Service Guide

Agilent Technologies
89410A Vector Signal Analyzer

Agilent Technologies

Part Number: 89410-90103

Supersedes: 89410-90065

Printed in USA
March 2002

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The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and it's meaning before operating this instrument.

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

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

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

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

WARNING: **The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from it's power supply.**

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This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of three years from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

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

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LIMITATION OF WARRANTY

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In this manual...

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 analyzer

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 analyzer

Chapter 4 **Replaceable Parts**

- Provides ordering information and lists the replaceable parts

Chapter 5 **Circuit Descriptions**

- Provides the overall instrument description and individual assembly description

Chapter 6 **Voltages and Signals**

- Shows where the signals and voltages are used in the analyzer 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 “A90/A91 Motherboard Voltages” table

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**]

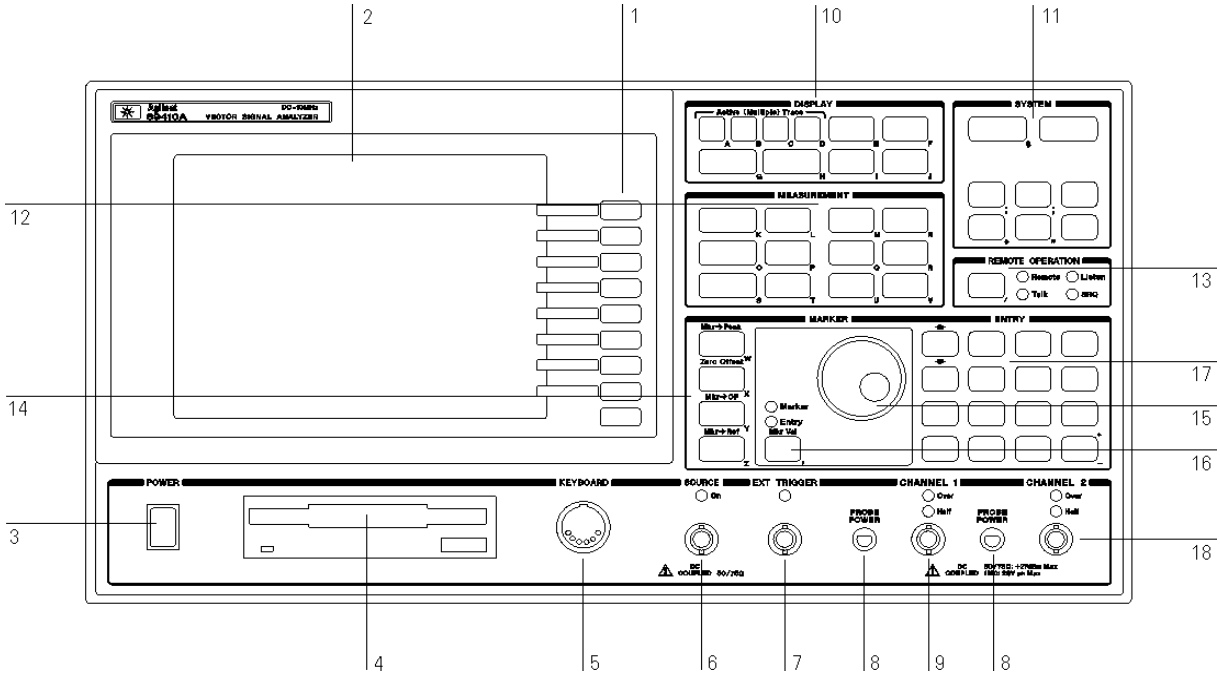
Numeric Entries

- 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.

The Agilent 89410A at a Glance



Agilent 89410A 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 Instrument BASIC programs.

6- The SOURCE connector routes the analyzer's source output to your DUT. Output impedance is selectable: 50 ohms or 75 ohms.

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

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

9-The CHANNEL 1 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.

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 easy of upgrading, the CHANNEL 2 BNC connector is installed even if option AY7 (second input channel) is not installed.

For more details on the Agilent 89410A front panel, display the online help topic ''Front Panel.''

Before applying power

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described in "Safety symbols and instrument markings" on page x.

Ground the instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Fuses

Use only fuses with the required rated current, voltage, and specified type (normal blow, time delay). Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

Safety symbols and instrument markings

Symbols and markings in manuals and on instruments alert you to potential risks, provide information about conditions, and comply with

international regulations. Table 1 defines the symbols and markings you may find in a manual or on an instrument.

Table 1 Safety symbols and instrument markings

Safety symbols	
	Warning: risk of electric shock.
	Warning: hot surface
	Caution: refer to accompanying documents.
	Laser radiation symbol: marked on products that have a laser output.
	Alternating current.
	Both direct and alternating current.
	Three-phase alternating current.
	Earth (ground) terminal
	Protective earth (ground) terminal
	Frame or chassis terminal
	Terminal is at earth potential. Used for measurement and control circuits designed to be operated with one terminal at earth potential.
	Terminal for neutral conductor on permanently installed equipment.
	Terminal for line conductor on permanently installed equipment.
	Standby (supply); units with this symbol are not completely disconnected from ac mains when this switch is off. To completely disconnect the unit from ac mains, either disconnect the power cord, or have a qualified electrician install an external switch.
Instrument markings	
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.

Table 1 Safety symbols and instrument markings (continued)

Safety symbols	
	The CSA mark is a registered trademark of the Canadian Standards Association.
	The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework regulations under the terms of the Radio Communications Act of 1992.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:
http://www.agilent.com/ services/English/index.html

If you do not have access to the Internet, one of these centers can direct you to your nearest representative.

Table 2 Telephone numbers for Agilent Call Centers

United States:	Test and Measurement Call Center (800) 452 4844 (toll-free in US)
Canada:	(905) 206 4725
Europe:	(31 20) 547 9900
Japan:	Measurement Assistance Center (81) 426 56 7832 (81) 426 56 7840 (FAX)
Latin America:	(305) 267 4245 (305) 267 4288 (FAX)
Australia / New Zealand:	1 800 629 485 (Australia) 0800 738 378 (New Zealand))
Asia-Pacific:	(852) 2599 7777 (852) 2506 9285 (FAX)

Contents

Contents

Contents

1 Troubleshooting the Analyzer

Troubleshooting the Analyzer

This chapter contains troubleshooting tests that can isolate most failures 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 Agilent 89410A DC-10 MHz Vector Signal Analyzer 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. Service must be performed by trained service personnel who are aware of the hazards involved (such as fire and electrical shock).

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

An operator should not remove any covers, screws, shields or in any other way access the interior of the Agilent 89410A DC-10 MHz Vector Signal Analyzer unless instructed by an option installation note. There are no operator controls inside the analyzer.

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 analyzer must be made inoperative and secured against any unintended operation.

When power is removed from the Agilent 89410A DC-10 MHz Vector Signal Analyzer, +11000 volts are present in the CRT for approximately 3 seconds. Be extremely careful when working in proximity to this area during this time. The high voltage can cause serious personal injury if contacted.

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

Equipment Required

The following table lists the recommended equipment needed to adjust and troubleshoot the analyzer. 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
Frequency Standard	Accuracy ±0.5 ppm	Agilent 5061B
Frequency Synthesizer	Frequency range 3 Hz to 10 MHz Amplitude range –36 to +20 dBm Amplitude resolution 0.01 Hz Impedance 50 Ω Harmonic distortion <–30 dBc Spurious <–70 dBc External reference input	Agilent 3326A Alternate Agilent 3325A Agilent 3325B
Milliwatt Power Meter	Range ±0.2 dBm Accuracy ±0.0625 dB	W&G EPM-1 †
Spectrum Analyzer	Frequency range 100 Hz to 40 MHz Amplitude range –60 to +15 dBm Dynamic range <–67 dBc Tracking Source @ 0 dBm Impedance 50 Ω and 75 Ω External reference input	Agilent 3585B Alternate Agilent 3585A Agilent 3588A Agilent 3589A
Digital Multimeter	Accuracy 25 ppm Maximum volts range ≥400 Vdc	Agilent 3458A Alternate Agilent 3456A
Frequency Counter	Frequency range 3 to 30 MHz Resolution <1 Hz Frequency accuracy ±0.25 Hz Impedance 1 MΩ	Agilent 5334B opt 010
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 0.3 dBp-p from 10 kHz to 16 MHz	Agilent 3577B Alternate Agilent 4195A Agilent 3589A with Agilent 35689A

†Wandel & Goltermann Inc., 1800 Wyatt Drive, Suite 2, Santa Clara, CA 95054 U.S.A (408)988-7622

Recommended Test Equipment (continued)

Logic Probe	TTL/CMOS	Agilent 545A Alternate Agilent 5006A Agilent 5005A/B
Oscilloscope	Bandwidth ≥150 MHz Vertical sensitivity 10 mV/div Input coupling AC, DC, 50 Ω, 1 MΩ Trigger Ext, Int	Agilent 54111D
Oscilloscope Probe	Input R ≥1 MΩ Division Ratio 1:1	Agilent 10438A
Oscilloscope Probe	Input R ≥1 MΩ Division Ratio 10:1	Agilent 10431A
50 Ω Feedthrough Termination (2 for opt AY7)	Accuracy ±0.2%	Agilent 11048C
(2) 50 Ω Termination	±2% at dc	Pomona Model 3840-50 † Alternate Agilent 11048C with Agilent 1250-0774
ThinLAN Transceiver	AUI to ThinLAN adapter	Agilent 28641B
Cables	(4) 50 Ω BNC Test clips-to-double banana plug	Agilent 8120-1840 Agilent 11002A
Adapters	BNC(f)-to-Dual Banana Plug N(m)-to-BNC(f) (2) Test Clips-to-BNC(f) BNC Tee N(f)-to-BNC(f) BNC(f)-to-Dual Banana Plug(m) BNC(f)-to-BNC(f)	Agilent 1251-2816 Agilent 1250-0780 Pomona Model 2631 † Agilent 1250-0781 Agilent 1250-1536 Agilent 1251-2277 Agilent 1250-0080
Service Kit	 Includes A10/A35 extender board A36/A60 extender board A61 extender board Motherboard cable extraction tool Plastic screw driver Flat-edge adjustment tool SMB extender cable (2) BNC(m)-to-SMB(f) cable (2) SMB(m)-to-SMB(m) adapter (2)	Agilent 89410-84401 Includes Agilent 89410-B1001‡ Agilent 89410-B1002‡ Agilent 89410-B1008‡ Agilent 8710-2050 Agilent 8710-2056 Agilent 8710-1928 Agilent 03585-61601 Agilent 03585-61616 Agilent 1250-0669
10 kW Series Resistor ††	Value: 10 kΩ Accuracy: 1% Power: 0.125 Ω	Agilent 0757-0442
CPU/Memory Service Utility Disk		Agilent 89410-19463

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

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

††See the following for assembly.

Suggested Assembly for Series Resistor

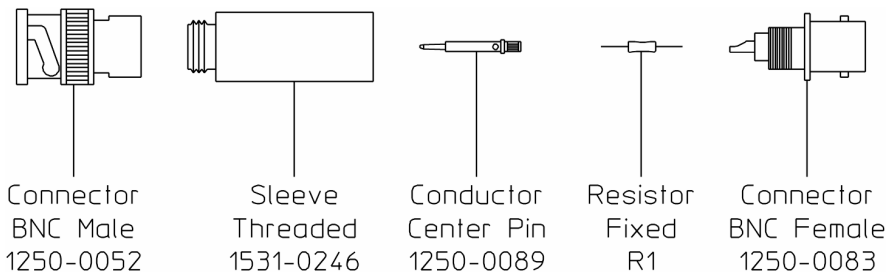
The following is a suggested assembly for the 10 kW series resistor. The 10 kΩ series resistor is required for the Input Offset adjustment.

1 Cut resistor leads to 12 mm on each end.

2 Solder one resistor lead to the center conductor of the BNC female connector.

3 Solder the conductor center pin to the other lead of the resistor.

4 Screw the sleeve and the BNC male connector into place. Tighten securely.



Troubleshooting Hints

- Check that the analyzer 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 ''A90/A91 Motherboard Voltages'' table on page 6-24 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 analyzer 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 analyzer does not have easily accessible +5 V supplies.
- 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 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 Replacing Assemblies in chapter 3 to determine how to disassemble and assemble the analyzer.

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

Symptom	Troubleshooting Test
Screen blank Screen grid is distorted or not displayed After power up, >3 minutes before keys active No response when key is pressed Incorrect response when key is pressed Fatal System Error Please Cycle Power message displayed Fan not turning	Initial verification, page 1-10
Keys are active and screen grid is displayed but screen is defective	Display, page 1-25
Error messages Calibration fails Performance test fails Intermittent failure HPIB fails Serial port fails External monitor port fails Parallel port fails Sync out fails System interconnect port fails ThinLAN port fails AUI port fails Probe power fails Oven reference fails	Self tests, page 1-32
HPIB trigger fails External trigger fails	Trigger, page 1-83

External keyboard does not work	DIN connector, page 1-92
NVRAM or Battery failure message displayed Nonvolatile states not saved after power cycled	Memory battery, page 1-93

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 page 3-5.''

To perform initial verification

Use this test to check signals that are vital to the operation of the analyzer.

1 Check voltage selector switch and fuse.

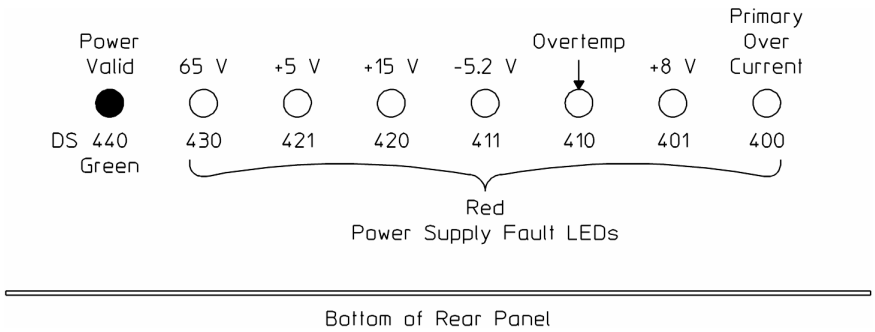
a Check that the voltage selector switch on the rear of the analyzer is set for the local line voltage.

b 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 ''To change the line-voltage selector switch'' and ''To change the fuse'' in chapter 1 of the *Agilent 89410A Installation and Verification Guide*.

2 Check power supply LEDs and fan.

a Check that no power supply fault LEDs are lit and that DS 440 (green) is lit.

b If any fault LEDs are lit or if the green power valid LED (DS 440) is not lit, go to page 1-15, ''To troubleshoot the power supply.''



c Check that the fan is turning at a moderate speed for normal room temperature.
The fan speed increases as the analyzer's internal temperature increases. If the fan is turning too fast, check that the air flow around the analyzer is not constricted and that the ambient temperature is between 0 and 55 °C.

d If the fan is not turning, go to page 1-15, ''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 1-15 ''To troubleshoot the power supply.''

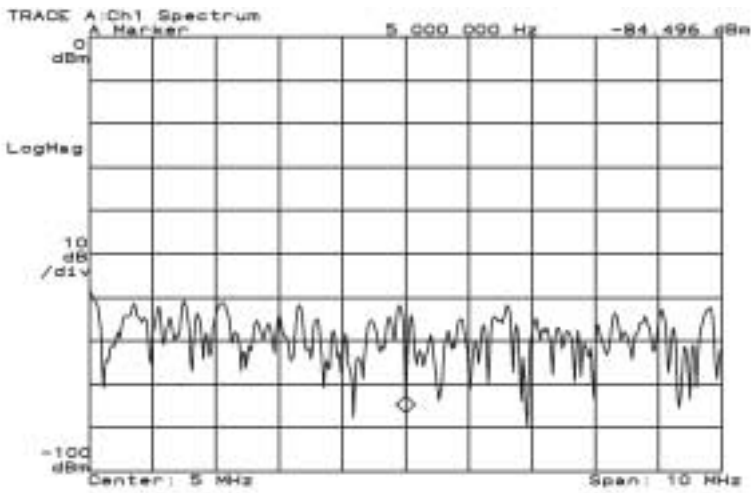
3 If the grid appears after power up, check that the calibration routine is not locking up the analyzer.

   a Set the power switch to off (O).

   b Press and hold [**Return**] (below softkeys) while setting the power switch to on (l).
   Pressing [**Return**] while setting the power switch to on (l) causes the analyzer to bypass the calibration routine.

   c If the keys are now active, go to page page 1-48, ''To troubleshoot self-test lockup failures.''

4 If the analyzer powers up normally with no error messages (see illustration below), the screen is continually updating, but the analyzer does not respond to key presses, the A80 Keyboard assembly is probably faulty.



5 Check frequency reference signals.

a Turn the analyzer upside down.

b Remove the bottom cover.

c Press [**Preset**].

d Using an oscilloscope and a 1 MΩ 10:1 probe with a grounding spanner, check the TTL signals in the following table.
The probe may load the 64 MHz, 48 MHz, and 80 MHz signals causing their amplitude level to be low.

Test Location	Ground Connection	Frequency	Probable Faulty Assembly
A91 P6 pin 16	A91 P6 pin 15	25.6 MHz	A60 Frequency Reference
A91 P6 pin 11	A91 P6 pin 12	25.6 MHz	A60 Frequency Reference
A91 P6 pin 18	A91 P6 pin 19	3.2 MHz	A60 Frequency Reference
A91 P4 pin 5	A91 P4 pin 6	378 kHz	A61 Clock
A91 P4 pin 21	A91 P4 pin 22	64 MHz	A61 Clock
A91 P4 pin 24	A91 P4 pin 23	48 MHz	A61 Clock
A91 P4 pin 25	A91 P4 pin 26	80 MHz	A61 Clock

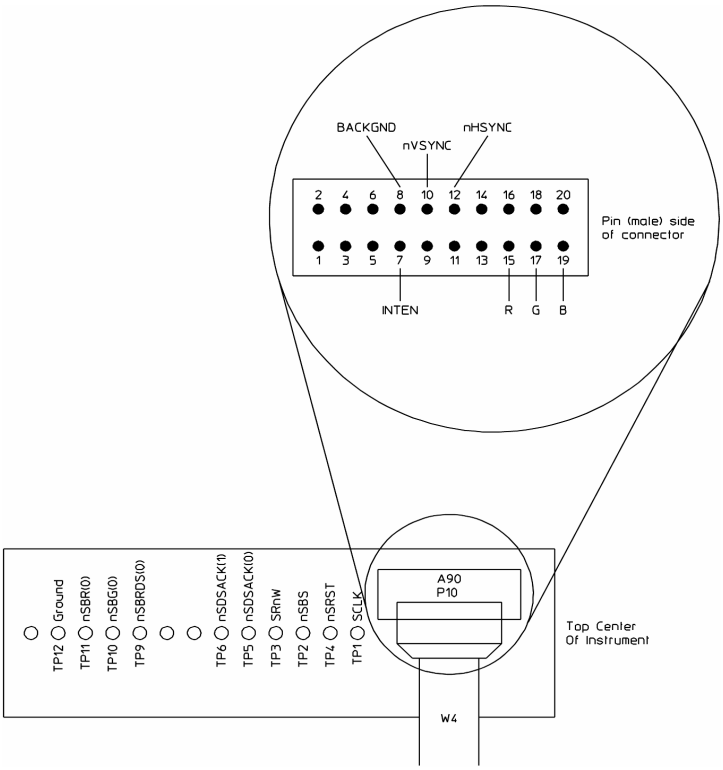
e If a signal is incorrect, replace the probable faulty assembly.
Before replacing the A60 Frequency Reference assembly, go to page 1-15, ''To troubleshoot the power supply,'' and do Step 7 to check the power supply voltages.

6 Step 6. Check signals required for power up.

a Remove the top cover.

b Connect a logic probe to A90 TP4 and its ground clip to A90 TP12.

c Set the power switch off (O) then on (|) and check that A90 TP4 is a TTL high 10 seconds after power up.



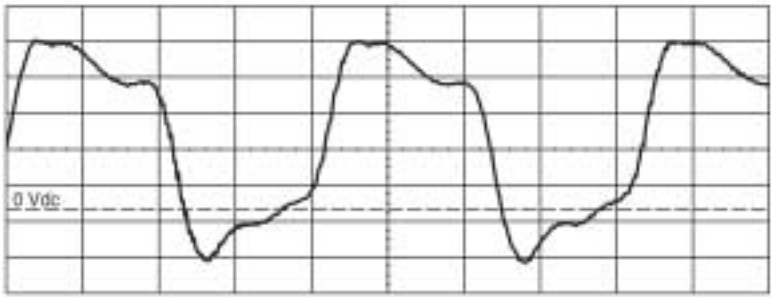
d If TP4 remains low, the A40 CPU assembly is probably faulty. Before replacing the assembly, go to page 1-15 ‘‘To troubleshoot the power supply,’’ and do Step 7 to check power supply voltages.

e Set the power switch to off (O) and disconnect the ribbon cable from A90 P10.

f Set the power switch to on (|).

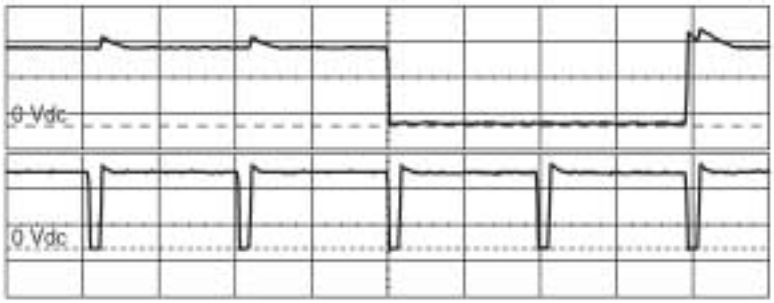
g Using an oscilloscope and 1 MΩ 10:1 probes, check the following system clock signals.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to A90 TP1		Time Duty Cycle	
CH1 V/div	1 V/div		
Input Impedance	1 MΩ		
CH1 Coupling	dc		
Probe Atten	10		
Display Mode	Repetitive		
Averaging	8		
Time/div	10 ns/div		
Trigger	Trg'd Sweep		
Trig Src	Chan1		



SCLK

Connect CH1 to A90 P10 pin 10 Connect CH2 to A90 P10 pin 12		Time Duty Cycle Time Relationship	
CH1 V/div	2 V/div		
Input Impedance	1 MΩ		
CH1 Coupling	dc		
Probe Atten	10		
CH2 V/div	2 V/div		
Input Impedance	1 MΩ		
CH2 Coupling	dc		
Probe Atten	10		
Display Mode	Repetitive		
Averaging	8		
Time/div	20 µs/div		
Trigger	Trg'd Sweep		
Trig Src	Chan1		



nVSYNC and nHSYNC

h If SCLK is incorrect, the A40 CPU assembly is probably faulty. Before replacing the assembly, go to page 1-15, ''To troubleshoot the power supply,'' and do Step 7 to check power supply voltages.

i If nVSYNC or nHSYNC is incorrect, the A47 DSP/Display Controller assembly is probably faulty.

j If the signals are correct, go to page 1-36 ''To troubleshoot power-up failures.''

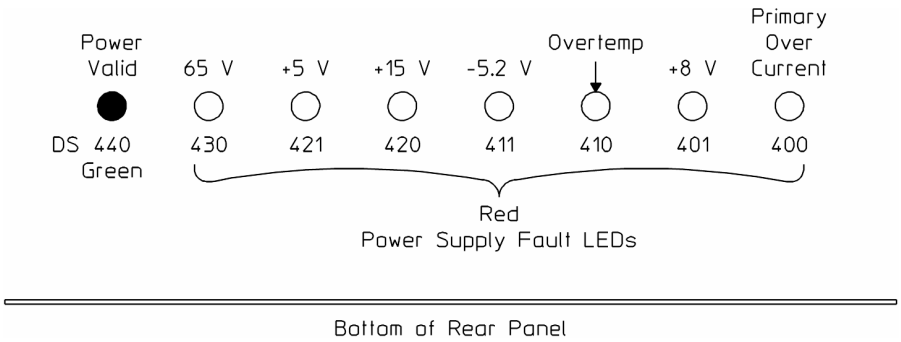
To troubleshoot the power supply

Use this test to do a complete check of the power supply and to isolate the failure between the A95 Main Power Supply assembly and A96 Primary Power Supply assembly.

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

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.

1 Determine the next step by comparing the power supply LEDs to the following table.



Power Supply LED	Next Step
DS400 Primary Over Current is lit All LEDs are off All fault LEDs are off and DS440 is lit but a power supply problem is suspected	Step 2
DS410 Overtemp is lit DS440 Power Valid is lit but fan is not turning	Step 5
DS430, 421,420, 411, or 401 secondary supply is lit	Step 7

2 Check the A96 Primary Power Supply assembly's voltages.

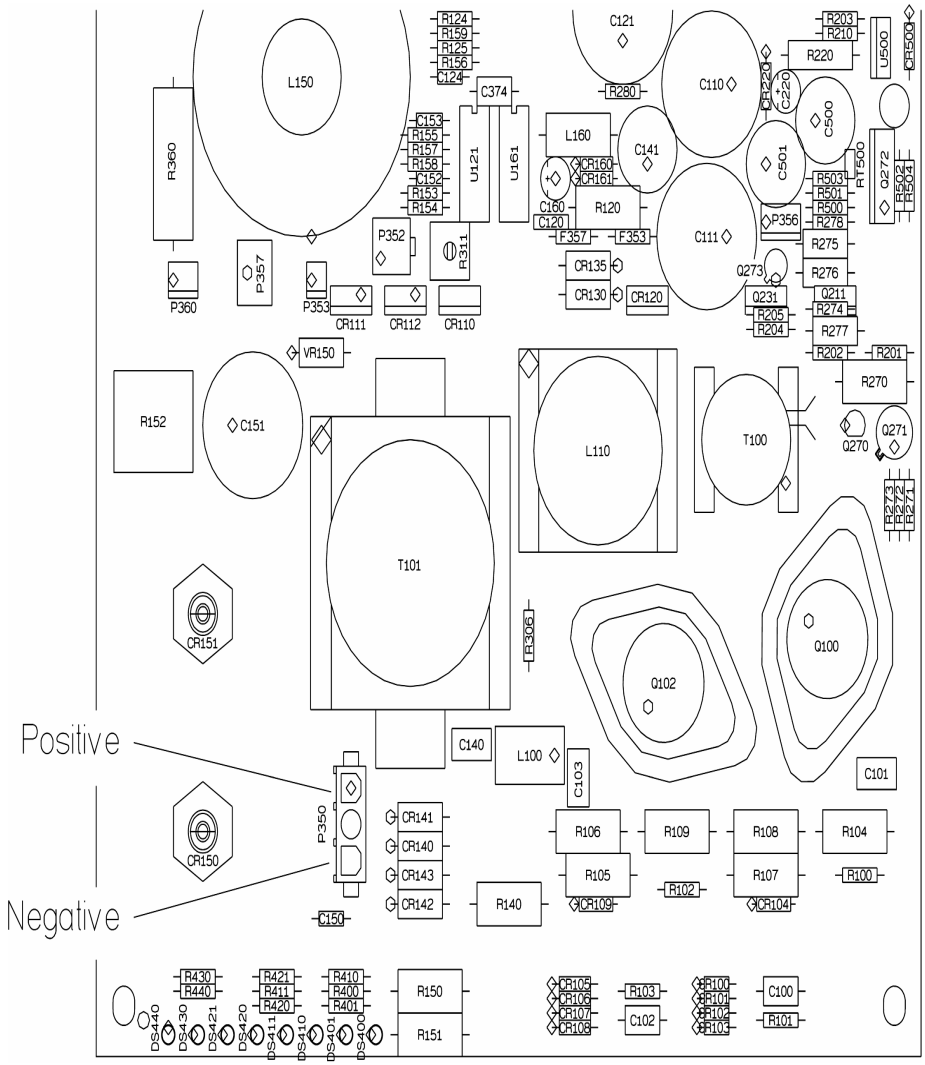
a Set the power switch to off (O) and disconnect the power cord from the rear panel.

b Remove the top cover.

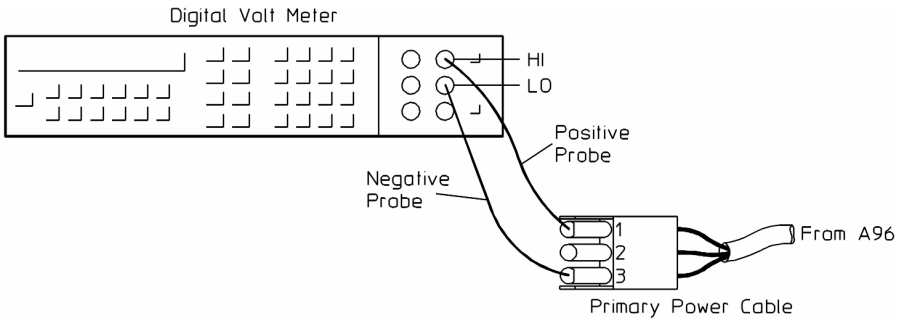
c Wait five minutes to allow time for the power supply capacitors to discharge.

d Remove the power supply shield located on top of the analyzer behind the display.

e Remove the primary power cable connected to A95 P350.



f Connect a digital voltmeter to the primary power cable as shown below.



g Connect the power cord to the rear panel.

h Calculate the differential voltage for the local line voltage using the following table.

