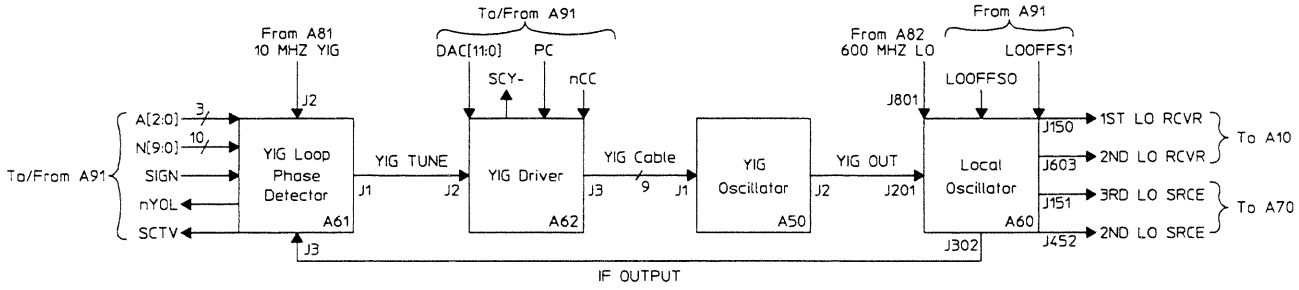
Overall Block Diagram



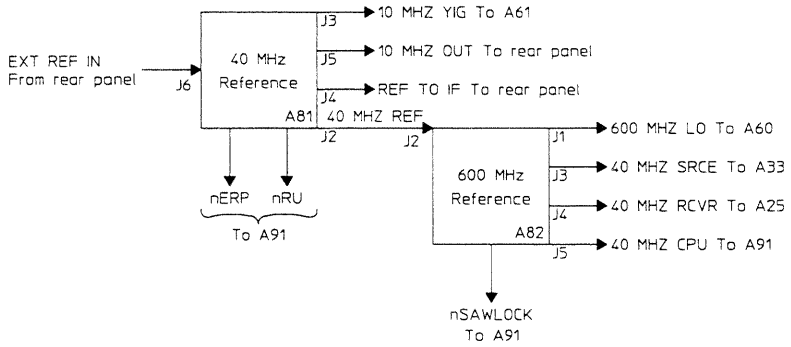
Receiver Block Diagram



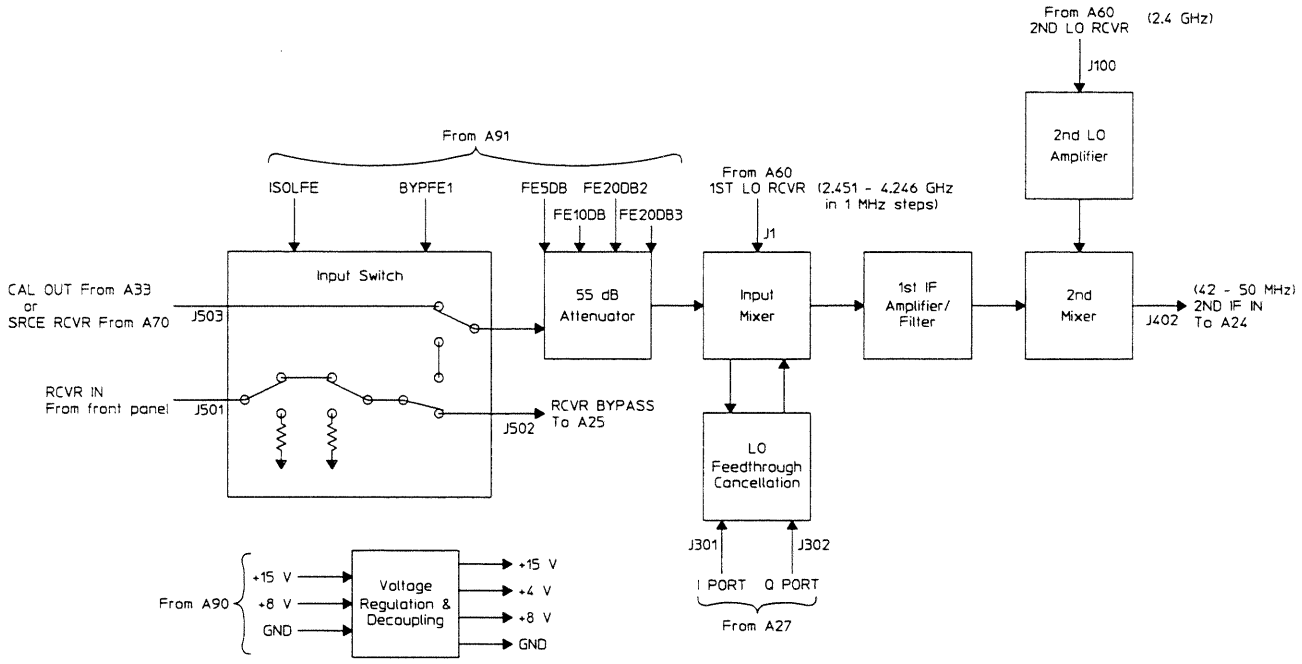
Source Block Diagram



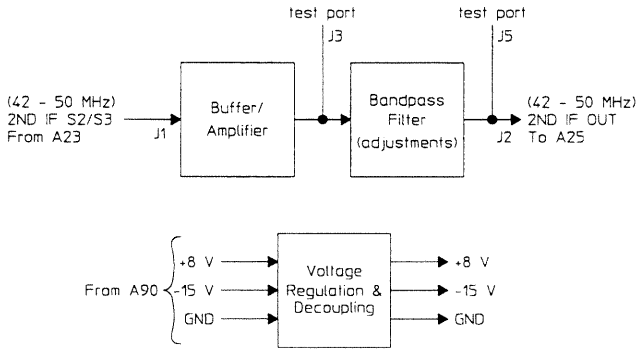
Local Oscillator Block Diagram



