



TROUBLESHOOTING BASICS

dc power supplies

Don Fielder, Hewlett-Packard

One of the major considerations given a linear supply is the internal power dissipated by the series regulator. Figure 1 shows a simple diagram of a fixed input power supply. If this were a 50-amp supply such as the HP 6269B DC Power Supply operated at full current and minimum voltage (RL shorted), the power dissipated in the series regulator would be about 2.5 KW ($V_{in} - V_{out} \times 50A$).

Since the practical power limit for a T03 transistor is about 50 watts, this would mean using 50 transistors for the regulator—a prohibitive solution both from an initial cost and the reduced operating efficiency that would result.

Figure 2 shows one approach to solve this problem. By monitoring the voltage across the series regulator and adjusting V_{in} to maintain the regulator voltage at about 3 volts, the power is reduced from 2.5 KW to 150 watts. This 3-volt regulator voltage is held relatively constant regardless of input or output conditions.

Keep this in mind when troubleshooting a unit that has no control (either locked up or down). In almost every case, if you have any output, the preregulator is probably operating properly. If you have no output but do have regulator voltage (3 to 6 volts), again no problem with

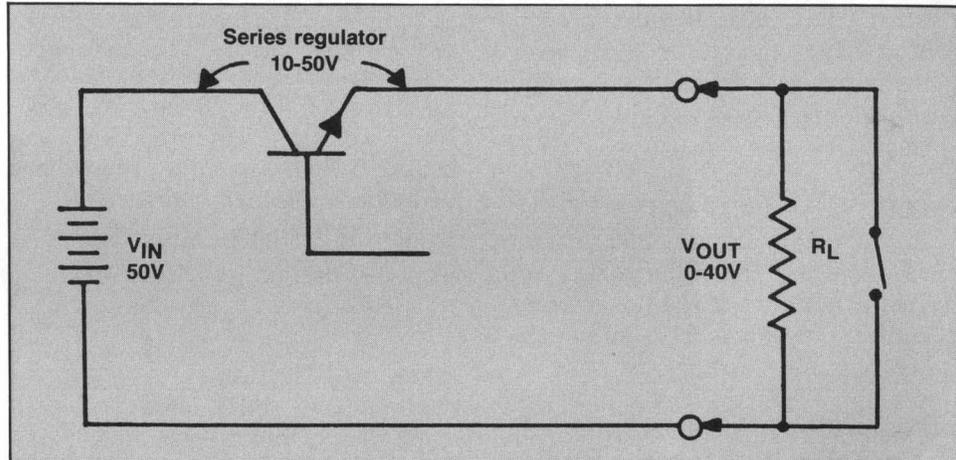


Figure 1. Sample fixed input power supply.

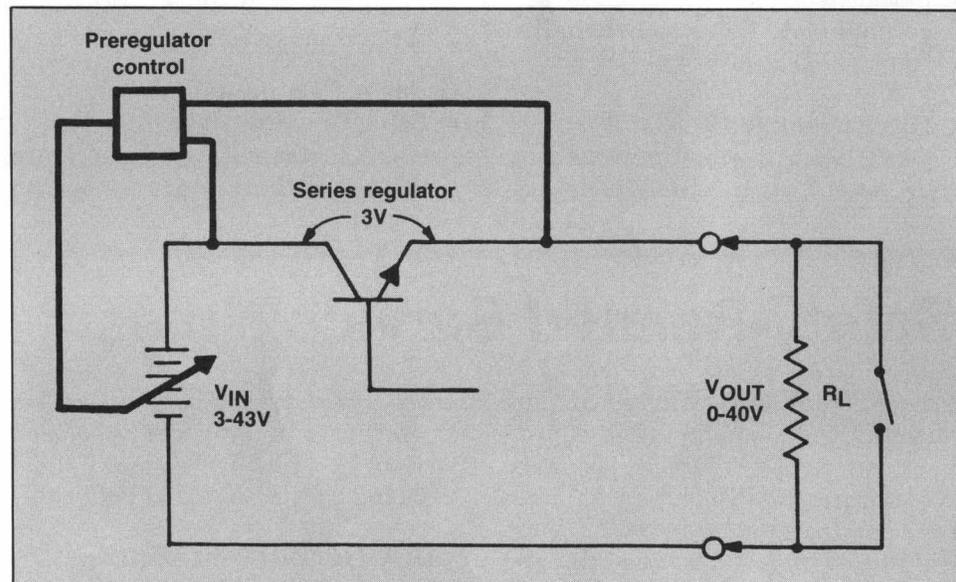


Figure 2. Sample regulator solution.

the preregulator. ONLY when you have BOTH no output AND no regulator voltage (<1 volt) should you suspect the preregulator.

Got a Scratch That Needs Repairing?

Use HP Touch-up Paint

Hewlett-Packard stocks touch-up paint in air-drying aerosol spray cans. The available colors match nearly all standard HP instrument cabinets and front panels. Use the following guidelines for ordering the appropriate colors.

Front Panels

■ Mint Gray (6010-0813)

Most front panels on our newer instruments are mint gray. You can identify it as a light creamy color.

■ Light Gray (6010-0035)

Front panels on our older instruments are a light bluegray. Instruments with this color of front panel sometimes have matching cabinets in a darker blue gray.

■ Cocoa Black (6010-0927)

Cocoa black is sometimes used as an accent color on the front panels of our newer instruments. It has a little less blue in it than the olive black. As a general guideline, use cocoa black touchup when the front panel is mint gray.