Line Selector Switch	Differential Voltage ±30 Vdc
115 V	Line Voltage (Vrms) x2.83
230 V	Line Voltage (Vrms) x1.414

For example, if the local line voltage is 110 Vrms, then the calculated differential voltage is 311 ±30 Vdc.

i If the measured voltage is not within ±30 Vdc of the calculated differential voltage, the A96 Primary Power Supply assembly is probably faulty.

j Disconnect the power cord from the rear panel.

k Wait five minutes to allow time for the power supply capacitors to discharge.

l Disconnect the probes from the primary power cable and reconnect the cable to A95 P350.

3 Check the A96 Primary Power Supply assembly's ac bias voltages.

a Place the analyzer on the side closest to the keypad.

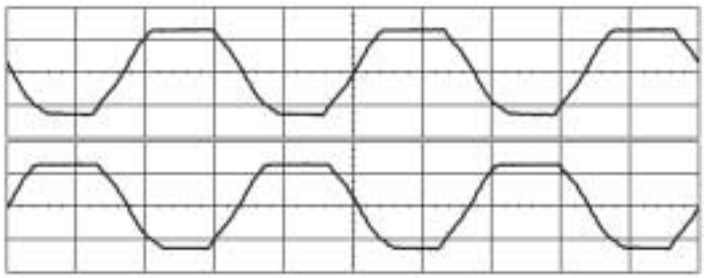
b Remove the bottom cover.

c Wait five minutes to allow time for the power supply capacitors to discharge.

d Remove the black power supply shield.

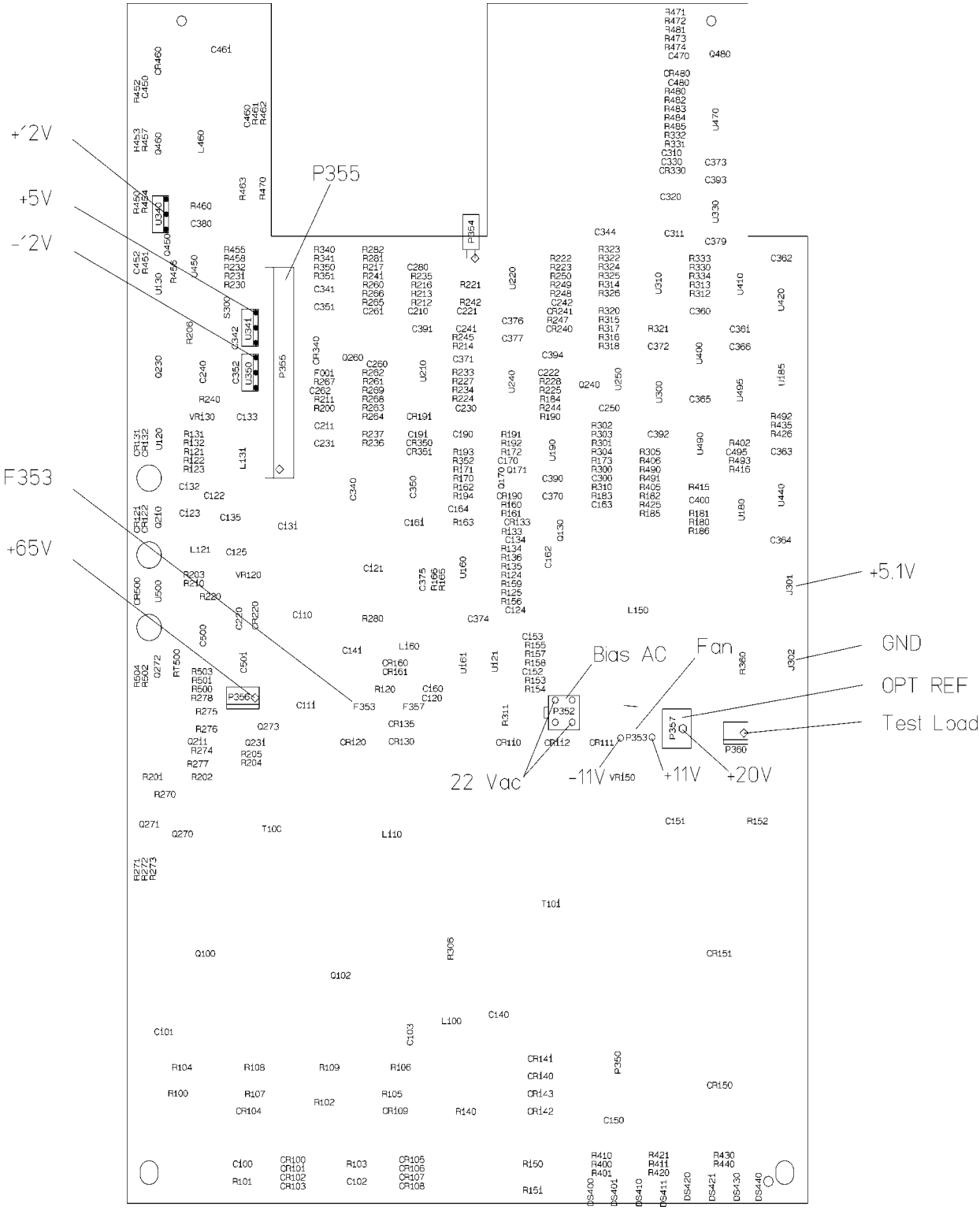
e Connect the power cord and set the power switch to on (l).

f Using an oscilloscope and two 1 MΩ 10:1 probes, check the following ac bias supplies. See page 1-19 for component location.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to A95 P352, pin 1 Connect CH2 to A95 P352, pin 4		Pulse Shape Time Relationship	
CH1 V/div Input Impedance CH1 Coupling Probe Atten	20 V/div 1 MΩ dc 10		
CH2 V/div Input Impedance CH2 Coupling Probe Atten	20 V/div 1 MΩ dc 10		
Display Mode Averaging Time/div Trigger Trigger Level Trig Src	Repetitive 8 5 ms/div Trg'd Sweep –1.8 V Chan1		AC BIAS

g If the waveforms are incorrect, the A96 Primary Power Supply assembly is probably faulty.

A95 Component Locator, Bottom View



4 Check the A95 Main Power Supply assembly's bias supply voltages.

a Check the bias supply voltages in the following table.
The ripple should be no more than 50 mVp-p. Do not include high frequency line noise when measuring ripple.

Test Location	Nominal Voltage	Minimum Voltage	Maximum Voltage	Ripple Tolerance
U341, pin 3	+5 V	+4.5 V	+5.5 V	50 mVp-p
U340, pin 2	+12 V	+11.4 V	+12.6 V	50 mVp-p
U350, pin 3	–12 V	–12.6 V	–11.4 V	50 mVp-p

b If any of the voltages are incorrect, the A95 Main Power Supply is probably faulty.
The A95 Main Power Supply assembly has no adjustments. Therefore if a voltage is incorrect, replace the assembly.

c If the voltages are correct and the fan is turning, go to Step 7.

5 Check the supply voltage fuse for the A102 Fan assembly.

a Set the power switch to off (O).

b Wait five minutes to allow time for the power supply capacitors to discharge.

c Measure the resistance across A95 F353.

d If the resistance is greater than 0Ω, replace the fuse.

6 Check A102 Fan assembly.

a Set the power switch to off (O) and disconnect the power cord from the rear panel.

b Remove the top cover.

c Wait five minutes to allow time for the power supply capacitors to discharge.

d Remove the power supply shield located on top of the analyzer behind the display.

e Disconnect the fan power cable from A95 P353 (red and black cable).

f Connect 10 Vdc to the fan cable. The fan should be turning slowly.

g Increase the voltage to 24 Vdc. The fan should turn faster as the voltage increases.
The power to the A102 Fan assembly is controlled by a thermistor which varies the fan voltage between +8 V when the analyzer is cold and +28 V when the analyzer is hot. The thermistor is on the A95 Main Power Supply assembly.

h If the fan did not respond correctly, the Fan assembly is probably faulty.

7 Check A95 Main Power Supply assembly voltages.

a Set the power switch to off (O) and disconnect the power cord from the rear panel.

b Place the analyzer on the side closest to the keypad.

c Remove the bottom cover.

d Wait five minutes to allow time for the power supply capacitors to discharge.

e Remove the black power supply shield.

f Connect the power cord and set the power switch to on (l).

g Check the voltages in following table.
The ripple should be no more than 50 mVp-p. Do not include high frequency line noise when measuring ripple. See page 1-19 for test locations.

Test Location	Nominal Voltage ±10%	Minimum Voltage	Maximum Voltage
P353, pin 1	+11 V	+8 V	+28 V
P353, pin 2	–11 V	–11.6 V	–10.5 V
P357, pin 2	+20 V	+17.0 V	+23.0 V
J301	+5.1 V	+4.8 V	+5.2 V
P356, pin 1	+65 V	+64.7 V	+65.3 V
P355, pin 1	+8 V	+7.8 V	+8.2 V
P355, pin 3	–8 V	–8.2 V	–7.8 V
P355, pin 5	+15 V	+14.6 V	+15.5 V
P355, pin 7	–15 V	–15.5 V	–14.6 V
P355, pin 14	–5.2 V	–5.4 V	–5.0 V

If the above voltages are correct, the fan is turning, and the power supply fault LEDs are off, the power supply is operating correctly.

8 Check for power supply loading.

a Set the power switch to off (O) and disconnect the power cord from the rear panel.

b Place the analyzer on the side closest to the display.

c Wait five minutes to allow time for the power supply capacitors to discharge.

d Disconnect the +5V (red) and GND (black) cables from J301 and J302.

e Remove the screws and standoffs holding the A95 Main Power Supply assembly in the chassis. See ''To remove main power supply'' on page 3-16

f Disconnect the motherboard cable from A95 P355, the display power cable from A95 P356, and the optional oven cable from A95 P357.

g Connect A95 J302 to the chassis.

h Connect A95 P360 pins 2 and 3 together. This provides a test load for the power supply.

i Place the A95 Main Power Supply assembly on its side.
The assembly should not be touching the analyzer and it should still be connected to the A96 Primary Power Supply.

j Connect the power cord and set the power switch to on (l).

k Check the voltages in the table on page 1-21.

l If the voltages are still incorrect, the A95 Main Power Supply assembly is probably faulty.
The voltages may vary slightly from the power supply nominal values due to the change in load.

9 Isolate assembly loading power supply.

a Set the power switch to off (O) and disconnect the power cord from the rear panel.

b Wait five minutes to allow time for the power supply capacitors to discharge.

c Disconnect A95 P360 pins 2 and 3.

d Reconnect all the cables to the A95 Main Power Supply assembly.

e Reinstall the A95 Main Power Supply assembly in the analyzer.

f Replace the black power supply shield and bottom cover.

g Repeat the following steps for each assembly suspected of loading the power supply.
Use the Power Supply Voltage Distribution table on page 6- and the A90/A91 Motherboard Voltages table on page 6- to help isolate the failing assembly.

h Set the power switch to off (O).

i Remove the suspected assembly or the power cable to the assembly.

j Set the power switch to on (l).

k Check the voltages in the table on page 1-21.

To troubleshoot display failures

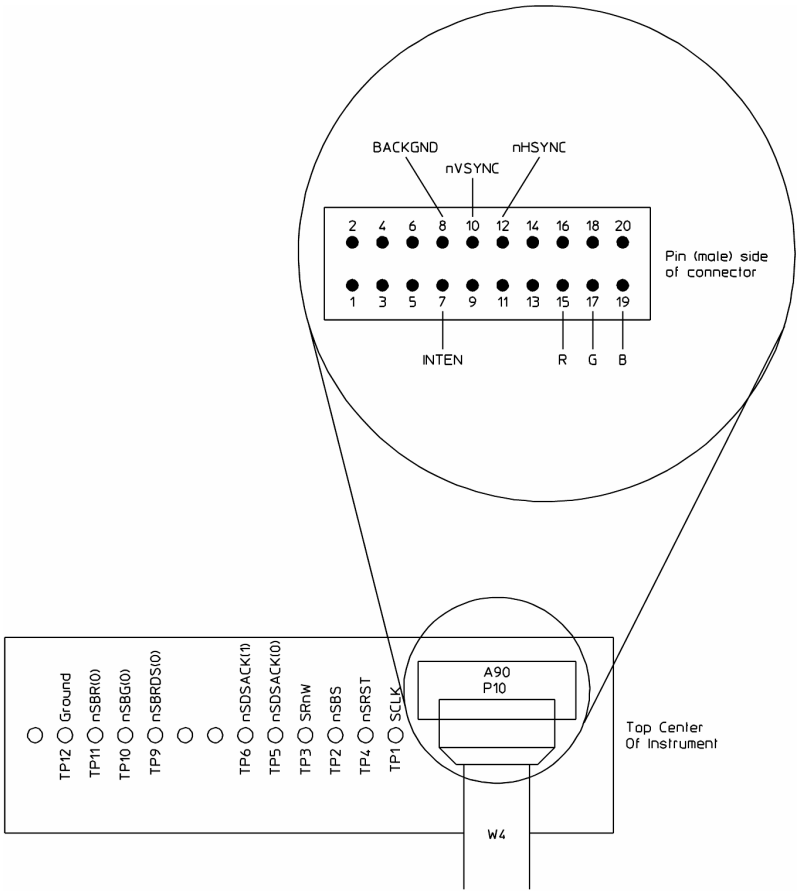
Use this test to separate A100 Display assembly failures from A47 DSP/Display Controller assembly failures. If the screen is blank or the grid is not displayed, do initial verification on page 1-10 to determine if the A40 CPU assembly is faulty.

1 Check the display controller signals.

a Set the power switch to off (O).

b Remove the top cover.

c Disconnect the ribbon cable from A90 P10.



d Set the power switch to on (l).

e Check the following display signals using a voltmeter.

Test Location	Signal Name	Amplitude (±10%)
A90 P10 pin 7	490 mVdc	INTEN
A90 P10 pin 15	R	25 to 45 mVdc
A90 P10 pin 17	G	25 to 45 mVdc
A90 P10 pin 19	B	25 to 45 mVdc

f If any of the signals are incorrect, the A47 DSP/Display Controller assembly is probably faulty.

2 Determine the probable faulty assembly by comparing the analyzer's symptoms to the following table.

Symptom	Probable Faulty Assembly
Vertical and horizontal scanning is occurring. Part of information is missing, for example only half letters. Blocks of information are missing. Information on the screen is scrambled or mixed up. Vertical or horizontal stripes appear across the screen.	A47 DSP / Display Controller
Screen is blank. Screen is tilted, compressed, or distorted. Line across the screen.	A100 Display †

† Before replacing the A100 Display assembly, go to page 1-15''To troubleshoot the power supply,'' and do Step 7 to check the +65 V power supply voltage.

3 Check the +65 Vdc power supply.

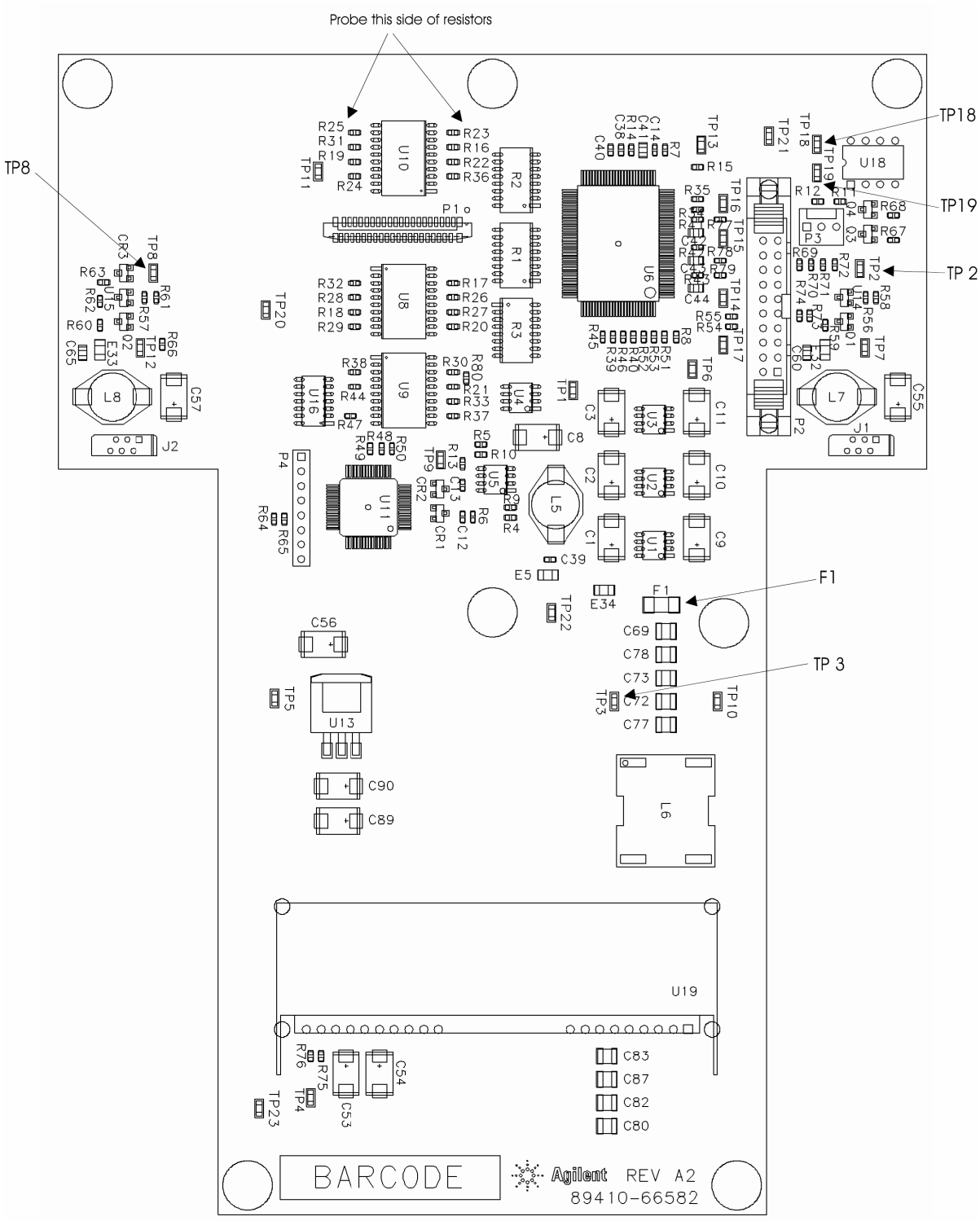
a Set the power switch to off (O).

b Place the front panel in the A82 test position. (see Chapter 3, “To place the A82 in the test position”, on page 3-12.)

c Set the power switch to on (l).

d Check for +65 Vdc ± 10% at TP3 using a Voltmeter.

e If the voltage is correct, continue with step 4.


Probe this side of resistors
TP8
TP18
TP19
TP 2
F1
TP 3
BARCODE
Agilent REV A2
89410-66582

f Check for +65 Vdc on both sides of F1.

g If the voltage is correct on one side of F1 and incorrect on the other replace F1.

h If the voltage is incorrect on both sides of F1, then the A95 Main Power Supply is probably faulty.

4 Check the programming signals from A81 to A82.

a Using a logic probe verify that TTL logic pulses are present at TP 18 and TP19 within 30 seconds of power up. These test points will remain high after programming is complete.

b If the signals are incorrect at TP18 or TP19 the A81 Keyboard Assembly is probably faulty.

5 Check the digital output signals to the LCD display.

a Using a logic probe verify that TTL logic pulses are present at the following locations:

Signal Line	Probe Location
B0	R31
B1	R19
B2	R24
B3	R23
B4	R16
B5	R22
G0	R32
G1	R20
G2	R27
G3	R26
G4	R17
G5	R25
R0	R33
R1	R21
R2	R30
R3	R29
R4	R18
R5	R28
DENA	R36
VSYNC	R38
HSYNC	R37
CLK	R44

b If any of the signals are incorrect, the A82 LCD Interface assembly is probably faulty

c Verify the back lights and inverter boards. When the display is in the test position the back lights are visible from the side of the display. Use this procedure if one or both are not lit.

a Press Display, more display setup, color setup, brightness, 100%. The brightness level controls the voltage applied to the back lights.

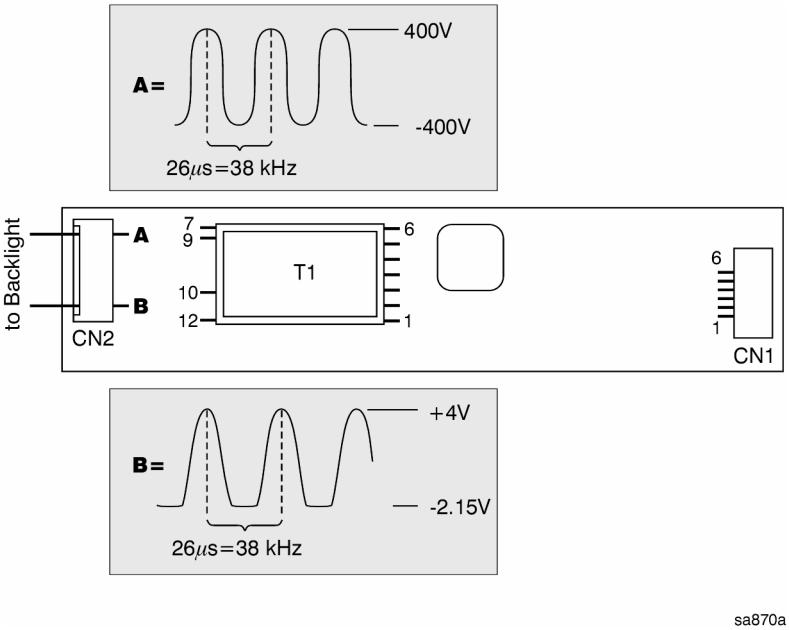
b Check for +4.5 Vdc ± 0.2 V at A82 TP2 using a voltmeter.

c If this voltage is incorrect then the A47 assembly is probably faulty.

d Check for +1.2 Vdc ± 0.2 V at A82 TP8 using a voltmeter.

e If this voltage is incorrect then the A82 assembly is probably faulty.

f Check the input and output signals of the inverter board as listed below.



Test Point	Signal or Voltage
CN 1 pin 1	+ 4.9 Vdc
CN 1 pin 2	+ 4.9 Vdc
CN 1 pin 6	+ 1.2 Vdc
CN 2 A	– 400 V to + 400 V sinewave @ 38kHz (see figure)
CN 2 B	– 2.15 V to + 4 V sinewave @ 38 kHz (see figure)

g If the inputs to the inverter are incorrect the cable is probably faulty.

h If the outputs of the inverter are incorrect then the inverter is probably faulty.

i If the outputs of the inverter are correct then the back light is probably faulty.

To perform self tests

Use this test when the keyboard is active and one of the following occurs:

- An error message is displayed
- Calibration fails
- Performance test fails
- Failure is intermittent
- Interface port fails
- Probe power fails
- Sync out fails

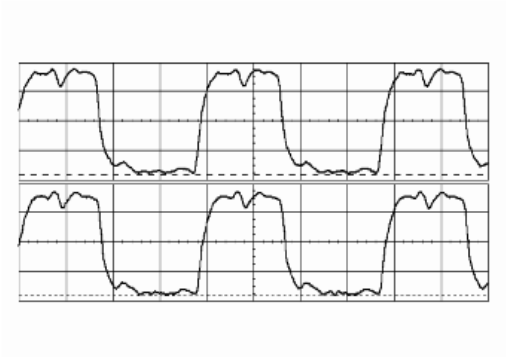
1 Check sample clocks.

a Remove the top cover.

b Set the power switch to on (l).

c Using an oscilloscope and 2 BNC(m)-to-SMB(f) cables, check the following signals.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to A60 J3 Connect CH2 to A60 J2		Time Duty Cycle Time Relationship	
CH1 V/div Input Impedance CH1 Coupling Probe Atten	1 V/div 50 Ω dc 1		
CH2 V/div Input Impedance CH2 Coupling Probe Atten	1 V/div 50 Ω dc 1		
Display Mode Averaging Time/div Trigger Trig Src	Repetitive 8 10 ns/div Trg'd Sweep Chan1		



Sample Clock

d If either signal is incorrect, the A60 Frequency Reference assembly is probably faulty.

e Reconnect the cables to A60 J3 and A60 J2.

2 Check for failing power-up results.

a 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]

During the additional hardware power-up test, the A40 CPU assembly requests the hardware revision numbers from the following assemblies:
A30 Digital Source
A35 Analog Source
A36 Trigger
A55/A56 Sample RAM
A71 Pass Through
A50 Digital Filter (listed as Lo/Df in test log)
A10 Analog Input (listed as channel 1 or 2 front end in test log)
A21 A/D Converter (listed as channel 1 or 2 ADC in test log)
A43 Expanded Memory (listed as Option UFG ROM in test log)
The A10 Analog Input, A21 A/D Converter, and A36 Trigger assemblies send their revision numbers through the A30 Digital Source assembly. The following shows a passing test log entry for the Power-up functional tests.

```
                              TEST LOG


Booting System

Power-up functional tests
Mult fctn peripheral . . . . . PASS
NVRAM  . . . . . PASS
Real time clock  . . . . . PASS
DIN controller . . . . . PASS
Front panel  . . . . . PASS
DSP/bus  . . . . . PASS
Additional hardware  . . . . . PASS
Sample RAM . . . . . PASS
DSP processor  . . . . . PASS

Power-up functional tests complete
```

b Determine the probable faulty assembly and next test or step by comparing the power-up test results to the following table. The power-up tests are listed in the order they are ran. If power-up test 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.

Power-up Troubleshooting Guide

Failing Self Test or Message Displayed	Probable Faulty Assembly	Next Test or Next Step
MC68030 Processor MC68882 Coprocessor Boot ROM Stack RAM Main RAM	A40 CPU	
Display RAM DSP RAM	A47 DSP/Display Controller	
Program ROM	A42 Memory	
Mult fctn peripheral	A40 CPU	
NVRAM Real time clock	memory battery A42 Memory	Memory battery, page 1-93
DIN controller FP kbd interface on memory board does not respond Failure during keyboard initialization	A42 Memory	
Front panel keyboard revision problem	A80 Keyboard	
DSP/bus	A47 DSP/Display Controller	
DSP processor DSP processor information: Failure during Sample RAM/DSP interface test	A55/A56 Sample RAM A47 DSP/Display Controller	
DSP processor	A47 DSP/Display Controller	
LAN ROM	A43 Expanded Memory	
Additional hardware Additional hardware information: *Any of the following:*		
Digital Source not found Digital Source address read problem! Digital Source revision read problem! Unable to program Digital Source hardware	A30 Digital Source	

Power-up Troubleshooting Guide

Internal Control Path 3 open Unable to write/read Internal Control Path 3 Unable to read Internal Control Path 3 Unable to program Source DC offset	A35 Analog Source A36 Trigger A30 Digital Source	Front-end control, page 1-60-
Extended RAM and Additional I/O not found Extended RAM Board Bus Error	A43 Expanded Memory	

Failing Self Test or Message Displayed	Probable Faulty Assembly	Next Test or Next Step
Additional hardware (continued) Additional hardware information: *Any of the following:*		
Trigger Board not found Unable to download default Trigger GA	A36 Trigger	
Sample RAM not found Sample/Capture RAM not found Sample RAM revision read problem! Unable to read Sample RAM hardware ID Unable to program Sample RAM hardware	A55/A56 Sample RAM	
Pass Thru not found Pass Thru address read problem! Pass Thru revision read problem! Unable to write Pass Thru control register	A71 Pass Through	
Lo/Df not found Lo/Df address read problem! Lo/Df revision read problem Lo/Df Channel 1 not found Lo/Df Channel 2 not found Unable to reset Lo/Df Unable to write Lo/Df control register IF Trigger RAM test failed	A50 Digital Filter	
Channel 1 Control Path test failed Channel 2 Control Path test failed	A10 Analog Input A21 A/D Converter A30 Digital Source	Front-end control, page 1-60
Channel *number* ADC not found	A21 A/D Converter, channel number	
RF section not found	Configuration Setup A42 Memory	Serial port, page 1-91
Sample RAM	A55/A56 Sample RAM	
LAN firmware Opt UFG is incompatible with main firmware. A firmware update is required.	Firmware A43 Expanded Memory	The A43 Expanded Memory assembly's ROM may not be programmed. To program, install firmware update.

Calibration ABORT Calibration information: Check source jumper?	A35 Analog Source A10 Analog Input, channel 2 A21 A/D Converter, channel 2	Check that the jumper on the A35 Analog Source assembly is set for 2 channel operation. Source and calibrator out, page 1-62
Calibration		Step 3

3 Step 3. Check for failing functional tests.

a Press the following keys:
[clear test log]
[**Return**]
[functional tests]
[ALL]

The power-up tests are ran at the beginning of the functional all self tests. Refer to Step 1 for power-up test failures. All the power-up tests need to pass (except for calibration) before using the Self-Test Troubleshooting Guide.
The test log can be printed by connecting a printer to the serial port or HPIB port. To print the test log to a HPIB printer, press the following keys:
[**Local / Setup**]
[system controller]
[peripheral addresses]
[printer adrs]
printer address
[enter]
[**Plot / Print**]
[output fmt]
[device defaults]
printer type
[**Return**]
[pcl]
[**Return**]
[output to]
[HPIB]
[**Return**]
[plot item]
[all display]
[**System Utility**]
[more]
[diagnostics]
[test log **on**]
[**Plot / Print**]
[start plot / print]

b If the analyzer did not finish the tests (analyzer locks up), go to page 1-48, ''To troubleshoot self-test lockup failures.''

c Determine the probable faulty assembly and next test by comparing the functional test results to the following table.

If the analyzer's test log matches 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 channel number (1 or 2), amplitude (mkr y: *amplitude*), and frequency (mkr x: *frequency*) of the failure.