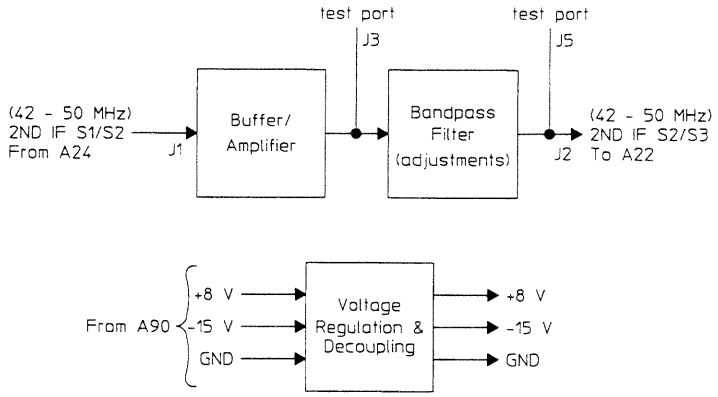
Frequency Reference Block Diagram



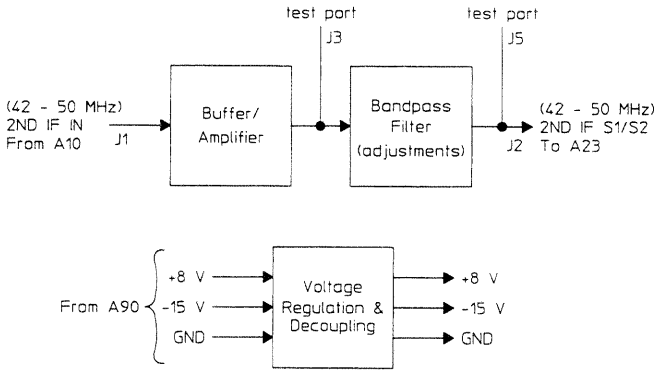
A10 Receiver Block Diagram



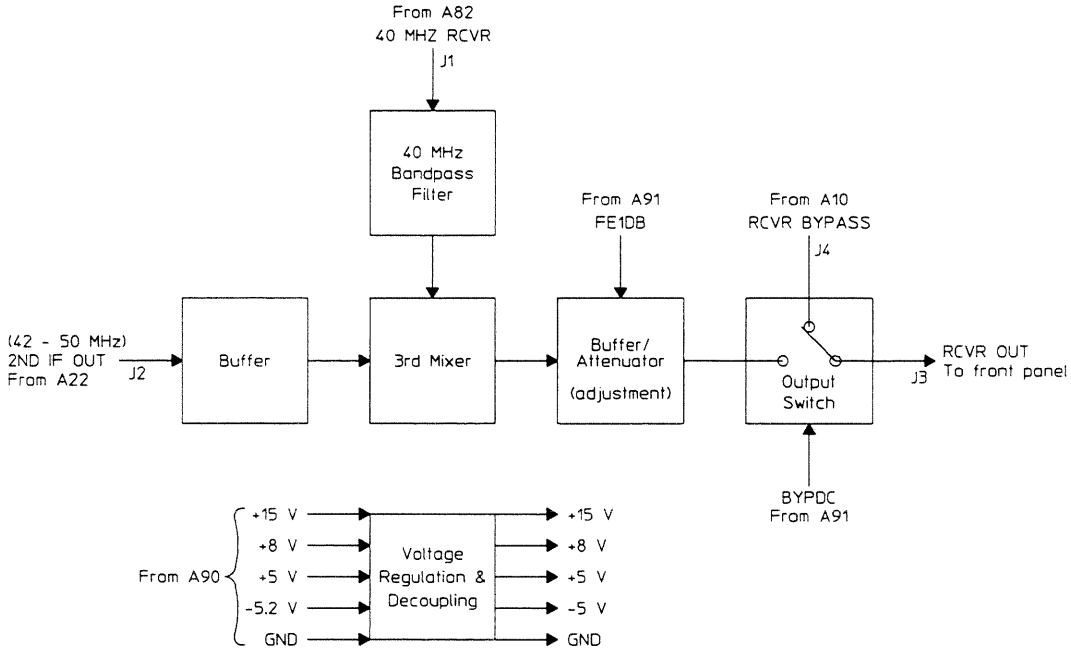
A22 Stage 3 Second IF Block Diagram



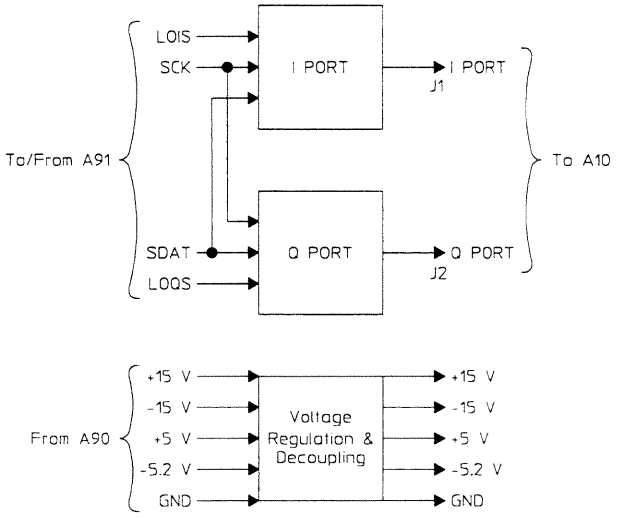
A23 Stage 2 Second IF Block Diagram



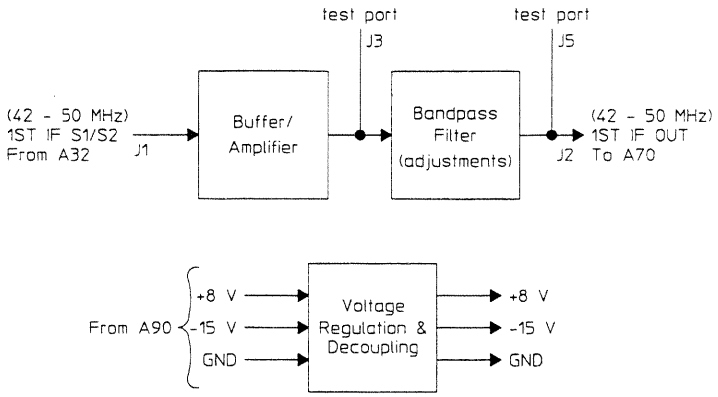
A24 Stage 1 Second IF Block Diagram



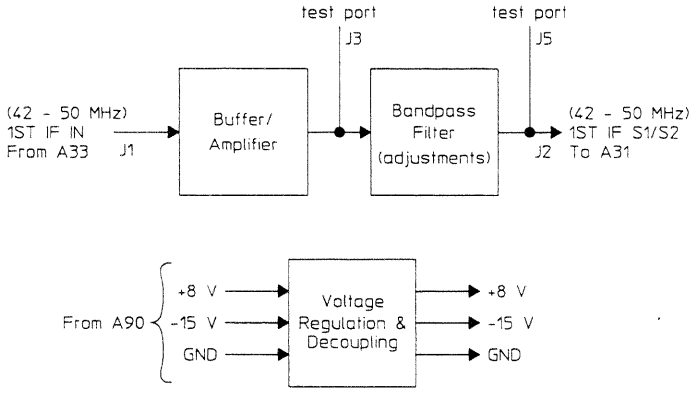
A25 3rd Mixer Amplifier Block Diagram



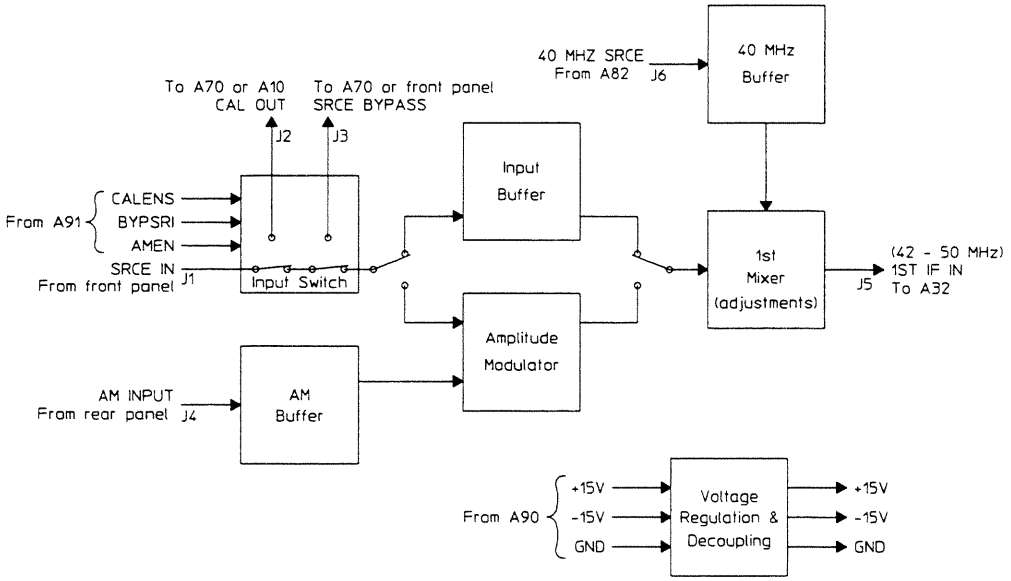
A27 LO Feedthrough Control Block Diagram