Self-Test Troubleshooting Guide

Failing Self Test or Message Displayed	Status	Probable Faulty Assembly	Next Test
Skipping time cal *(Time for an analyzer calibration. This message can appear anywhere in the test log.)*		This is not a failure message.	
Full Sample RAM Full Sample RAM information: Cal HW Timeout in readTrigPoints() Failed to trigger *and all of the following:* Digital Source Digital filter ADC . .	ABORT PASS PASS PASS	A36 Trigger A10 Analog Input A30 Digital Source A55 / A56 Sample RAM A50 Digital Filter	Trigger, page 1-83-
Full Sample RAM *(This is probably not a sample RAM failure. The sample RAM information will state why the self test aborted.)*	ABORT	Go to next self test failing.	
Full Sample RAM . Full Sample RAM information: RAM *number* test failed	FAIL	A55 / A56 Sample RAM	
Full Sample RAM Full Sample RAM information: *Any of the following:* Address counter verification failed Counter *number* interrupt test failed Counter 2 failed Counter 1 failed	FAIL	A55 / A56 Sample RAM	
Full Sample RAM Full Sample RAM information: *Any of the following:* Single channel pre-trigger failed Single channel post-trigger failed Two channel pre-trigger failed Two channel post-trigger failed *and both of the following:* Digital Source . Digital filter	FAIL PASS PASS	A36 Trigger A55 / A56 Sample RAM	Trigger, page 1-83-
Full Sample RAM .	FAIL	A55 / A56 Sample RAM	

Failing Self Test or Message Displayed	Status	Probable Faulty Assembly	Next Test
Digital Source *and both of the following:* Digital filter ADC.	FAIL PASS PASS	A30 Digital Source	
Digital Source Digital Source information: LO sine wave test failed	FAIL	A30 Digital Source	
Digital Source	FAIL *or* ABORT	A10 Analog Input A21 A/D Converter A30 Digital Source A50 Digital Filter	Input and ADC, page 1-71
Digital filter .	FAIL	A50 Digital Filter	
ADC.	ABORT	A35 Analog Source A21 A/D Converter	Source and calibrator out, page 1-62-
ADC . ADC information: Channel *number*	FAIL	A21 A/D Converter, channel *number*	
Analog source Analog source information: Any of the following: Analog source check failed, Input check passed Calibrator check failed, Input check passed Reconstruction filter check failed 75 Ω impedance check failed	FAIL	A35 Analog Source	
Analog source	FAIL *or* ABORT	A35 Analog Source A10 Analog Input A21 A/D Converter A30 Digital Source	Source and calibrator out, page 1-62
Input Input information: *Any of the following:* channel 1 fails flatness test channel 1 fails DC gain test	FAIL *or* ABORT	A10 Analog Input A21 A/D Converter	Input and ADC, page 1-71
Input. Input information: *Any of the following:* channel *2* fails flatness test channel 2 fails DC gain test	FAIL *or* ABORT	A10 Analog Input A21 A/D Converter	Two channel analyzer, page 1-75

Failing Self Test or Message Displayed	Status	Probable Faulty Assembly	Next Test
Calibration Calibration information: Channel *number* fails pad test	FAIL	A10 Analog Input, channel *number*	
Calibration Calibration information: Calibrator way out of range	FAIL		To adjust calibrator, page 2-37
Calibration Calibration information: *Any of the following:* Source fails level test Calibrator level message Calibrator gain reset to 1.0 Auto-zero: can't compensate CH1 DC offset. Can't compensate CH1 DC offset.	FAIL *or* ABORT	A35 Analog Source A10 Analog Input A21 A/D Converter A30 Digital Source	Source and calibrator out, page 1-62
Calibration Calibration information: *Any of the following:* Auto-zero: can't compensate CH2 DC offset. Can't compensate CH2 DC offset.	FAIL *or* ABORT	A10 Analog Input, channel *2* A21 A/D Converter, channel 2	Two channel analyzer,page 1-75
Calibration Calibration information: *Any of the following:* Failure in partial trigger counter Partial trigger cal: can't trigger! Bad value from partial sample counter Exceeded trigger jitter limits Cal HW Timeout in readTrigPoints() Cal HW Timeout in getTimeAvgData() Failed to trigger	FAIL *or* ABORT	A36 Trigger A10 Analog Input A55/A56 Sample RAM A50 Digital Filter A30 Digital Source	Trigger, page 1-83
Calibration Calibration information: Hardware timeout occurred during calibration while waiting for sample RAM to acquire data.	ABORT	A36 Trigger A10 Analog Input	Check cables to A36 Trigger Trigger, page 1-83
Calibration Calibration information: *Use the information to help isolate the failure*	FAIL *or* ABORT		Performance test, page 1-58
All self tests and calibration	PASS		Step 4

4 Determine the probable faulty assembly and next test by comparing the analyzer's symptoms to the following table.

For additional information on the self tests, see the self-test descriptions starting on page 7-13

Failure	Probable Faulty Assembly	Next Test
Disk Drive	Disk Drive Diskette W5 Ribbon Cable A42 Memory	Disk drive, page 1-88
HPIB	HPIB Connector A42 Memory	Step 5
Serial Port	Serial Port A42 Memory	Serial port, page 1-91
Rear panel oven ref out	A95 F357 fuse A85 Oven	Step 6
Rear panel ext ref out	A60 Frequency Reference	
Rear panel ext ref in	A60 Frequency Reference	
Rear panel sync out or parallel port	A30 F1 fuse A30 F2 fuse A30 Digital Source	Sync out and parallel port, page 1-95
System interconnect ThinLAN AUI port	A43 Expanded Memory	System interconnect and LAN port,page 1-96
Probe Power	A95 F1 fuse A92 Probe Power	Step 7
Random Noise	A30 Digital Source	
Rear panel EXT ARM	A36 Trigger	
Front panel external trigger	A36 Trigger	
Source	A35 Analog Source A30 Digital source	Source and calibrator out, page 1-62-
Auto-range Over-range	A36 Trigger A10 Analog Input A21 A/D Converter	Auto-range,page 1-80
Input Any of the following functions: ch *number* input Z 75 Ω ch *number* input Z 1 MΩ ch *number* coupling ch *number* alias LPF	A10 Analog Input, ch *number*	
External Keyboard	A80 F1 fuse External Keyboard A80 Keyboard	DIN connector, page 1-92

Performance test	Performance test, page 1-58
Intermittent failure	Intermittent, page 1-52-

5 Check the HPIB controller on the A42 Memory assembly.

a Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[functional tests]
[I/O]
[HPIB controller]

b If the HPIB controller test fails, the A42 Memory assembly is probably faulty.

6 Check the oven fuse on the A95 Main Power Supply assembly.

a Set the power switch to off (O).

b Turn the analyzer upside down.

c Remove the bottom cover.

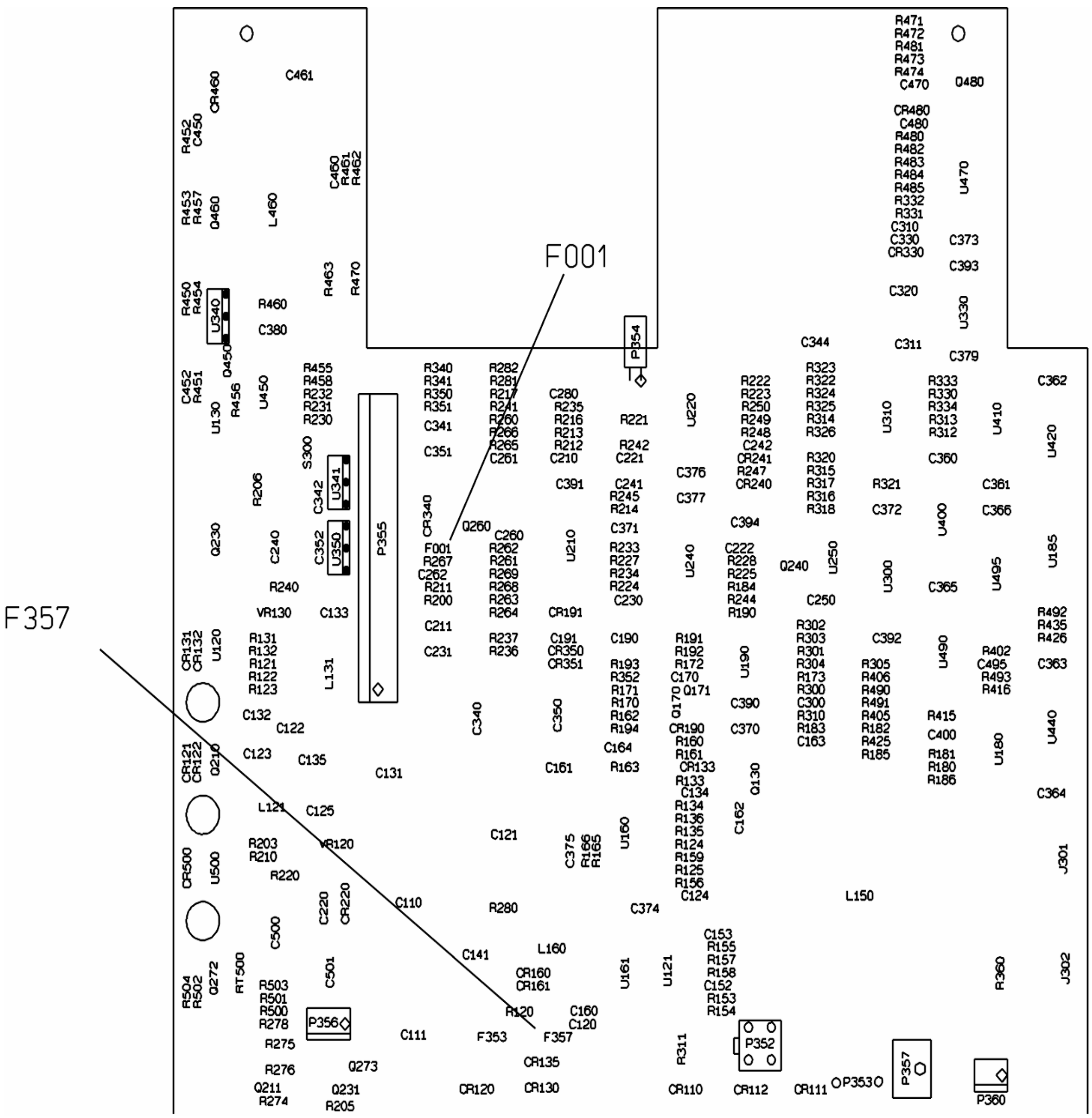
d Wait five minutes to allow time for the power supply capacitors to discharge.

e Remove the black power supply shield.

f Measure the resistance across F357.

g If the resistance is 0Ω, the A85 Oven assembly is probably faulty.

h If the resistance was greater than 0Ω, replace the fuse.


F001
F357

7 Check the probe power fuse on the A95 Main Power Supply assembly.

a Set the power switch to off (O).

b Turn the analyzer upside down.

c Remove the bottom cover.

d Wait five minutes to allow time for the power supply capacitors to discharge.

e Remove the black power supply shield.

f Measure the resistance across F1.

g If the resistance is 0Ω, the A92 Probe Power assembly is probably faulty.

h If the resistance was greater than 0Ω, replace the fuse.

To troubleshoot self-test lockup failures

Use this test to continue troubleshooting if calibration or the functional test ''ALL'' locks up the analyzer.

1 Check for failing self tests.

a Set the power switch to off (O).

b Press and hold [**Return**] (below softkeys) while setting the power switch to
on (l).
Pressing [**Return**] while setting the power switch to on (l) causes the analyzer to bypass the calibration routine.

c 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]

d If any of the power-up tests fail, go to page 1-32, ''To perform self tests,'' and do Step 2 to determine the probable faulty assembly or next test.
The power-up test results are saved in the test log. Use the RPG knob to scroll through the test log. The test log can also be displayed at power-up by pressing and holding [.] [**3**] while setting the power switch to on (l). The fault log can be displayed at power-up by pressing and holding [.] [**4**] while setting the power switch to on (l). Fault log messages are described on page 7-9

e Press the following keys in the order listed. Allow enough time for each test to finish before pressing the next key.
[**Return**]
[functional tests]
[sample RAM]
[digital filter]
[digital source]
[ADC]
[more]
[analog source]
[input]
[calibration]
A failure may cause the self tests to be very slow. Wait three minute before assuming the analyzer is locked up.

f Determine the probable faulty assembly and next test or step by comparing the self-test results to the following table.
If the analyzer's test log matches more than one entry in the table, use the entry closest to the beginning of the table. The table lists the probable faulty assembly or assemblies and troubleshooting procedure to do before replacing an assembly. Assemblies are listed in order of probable failure when more than one assembly can cause the failure. 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 channel number (1 or 2), amplitude (mkr y: *amplitude*), and frequency (mkr x: *frequency*) of the failure.

Failing Self Test or Message Displayed	Status	Probable Faulty Assembly	Next Test or Step
Skipping time cal *(Time for an analyzer calibration. This message can appear anywhere in the test log.)*		This is not a failure message.	
Full Sample RAM . *(This is probably not a sample RAM failure. The sample RAM information will state why the self test aborted.)*	ABORT	Go to next self test failing.	
Full Sample RAM	FAIL *or locks analyzer*	A55/A56 Sample RAM	
Digital filter	FAIL *or locks analyzer*	A50 Digital Filter	
Digital Source	Locks analyzer	A30 Digital Source A55/A56 Sample RAM	Step 3
Digital Source	FAIL	A30 Digital Source	
Digital Source	ABORT	A10 Analog Input A21 A/D Converter A30 Digital Source A50 Digital Filter	Input and ADC, page 1-71
ADC	ABORT	A35 Analog Source A21 A/D Converter	Source and calibrator out, page 1-62
ADC ADC information: Channel *number*	FAIL *or locks analyzer*	A21 A/D Converter, channel *number*	If ADC self test locks 2 channel analyzer and there is no failure information, go to Two channel analyzer, page 1-75
Analog source	FAIL, ABORT, *or locks analyzer*	A35 Analog Source A10 Analog Input A21 A/D Converter A30 Digital Source	Source and calibrator out, page 1-62
Input	FAIL, ABORT, *or locks analyzer*	A10 Analog Input A21 A/D Converter	Input and ADC, page 1- or Two channel analyzer, page 1-75
Calibration	Locks analyzer	A35 Analog Source A10 Analog Input A21 A/D Converter A30 Digital Source	Source and calibrator out, page 1-62

2 Repeat the sample RAM self test without the Digital Source assembly.

a Set the power switch to off (O).

b Pull the A30 Digital Source assembly out of the card nest about 1 inch.

c Set the power switch to on (l).

d 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]
[sample RAM]

e If the sample RAM self test fails or aborts, the A55/A56 Sample RAM assembly is probably faulty.

f If the sample RAM self test passes, the A30 Digital Source assembly is probably faulty.

To troubleshoot intermittent failures

Use this test to help isolate intermittent failures to the assembly.

1 Check that the analyzer has the latest firmware revision.
See service note Agilent 89410A-01 for description of updates.

2 Step 2. Determine if your intermittent failure is caused by one of the following common causes.

Common Causes	Troubleshooting Procedure
Loose screws and cables	Check that the screws in the analyzer are tight and that the cables are firmly in their sockets. It is especially important to check the SMB cables connecting the front-end analog assemblies.
Loose or bent pins on motherboard connectors	Pull out each assembly connected to a motherboard and check the pins. See the ''Assembly Connections'' illustration on page 6-6 for assemblies connected to the motherboards.
Out-of-adjustment	Do the adjustments for the analyzer in chapter 2.
Air flow restricted	The analyzer cools by drawing air from the back and blowing out the sides. Check that the air flow was not restricted in these areas when the failure occurred. If the analyzer overheats, the power supply and fan will shut down and the Overtemp LED will be lit. Go to page page 1-15
Power supply voltages	Check for correct power-supply voltages. Go to page page 1-15
External voltage	Verify that the line voltage is within the electrical specification for the analyzer. See power requirements in the *Agilent 89410A Technical Data* publication.

3 Step 3. Run the functional tests in loop mode.

a Set the power switch to on (l).

b When the power-up tests are completed, 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]
[clear test log]
[Return]
[loop mode setup]
[until failure]
[**Return**]
[functional tests]
[ALL]
The analyzer runs the functional tests until a failure occurs, then writes the failure message in the test log and stops.

c If a failure message occurs, go to ''To perform self tests'' on page page 1-32 to compare the error message to the ''Self-Test Troubleshooting Guide.''

4 Determine the probable faulty assembly or next test by comparing the fault log entries to the following table.

a Press the following keys:
[Preset]
[Return]
[fault log]
Pressing [**Preset**] while a functional test is running will cause the self test to abort. This should not be counted as a failure.

b Compare the fault log entries to the following table.
The order that the messages are listed in the table is not significant. If fault log messages match more than one entry in the table, all assemblies listed for each message should be suspected and the assembly common to each fault log message is most likely the faulty assembly. Assemblies are listed in order of probable failure when more than one assembly can cause the

failure.See ''Fault Log Messages'' on page 7-9for detailed descriptions of each fault log message.

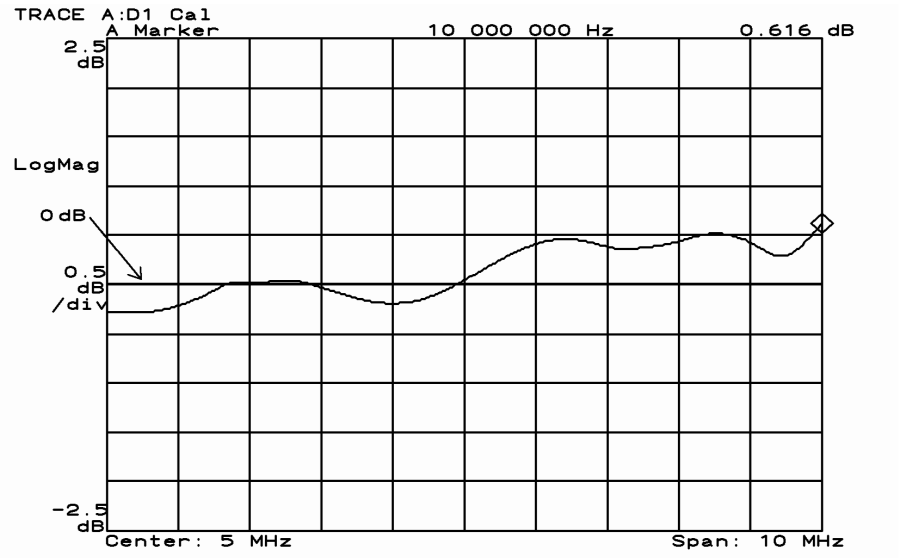
Failing Message Displayed	Probable Faulty Assembly	Next Test
System Error System Error during Calibration	A40 CPU A47 DSP/Display Controller A42 Memory A30 Digital Source A50 Digital Filter A43 Expanded Memory A71 Pass Through	Initial verification, page 1-10
Internal Disk Trk0 Failure	A101 Disk Drive A42 Memory Disk drive cable	Disk drive, page 1-88-
NVRAM or Battery Failure Floppy Controller Timeout	memory battery A42 Memory	Memory battery, page 1-93-
Input Tripped	User over-voltage connected to input A10 Input	
Source Tripped	User over-voltage connected to source A35 Analog Source	
Real Time Clock Timeout	A42 Memory	
CPU Failure CPU Board Bus Error	A40 CPU	
Memory Board Bus Error Memory Board Failure	A42 Memory	
Display/DSP Board Bus Error DSP Failure Display Failure	A47 DSP/Display Controller	
Digital Source Board Bus Error Digital Source Board Failure	A30 Digital Source	
Internal Control Path 3 Failure	A35 Analog Source A36 Trigger A30 Digital Source	Front-end control, page 1-60
Trigger Board Failure	A36 Trigger A35 Analog Source A30 Digital Source	Front-end control, page 1-60
Sample/Capture RAM Board Bus Error Sample/Capture RAM Board Failure	A55/A56 Sample RAM	
Pass Thru Board Bus Error Pass Thru Board Failure	A71 Pass Through	
Digital Filter Board Bus Error Digital Filter Board Failure	A50 Digital Filter	

Failing Message Displayed	Probable Faulty Assembly	Next Test
Channel 1 Control Path Failure Channel 2 Control Path Failure	A10 Analog Input A21 A/D Converter A30 Digital Source	Front-end control,page 1-60
Calibration Failure Calibration Hardware Timeout	A10 Analog Input A35 Analog Source A21 A/D Converter A36 Trigger A30 Digital Source Any assembly can cause these failure messages	
Calibration Failure — Source Level	A35 Analog Source A10 Analog Input A21 A/D Converter	Source and calibrator out, page 1-62
Calibration Failure — Bad Data Calibration Failure — Channel 1 DC Gain Calibration Failure — Channel 2 DC Gain Calibration Failure — Channel 1 Flatness Calibration Failure — Channel 2 Flatness Calibration Failure — Channel 1 Auto Zero Calibration Failure — Channel 2 Auto Zero	A10 Analog Input A21 A/D Converter A35 Analog Source	Source and calibrator out, page 1-62
Calibration Failure — Channel 1 Pads Calibration Failure — Channel 2 Pads	A10 Analog Input	
Calibration Failure — Source Level	A35 Analog Source A10 Analog Input A21 A/D Converter	Source and calibrator out, page 1-62
Calibration Failure — Channel 1 Trigger Calibration Failure — Channel 2 Trigger	A10 Analog Input	Trigger,page 1-83

5 Check the calibration correction curves.

a Press the following keys:
[Preset]
[System Utility]
[auto cal **off**]
[more cal setup]
[auto zero cal **off]**
[Measurement Data]
[freq response]
[Ref Lvl / Scale]
[Y ref level]
0
[dB]
[Y per div]
0.5
[dB]
[rng tracking **off]**
[ref position]
50
[%]
[ref line **on**]
Since there is no input, the display will show lines across the screen.

b Press the following keys for each of the primary calibration ranges:
The primary calibration ranges are -14, –12, –10, –8, –6, and 0 dBm.
[Range]
[ch1 range]
primary calibration range
[dBm]
[System Utility]
[more cal setup]
[save ch1 cal trace]
[into D1]
[Measurement Data]
[data reg]
[D1]
The following is a typical calibration correction curve display:



c If the analyzer has the optional second channel, repeat the previous two steps for channel 2.

After pressing [**Preset**], press **[** B] **[** Range] [channel 2] and substitute [ch2 range] for [ch1 range].

d If a calibration curve is not within +2.5 dB and -1 dB of the range level setting, go to page page 1-62‘’To troubleshoot source and calibrator out failures’’ or page 1-71- ‘’To troubleshoot input and ADC failures.’’

To troubleshoot performance test failures

Use this test when a performance test is failing and the self tests passed except for calibration.

1 Determine if an adjustment is causing the analyzer to fail a performance test.

   a Do the adjustments in chapter 2, ''Adjusting the Analyzer'' for the following assemblies:
   A10 Analog Input
   A21 A/D Converter
   A35 Analog Source
   A60 Frequency Reference
   A61 Clock

   b Repeat the failing performance test.

2 Determine the probable faulty assembly or next 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 assembly or assemblies most likely to cause the failure. In some cases, the failure can be isolated to one assembly based on the exact failure. When the cause of the failure cannot be isolated to one assembly, an additional test is provided to help isolate the faulty assembly. Multiple probable faulty assemblies are listed in order of probability.

Failing Performance Test	Probable Faulty Assembly (in order of probability)	Troubleshooting Test
DC Offset	A10 Analog Input A21 A/D Converter	Input and ADC, page 1-71 or Two channel analyzer, page 1-75
Amplitude Accuracy	A10 Analog Input A35 Analog Source A21 A/D Converter	Source and calibrator out, page 1-62-
Amplitude Linearity	A10 Analog Input A21 A/D Converter	Input and ADC, page 1-71- or Two channel analyzer,page 1-75
Frequency Accuracy	A60 Frequency Reference A61 Clock	Initial verification, page 1-10, Step 5, Use a frequency counter instead of an oscilloscope.
Amp_Phase Match	A10 Analog Input A21 A/D Converter A36 Trigger	Amplitude failure: Two channel analyzer, page 1-75- Phase Match failure: Trigger, page 1-83
Cross Talk Anti-Alias Filter Input Coupling Input Capacitance Input resistance Input Rtn Loss	A10 Analog Input	
Harmonic Distortion Spurious Signals Intermodulation Distortion Noise	A10 Analog Input A21 A/D Converter	Input and ADC, page 1-71 or Two channel analyzer, page 1-75
External Trigger External Arm	A36 Trigger	
Input Trigger	A10 Analog Input A36 Trigger	Trigger, page 1-83
Source Amplitude Accuracy Source Rtn Loss Source Distortion	A35 Analog Source	

To troubleshoot front-end control failures

Use this test when a control path test fails or an assembly is not found.

1 Check the digital source.

a Set the power switch to on (l).

b After the power-up routine is 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]
[digital source]

c Determine the probable faulty assembly, next step, or test by comparing the self-test results to the following table.

Digital Source Self-test Result	Power-up tests Additional hardware information	Probable Faulty Assembly, Next Test or Step
PASS	*Two channel analyzer:* Channel *number* Control Path test failed Channel *number* Front End not found	Two channel analyzer,page 1-75
PASS	*Single channel analyzer:* Channel 1 Control Path test failed Channel 1 Front End not found	Step 2
PASS	Internal Control Path 3 open Unable to write/read Internal Control Path 3 Unable to read Internal Control Path 3 Unable to program Source DC offset	A35 Analog Source
FAIL		A30 Digital Source
Locks up analyzer		Step 2

2 Check front-end control loop signals.

a Place the analyzer on the side closest to the display.

b Remove the bottom cover.

c Press the following keys:
[**Return**]
[loop mode setup]
[forever]
[**Return**]
[functional tests]
[power-up tests]
[more]
[additional hardware]

d Using a logic probe, check that the TTL signals listed in the following table are toggling.

Test Location	Signal Name	Probable Faulty Assembly
A91 P6 pin 16	FSA1	A60 Frequency Reference
A91 P6 pin 10	CLK25M	A60 Frequency Reference
A91 J4 pin 18A	FECLK1	A30 Digital Source
A91 J5 pin 18A	FECLK2	A30 Digital Source
A91 J6 pin 19B	FECLK3	A30 Digital Source
A91 J2 pin 29A	FEDATA	A30 Digital Source
A91 J2 pin 30A	nFEPROG	A30 Digital Source
A91 J2 pin 30B	FELATCH	A30 Digital Source
A91 J2 pin 28B	FELOOP1	A21 A/D Converter
A91 J4 pin 17B	FERET1	A10 Analog Input
A91 P1 pin 43	FELOOP3	A36 Trigger
A91 J6 pin 18B	FERET3	A35 Analog Source

e If a signal is incorrect, replace the probable faulty assembly.

f Press [**Preset**] to stop the loop mode.
Probing the signals on the motherboard may cause the self test to fail or abort.

g If the signals are correct in the previous table, go to the next test, ''To troubleshoot source and calibrator out failures.''

To troubleshoot source and calibrator out failures

Use this test when the analog source or calibrator is suspected of failing and all self tests listed before the ADC in the Self-Test Troubleshooting Guide on page 1-32 passed.

1 Check the sine wave output.

a Set the power switch to on (l).

b Using a BNC cable, connect an oscilloscope to the SOURCE output.

c Set the oscilloscope as follows:

CH1 V/div	400 mV/div
Input Impedance	50 Ω
CH1 Coupling	dc
Probe Atten	1
Display Mode	Real Time
Time/div	200 ns/div
Trigger	Trg'd Sweep
Trig Src	Chan1
Trigger Level	0 V

d Press the following keys:
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero cal **off**]
[**Source**]
[source **on**]
[level]
1
[V]

e The oscilloscope should display a 1 MHz, 2 Vp-p sine wave with no dc offset. If the signal is incorrect, go to Step 7.
This is only a quick check of the source sine wave. If the source is suspected of failing at a specific frequency or amplitude, check

the source sine wave at the failing values. If the signal is incorrect, go to Step 7.

f Set the oscilloscope to 600 mV/div.

g Press the following keys:
[DC offset]
[**Marker / Entry**]

h Rotate the RPG knob while monitoring the oscilloscope. The sine wave dc offset value should change from +1 V to -1 V as the RPG knob is turned.
To keep the sine wave displayed, adjust the oscilloscope's trigger level while varying the dc offset value.

i If the dc offset function operates correctly, go to Step 3.

2 Check the DC offset control signals.

a Place the analyzer on the side closest to the display.

b Remove the bottom cover.

c Press the following keys:
[**Preset**]
[**Source**]
[source **on**]
[DC offset]
[**Marker / Entry**]

d Using a logic probe, check the TTL signals listed in the following table while rotating the RPG knob. The signals should toggle as the dc offset is varied from minimum to maximum.

Test Location	Signal Name
A91 J6 pin 12B	OFF[0]
A91 J6 pin 12C	OFF[1]
A91 J6 pin 13B	OFF[2]
A91 J6 pin 13C	OFF[3]
A91 J6 pin 14B	OFF[4]
A91 J6 pin 14C	OFF[5]
A91 J6 pin 15B	OFF[6]
A91 J6 pin 18A	NOFFWR

e If the signals are correct, the A35 Analog Source is probably faulty.