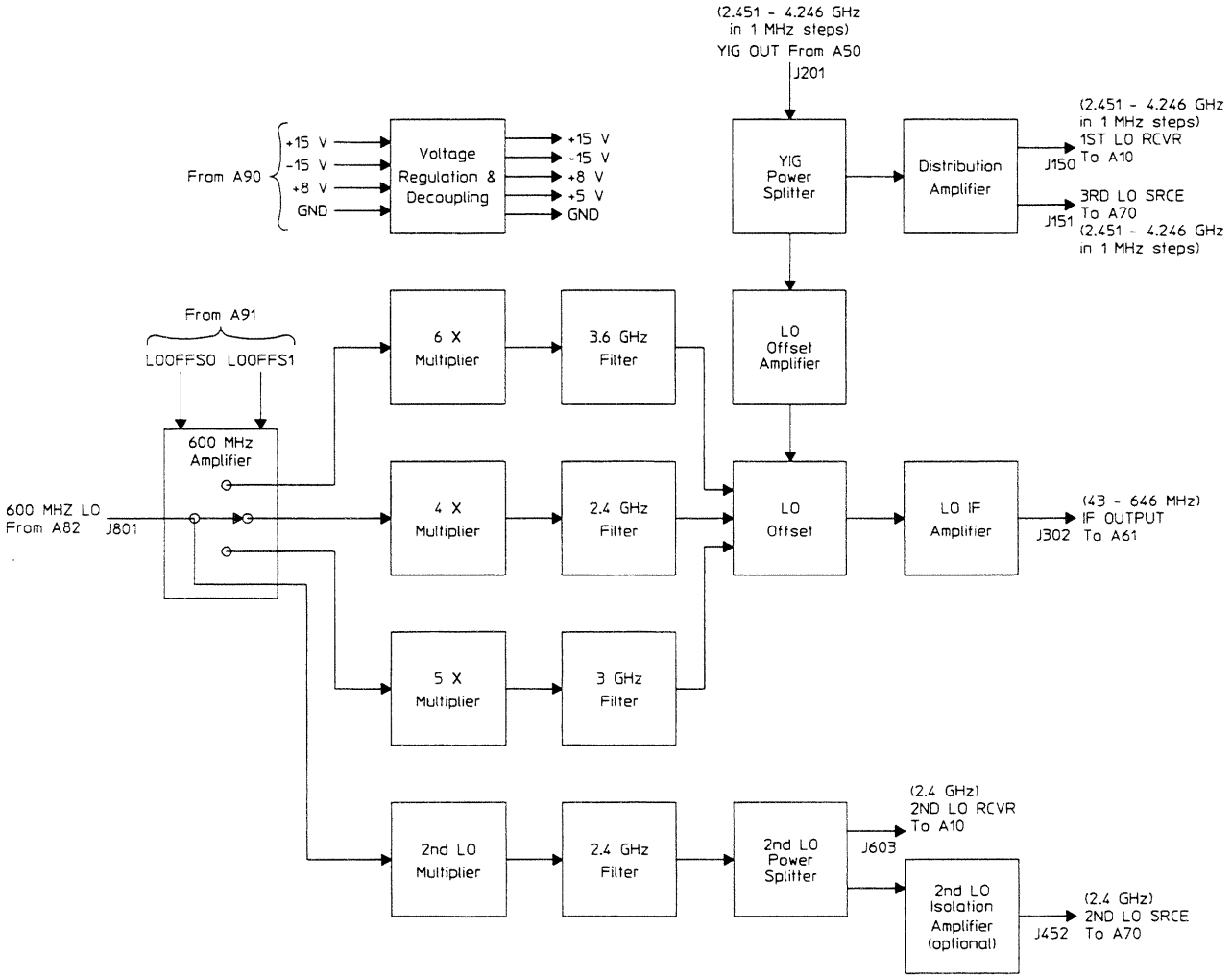
A31 Stage 2 First IF Filter Block Diagram



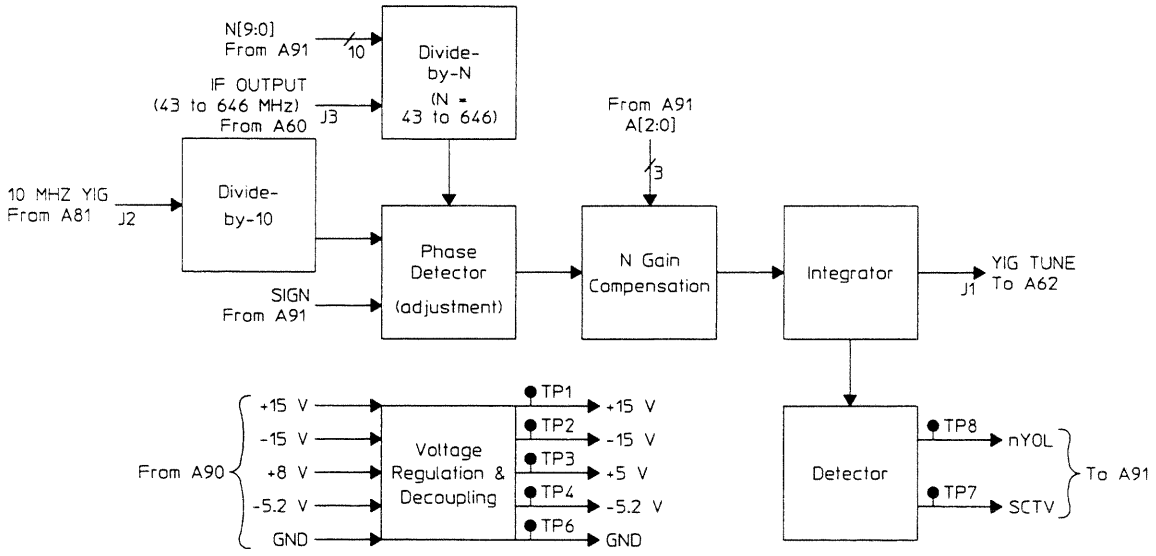
A32 Stage 1 First IF Filter Block Diagram



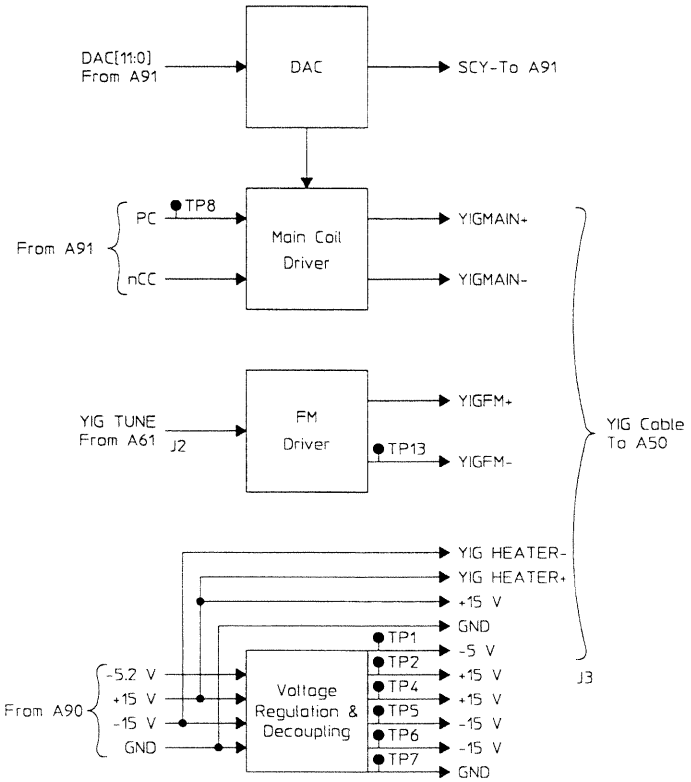
A33 Source AM/1st Conversion Block Diagram