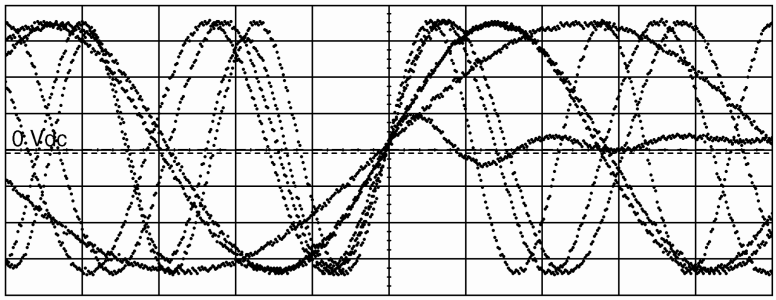
f If any of the signals are incorrect, the A30 Digital Source assembly is probably faulty.

3 Check the periodic chirp output.

a Press the following keys:
[DC offset]
0
[V]
[source type]
[periodic chirp]

b Using an oscilloscope and 1:1 probe, check the following signal.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to SOURCE		Variations	
CH1 V/div	300 mV/div		
Input Impedance	50 Ω		
CH1 Coupling	dc		
Probe Atten	1		
Display Mode	Repetitive		
Averaging	off		
Persistence	500 ms		
Time/div	50 ns/div		
Trigger	Trg'd Sweep		
Trig Src	Chan1		



Periodic Chirp

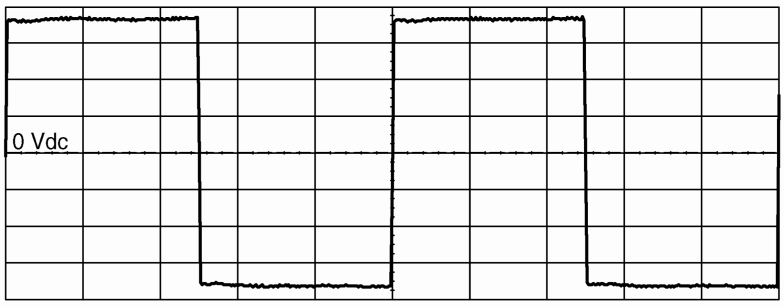
c If the signal is incorrect, go to Step 7.

4 Check the calibrator output.

a Press the following keys:
[**Preset**]
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero cal **off**]
[**Return**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[cal]
[cal signal on]

b Using an oscilloscope and 1:1 probe, check the following signal.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to SOURCE		Amplitude Time Duty Cycle Pulse Shape	
CH1 V/div	20 mV/div		
Input Impedance	50 Ω		
CH1 Coupling	dc		
Probe Atten	1		
Display Mode	Repetitive		
Averaging	8		
Time/div	500 ns/div		
Trigger	Trg'd Sweep		
Trig Src	Chan1		
Trigger Level	0 V		



Calibrator

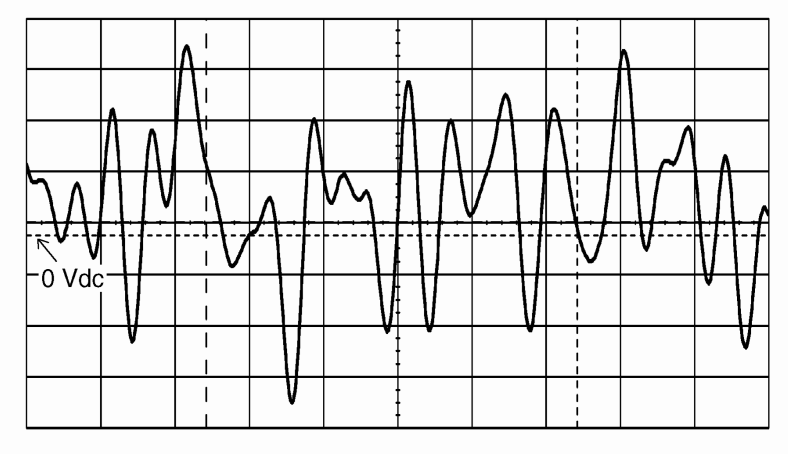
c If the signal is incorrect, go to Step 7.

5 Check the random noise output.

a Press the following keys:
[cal signal **off**]
[**Source**]
[source **on**]
[level]
1
[V]
[source type]
[random noise]

b Using an oscilloscope and 1:1 probe, check the following signal.

Oscilloscope Setup		Parameters	Waveform
Connect CH1 to SOURCE		Variations No Pattern	
CH1 V/div	100 mV/div		
Input Impedance	50 Ω		
CH1 Coupling	dc		
Probe Atten	1		
Display Mode	Real Time		
Resolution	7 bits		
Time/div	200 ns/div		
Trigger	Trg'd Sweep		
Trig Src	Chan1		



Random Noise

c If the random noise source is incorrect, the A30 Digital Source assembly is probably faulty.
This is only a quick check of the random noise signal. Do the Random Noise performance test to thoroughly check the random noise signal.

6 Step 6. Check the source attenuation.

a Connect a digital multimeter to the SOURCE output using a 50 Ω feedthrough termination and BNC cable.

b Press the following keys:
[CW (fixed sine)]
[**Return**]
[sine freq]
1
[kHz]
[level]
5
[V]
[**System Utility**]
[more]
[diagnostics]
[service functions]
[special test modes]
[source]
[**Marker / Entry**]

c Slowly rotate the RPG knob while monitoring the digital multimeter. The sine wave's amplitude should vary as follows.

Source Attenuation	Source Amplitude (nominal)		
	dBm	Vp-p	Vrms
0	24	10.0	3.54
1	14	3.17	1.12
2	4	1.00	354 m
3	–6	317 m	112 m
4	–16	100 m	35.4 m
5	–26	31.7 m	11.2 m
6	–36	10.0 m	3.54 m
7	–46	3.17 m	1.12 m

d If all the values are incorrect, go to Step 7.

e If only a few of the values are incorrect, the A35 Analog Source is probably faulty.

f If all the values are correct, the analog source and calibrator are operating correctly. For a single channel analyzer, go to page 1-71, ''To troubleshoot input and ADC failures.'' For a two

channel analyzer, go to page 1-75, ''To troubleshoot two channel analyzer failures.''

7 Check frequency sample signals.

a Place the analyzer on the side closest to the display.

b Remove the bottom cover.

c Press [**Preset**].

d Using a logic probe, check that the TTL signals listed in the following table are toggling.

Test Location	Signal Name
A91 P6 pin 4	FSAAD
A91 P6 pin 5	FSASRC
A91 P6 pin 11	FSA2
A91 P6 pin 16	FSA1

e If any of the signals are incorrect, the A60 Frequency Reference assembly is probably faulty.

8 Check DAC signals.

a Press the following keys:
[**Preset**]
[**Source**]
[source **on**]

b Using a logic probe, check that the TTL signals listed in the following table are toggling.

Test Location	Signal Name
A91 J6 pin 4A	DAC[0]
A91 J6 pin 4C	DAC[1]
A91 J6 pin 5B	DAC[2]
A91 J6 pin 6A	DAC[3]
A91 J6 pin 6C	DAC[4]
A91 J6 pin 7B	DAC[5]
A91 J6 pin 8A	DAC[6]
A91 J6 pin 8C	DAC[7]
A91 J6 pin 9B	DAC[8]
A91 J6 pin 10A	DAC[9]
A91 J6 pin 10C	DAC[10]
A91 J6 pin 11B	DAC[11]

c If any of the signals are incorrect, the A30 Digital Source assembly is probably faulty.

d If the signals are correct, the A35 Analog Source assembly is probably faulty. Before replacing the A35 Analog Source assembly, go to page 1-15, ''To troubleshoot the power supply,'' and do Step 7 to check the -8 V power supply.

To troubleshoot input and ADC failures

Use this test to isolate input failures to the A10 Analog Input assembly or A21 A/D Converter assembly.

1 Check the input path.

a Set the synthesizer as follows:

Frequency	1 MHz
Amplitude	2 Vp-p
Function	Sine Wave

b Set the oscilloscope as follows:

CH1 V/div	30 mV/div
Input Impedance	50 Ω
CH1 Coupling	dc
Time/div	200 ns/div
Probe Atten	1

c Press the following keys:
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero **off**]
[**Range**]
1
[V]

d Connect the synthesizer to the front panel CHANNEL 1 input using a BNC cable.

e Remove the top cover.

f Using the oscilloscope and a BNC(m)-to-SMB(f) cable, check the following signals:

Test Location	Signal Name	Amplitude (±10%)
A10 J2	ANALOGIN	193 mVp-p
A10 J3	TRIGGER	687 mVp-p

g If the signals are incorrect, the A10 Analog Input assembly is probably faulty.

h Reconnect A10 J3 to A36 J5 and A10 J2 to A21 J4.
This is only a quick check of the A10 Analog Input assembly. If the assembly is still suspected of failing, set the analyzer to the

failing range, impedance, and frequency. Input a full scale signal. If the input level equals the range level, A10 J2 and A10 J3 should match the amplitudes in the above table.

2 Check the dc offset DAC.

a Connect the oscilloscope to A10 J2 using the BNC(m)-to-SMB(f) cable.

b Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[input]
[**Marker / Entry**]

c Rotate the RPG knob while monitoring the oscilloscope. The sine wave dc offset value should change from +0.4 V to -0.4 V as the RPG knob is turned.
To keep the sine wave displayed, adjust the oscilloscope's trigger level while varying the dc offset value.

d If the dc offset function is incorrect, the A10 Analog Input assembly is probably faulty.

e Reconnect A10 J2 cable to A21 J4.

3 Check the trigger offset DAC.

a Connect the oscilloscope to A10 J3 using the BNC(m)-to-SMB(f) cable.

b Press the following keys:
[dc offset]
2000
[enter]
[trig offset]

c Rotate the RPG knob while monitoring the oscilloscope. The sine wave dc offset value should change from +0.4 V to -0.4 V as the RPG knob is turned.

To keep the sine wave displayed, adjust the oscilloscope's trigger level while varying the trigger offset value.

d If the trigger offset function is incorrect, the A10 Analog Input assembly is probably faulty.

e Reconnect A10 J3 to A36 J5.

f Disconnect the synthesizer from CHANNEL 1.

4 Check the analog source to input path.

a Press the following keys:
[**Preset**]
[**Source**]
[source **on**]
[level]
0
[dBm]
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero cal **off**]
[**Return**]
[more]
[diagnostics]
[service functions]
[special test modes]
[input]
[source]

b Connect the oscilloscope to A10 J2 using the BNC(m)-to-SMB(f) cable.

c The oscilloscope should display a 130 ±13 mVp-p sine wave.

d If the signal is correct, go to Step 5.

e Place the analyzer on the side closest to the display.

f Remove the bottom cover.

g Set the oscilloscope as follows:

CH1 V/div	100 mV/div
Input Impedance	1 MΩ
CH1 Coupling	dc

Time/div	200 ns/div
Probe Atten	1

h Connect a high impedance 1:1 oscilloscope probe to A91 J6 pin 29B.
The signal should be 423 ±42 mVp-p.

i If the signal is incorrect, the A35 Analog Source assembly is probably faulty.

5 Check the frequency sample signals.

a Reconnect A10 J2 to A21 J4.

b Place the analyzer on the side closest to the display.

c Remove the bottom cover.

d Press [**Preset**].

e Using a logic probe, check that the TTL signals listed in the following table are toggling.

Test Location	Signal Name
A91 P6 pin 4	FSAAD
A91 P6 pin 11	FSA2
A91 P6 pin16	FSA1

f If the signals are incorrect, the A60 Frequency Reference assembly is probably faulty.

g If the signals are correct, the A21 A/D Converter assembly is probably faulty.
This test does not check the A71 Pass Through assembly. The Pass Through assembly buffers the signals from the A21 A/D Converter assembly before they go to the A50 Digital Filter assembly. There is a separate set of buffers for each channel. The Pass Through assembly is less likely to fail than the A21 A/D Converter assembly.

h If the calibration error message is ''Channel 1 fails flatness test,'' the A50 Digital Filter assembly may be failing even though the digital filter self test passes.
If replacing the A21 A/D Converter assembly does not fix the failure, the A71 Pass Through assembly or A50 Digital Filter assembly is probably faulty.

To troubleshoot two channel analyzer failures

Use this test to isolate the failure when one channel fails in a two channel analyzer.

1 Check for failing self tests and calibration routine.

a Set the power switch to on (l).

b 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]
[ADC]
(wait for test to finish)
[more]
[input]
(wait for test to finish)
[calibration]

c Do one of the following:

- If the self tests fail but do not lockup the analyzer, note the failure messages and go to Step 2.
- If the analyzer locks up on the calibration routine but not on the ADC or Input self test, note the failure messages and go to Step 2. Follow the procedure except do not press the [calibration] softkey.
- If the analyzer locks up on the ADC or Input self test, do Step 2 to see if exchanging assemblies will allow the self tests to run. If the analyzer still locks up on the ADC or Input self test after performing Step 2, go to page 1-71 and follow ''To troubleshoot input and ADC failures'' for each channel.
- If the self tests pass, determine the failure symptom before continuing with Step 2. For example, use the performance test procedures to

isolate the failure symptom. Once the exact failure symptom is known, do the following steps but substitute the failure symptom for the self tests.

2 Exchange the assemblies in channel 1 with the assemblies in channel 2, then check for failing tests.

a Set the power switch to off (O).

b Remove the top cover.

c Exchange the A21 A/D Converter assembly and A10 Analog Input assembly in channel 1 with the A21 A/D Converter assembly and A10 Analog Input assembly in channel 2.

d Reconnect the cables as follows:

Channel 1:	A10 J2 to A21 J4
	A10 J3 to A36 J2
	A21 J1 to A60 J3
Channel 2:	A10 J2 to A21 J4
	A10 J3 to A36 J5
	A21 J1 to A60 J2

e Set the power switch to on (l).

f 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]
[ADC]
(wait for test to finish)
[more]
[input]
(wait for test to finish)
[calibration]

g If the channel that failed before the exchange still fails, go to Step 4.
The noise floor may appear higher than usual even if a channel is

operating correctly. This is caused by the ADC dither function. The noise floor should settle after about 3 minutes and should not affect the self-test results.

3 Step 3. Exchange channel 1 and channel 2 A/D Converter assemblies, then check for failing tests.

a Set the power switch to off (O).

b Exchange the channel 1 A21 A/D Converter assembly with the channel 2 A/D Converter assembly.

c Reconnect the cables as follows:

Channel 1:	A10 J2 to A21 J4
	A10 J3 to A36 J2
	A21 J1 to A60 J3
Channel 2:	A10 J2 to A21 J4
	A10 J3 to A36 J5
	A21 J1 to A60 J2

d Set the power switch to on (l).

e 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]
[ADC]
(wait for test to finish)
[more]
[input]
(wait for test to finish)
[calibration]

f If the channel that failed before the exchange still fails, the A10 Analog Input assembly in the failing channel is probably faulty.

g If the other channel now fails, the A21 A/D Converter assembly in the failing channel is probably faulty.

4 Check the analog source to input paths.

a Press the following keys:
[Preset]
[Source]
[source **on**]
[level]
0
[dBm]
[System Utility]
[more cal setup]
[auto zero cal **off**]
[Return]
[more]
[diagnostics]
[service functions]
[special test modes]
[input]
[channel 1 source]

b Using a BNC(m)-to-SMB(f) cable, connect the oscilloscope to channel 1 A10 J2.
The oscilloscope should display a 130 ±13 mVp-p sine wave.

c Reconnect the cable from channel 1 A10 J2 to A21 J4.

d Press the following keys:
[channel 1 front BNC]
[channel 2 source]

e Using a BNC(m)-to-SMB(f) cable, connect the oscilloscope to channel 2 A10 J2.
The oscilloscope should display a 130 ±13 mVp-p sine wave.

f Reconnect the cable from channel 2 A10 J2 to A21 J4.

g If both signals are correct, go to Step 5.

h Place the analyzer on the side closest to the display.

i Remove the bottom cover.

j Set the oscilloscope as follows:

CH1 V/div	100 mV/div
Input Impedance	1 MΩ
CH1 Coupling	dc

Time/div	200 ns/div
Probe Atten	1

k Using a a high impedance 1:1 oscilloscope probe, check that A91 J6 pin 27B is a 423 ±42 mVp-p signal.

l Press the following keys:
[channel 2 front BNC]
[channel 1 source]

m Using a high impedance 1:1 oscilloscope probe, check that A91 J6 pin 29B is a 423 ±42 mVp-p signal.

n If either signal is incorrect, the A35 Analog Source assembly is probably faulty.

5 Check the frequency sample signals.

a Place the analyzer on the side closest to the display.

b Remove the bottom cover.

c Press [**Preset**].

d Using a logic probe, check that the TTL signals listed in the following table are toggling.

Test Location	Signal Name
A91 P6 pin 4	FSAAD
A91 P6 pin 11	FSA2
A91 P6 pin 16	FSA1

e If a signal is incorrect, the A60 Frequency Reference assembly is probably faulty.

f If all signals are correct, the A50 Digital Filter assembly is probably faulty.
This test does not check the A71 Pass Through assembly. The Pass Through assembly buffers the signals from the A21 A/D Converter assembly before they go to the A50 Digital Filter assembly. There is a separate set of buffers for each channel. The Pass Through assembly is less likely to fail than the A50 Digital Filter assembly.

To troubleshoot auto-range failures

Use this test when the auto-range function is suspected of failing and the following self tests passed:

- Input
- ADC

If the analyzer has the optional second channel, perform Step 1 for both channels.

1 Check over-range and half-range circuits.

a Using a BNC cable, connect the front panel SOURCE output to the failing input channel.

b Press the following keys:
[**Preset**]
[**Source**]
[source **on**]
[level]
0
[dBm]

The channel over-range LED should be off and half-range LED should be lit.

c Press the following keys:
10
[dBm]

The over-range and half-range LEDs should be lit.

d Press the following keys:
-10
[dBm]

The over-range and half-range LEDs should be off.

e If the LEDs responded correctly, the A30 Digital Source assembly is probably faulty.

2 Check the channel 1 auto-range signals.

a Place the analyzer on the side closest to the display.

b Remove the bottom cover.

c Press the following keys:
0
[dBm]
[**Marker/Entry**]

d Using a BNC cable, connect the SOURCE output to CHANNEL 1 input.

e Using a logic probe, check the TTL signals listed in the following table. Rotate the RPG knob to change the source's amplitude to an under-range and over-range condition.

Test Location	Signal Name	Input Range Correct	Input Under Range (<-10 dBm)	Input Over Range (>+6 dBm)	Probable Faulty Assembly
A91 P1 pin 47	nOVRRNG1	High	High	Low	A36 Trigger
A91 P1 pin 48	nHLFRNG1	Low	High	Low	A36 Trigger
A91 J2 pin 11B	nADCOVR1	High	High	Toggling	A21 A/D Converter

f Press the following keys:
[**Range**]
[ch1 autorange up-down]
[**Source**]

g Rotate the RPG knob until the analyzer changes its range. When the analyzer changes its range, the signals in the above table should toggle.

h If the analyzer does not have the optional second channel and the signals are correct, the A30 Digital Source assembly is probably faulty.

3 For analyzers with the optional second channel, check the channel 2 auto-range signals.

a Press the following keys:
[**Source**]
0
[dBm]

b Using a BNC cable, connect the SOURCE output to CHANNEL 2 input.

c Using a logic probe, check the TTL signals listed in the following table. Rotate the RPG knob to change the source's amplitude to an under-range and over-range condition.

Test Location	Signal Name	Input Range Correct	Input Under Range (< -10 dBm)	Input Over Range (> +6 dBm)	Probable Faulty Assembly
A91 P1 pin 49	nOVRRNG2	High	High	Low	A36 Trigger
A91 P1 pin 50	nHLFRNG2	Low	High	Low	A36 Trigger
A91 J1 pin 11B	nADCOVR2	High	High	Toggling	A21 A/D Converter

d Press the following keys:
[**Range**]
[channel 2]
[ch2 autorange up-down]
[**Source**]

e Rotate the RPG knob until the analyzer changes its range. When the analyzer changes its range, the signals in the above table should toggle.

f If the signals are correct, the A30 Digital Source assembly is probably faulty.

To troubleshoot trigger failures

Use this test when the trigger function is suspected of failing and the following self tests passed:

- Digital Source
- Digital Filter
- ADC

1 Check the trigger calibration signal.

a Set the power switch to on (l).

b When the power-up tests are finished, press the following keys:
[Preset]
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero cal **off**]
[Return]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[cal]
[cal signal **on**]

c Place the analyzer on the side closest to the display.

d Remove the bottom cover.

e Set the oscilloscope as follows:

CH1 V/div	200 mV/div
Input Impedance	1 MΩ
CH1 Coupling	dc
Time/div	500 ns/div
Probe Atten	1

f Using a high impedance 1:1 oscilloscope probe, check that A91 J6 pin 25B is a 1±0.1 Vp-p square wave.

g If the signal is incorrect, the A35 Analog Source assembly is probably faulty.

h Return the analyzer to its normal position.

2 Check trigger modes.

a Press the following keys:
[Preset]
[System Utility]
[more cal setup]
[auto zero **off**]
[Return]
[Range]
4
[dBm]
[Source]
[source **on**]
[source type]
[periodic chirp]
[Return]
[level]
0
[dBm]
[Frequency]
[time data **zoom**]
If the analyzer has two channels, press **[Range**] [channel **both**], then [ch* range] 4 [dBm].

b Connect the SOURCE output to the front panel CHANNEL 1 input and EXT TRIGGER connectors using a BNC tee and BNC cables.

c Press the following keys while monitoring the display. Note which trigger types are functioning:
[Trigger]
[trigger type]
[IF channel 1]
[internal source]
[external]
[channel 1]
[**Return**]
[chan level]
200
[mV]
[chan slope]
[–]
[+]
The message ‘’WAITING FOR TRIGGER‘’ is displayed when the analyzer is not triggering.

d If the analyzer has the optional second channel, move the source output to the front panel CHANNEL 2 input and press the

following keys while monitoring the display. Note which trigger types are functioning:
[Trigger]
[trigger type]
[IF channel 2]
[channel 2]
[Return]
[chan level]
0
[V]
[slope]
[–]
[+]

e Compare the trigger failure to the failures listed in the following table.

Trigger Mode Failing (only one of the following categories)	Probable Faulty Assembly or Next Step
External Trigger	A36 Trigger
Trigger Slope	A36 Trigger
Trigger Level	A36 Trigger
IF channel 1 and/or IF channel 2	A50 Digital Filter
Internal source	A30 Digital Source
Channel 1 Trigger and Channel 2 Trigger	A36 Trigger
Channel 1 Trigger or Channel 2 Trigger	Step 3

f If the failure has not been isolated, continue troubleshooting with Step 3.

3 Check channel trigger circuits.

a Set synthesizer as follows:
Frequency 1 MHz
Amplitude 724 mVp-p
Function Sine Wave

b Using a BNC(m)-to-SMB(f) cable, connect the synthesizer to A36 J2 to check channel 1 trigger or A36 J5 to check channel 2 trigger.

c Press the following keys:
[**Trigger**]
[trigger type]
[channel 1] or [channel 2]
[Return]
[chan level]
0
[V]

d If the analyzer now triggers, the A10 Analog Input assembly is probably faulty.

e If the analyzer does not trigger and channel trigger is the only function failing, the A36 Trigger is probably faulty.

f Reconnect channel 1 A10 J3 to A36 J2 and channel 2 A10 J3 to A36 J5.

4 Check trigger control lines.

a Place the analyzer on the side closest to the display.

b Set the synthesizer to 2 Vp-p and connect to the front panel CHANNEL 1 input using a BNC cable.

c Press the following keys:
[**Range]**
1
[V]
[**Trigger**]
[trigger type]
[channel 1]

d For each TTL signal listed in the following table, check that the signal is toggling using a logic probe.

Test Location	Signal Name	Probable Faulty Assembly
A91 P6 pin 10	CLK25M	A60 Frequency Reference
A91 P6 pin 11	FSA2	A60 Frequency Reference
A91 P6 pin 16	FSA1	A60 Frequency Reference
A91 P1 pin 16	GTCLK	A36 Trigger
A91 P1 pin 22	PTA	A55/A56 Sample RAM
A91 P1 pin 23	TPSD	A36 Trigger
A91 P1 pin 26	nSTRIGa	A36 Trigger

e If the signals in the table are correct, the A36 Trigger is probably faulty.

To troubleshoot disk drive failures

Use this test to isolate disk drive failures to the A42 Memory assembly, the A101 Disk Drive assembly, or the flexible disk.

1 Check disk controller.

   a Press the following keys:
   [**System Utility**]
   [more]
   [diagnostics]
   [service functions]
   1125
   [enter]
   [functional tests]
   [I/O]
   [disk controller]

   b If the disk controller test aborts and displays the message ''Mass Storage Unit not Present!!,'' the fuse on the Memory assembly, Disk Drive assembly or disk drive cable is probably faulty. Go to Step 2 to check the memory fuse.

   c If the disk controller test fails, the A42 Memory assembly is probably faulty.

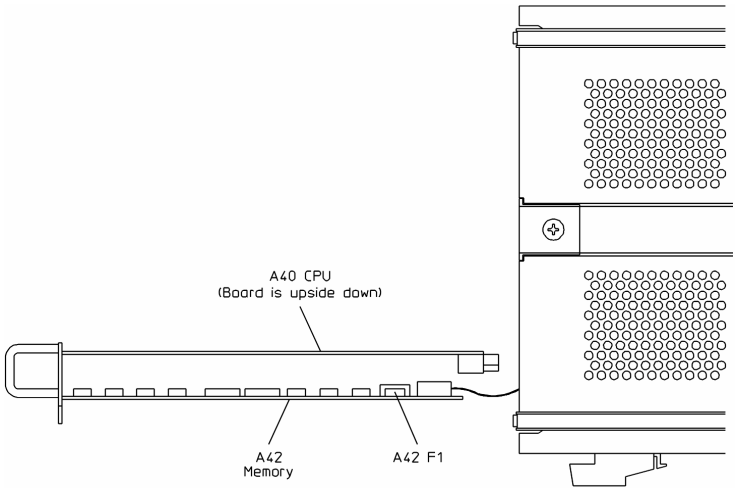
   d If the disk controller test passes, go to Step 3.

2 Check fuse on the A42 Memory assembly.

   a Set the power switch to off (O).

   b Remove the screws on each side of cover number 6.

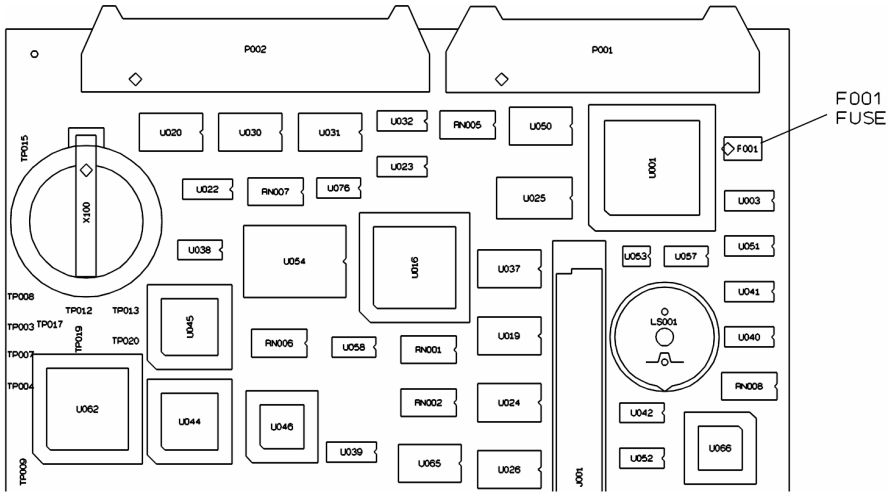
   c Pull out the assemblies attached to cover number 6 until the edge of the assemblies clear the rear panel.



d Measure the resistance across F1.

e If the resistance is 0 Ω, the Disk Drive assembly or the disk drive cable is probably faulty.

f If the resistance was greater than 0 Ω, replace the fuse.



3 Check the Disk Drive assembly.

a Insert a formatted disk into the Disk Drive assembly and press the following keys:
[**Return**]
[**Return**]
[test log]
[clear test log]
[**Return**]
[special test modes]
[I/O]
[disk drive]
[restore]
[random seek]
[seek record]
Any number between 1 and 2771
[read]
[read/write]

b If any of the self tests failed, insert a new formatted disk and repeat the previous step.
If the self-test message reads ''Bad or unformatted media,'' the flexible disk is most likely bad or unformatted. The analyzer can use either LIF (Logical Interchange Format) or a DOS formatted disk.

c If the disk drive self tests still fail, the Disk Drive assembly is probably faulty.

d Press the [read/write all] key.
The read/write self test can take up to 40 minutes to complete if there are no failures.

e If the self-test message reads ''Bad or unformatted media,'' change flexible disk and repeat the read/write all self-test.

f If the self test fails a second time, the Disk Drive assembly is probably faulty.
If the self tests pass, the Disk Drive assembly and flexible disk are functioning correctly.

To troubleshoot serial port failures

Use this test to check the serial 1 and serial 2 ports on the A42 Memory assembly.

1 Check the serial port controller.

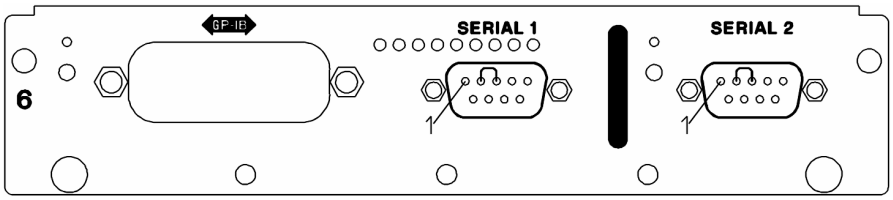
a Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[functional tests]
[I/O]
[serial port controller]

b If the serial port test fails, the A42 Memory assembly is probably faulty.