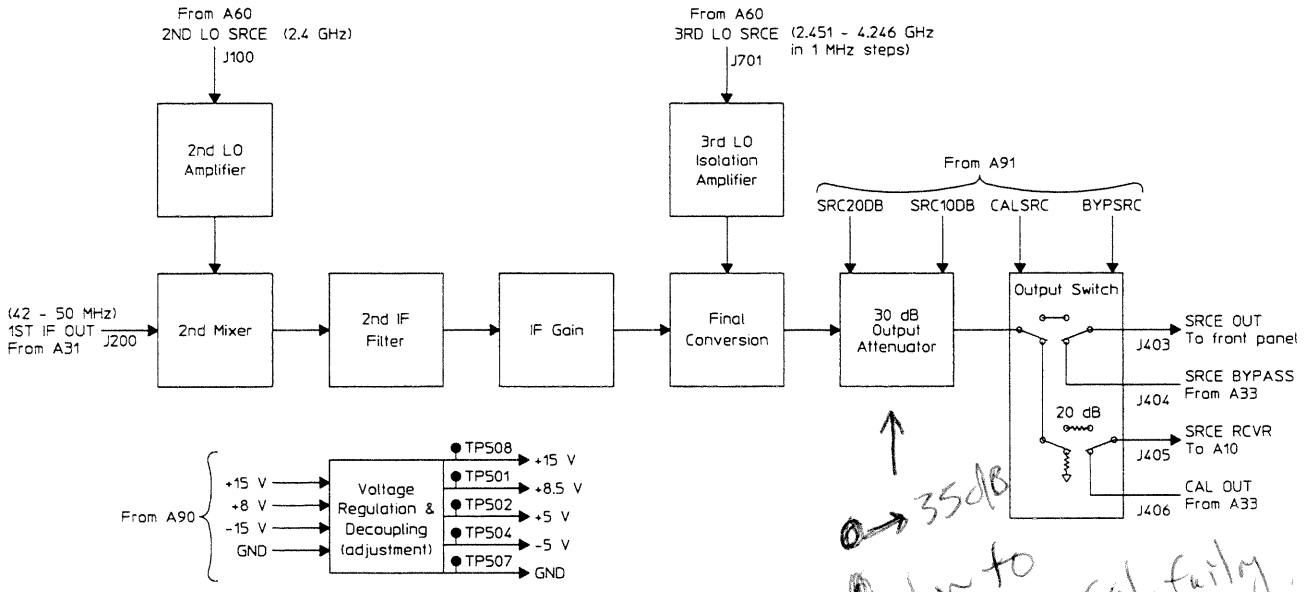
A60 Local Oscillator Block Diagram



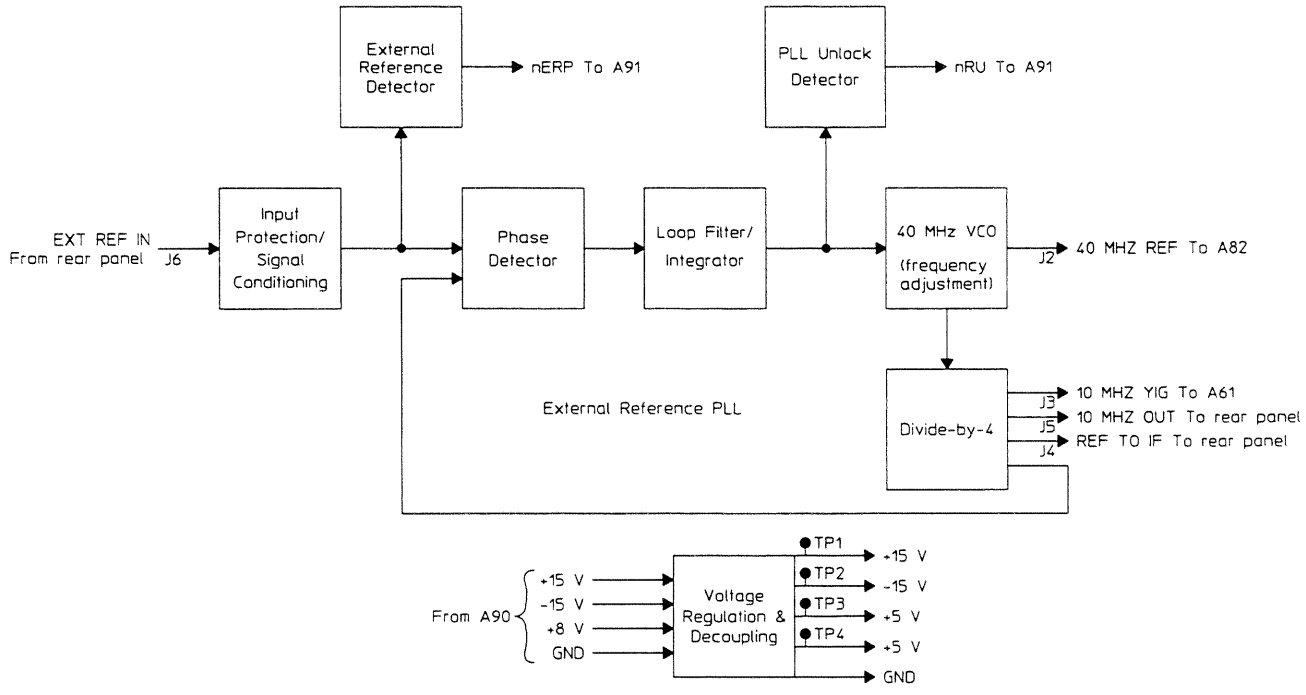
A61 YIG Loop Phase Detector Block Diagram