2 Check the serial 1 and serial 2 ports.

a Connect SERIAL 1 pin 2 to pin 3.

b Connect SERIAL 2 pin 2 to pin 3.



c Press the following keys:
[**Return**]
[**Return**]
[special test modes]
[I/O]
[serial port loop back]

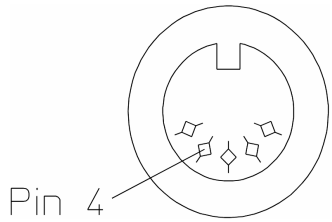
d If the self test fails, the A42 Memory assembly is probably faulty. If the self test passes, the serial ports are probably operating correctly.

To troubleshoot DIN connector failures

Use this test to determine if the fuse for the DIN connector is failing before replacing the A80 Keyboard assembly.

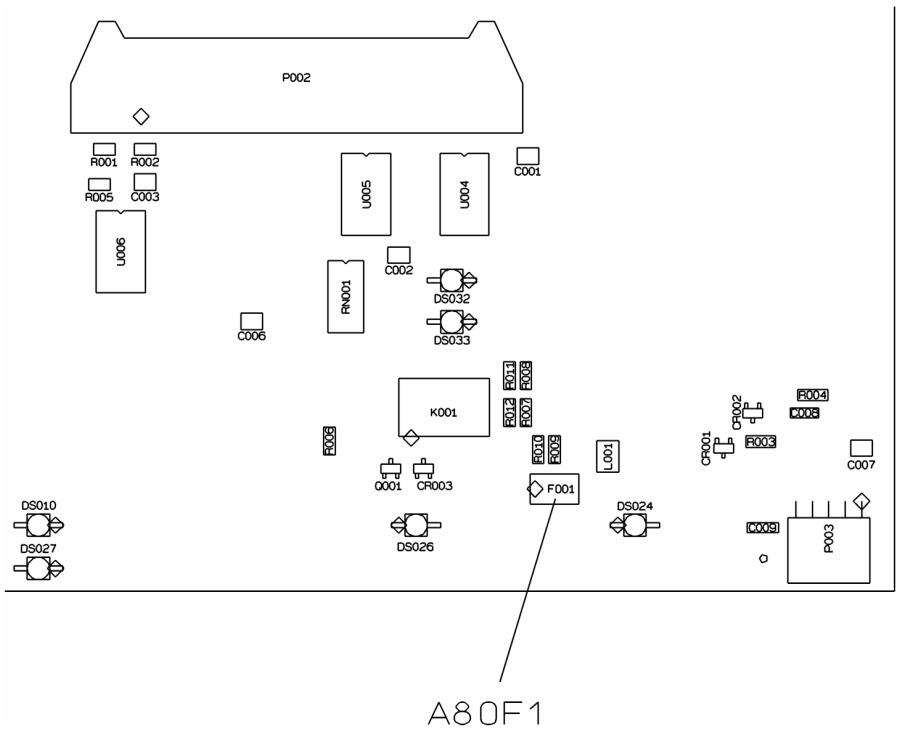
1 Set the power switch to on (l).

2 Check the voltage on pin 4 of the KEYBOARD connector for +5V.



3 If the voltage is correct, the Keyboard assembly is probably faulty.

4 If the voltage is not correct, replace the A80 F1 fuse.



To troubleshoot memory battery failures

Use this test when battery-backed-up memory is suspected of failing. This test separates A42 Memory assembly failures from memory battery failures.

1 Check battery-backed-up memory.

   a Set the power switch to on (l).

   b Press the following keys:
   [**System Utility**]
   [more]
   [time/date setup]
   [date]
   010193
   [enter]

   c Set the power switch to off (O), then to on (l).

   d Press the following keys:
   [**System Utility**]
   [more]
   [time/date setup]

   e If the date is 01-01-93, the battery-backed-up memory is probably functioning correctly. Go to page 1-32, ''To perform self tests,'' to continue troubleshooting.

2 Check the battery voltage.

   a Set the power switch to off (O).

   b Remove the screws on each side and across the bottom of cover number 6.

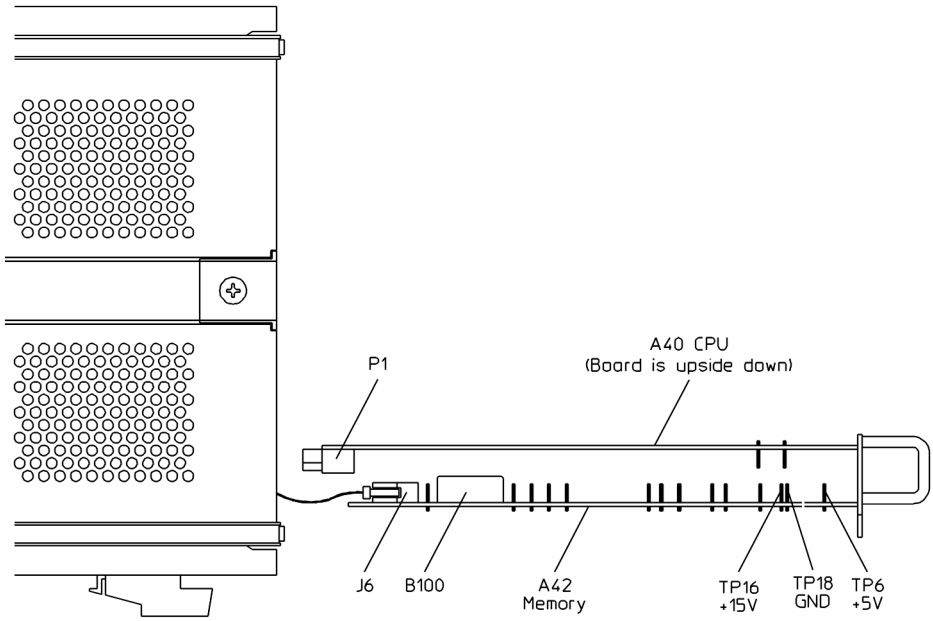
   c Pull out the assemblies attached to cover number 6 until the battery on the Memory assembly is visible.

   d Measure the voltage between the top of the battery and A42 TP18.

   e If the voltage is 3 ±1 V, the A42 Memory assembly is probably faulty.

   f If the voltage is incorrect, replace the battery (A42 B100).

CAUTION: There is danger of explosion if battery is incorrectly replaced. Replace the battery with the same or an equivalent type listed in Chapter 4, "Replaceable Parts", Discard used batteries according to the battery manufacturer's instructions.



To troubleshoot sync out and parallel port failures

Use this test to determine if the fuses for the parallel port and sync out are failing before replacing the A30 Digital Source assembly. The sync out fuse will fail if an input signal (≥-20 V) is connected to this output.

1 Set the power switch to off (O).

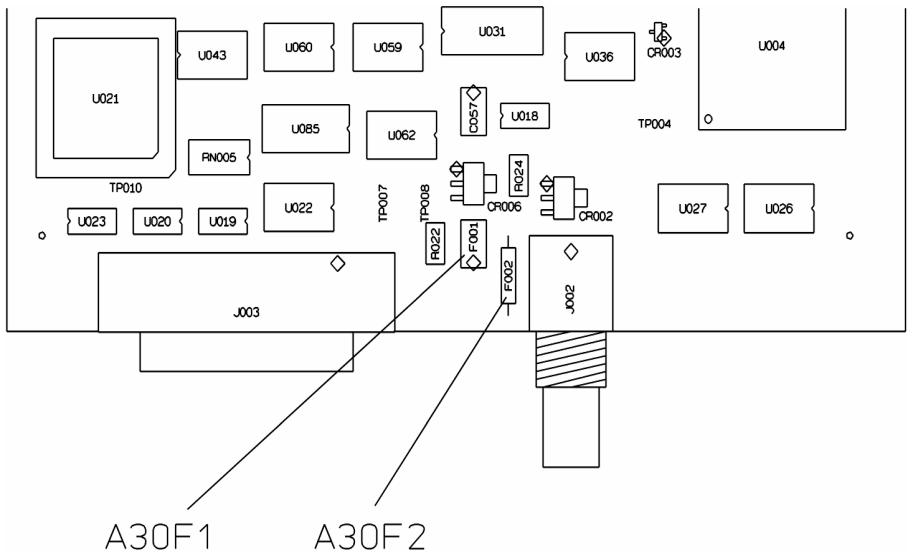
2 Remove the screws on each side of cover number 4.

3 Remove the A30 Digital Source assembly attached to cover number 4.

4 Using a multimeter, measure the resistance across F1 and across F2. The A30 F1 fuse is for sync out and the A30 F2 fuse is for the parallel port.

5 If the resistance of both fuses is 0Ω, the A30 Digital Source is probably faulty.

6 If the resistance of a fuse did not measure 0Ω, replace the fuse.



To troubleshoot system interconnect and LAN port failures

Use this test to check the system interconnect, ThinLAN, and AUI ports on the A43 Expanded Memory assembly.

1 Check the HPIB interconnect and LAN controller.

a Press the following keys:
[**Preset**]
[**System Utility**]
[auto cal **off**]
[more cal setup]
[auto zero cal **off**]
[**Return**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[test log]
[**Return**]
[functional tests]
[I/O]
[ALL]
If the analyzer is an Agilent 89440A/89441A, the message Failure of communication link with RF section may appear. This is not a failure and should be ignored.

b If the HPIB interconnect or LAN controller self tests fail, the A43 Expanded Memory assembly is probably faulty.

c If any other self test fails, go to Step 4 of ''To perform self tests'' on page 1-32.

2 Check the ThinLAN port.

a Connect a BNC tee to the ThinLAN port.

b Connect a 50Ω termination to each side of the BNC tee (use two 50 Ω terminations.)

c Press the following keys:
[**Return**]
[**Return**]
[special test modes]

[I/O]
[ThinLAN loop back]

d If the ThinLAN loop back test fails, the A43 Expanded Memory assembly is probably faulty.

3 Check the AUI LAN port.

a Connect a ThinLAN Transceiver (AUI to ThinLAN converter) to the AUI LAN port.

b Set the switches on the ThinLAN Transceiver to their disable position.

c Connect a BNC tee to the transceiver's BNC connector.

d Connect a 50 Ω termination to each side of the BNC tee (use two 50 Ω terminations.)

e Press the [AUI LAN loop back] softkey.

f If the AUI LAN loop back test fails, the A43 Expanded Memory assembly is probably faulty.

g If the self tests pass, the LAN ports are probably operating correctly.

h Set the power switch off (O), then on (l) to return the analyzer to normal LAN operation.

2 Adjusting the Analyzer

Adjusting the Analyzer

This chapter contains the adjustment procedures for the Agilent 89410A DC-10 MHz Vector Signal Analyzer. 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.

Analyzers with the precision frequency reference (option AY5) must be off for at least 8 hours before doing the oven shutdown adjustment and must warm up for at least 48 hours before doing the oven frequency adjustment.

Before starting the input flatness adjustment, allow the Agilent 89410A Vector Signal Analyzer to warm up for at least an hour. If the analyzer has the optional second channel (option AY7), perform the input adjustments for channel 1 and repeat for channel 2.

The following table shows the assembly and components adjusted during each adjustment procedure. If the channel 1 A10 Analog Input or A35 Analog Source adjustments are done, the calibrator adjustment must also be done.

Adjustment	Assembly	Component
Oven shutdown	A85 Oven	R2
Input flatness	A10 Analog Input	C122, C143
Input capacitance	A10 Analog Input	C123
Input offset	A10 Analog Input	R61
Anti-alias filter	A10 Analog Input	L38, L39, L40, L41
ADC	A21 A/D Converter	software
10 MHz low pass filter	A35 Analog Source	L3, L4
Autorange detect level	A36 Trigger	R113, R114
Reference oscillator	A60 Frequency Reference	C55, R66
Clock	A61 Clock	R12, C21
Display	A100 Display	
Oven frequency	A85 Oven	HR1, R12
Calibrator	A35 Analog Source	software

The fault log should be cleared after an adjustment that required cables to be disconnected. To clear the fault log press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[fault log]
[clear fault log]

Safety Considerations

Although the Agilent 89410A analyzer 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. These adjustments must be performed by trained service personnel who are aware of the hazards involved (such as fire and electrical shock).

WARNING: **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 Agilent 89410A analyzer. There are no operator controls inside the analyzer.

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.

Remote Operation

Adjustments can be setup using the remote operation capability of the Agilent 89410A analyzer. The following table lists the adjustments and corresponding HPIB codes. See the *Agilent 89400 Series HPIB Command Reference* for general information on remote operation.

Adjustment	HPIB Code
Channel 1 Input flatness setup 1	DIAG:ADJ:INP1:FLAT 1
Channel 1 Input flatness setup 2	DIAG:ADJ:INP1:FLAT 2
Channel 1 Input flatness setup 3	DIAG:ADJ:INP1:FLAT 3
Channel 2 Input flatness setup 1	DIAG:ADJ:INP2:FLAT 1
Channel 2 Input flatness setup 2	DIAG:ADJ:INP2:FLAT 2
Channel 2 Input flatness setup 3	DIAG:ADJ:INP2:FLAT 3
Channel 1 Input capacitance setup 1	DIAG:ADJ:INP1:CAP 1
Channel 1 Input capacitance setup 2	DIAG:ADJ:INP1:CAP 2
Channel 2 Input capacitance setup 1	DIAG:ADJ:INP2:CAP 1
Channel 2 Input capacitance setup 2	DIAG:ADJ:INP2:CAP 2
Channel 1 Input offset	DIAG:ADJ:INP1:FET 1
Channel 2 Input offset	DIAG:ADJ:INP2:FET 1
Channel 1 Anti-alias filter setup 1	DIAG:ADJ:INP1:AAF 1
Channel 1 Anti-alias filter setup 2	DIAG:ADJ:INP1:AAF 2
Channel 1 Anti-alias filter setup 3	DIAG:ADJ:INP1:AAF 3
Channel 2 Anti-alias filter setup 1	DIAG:ADJ:INP2:AAF 1
Channel 2 Anti-alias filter setup 2	DIAG:ADJ:INP2:AAF 2
Channel 2 Anti-alias filter setup 3	DIAG:ADJ:INP2:AAF 3
ADC	DIAG:ADJ:ADC:SDIT
10 MHz low pass filter setup 1	DIAG:ADJ:SOUR 1
10 MHz low pass filter setup 2	DIAG:ADJ:SOUR 2
Autorange detect level	DIAG:MODE:TRIG:LEV 128
Display brightness	DISP:BRIG 100 PCT

To adjust oven shutdown

This procedure adjusts the optional A85 Oven assembly's heater shutdown trip point. When the oven is cold, the heater shutdown circuit disconnects the oven output from the rear panel output connector. After the oven has been on long enough for the frequency to be stable, the heater shutdown circuit connects the oven output to the rear panel output connector.

The Agilent 89410A Vector Signal Analyzer must be off for at least 8 hours before this adjustment is made. Once power is applied, the adjustment **MUST** be completed within **FIVE MINUTES**.

Equipment Required:

Spectrum analyzer
BNC cable
Flat-edge adjustment tool,
Agilent part number 8710-1928

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

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.

---

1 Remove the power supply shield.

   a Check that the power switch is off (O).
   The Agilent 89410A must be off for at least 8 hours before doing this adjustment.

   b Remove the power supply shield. The power supply shield is located behind the display.

2 Set up the spectrum analyzer.

a Set the spectrum analyzer as follows:

Center Frequency	**10 MHz**
Frequency Span	**1 MHz**
Reference Level	**–60 dBm**

b Connect the spectrum analyzer to the Agilent 89410A's OVEN REF OUT connector using the BNC cable.

3 Check that the 10 MHz signal is ≤-70 dBm.

a Set the power switch to on (l).

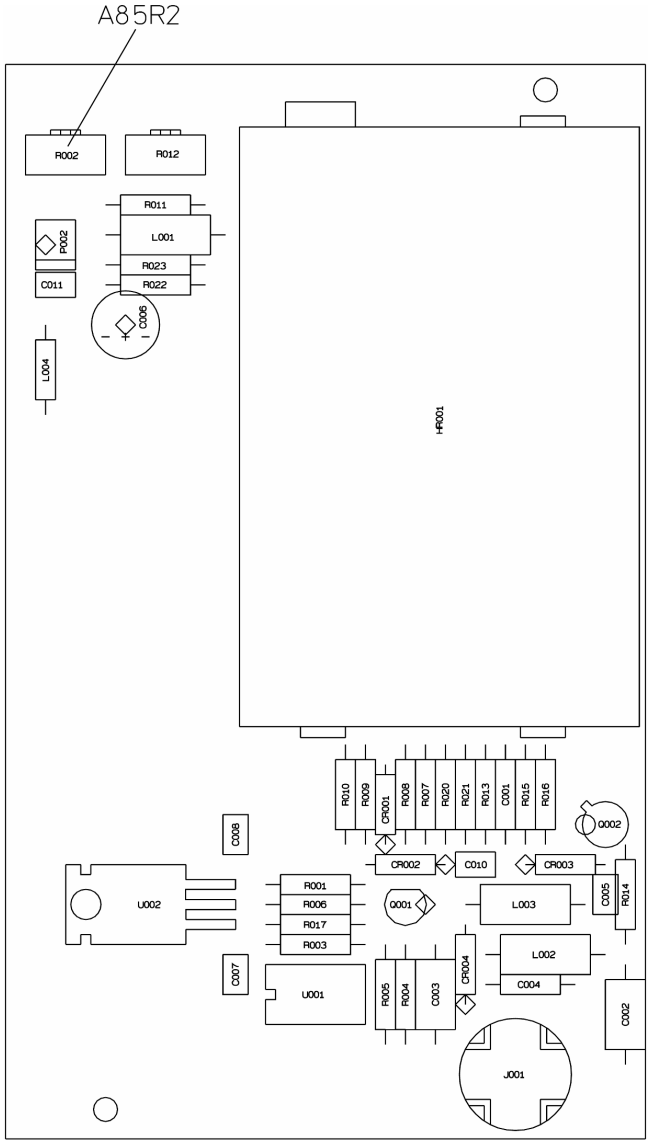
b Check that the amplitude of the 10 MHz signal is ≤-70 dBm (oven is cold).

4 Adjust A85 R2.

a Change the spectrum analyzer's reference level to 10 dBm.

b Turn A85 R2 counterclockwise until the 10 MHz signal's amplitude is > 0 dBm.

c Turn A85 R2 clockwise until the signal's amplitude just returns to approximately -70 dBm, then turn R2 an additional 10 degrees clockwise.



5 Replace the power supply shield.

a Set the power switch to off (O).

b Replace the power supply shield.
To continue the oven adjustments, allow the Agilent 89410A to warm up for at least 48 hours then do the oven frequency adjustment on page 2-34.

To adjust input flatness

This procedure adjusts the A10 Analog Input assembly's first and second 20 dB attenuators to improve input assembly flatness.

Equipment Required:

Network analyzer
Extender board, Agilent part number 89410-B1001
BNC cable
SMB(f)-to-BNC(m) cable
(2) N(m)-to-BNC(f) adapters
Flat-edge adjustment tool, Agilent part number 8710-1928

1 Place the A10 Analog Input assembly on an extender board.

c Set the power switch to off (O).

d Remove screws holding the A10 Analog Input assembly in the card nest.

e Place the assembly on an extender board.

f Set the power switch to on (l).

2 Set up the Agilent 89410A.

a Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[adjustments]
[channel 1 input] or [channel 2 input]
[pad flatness]
[setup 1]

3 Set up the network analyzer.

a Set the network analyzer as follows:

Receiver	**reference channel**
Attenuation	**20 dB**
Resolution BW	**1 kHz**
Source	
Sweep Mode	**continuous**
Sweep Time	**1 s**
Sweep Type	**log frequency**
Amplitude	**-22 dBm**
Start Frequency	**10 kHz**
Stop Frequency	**1 MHz**
Display format	**log magnitude**

b Connect the network analyzer's reference channel to A10 J2 using an N(m)-to-BNC(f) adapter and SMB(f)-to-BNC(m) cable.

c Connect the network analyzer's source to the Agilent 89410A's input using an N(m)-to-BNC(f) adapter and BNC cable.

4 Normalize the measurement.

a Wait for a complete sweep on the network analyzer.

b Store the trace data in a storage register.

c Set the network analyzer to divide the reference channel by the storage register.

5 Adjust A10 C122.

a Press the [setup 2] softkey.

b Set the network analyzer's reference level to the value at 10 kHz.

c Center the trace on the network analyzer's display, then set the scale to 0.1 dB/div.

d Adjust C122 for a flat trace using the flat-edge adjustment tool.

6 Normalize the measurement.

a Press the [setup 1] softkey.

b Set the network analyzer's input to the reference channel.

c Wait for a complete sweep on the network analyzer.

d Store the trace data in a storage register.

e Set the network analyzer to divide the reference channel by the storage register.

7 Adjust A10 C143.

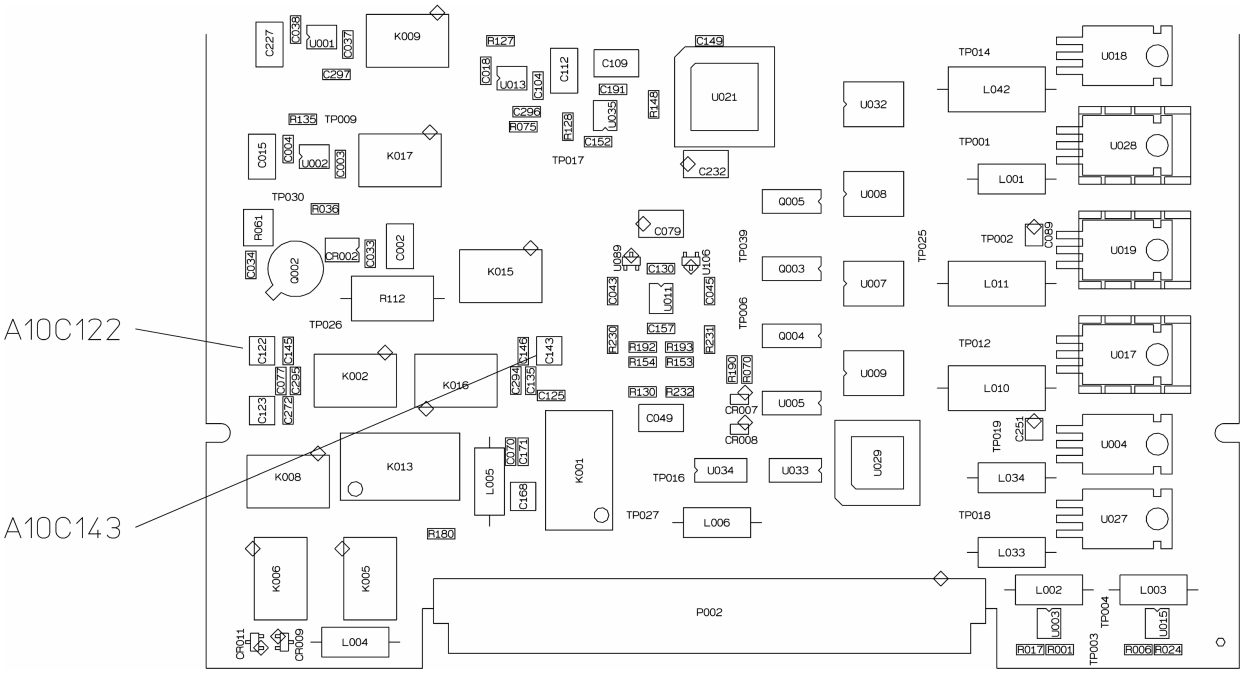
a Press the [setup 3] softkey.

b Set the network analyzer's reference level to the value at 10 kHz.

c Center the trace on the network analyzer's display, then set the scale to 0.1 dB/div.

d Adjust C143 for a flat trace using the flat-edge adjustment tool.

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



To adjust input capacitance

This procedure adjusts the A10 Analog Input assembly's input capacitance for a constant value over all input ranges and attenuator settings.

Perform the previous adjustment before doing this adjustment.

Equipment Required:

Network analyzer
Extender board, Agilent part number 89410-B1001
BNC cable
SMB(f)-to-BNC(m) cable
50 Ω feedthrough termination
10 kΩ series resistor
(2) N(m)-to-BNC(f) adapters
Flat-edge adjustment tool, Agilent part number 8710-1928

1 Set up the Agilent 89410A.

a Disconnect the network analyzer's source and receiver from the Agilent 89410A.

b Press the following keys:
[**Return**]
[input capacitance]
[setup 1]

2 Step 2. Set up the network analyzer.

a Set the network analyzer as follows:

Receiver	**reference channel**
Attenuation	**20 dB**
Resolution BW	**1 kHz**
Source	
Sweep Type	**linear frequency sweep**
Sweep Mode	**continuous**
Sweep Time	**1 s**
Amplitude	**-22 dBm**
Start Frequency	**10 kHz**
Stop Frequency	**1 MHz**
Display format	**log magnitude**

b Connect the network analyzer's reference channel to A10 J2 using an N(m)-to-BNC(f) adapter and SMB(f)-to-BNC(m) cable.

c Connect a 10 kΩ series resistor to the Agilent 89410A's input.

d Connect a 50 Ω feedthrough termination to the 10 kW series resistor.

e Connect the network analyzer's source to the 50Ω feedthrough termination using an N(m)-to-BNC(f) adapter and a BNC cable.

3 Normalize the measurement.

a Wait for a complete sweep on the network analyzer.

b Store the trace data in a storage register.

c Set the network analyzer to divide the reference channel by the storage register.

4 Adjust A10 C123.

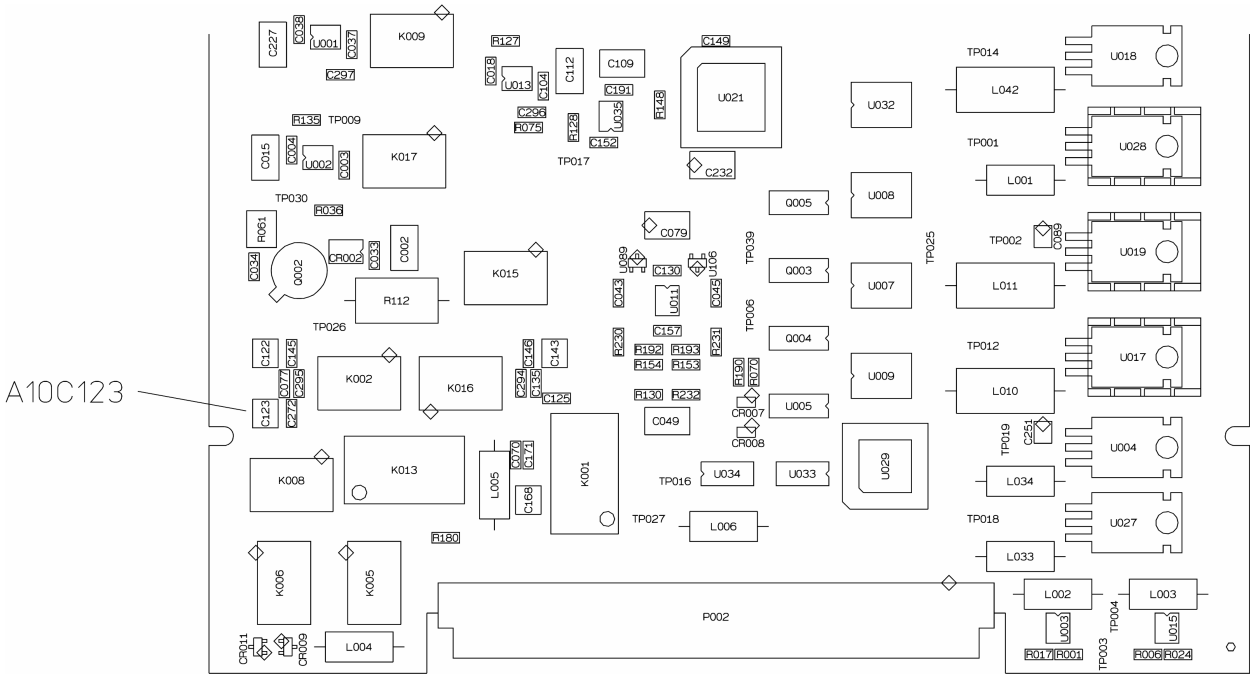
a Press the [setup 2] softkey.

b Set the network analyzer's reference level to the value at 10 kHz.

c Center the trace on the network analyzer's display, then set the scale to 0.5 dB/div.

d Adjust C123 for a flat trace using the flat-edge adjustment tool.

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



To adjust input offset

This procedure adjusts the A10 Analog Input assembly's offset voltage to zero volts.