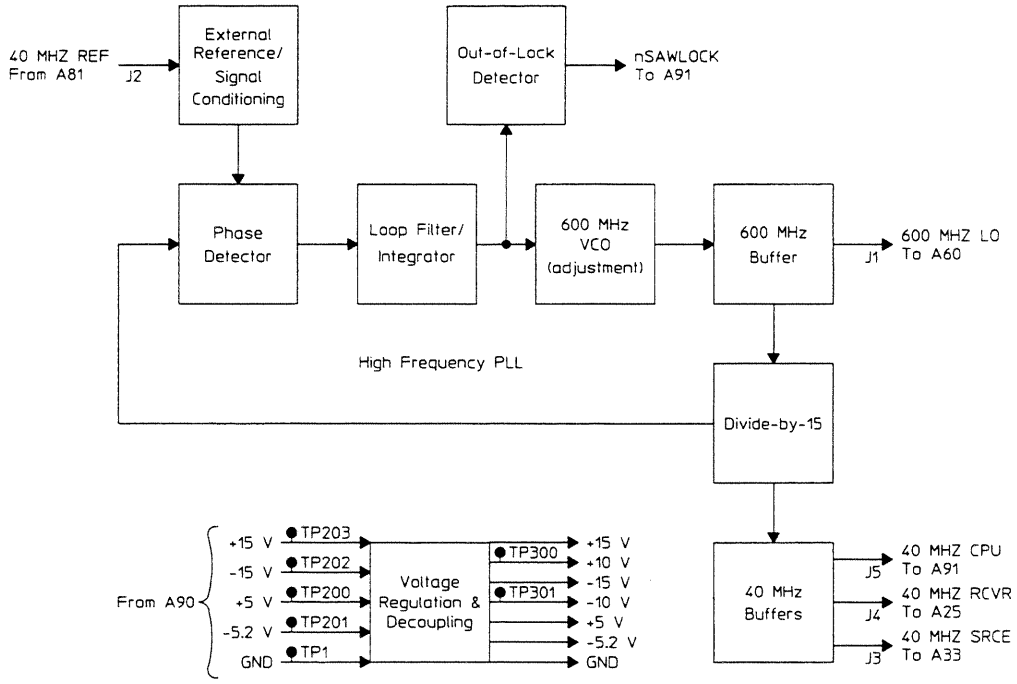
A62 YIG Driver Block Diagram



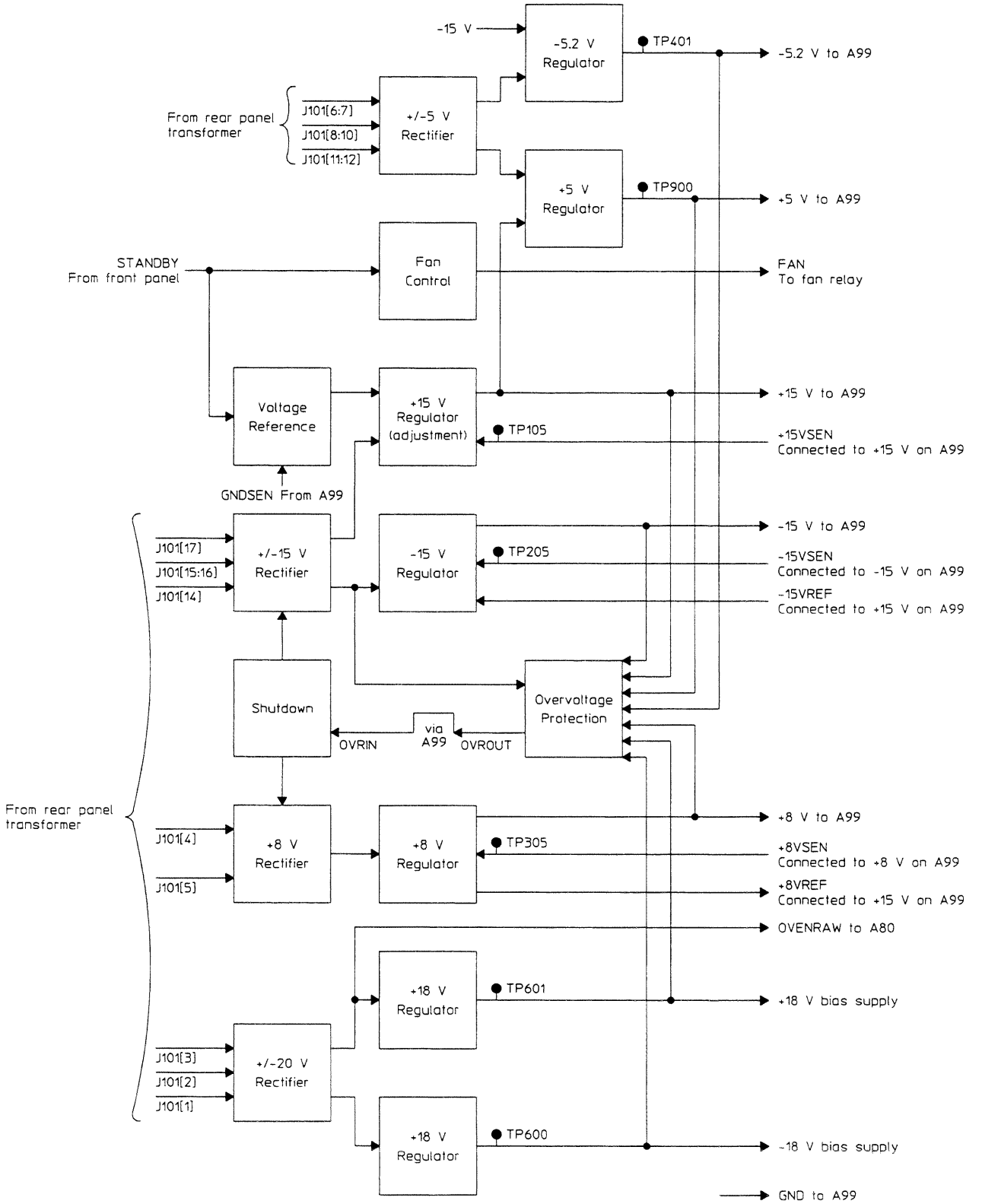
A70 Source Block Diagram



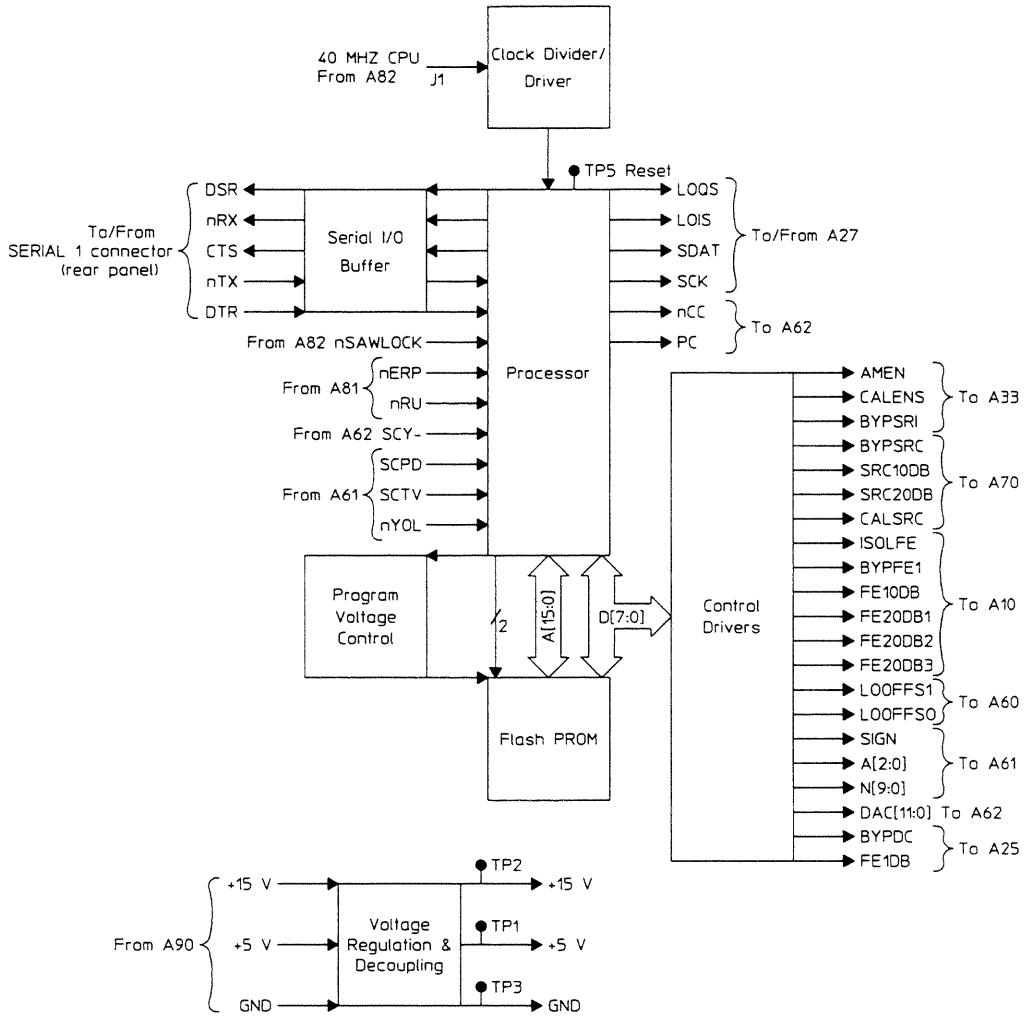
A81 40 MHz Reference Block Diagram



A82 600 MHz Reference Block Diagram



A90 Power Supply Block Diagram



A91 Digital Control Block Diagram

Motherboard Voltages

Voltage	Assembly Using Voltage																		
	A10	A22	A23	A24	A25	A27	A31	A32	A33	A60	A61	A62	A70	A80	A81	A82	A90	A91	FP
	Motherboard Connector																		
	P10	P22	P23	P24	P25	P27	P31	P32	P33	P60	P61	P62	P70	P97	P81	P82	J90	P91	P97
	Connector Pin Number																		
+15 V	3-4	1-2	1-2	1-2	1-2	11-12	1-2	1-2	11-12	6	11-12	3-4	3-5		1	1	8 24 40	9-10	
−15 V	1-2	15-16	15-16	15-16	9-10	15-16	15-16	15-16	7-8	8	7-8	13-14	1-2		9	9	6 22 38		
+8 V	7-8	19-20	19-20	19-20	5-6		19-20	19-20		10	10		6-8		13		1-2 17-18 33-34		
+5 V					17-18	3-4				5						17	11-12 27	1-4	
−5.2 V					13-14	1-2				3	1-2	5-6				13	4-5 20-21		
GND	9 11 13 15 17 19	3-14 17-18	3-14 17-18	3-14 17-18	3-4 7-8 11-12 15 20	13-14 17-18	3-14 17-18	3-14 17-18	4-6 9-10 13-20	4 7 9	5-6 9 14	3 8 11-12 15-18	9 11 13 15 17 19	1	2-3 5 7-8 10-12 14-16 18-20	2-3 5 7 10-12 14-16 18-20	13-16 23 28-32 45-48	5-8 11-12 29-30 37 40 42 57-58 65 75-76 89-90 95-96	3

Index

A

B

C

D

E

M

N

O

P

Q

R

S

T

V

W

Y

HP 89400-Series Documentation Roadmap

If you are thinking about...	And you want to...	Then read the analyzer's...
♦ Unpacking and installing the analyzer	Install the analyzer, or do operation verification or performance verification tests	*Installation and Verification Guide*
♦ Getting started	Make your first measurements with your new analyzer	*Getting Started Guide*
	Review measurement concepts	*Operator's Guide*
	Learn what each key does	Online Help (press the [Help] key)
♦ Making measurements	Learn how to make typical measurements	*Getting Started Guide and Operator's Guide*
♦ Creating automated measurements (To receive HP Instrument BASIC and HP Instrument BASIC manuals, order option 1C2)	Learn the HP Instrument BASIC interface	*HP 89400-Series Using HP Instrument BASIC*