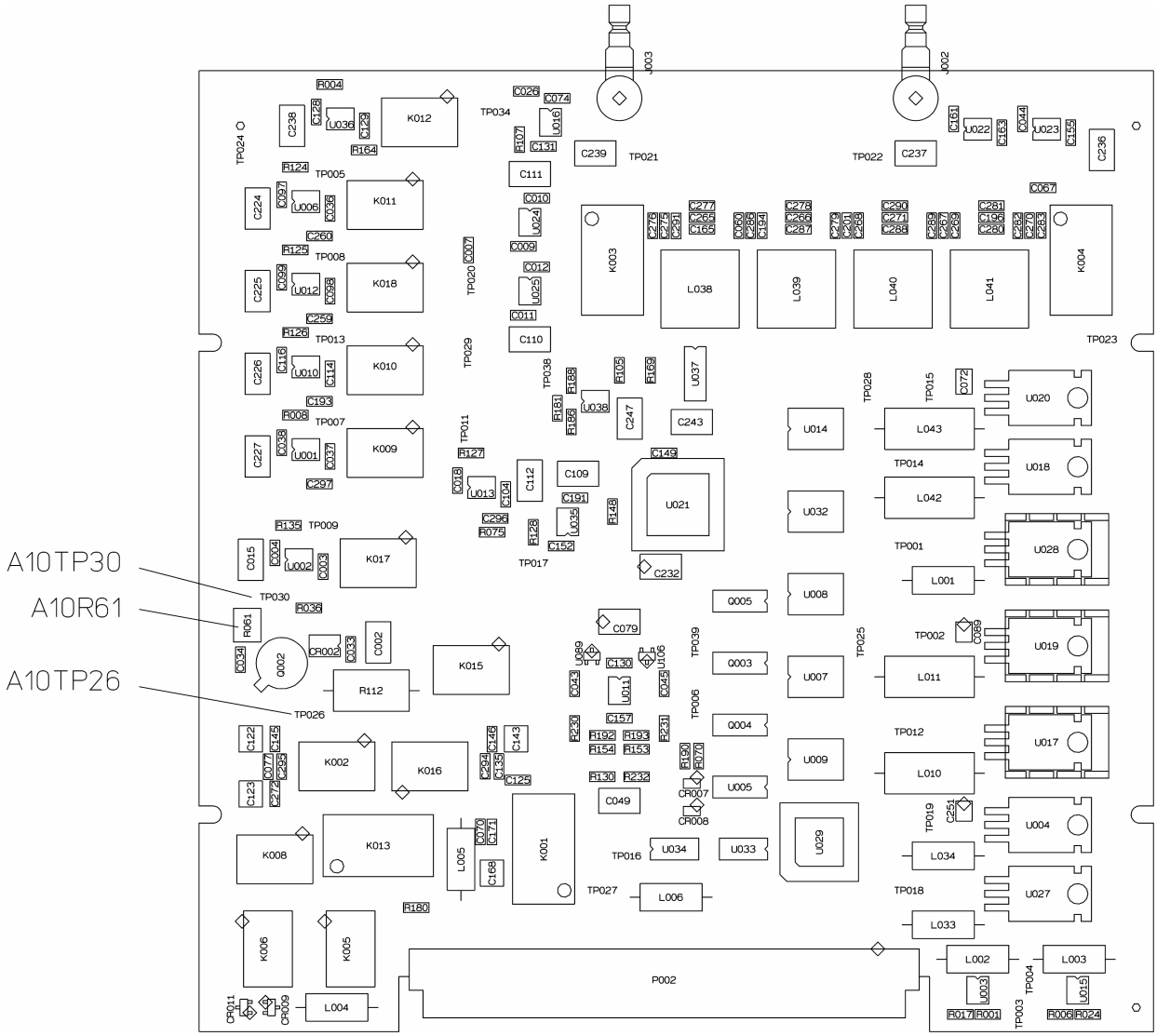
Perform the previous adjustment before doing this adjustment.

Equipment Required:

Digital multimeter
Extender board, Agilent part number 89410-B1001
50Ω termination
Flat-edge adjustment tool, Agilent part number 8710-1928

1. Remove all external connections.
2. Connect a 50Ω termination to the input.
3. Press the following keys:
   [**Return**]
   [FET offset]
   [setup 1]
4. Set the multimeter to Vdc.
5. Connect the multimeter to A10 TP30 and A10 TP26 (gnd) using test leads.
6. Adjust A10 R61 for a multimeter reading of 0 ±100 mV using the flat-edge adjustment tool.

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


A10TP30
A10R61
A10TP26
TP030
R036
TP026
J003
J002
TP024
TP034
TP021
TP022
TP005
TP008
TP013
TP007
TP009
TP020
TP029
TP038
TP011
TP017
TP023
TP028
TP015
TP014
TP001
TP002
TP025
TP039
TP006
TP012
TP019
TP016
TP027
TP018
TP004
TP003
K012
K011
K018
K010
K009
K017
K015
K002
K016
K013
K008
K001
K003
K004
K006
K005
L038
L039
L040
L041
L043
L042
L001
L011
L010
L034
L033
L002
L003
L004
L005
L006
P002
U020
U018
U028
U019
U017
U004
U027
U021
U029
U014
U032
U008
U007
U009
U005
U033
U034
Q005
Q003
Q004
R112
CR002
CR007
CR008
CR011
CR009
R017
R001
R006
R024

To adjust anti-alias filter

This procedure adjusts the corner frequency, pass band ripple, and band stop rejection of the A10 Analog Input assembly's anti-alias filter.

Perform the previous adjustment before doing this adjustment.

Equipment Required:

Network analyzer
Extender board, Agilent part number 89410-B1001
BNC cable
SMB(f)-to-BNC(m) cable
(2) N(m)-to-BNC(f) adapters
Flat-edge adjustment tool, Agilent part number 8710-1928

1 Set up the Agilent 89410A.

a Remove all external connections from the Agilent 89410A.

b Press the following keys:
[**Return**]
[anti-alias filter]
[setup 1]

2 Set up the network analyzer.

a Set the network analyzer as follows:

Receiver	**reference channel**
Attenuation	**0 dB**
Resolution BW	**10 Hz**
Source	
Sweep Mode	**manual**
Manual Frequency	**15.4 MHz**
Amplitude	**-13 dBm**
Display format	**log magnitude**

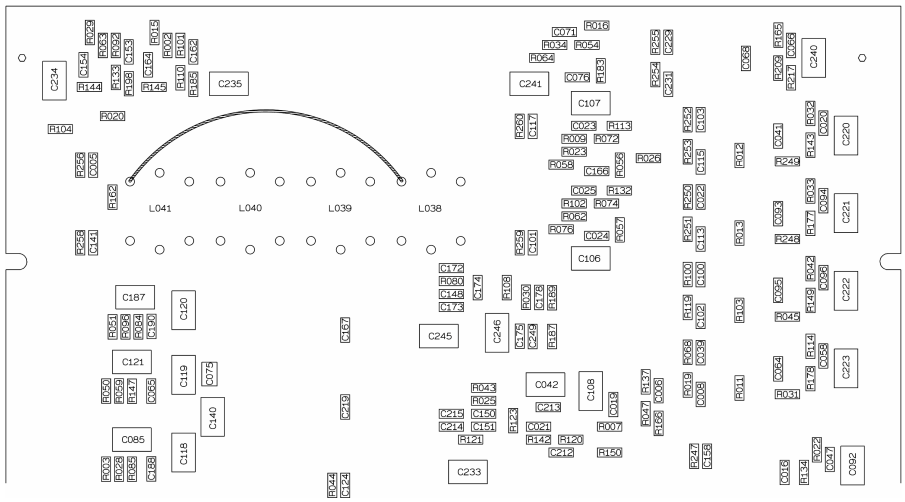
b Connect the network analyzer's reference channel to A10 J2 using an N(m)-to-BNC(f) adapter and SMB(f)-to-BNC(m) cable.

c Connect the network analyzer's source to the Agilent 89410A's input using an N(m)-to-BNC(f) adapter and BNC cable.

3 Adjust L38.

a Attach a jumper to the pins shown in the following illustration.

A10 Analog Input Component Locator, Back View

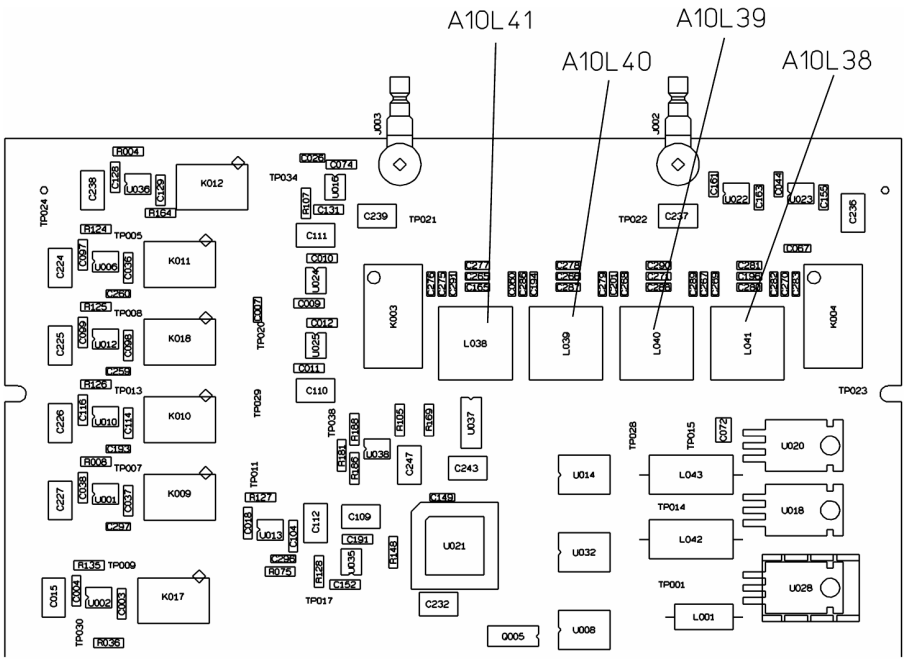


b Adjust the network analyzer's reference level so the signal is visible.

c Adjust L38 for a minimum marker reading using the flat-edge adjustment tool.

d Remove the jumper.

A10 Analog Input Component Locator, Front View



4 Normalize the measurement.

a Press the [setup 2] softkey.

b Set the network analyzer as follows:

Receiver	**reference channel**
Attenuation	**0 dB**
Resolution BW	**1 kHz**
Source	
Sweep Mode	**continuous**
Sweep Type	**linear frequency sweep**
Sweep Time	**1 s**
Amplitude	**-13 dBm**
Start Frequency	**100 kHz**
Stop Frequency	**20.1 MHz**
Display format	**log magnitude**

c Wait for a complete sweep on the network analyzer.

d Store the trace data in a storage register.

e Set the network analyzer to divide the reference channel by the storage register.

5 Adjust A10 L39, L40, and L41.

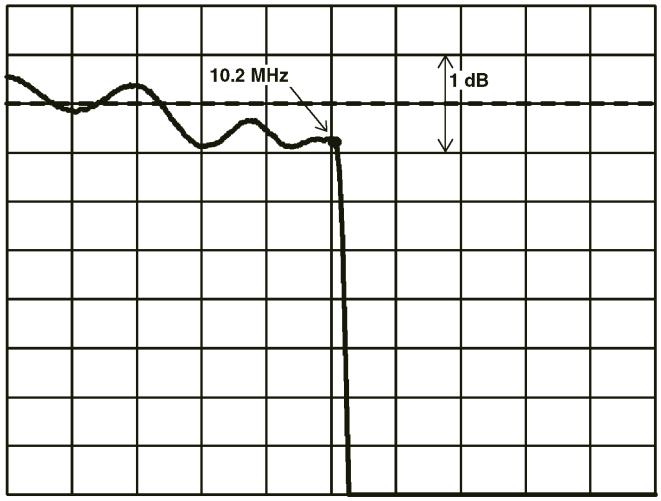
a Press the [setup 3] softkey.

b Set the network analyzer's reference level 0 dB.

c Set the reference position at 80% of the display and the scale to 0.5 dB/div.

d Put the marker at 10.2 MHz.

e Adjust A10 L39, L40, and L41 for less than 1 dB ripple from 100 kHz to 10.2 MHz using the flat-edge adjustment tool. L39, L40, L41 Correctly Adjusted



6 Normalize the measurement.

a Press the [setup 2] softkey.

b Change the network analyzer to the following:

Receiver	**reference channel**
Resolution BW	**10 Hz**
Source	
Sweep Time	**40 s**
Start Frequency	**15.6 MHz**
Stop Frequency	**54 MHz**

c Wait for a complete sweep on the network analyzer.

d Store the trace data in a storage register.

e Set the network analyzer to divide the reference channel by the storage register.

7 Check that there is at least 90 dB of rejection from 15.6 MHz to 54 MHz.

a Press the [setup 3] softkey.

b Set the network analyzer's reference level to 0 dB.

c Set the scale to 10 dB/div.

d Set the reference position to 100%.

e Wait for a complete sweep on the network analyzer.

f Check that there is at least 90 dB of rejection from 15.6 MHz to 54 MHz.
If there is not 90 dB of rejection between 15.6 MHz and 54 MHz, repeat the anti-alias filter adjustments starting at **Step 1**.

8 Reinstall the A10 Analog Input assembly.

a Set the power switch to off (O).

b Place the assembly in the card nest.

c Reconnect the following using original cables:
A10 J2 to A21 J4 (red cable)
A10 J3 to A36 J2 (channel 1, orange cable)
A10 J3 to A36 J5 (channel 2, orange cable)

If only the input assembly adjustments are being done, go to Chapter 2, "To adjust calibrator"to adjust the calibrator. The calibrator adjustment

must be done after the channel 1 A10 Analog Input assembly or the A35 Analog Source assembly is adjusted.

This completes the A10 Analog Input assembly adjustments.

To adjust ADC

This procedure adjusts the A21 A/D Converter assembly's ADC. The Agilent 89410A optimizes the ADC circuits. This procedure only needs to be done if an A21 A/D Converter assembly is replaced.

Equipment Required:

None

1 Set the power switch to on (l).

2 Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[adjustments]
[ADC settle dither]

3 Wait until the Agilent 89410A completes the adjustment.
It takes about 6 minutes to perform the ADC software adjustment.
The message box will disappear when the adjustment is done.

This completes the A21 A/D Converter assembly adjustment.

To adjust 10 MHz low pass filter

This procedure adjusts the A35 Analog Source assembly's reconstruction filter. The reconstruction filter is a 10 MHz low pass filter.

Equipment Required:

Network analyzer
Extender board, Agilent part number 89410-B1001
(2) BNC cables
(2) N(m)-to-BNC(f) adapters
BNC(f)-to-test clips
Flat-edge adjustment tool, Agilent part number 8710-1928

1 Place the A35 Analog Source assembly on an extender board.

a Set the power switch to off (O).

b Remove screws holding the A35 Analog Source assembly in the card nest. Do not remove the screws in the center of the cover.

c Place the assembly on an extender board.

d Set the power switch to on (l).

2 Set up the Agilent 89410A.

a Press the following keys:
[**System Utility**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[adjustments]

[analog source]
[setup 1]

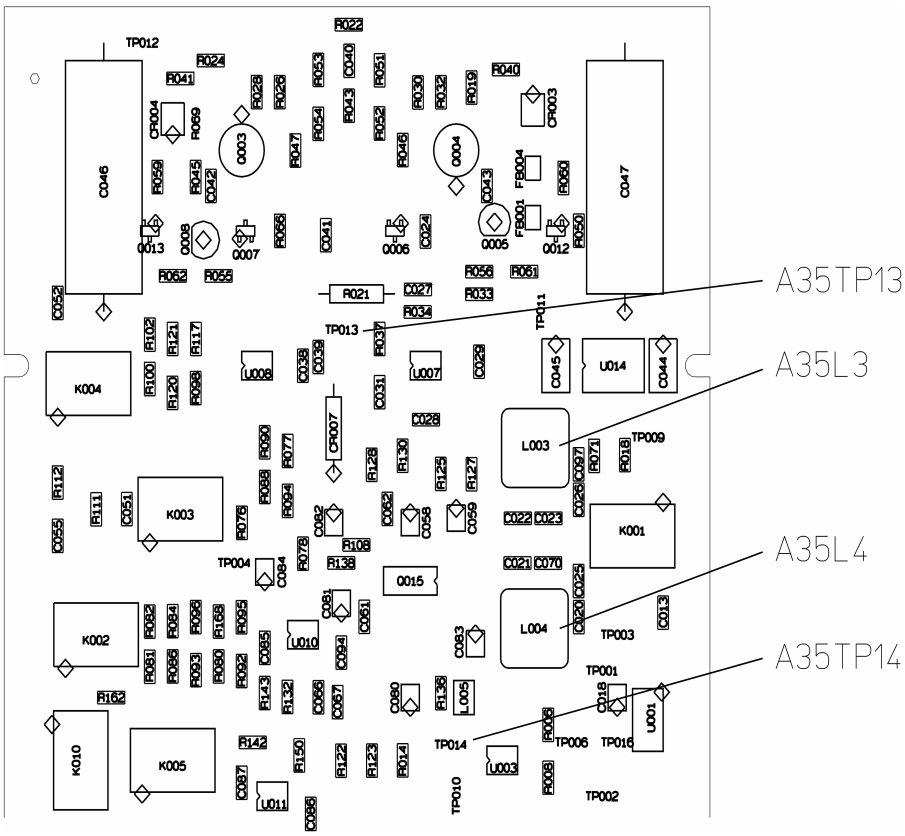
3 Set up the network analyzer.

a Set the network analyzer as follows:

Receiver	**reference channel**
Attenuation	**20 dB**
Resolution BW	**100 Hz**
Display format	**log magnitude**
Source	
Sweep Mode	**continuous**
Sweep Type	**linear frequency sweep**
Sweep Time	**3 s**
Amplitude	**-40 dBm**
Start Frequency	**10 MHz**
Stop Frequency	**30 MHz**

b Connect the network analyzer's reference channel to the Agilent 89410A's source using an N(m)-to-BNC(f) adapter and BNC cable.

c Connect the network analyzer's source to A35 TP14 (AMPIN) and TP13 (Ground) using an N(m)-to-BNC(f) adapter, BNC cable, and BNC(f)-to-test clips adapter.



4 Normalize the measurement.

a Wait for a complete sweep on the network analyzer.

b Store the trace data in a storage register.

c Set the network analyzer to divide the reference channel by the storage register.

5 Adjust A35 L3 and A35 L4.

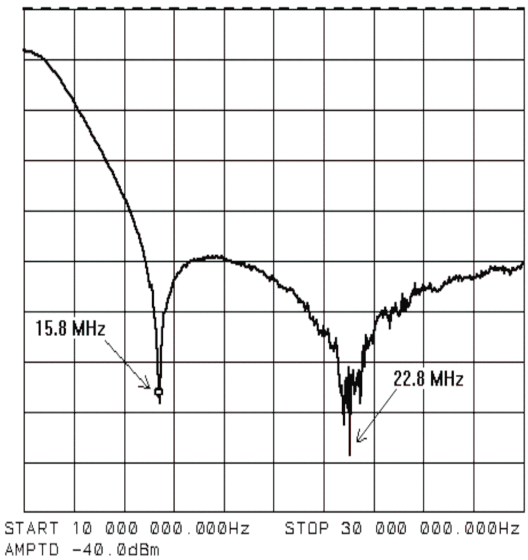
a Press the [setup 2] softkey.

b Set the network analyzer's reference level to 10 dB.

c Set the scale to 10 dB/div.

d Adjust A35 L3 for zero transmission at 15.8 MHz using the flat-edge adjustment tool.

e Adjust A35 L4 for zero transmission at 22.8 MHz using the flat-edge adjustment tool. L3 and L4 correctly adjusted



6 Reinstall the A35 Analog Source assembly.

a Set the power switch to off (O).

b Place the assembly in the card nest.
If only the source assembly adjustments are being done, go to page 2-37 to adjust the calibrator. The calibrator adjustment must be done after the channel 1 A10 Analog Input assembly or A35 Analog Source assembly is adjusted.

This completes the A35 Analog Source assembly adjustments.

To adjust auto-range detect level

This procedure adjusts the A36 Trigger assembly's ±12 Vdc regulators. The regulators are used to set the over-range and half-range detect levels in the auto-range circuits.

Equipment Required:

Digital multimeter
Extender board, Agilent part number 89410-B1002
Flat-edge adjustment tool, Agilent part number 8710-1928
Test clips-to-dual banana plug cable

1 Place the A36 Trigger assembly on an extender board.

   a Set the power switch to off (O).

   b Remove screws holding the A36 Trigger assembly in the card nest.

   c Place the assembly on an extender board.

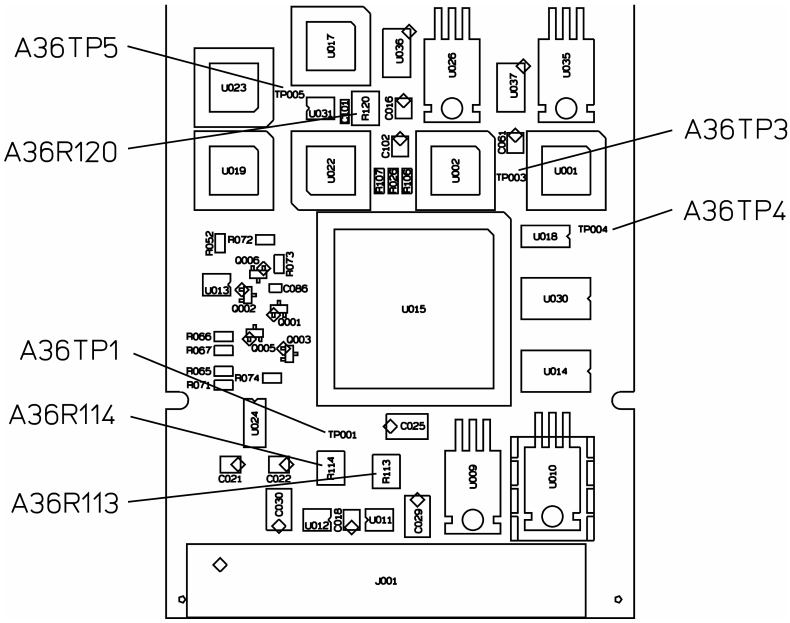
   d Set the power switch to on (l).

2 Adjust A36 R113.

   a Set the digital voltmeter to Vdc.

   b Connect the digital voltmeter to A36 TP3 and TP1 (ground).

   c Adjust A36 R113 for a voltmeter reading of 1.259 ±0.003 Vdc using the flat-edge adjustment tool.



3 Adjust A36 R114.

a Connect the digital voltmeter to A36 TP4 and TP1 (ground).

b Adjust A36 R114 for a voltmeter reading of -1.259 ±0.003 Vdc using the flat-edge adjustment tool.

4 Adjust A36 R120.

a Connect the digital voltmeter to A36 TP5 and TP1 (ground).

b Press the following keys:
[**System Utility**]
[auto cal **off**]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[trigger]
[level DAC]
128
[enter]

c Adjust A36 R120 for a voltmeter reading of 0 ±2 mVdc using the flat-edge adjustment tool.

5 Reinstall the A36 Trigger assembly.

a Set the power switch to off (O).

b Place the assembly in the card nest.

c Reconnect the following using original cables:
A36 J3 to rear panel EXT ARM (white cable)
A36 J4 to front panel EXT TRIGGER (blue cable)
A36 J2 to A10 J3 (channel 1)
A36 J5 to A10 J3 (channel 2)

This completes the A36 Trigger assembly adjustments.

To adjust reference oscillator

This procedure adjusts the A60 Frequency Reference assembly's reference oscillator.

Equipment Required:

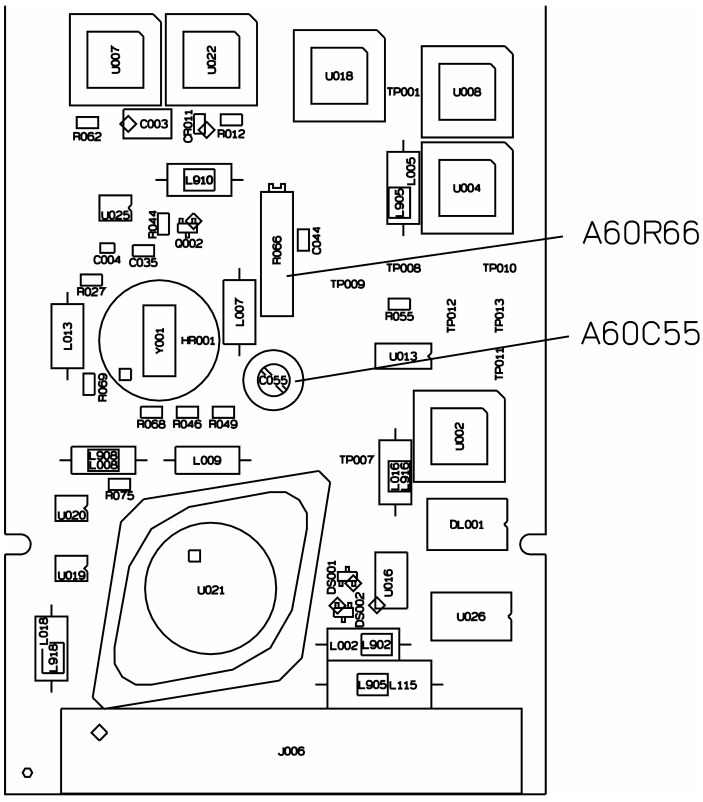
Frequency counter
Extender board, Agilent part number 89410-B1002
SMB(f)-to-BNC(m) cable
Flat-edge adjustment tool, Agilent part number 8710-1928
Plastic screw driver, Agilent part number 8710-2056

1 Place the A60 Frequency Reference assembly on an extender board.

   a Set the power switch to off (O).

   b Remove screws holding the A60 Frequency Reference assembly in the card nest.

   c Place the assembly on an extender board.



2 Adjust A60 C55.

   a Center A60 R66 by turning the potentiometer to the end and then 10 turns back.
   This is the fine frequency adjustment potentiometer. It needs to be centered before the coarse frequency adjustment is done.

   b Connect the frequency counter to A60 J2 using the SMB(f)-to-BNC(m) cable.

   c Set the power switch to on (l).

   d Adjust A60 C55 for a frequency counter reading of 25.6 MHz ±50 Hz using the flat-edge adjustment tool.

3 Reinstall the A60 Frequency Reference assembly.

   a Set the power switch to off (O).

   b Place the assembly in card nest.

   c Set the power switch to on (l).

4 Wait 5 minutes, then adjust A60 R66.

   a Wait 5 minutes for the frequency oscillator to stabilize.

   b Adjust A60 R66 for a frequency counter reading of 25.6 MHz ±10 Hz using the plastic screw driver.

5 Reconnect the cables.

   a Set the power switch to off (O).

   b Reconnect the following using original cables:
   A60 J2 to A10 J1 (channel 2)
   A60 J3 to A10 J1 (channel 1)
   A60 J4 to rear panel EXT REF IN (green cable)
   A60 J5 to rear panel EXT REF OUT (gray cable)

This completes the A60 Frequency Reference assembly adjustments.

To adjust oven frequency

This procedure adjusts the optional A85 Oven assembly's frequency. The Agilent 89410A must be on for at least 48 hours before this adjustment is made.

Equipment Required:

Oscilloscope
Frequency standard
BNC cable
Flat-edge adjustment tool, Agilent part number 8710-1928

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

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.

---

1 Remove the power supply shield.

   a Set the power switch to off (O).

   b Remove the power supply shield. The power supply shield is located behind the display.

   c Set the power switch to on (l).

2 Set up the oscilloscope.

a Connect the frequency standard's output to the oscilloscope's external trigger. Check that the frequency standard is properly terminated.

b Set the oscilloscope as follows:

Channel 1	
Volts / Div	**100 mV / div**
Offset	**0 V**
Coupling	**1 MΩ ac**
Timebase	
Time / Div	**50 ns / div**
Sweep	**Triggered**
Trigger	
Level	**0 V**
Slope	**Positive**
Mode	**Edge**
Source	**External Trigger**
Display	
Mode	**Real Time**
Screen	**Single**

c Connect the rear panel OVEN REF OUT connector to the oscilloscope's channel 1 input.

3 Adjust A85 HR1.

a Adjust A85 R12 to the center of its adjustment range.

b Remove the oven adjustment screw.

c Adjust the A85 HR1, FREQ ADJ, for a stable (not moving) display on the oscilloscope.

4 Adjust A85 R12.

a Change the oscilloscope timebase to 10 ns per division.

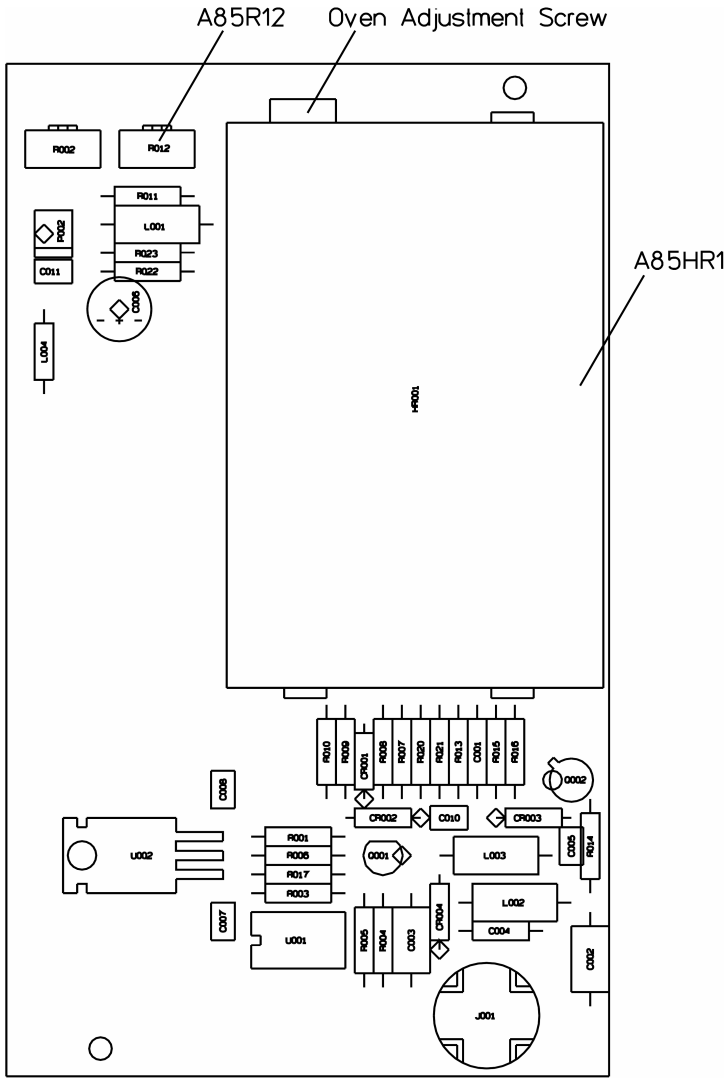
b Adjust A85 R12 for a stable display on the oscilloscope.

5 Replace the oven screw and power supply shield.

a Set the power switch to off (O).

b Replace the oven adjustment screw.

c Replace the power supply shield.



This completes the A85 Oven assembly adjustments.

To adjust calibrator

This procedure determines the exact amplitude of the calibrator signal and stores the results in Monitor Flash ROM. The calibrator signal is the amplitude reference used by the calibration routine. This procedure must be done if the channel 1 A10 Analog Input assembly, channel 1 A21 A/D Converter, or the A35 Analog Source assembly is adjusted. This procedure must also be done if the A40 CPU assembly is replaced.

CAUTION: The Monitor Flash ROM can only be written to a limited number of times. Do this procedure only when required.

Equipment Required:

Milliwatt power meter
Synthesizer
(2) BNC cables
N(f)-to-BNC(f) adapter

1 Set up the Agilent 89410A.

a Replace all covers.

b Set the power switch to on (l).

c Press the following keys:
[**System Utility**]
[single cal]
[more]
[diagnostics]
[service functions]
1125
[enter]
[special test modes]
[cal]
[calibrator cal]
[**System Utility**]

2 Set up the synthesizer.

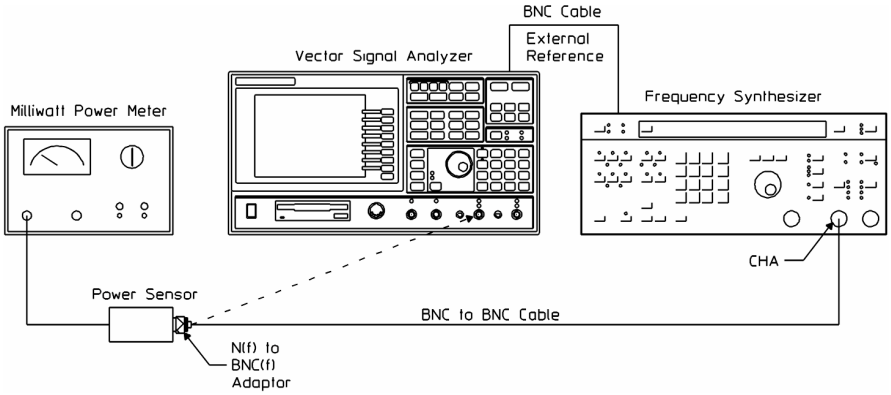
a Set the synthesizer as follows:

Frequency	**3.2 MHz**
Amplitude	**0 dBm**
Function	**sine wave**

b Connect the synthesizer's external reference to the Agilent 89410A's EXT REF IN. See the following illustration for setup.

c Connect the synthesizer's output to the milliwatt power meter.

d Adjust the synthesizer's amplitude to read 0 dBm on the milliwatt power meter.



3 Determine and store the exact amplitude of the calibrator signal.

a Connect the synthesizer's output to Agilent 89410A's channel 1.

b Press the [single cal] softkey.

c Wait for the program to finish.
The program takes about 2 minutes to complete.

The exact amplitude of the calibrator signal is now stored in Monitor Flash ROM.

3 Replacing Assemblies

Replacing Assemblies

This chapter tells you what to do before and after you replace an assembly and shows you how to disassemble the analyzer.

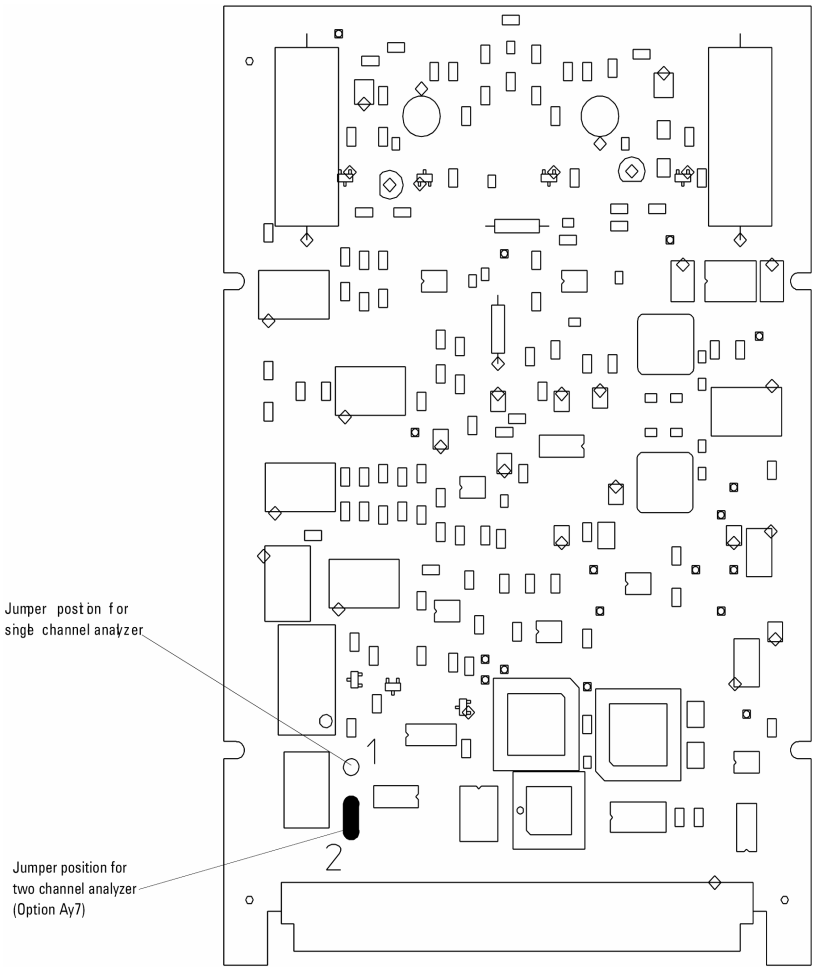
WARNING: **Disconnect the power cord from the rear panel before disassembly or assembly of the Agilent 89410A.**
Even with power removed, there can be sufficient stored energy in some circuits to cause personal injury. These voltages will discharge to a relatively safe level approximately five minutes 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 before replacing the analog source

Before replacing the A35 Analog Source assembly, check that the jumper is in the correct position.



What to do after replacing an assembly

Option and configuration information is stored in the A40 CPU assembly and A42 Memory assembly. Providing only one assembly is replaced at a time, the option and configuration information will be stored in the replaced assembly at power up. If both the A40 and A42 must be replaced at the same time, refer to the procedures in service note 89410-09.

Follow this procedure after you replace an assembly.

1 Reinstall all assemblies and cables that were removed during troubleshooting.

2 After replacing the A40 CPU assembly, store the serial number in memory.

CAUTION: The serial number cannot 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]

3 After replacing the A40 CPU assembly, A42 Memory assembly, or A43 Expanded Memory assembly, install new firmware. The revision of software installed in these assemblies must match.

4 After replacing the A43 Expanded Memory assembly, set the LAN address (see the *Installation and Verification Guide*).

5 Do the required adjustments listed in the following table.

6 Do the self test (page 1-32).

7 Do the required performance tests listed in the following table (see the *Installation and Verification Guide*).

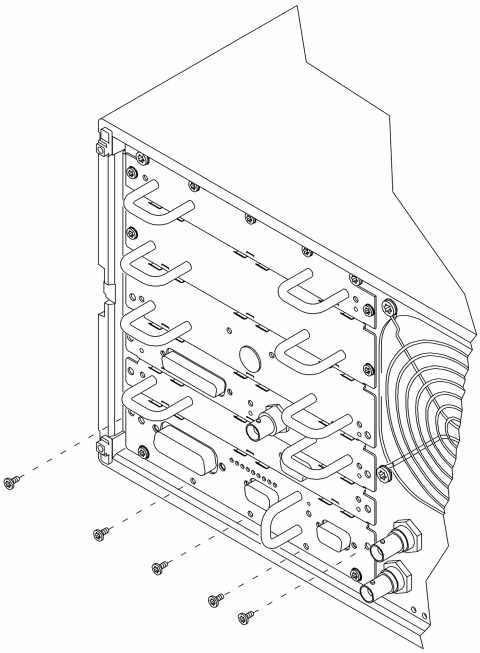
Assembly Replaced	Adjustment	Performance Test
A10 Analog Input , channel 1	Input flatness, page 2-10- Input capacitance, page 2-13- Input offset, page 2-16 Anti-alias filter, page 2-18 Calibrator, page 2-37	Amplitude accuracy Amp_phase match (option AY7 only) Input trigger Harmonic distortion Input capacitance DC offset Spurious signals Noise
A10 Analog Input, channel 2	Input flatness, page 2-10 Input capacitance, page 2-13- Input offset, page 2-16- Anti-alias filter, page 2-18	Amplitude accuracy Amp_phase match (option AY7 only) Input trigger Harmonic distortion Input capacitance DC offset Spurious signals Noise
A11 Front Panel Connector		
A12 Rear Panel Connector		
A21 A/D Converter, channel 1	ADC, page 2-24- Calibrator, page 2-37	Amplitude accuracy Amp_phase match (option AY7 only) Harmonic distortion DC offset Spurious signals Noise
A21 A/D Converter, channel 2	ADC, page 2-24	Amplitude accuracy Amp_phase match (option AY7 only) Harmonic distortion DC offset Spurious signals Noise
A30 Digital Source		
A35 Analog Source	10 MHz low pass filter, page 2-25 Calibrator, page 2-37	Amplitude accuracy Source amplitude accuracy Source distortion
A36 Trigger	Autorange detect level, page 2-29	Amp_phase match Input trigger External trigger External arm
A40 CPU	Calibrator, page 2-37	
A42 Memory		
A43 Expanded Memory		
A47 DSP/Display Controller		
A50 Digital Filter		
A55 Sample RAM		
A56 Expanded Sample RAM		

A60 Frequency Reference	Reference oscillator, page 2-32	Frequency accuracy
A61 Clock	Clock, page 2-34	Frequency accuracy
A71 Pass Through		
A81 Keyboard		
A82 Flat Panel Display Interface		
A85 Oven	Oven shutdown, page 2-7 Oven frequency, page 2-34	Frequency accuracy
A90 Digital Motherboard		
A91 Analog Motherboard		
A92 Probe Power		
A95 Main Power Supply		
A96 Primary Power Supply		
A100 Display		
A101 Disk Drive		

To remove CPU and memory

1

Using a T-10 torx driver, remove the five screws from the #6 cover.

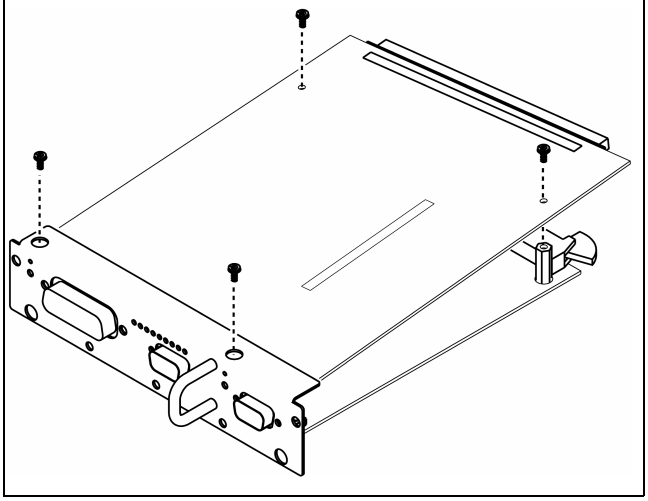


2

Pull the assemblies out of the card nest and disconnect the cables. The cables can be pulled about two inches out of the card nest.

3

Remove the four screws that hold the assemblies together. Use a T-8 torx driver to remove the two front screws and a T-10 torx driver to remove the two rear screws.



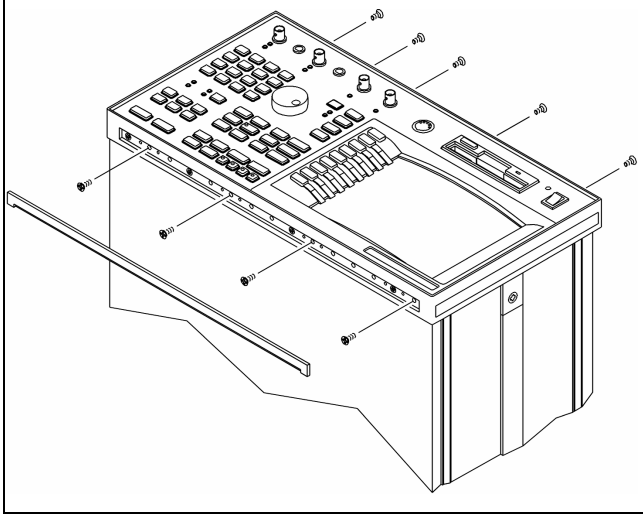
4

Unplug the A40 CPU assembly from the A42 Memory assembly.

To remove front panel

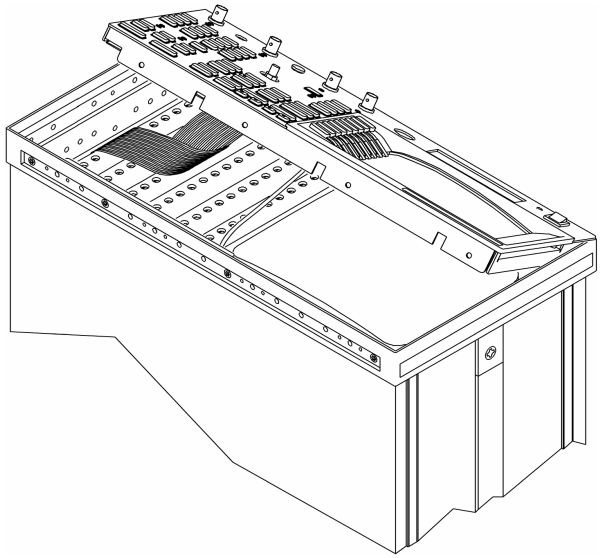
1

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



2

Pull the top of the front panel out of the frame.



3

Disconnect the ribbon cable from the A82 Flat Panel Display Interface assembly. Disconnect the ribbon cable from the Keyboard assembly. Disconnect the coaxial cables connected to the front panel BNCs. Disconnect the probe power cables connected to the A91 Analog Motherboard assembly. Disconnect the power switch cable.

To remove the Flat Panel Display

1 Remove the front panel (see ‘’To remove front panel’’page 3-10).	**2** Unplug the 3 pin connector from the A82 Flat Panel Interface assembly. .
3 Using a T-10 torx driver, remove the six screws from the A82 shield. Remove the A82 shield, then disconnect the ribbon cable from the A82.	**4** Using a T-10 torx driver, remove the four screw from the display bracket. Remove the display bracket by sliding down slightly towards the power switch, then lifting off.

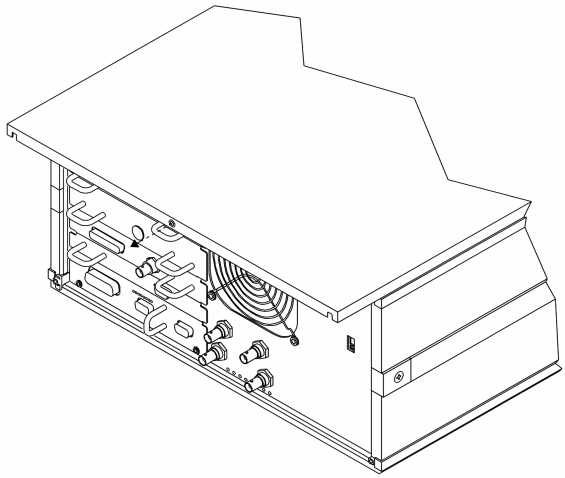
To place the A82 in the test position

1

Remove the front panel (see ‘’To remove front panel’’page 3-10).

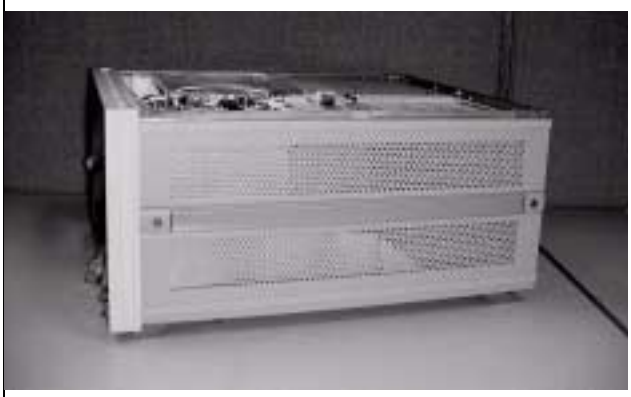
2

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



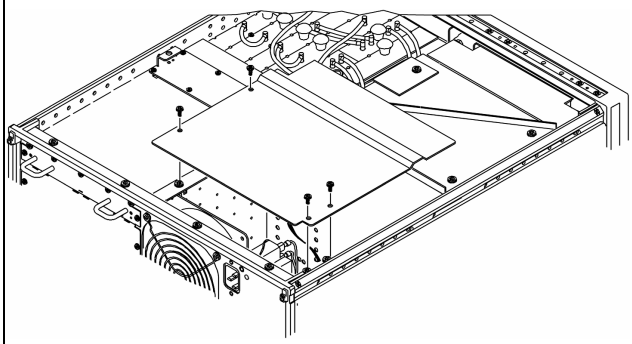
3

Using a 2 point posidrive, remove the screw from both end caps of the right side strap handle. Remove the strap handle and side cover.



4

Using a T-15 torx driver, remove the four screws from the power supply shield. Remove the power suppply shield.



5

Unplug the 3 pin connector from the A82 Flat Panel Interface assembly.

6

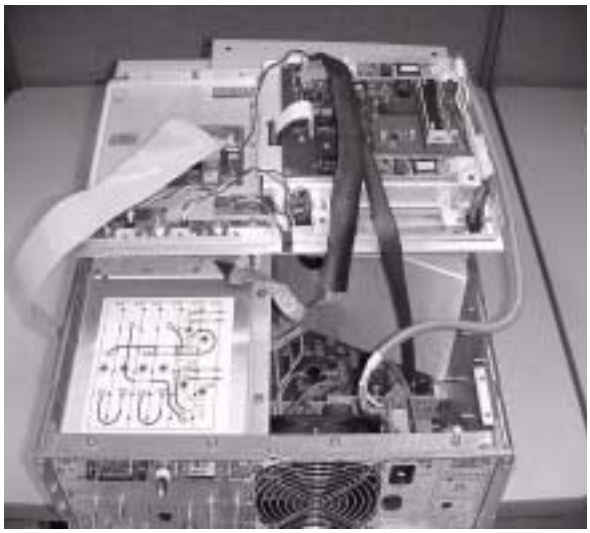
Using a T-10 torx driver, remove the six screws from the A82 sheild. Remove the A82 shield.

7

Reconnect the 3 pin connector to the A82 Flat Panel Interface assembly.

8

Route W4, W6, and W17 to the top and reconnect to the front panel assembly. W4 will need to be unplugged from A90P10 in order to route it under the air dam.



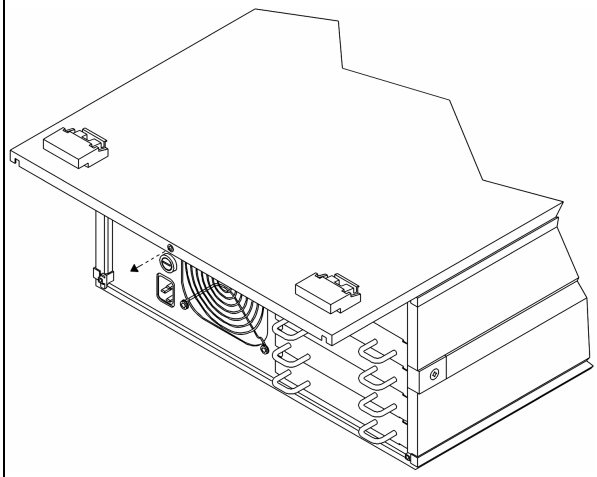
To remove disk drive

1

Remove the front panel (see ‘’To remove front panel’’page 3-10).

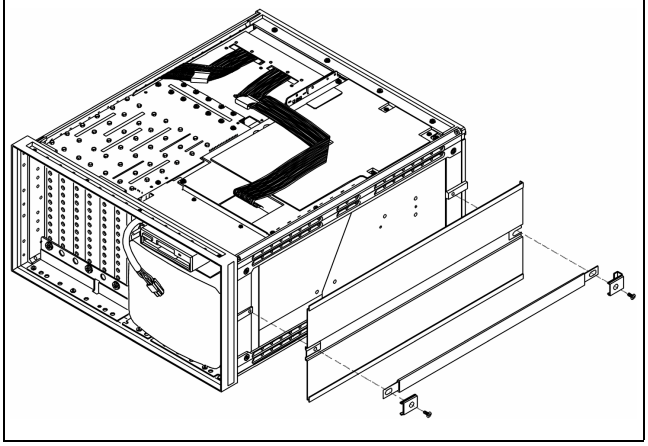
2

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



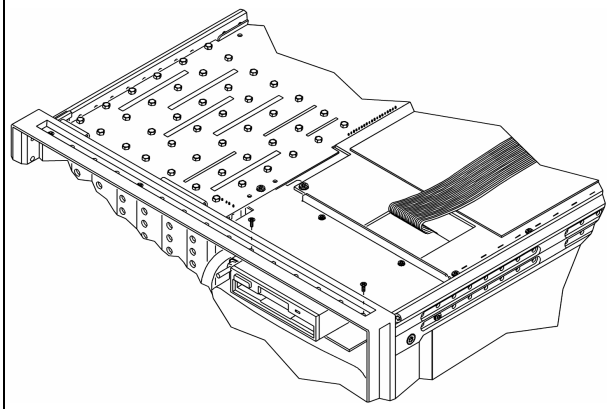
3

Using a 2 point pozidriv, remove the screw from both end caps on the strap handle nearest the Disk Drive assembly. Remove the strap handle and side cover.



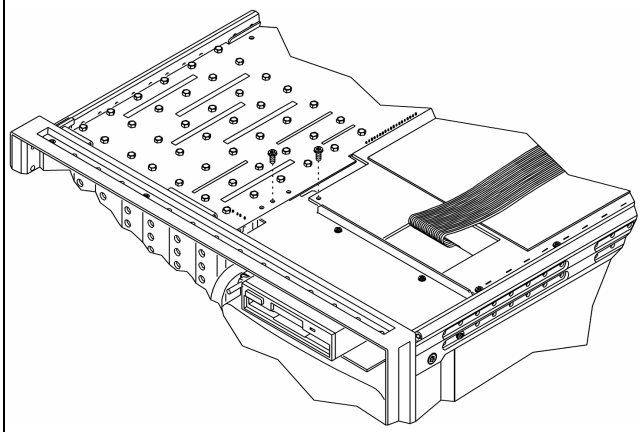
4

Using a 2 point pozidriv, remove the two screws from the front frame.



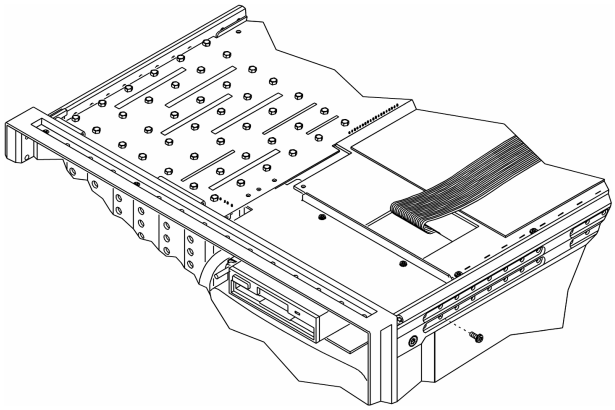
5

Using a T-15 torx driver, remove the two screws from the disk drive bracket.



6

Using a T-15 torx driver, remove the screw from the side strut.

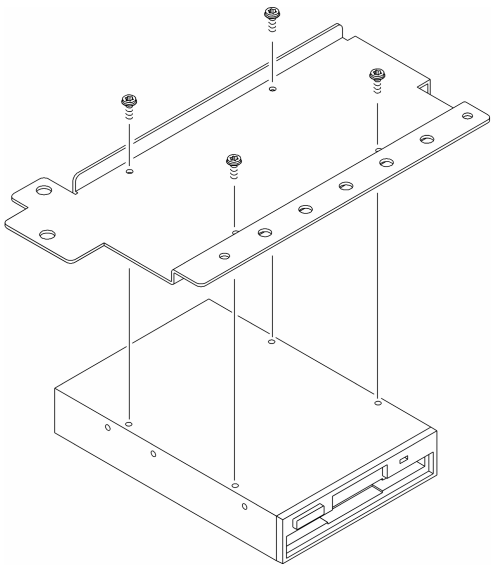


7

Note the polarity of the disk drive cable (the cable is not keyed to the Disk Drive assembly and can be incorrectly connected). Disconnect the disk drive cable from the Disk Drive assembly. Carefully guide the Disk Drive assembly, dust cover, and bracket out the front.

8

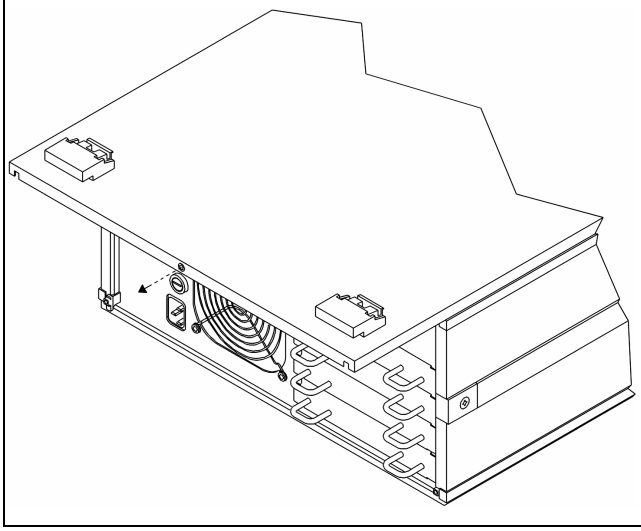
Using a T-10 torx driver, remove the four screws from the disk drive bracket.



To remove main power supply

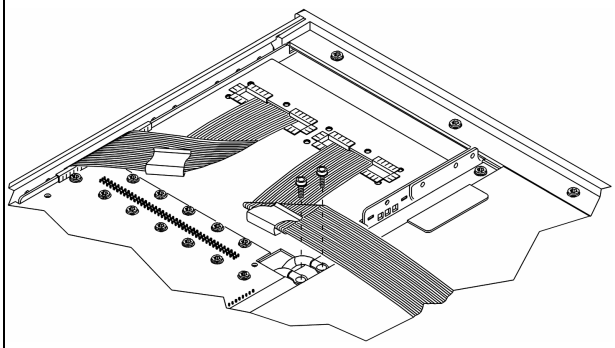
1

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



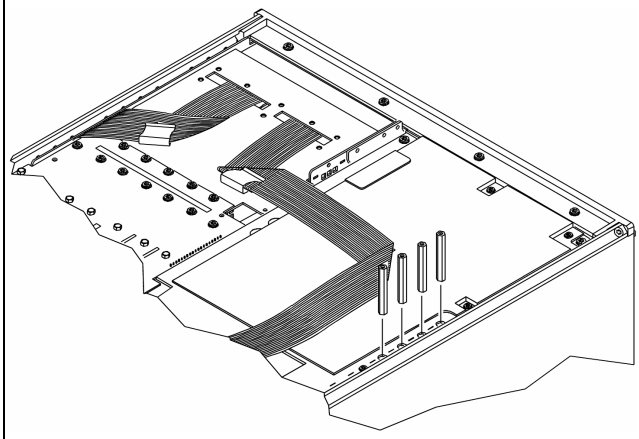
2

Using a 2.5 mm hex driver, remove the screws that fasten the red cable to A95 J301 and the black cable to A95 J302.



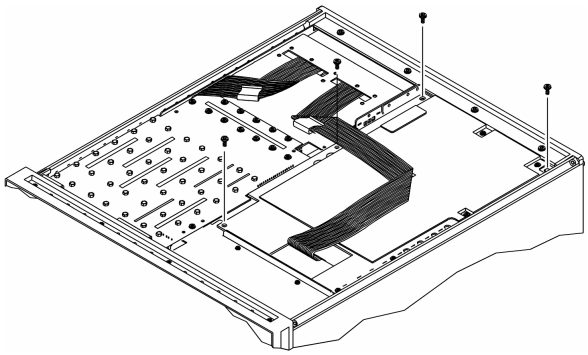
3

Using a 6 mm nut driver, remove the four standoffs.



4

Using a T-15 torx driver, remove the four screws from the A95 Main Power Supply assembly.