	Program with HP Instrument BASIC	*HP Instrument BASIC User's Handbook*
♦ Remote operation	Learn about the HP-IB and SCPI	*HP-IB Programmer's Guide*
	Find specific HP-IB commands quickly	*HP 89400-Series HP-IB Commands: Quick Reference*
	Find HP-IB command details	*HP 89400-Series HP-IB Command Reference*
♦ Using analyzer data with a PC application	Transfer analyzer data to or from a PC (Personal Computer) application	*Standard Data Format Utilities: User's Guide*
	Display analyzer data on a PC, or display PC data on the analyzer	
♦ Servicing the analyzer (To receive service information, order option OB3)	Adjust, troubleshoot, or repair the analyzer	*Service Guide*

89441-90012

Need Assistance?

If you need assistance, contact your nearest Hewlett-Packard Sales and Service Office listed in the HP Catalog, or contact your nearest regional office listed on the inside back cover. If you are contacting Hewlett-Packard about a problem with your HP 89440A Vector Signal Analyzer, please provide the following information:

- ❑ Model number: HP 89440A
- ❑ Firmware version: †
- ❑ IF section serial number: ‡
- ❑ RF section serial number: ‡
- ❑ Options:
- ❑ Date the problem was first encountered:
- ❑ Circumstances in which the problem was encountered:
- ❑ Can you reproduce the problem?
- ❑ What effect does this problem have on you?

† To display the firmware version, press [**System Utility**] [more] [firmware version].
‡ To display the serial number, press [**System Utility**] [more] [serial number]

About this edition

September 1995: In this edition, the IF filter adjustment was removed from Chapter 2. Several part number changes were made and backdating relevant to these changes was documented.

July 1994: In this edition, the "Specifications," "Preparing the Analyzer for Use," and "Verifying Specifications" chapters were removed. The information that was contained in these chapters is in the *HP 89440A Installation and Verification Guide*. Since the remainder of this guide applies only to the RF section (the HP 89430A), the guide's name was changed from the *HP 89440A Service Guide* to the *HP 89430A Service Guide*.