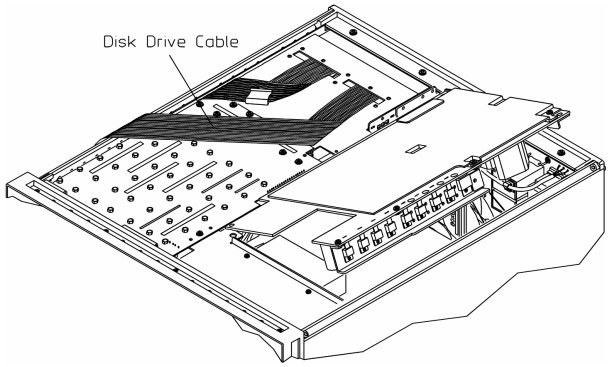


5

Note the polarity of the disk drive cable (the cable is not keyed to the Disk Drive assembly and can be incorrectly connected). Disconnect the disk drive cable from the Disk Drive assembly.

6

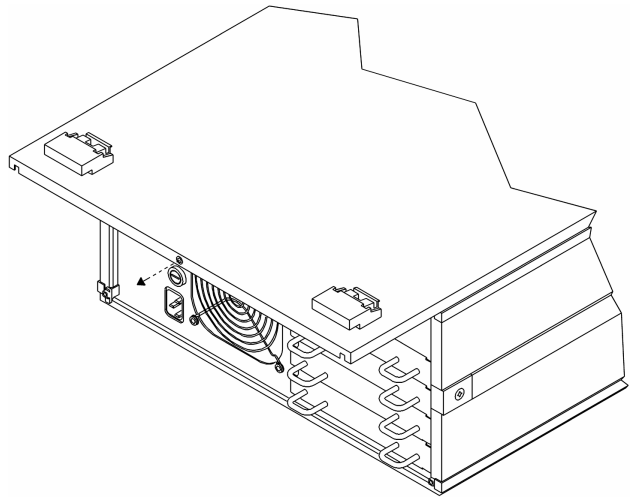
Lift the A95 Main Power Supply assembly up and disconnect all cables.



To remove analog motherboard

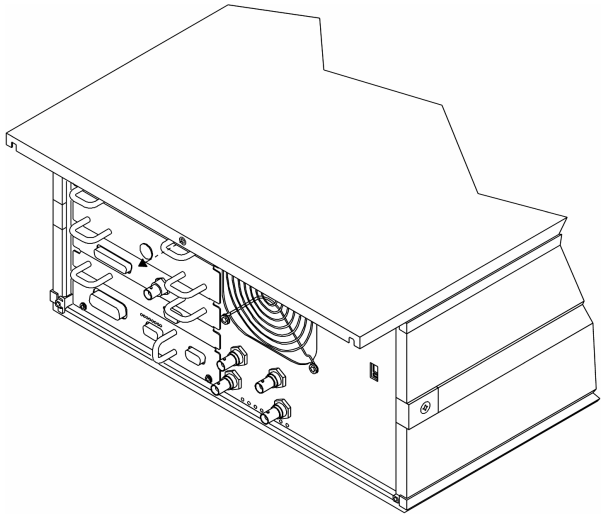
1

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



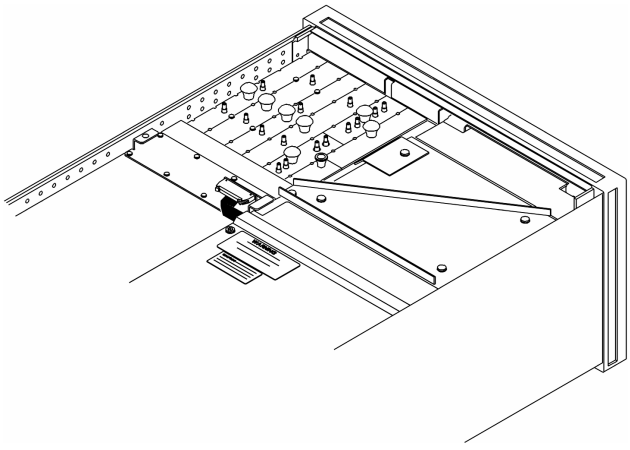
2

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



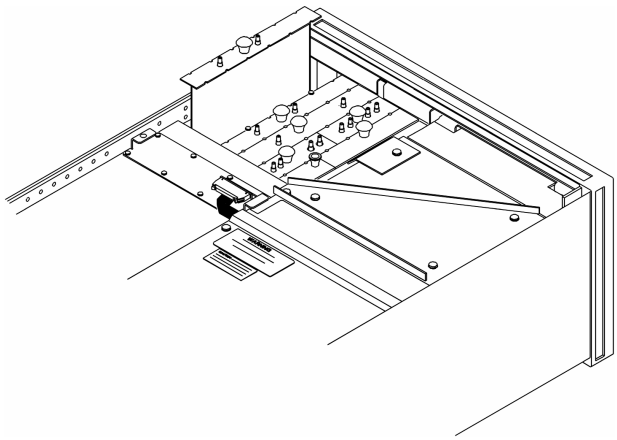
3

Disconnect the coaxial cables from the assemblies.



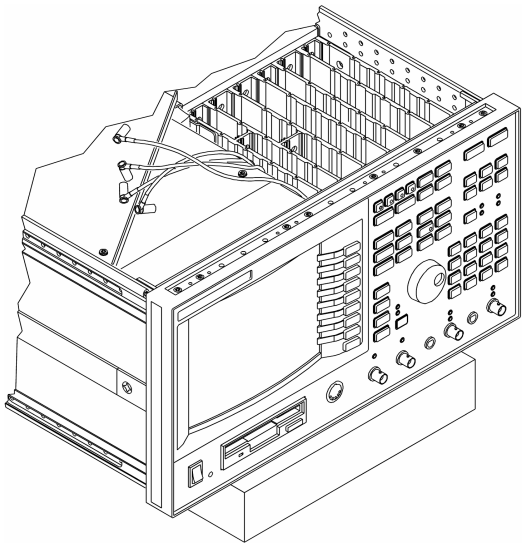
4

Using a 5 mm nut driver, remove the screws holding the assemblies in the card nest. Remove all the assemblies from the card nest.



5

Raise the front of the analyzer off the bench by placing a book under the analyzer's front frame.

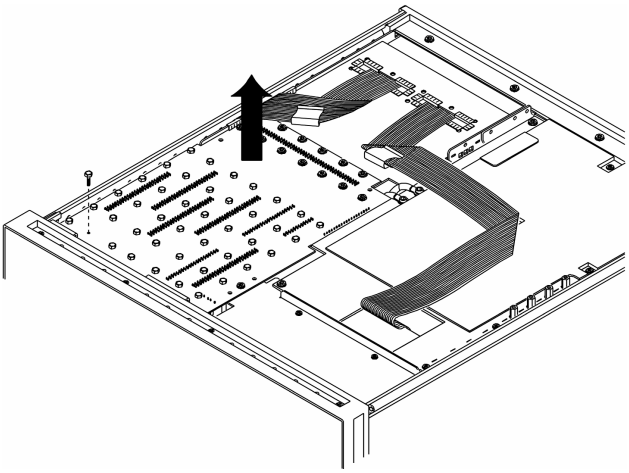


6

Position the motherboard cable extraction tool (from the service kit) inside the cardnest over the coaxial cable connector for the A35 Analog Source assembly. Carefully lower the tool allowing the center to come up as the tool is lowered into position. Once in position, push the center down to push the cable out of the A91 Analog Motherboard. Repeat for the A10 Analog Input assemblies.

7

Remove the screws from the A91 Analog Motherboard. Use a 5 mm nut driver for 42 screws, a T-10 torx driver for 13 screws, and a T-15 torx driver for 1 screw.



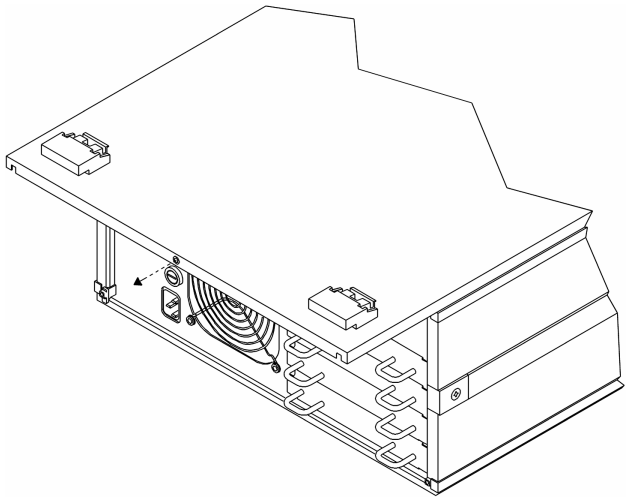
8

Lift up the A91 Analog Motherboard unplugging it from the A90 Digital Motherboard. Disconnect the power supply cable from A91 P2 and the probe power cables from A91 P3 and P5.

To remove rear panel

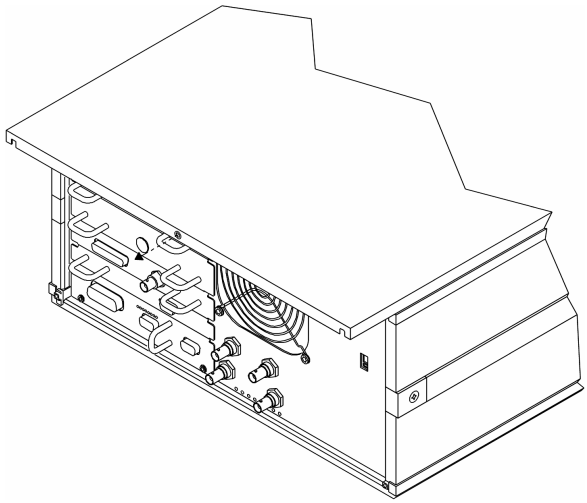
1

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



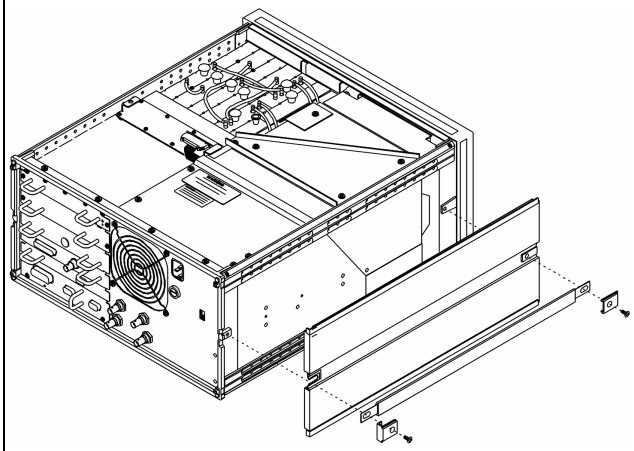
2

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



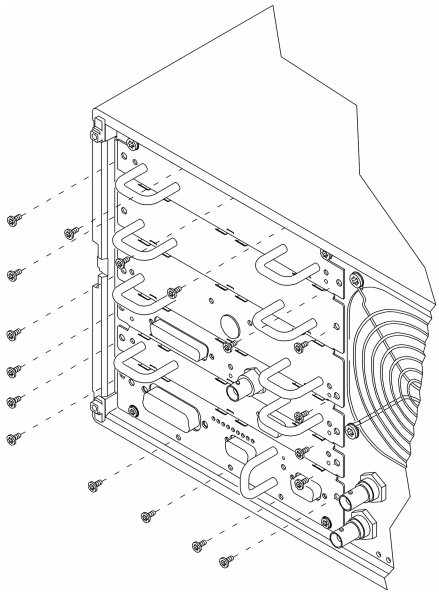
3

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



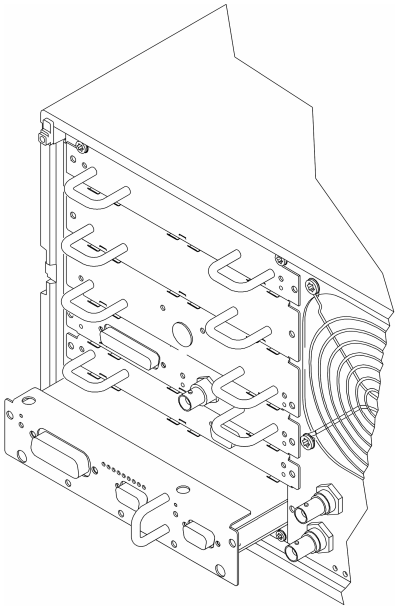
4

Using a T-10 torx driver, remove the screws from the assembly covers.



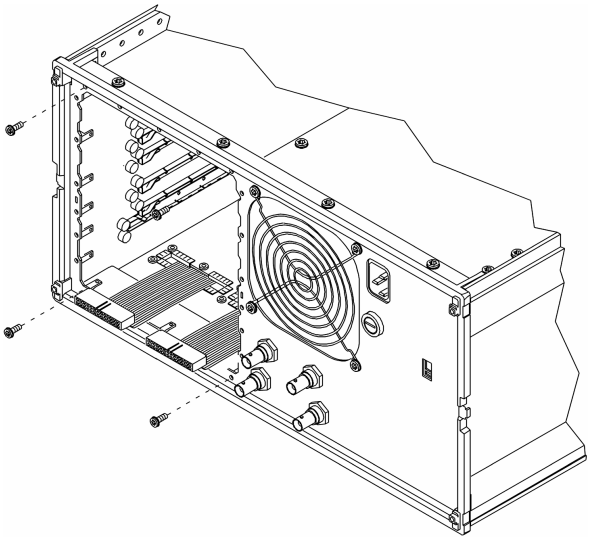
5

Remove all assemblies attached to the covers. When removing cover #6, pull the assemblies out and disconnect the cables. Assemblies not attached to a cover may be left in the card nest.



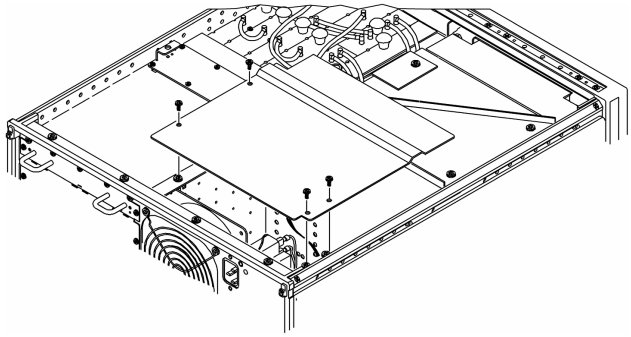
6

Using a T-10 torx driver, remove the four screws that fasten the rear panel to the card nest.



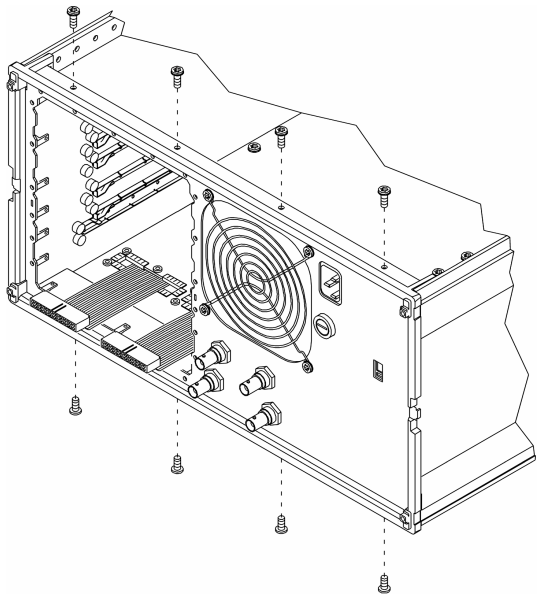
7

Using a T-15 torx driver, remove the four screws from the power supply shield. Remove the power supply shield.



8

Using a T-15 torx driver, remove the four screws on top and bottom of rear frame.

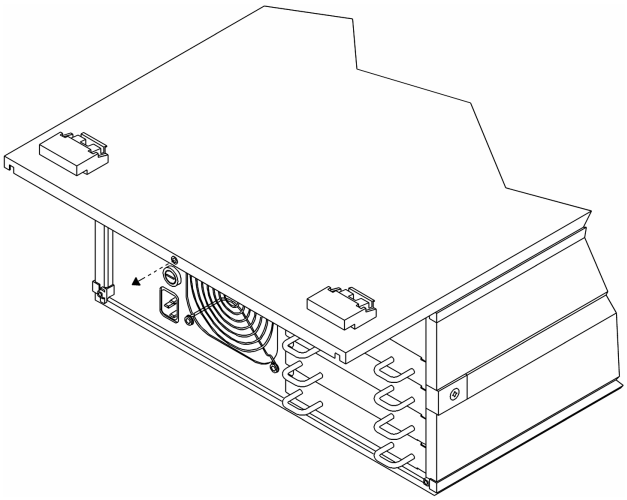


9 Disconnect the cables connected to A36 J3, A60 J4, and A60 J5. Remove the gray cable from the cable clamp on the right rear of the display. Disconnect the fan cable from A95 P353. Disconnect the primary power cables from A95 P350 and A95 P352. Disconnect the power switch cable from the A96 Primary Power Supply assembly, fuse holder, and line filter (use a 7 mm nut driver to disconnect the orange wire from the line filter). For analyzers with the oven option, disconnect the cable to OVEN REF OUT. Pull the top of the rear panel out of the frame.	

To remove digital motherboard

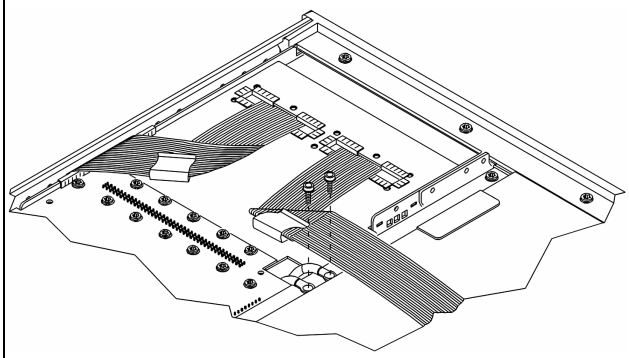
1

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



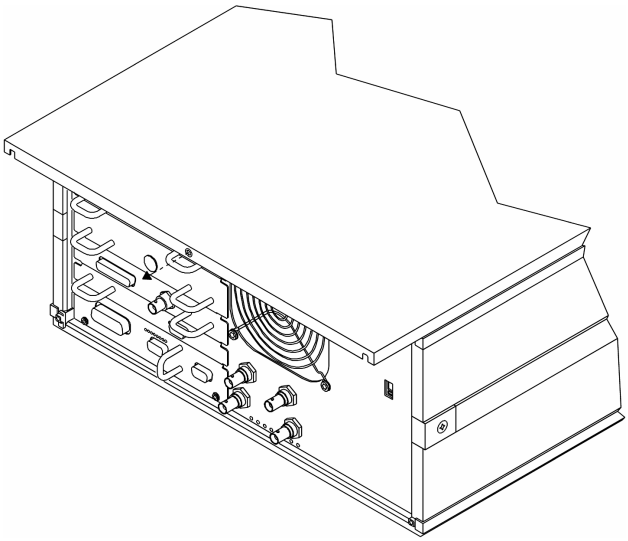
2

Using a 2.5 mm hex driver, remove the screws that fasten the red cable to A95 J301 and the black cable to A95 J302.



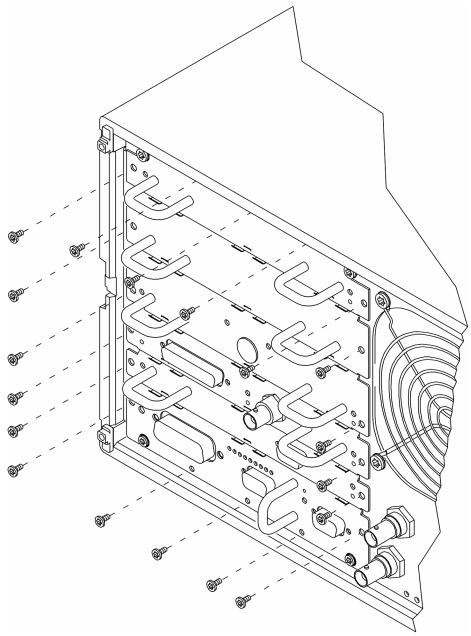
3

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



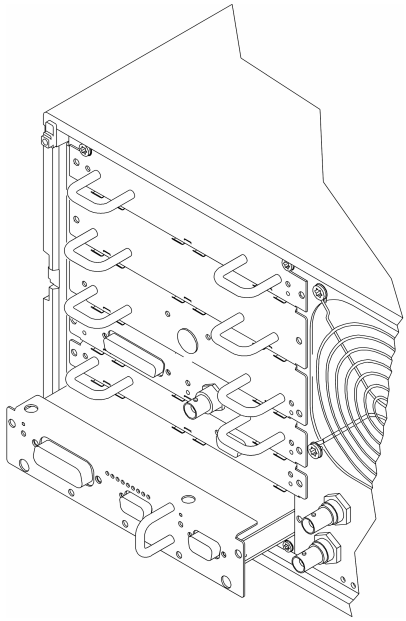
4

Using a T-10 torx driver, remove the screws from the assembly covers.



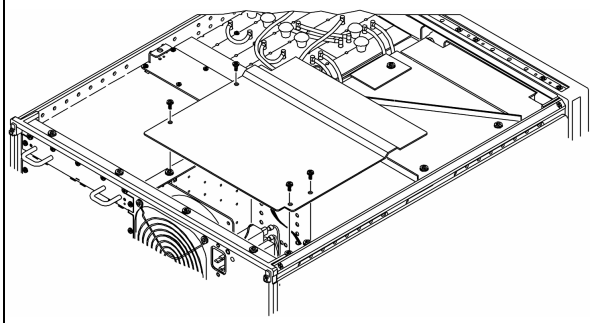
5

Unplug all assemblies from the A90 Digital Motherboard. To unplug the assembly behind cover #3, remove assembly attached to cover #3.



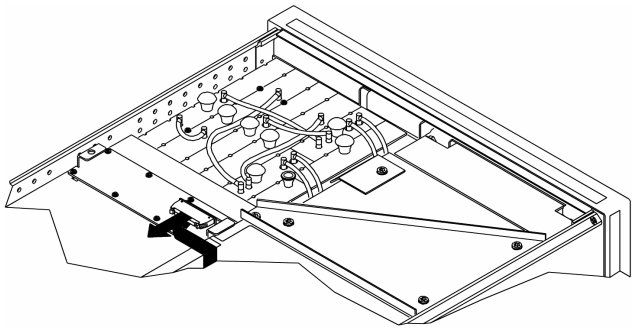
6

Using a T-15 torx driver, remove the four screws from the power supply shield. Remove the power supply shield.



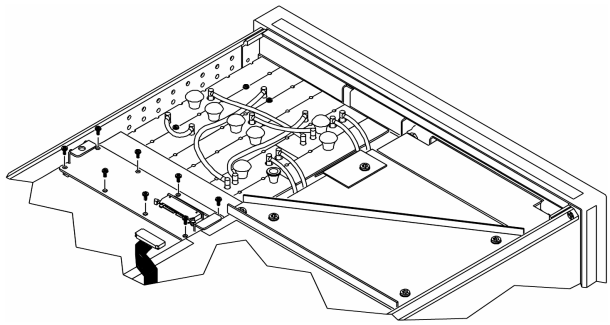
7

Disconnect the display cable from the A90 Digital Motherboard.



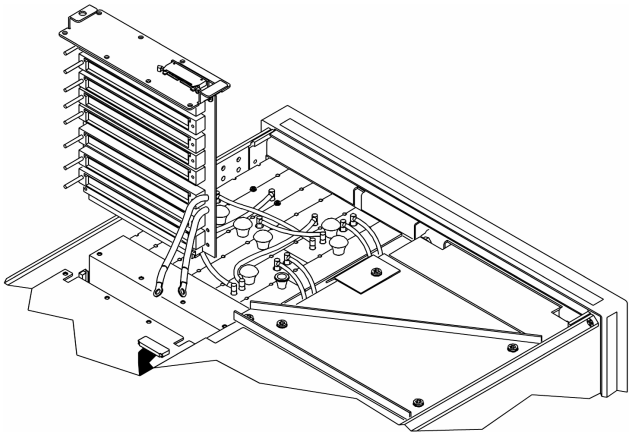
8

Using a T-10 torx driver, remove the eight screws from the A90 Digital Motherboard.



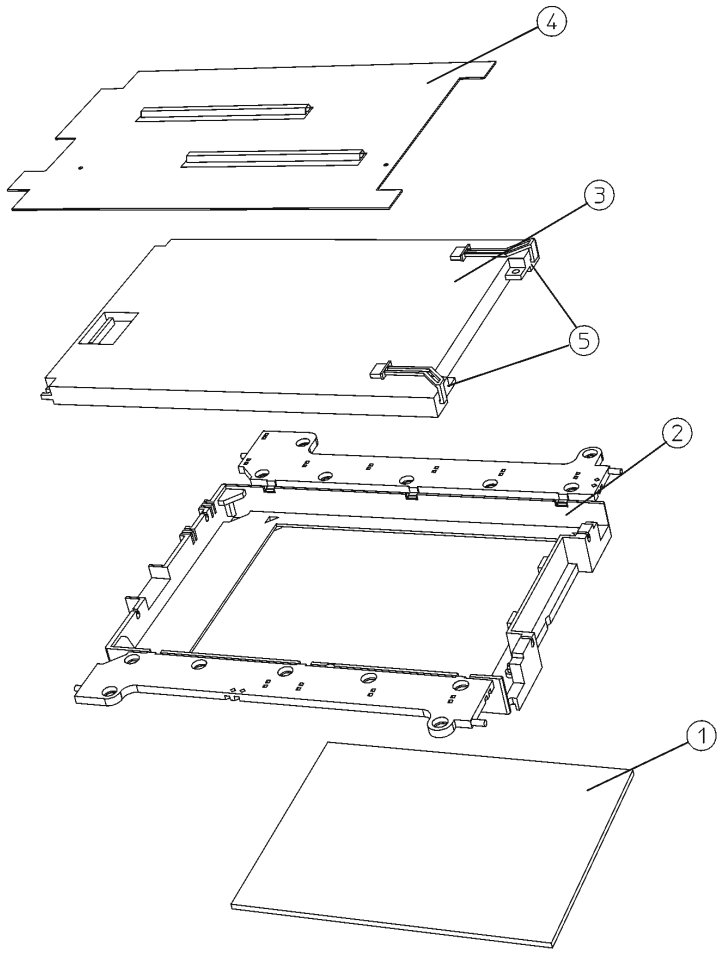
9

Pull the A90 Digital Motherboard out of the card nest.



A100 Display, Backlights, and Filter

Display Parts



Refer to firgure above. The display assembly consist of:

- EMI filter (1)
- display mount (2)
- LCD with backlights (3)
- display shield board (4)

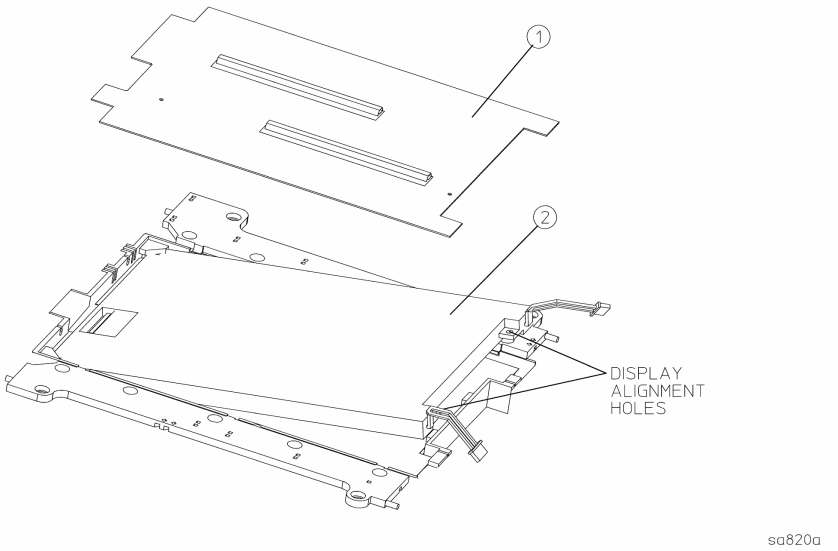
Display Removal

CAUTION: The new flat panel display comes with a protective plastic sheet over the glass. Remove this plastic very slowly to avoid damage due to ESD.

CAUTION: The surface of the display is very easily scratched. Avoid touching it with your bare hands or other objects. Use a blower to remove any dust from the display surface.

1. Remove the rubber mount that houses the display assembly from the front frame
2. Pull open the flaps of the rubber mount.
3. Remove the display shield board (1).
4. Now it is possible to carefully lift up on the display (2) to remove it from the rubber mount.

A2 Display Replacement



Display Replacement

1 Carefully slide the display into the rubber mount. Align the pins on the mount with the holes in the display.

2 Replace the display shield.

3 Close the flaps on the rubber mount.

4 Carefully place the display mount into position in the front frame assembly as shown in Display Removal procedure.

5 Plug the flat flex cable into the display connector.

Backlight Removal / Replacement

There are two backlight assemblies installed in the flat panel display.

NOTE: The backlight lamps should be replaced as a pair, even if only one lamp is bad. The other one might fail shortly.

Refer to the "Display Removal" procedure on page 3-27. Unplug the backlight cables from the backlight connectors

It is not necessary to remove the display mount from the front frame to change the backlights.

The following Figure shows how the backlights slide out of the display. Carefully pull on the tab on the backlight assembly (2) to slide the backlight partially out of the display. Once the end of the backlight casing is exposed, you can pull it straight out from the display.

NOTE: Do not touch the bulb encased in the plastic backlight assembly.

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1 Insert the new backlight assembly (2) by sliding it into the display, non-wired end first, taking care not to force it. It is keyed so it will only fit properly one way. Slide it all the way in to the end of the casing.

2 Connect the backlight cables to the backlight connectors.

Display Backlight Replacement