■ Olive Black (6010-0812)

Olive black is sometimes used as an accent on the front panels of

our older and some newer instruments. It is very close in shading to cocoa black, except the olive has a little more blue.

■ Jade Gray (6010-0542)

Jade gray is sometimes used as an accent around groups of controls. It is also the color of most of the knobs. Jade gray is considerably darker than mint gray.

Cabinets

Cabinets are the enclosures for the instruments. Discounting the obsolete HP instruments that are redish/brown in color, there are three basic cabinet colors:

System II design — Moss Gray

System I design — Olive Gray

Early design — Blue Gray

(System II Cabinets)

■ Moss Gray (6010-0801)

Molded cabinets and newer instrument cabinets are moss gray. You can identify System II cabinets by their handles. The handles are separate pieces, flared outward and attached to the edges of the front panel.

(System I Cabinets)

■ Olive Gray (6010-0814)

Older instrument enclosures are painted with olive gray. You can

also identify System I cabinets by their handles. The handles are an integral extension of the aluminum side frame.

(Early Design)

■ Blue Gray (6010-0805)

Really old instrument enclosures are a distinctive blue gray and are usually wrinkled like vinyl.

Application

Surface preparation and the actual application of spray paint is an entire subject in itself. Therefore, it is beyond the scope of this article to describe detailed surface preparation and painting procedures. However, for minor scratches, we can recommend that you clean the area with a solution of water and alcohol and apply the paint with a small stick or Q-tip. Beyond this, proceed at your own risk.

Ordering

You can order these paints through the Mail Order Department at the Hewlett-Packard Corporate Parts Center, or through your local HP sales/service office.

For direct mail ordering write to:

Hewlett-Packard

Mail Order Department

P.O. Box 7220

Mountain View, CA 94043

Safety-Related Service Notes

Service Notes from HP relating to personal safety and possible equipment damage are of vital importance to our customers. To make you more aware of these important notes, they are printed on paper with a red border, and the service note number has a "-S" suffix. In order to make you immediately aware of any potential safety problems, we are highlighting safety-related service notes here with a brief description of each problem. Also, in order to draw your attention to safety-related service

notes on the service note order form at the back of *Bench Briefs*, each appropriate number is highlighted by being printed in color.

419A DC Null Voltmeter

Several of the voltmeters produced by Hewlett-Packard have the capability to make a floating voltage measurement (i.e. measure a voltage that is not referenced to earth ground.) To accomplish this measurement, the grounded enclosure of

the voltmeter is electrically isolated from both the "high" and the "low" input terminals. When the voltmeter contains an internal battery and the battery mode is used, this outer enclosure is not grounded.

One example is the HP 419A DC Null Voltmeter. It was designed with a metal case that necessitated special precautions to maintain the DC isolation. Short screws are used to attach the side covers to the outer framework. If, by any chance, the

side covers have been removed and then replaced with the wrong length screws, it is possible for the longer screws to short the LOW input terminal to the outer chassis in the battery mode. This would allow the low terminal's voltage to be connected to the outer chassis resulting in a possible shock hazard to the operator.

The correct length screws are 0.188 inch, 6-32, flat head screws. For more information, order Safety Service Note 419A-13-S.

8080A Data Generator

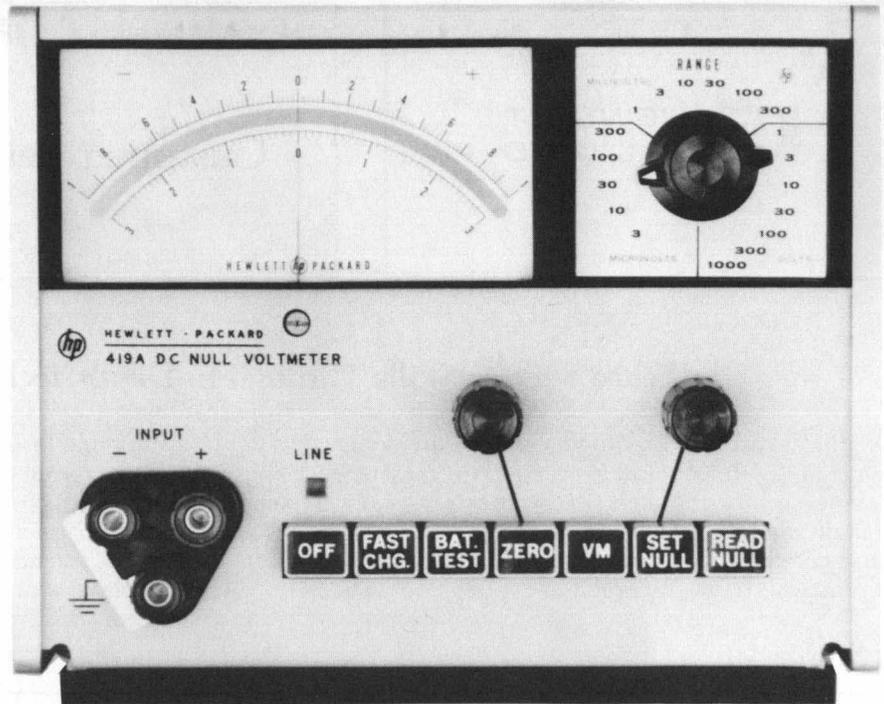
8160A Programmable Pulse Generator

8161A Programmable Pulse Generator

There is a possibility that the line fuse may be wired into the neutral (return) side of the line supply on some of the above instruments. To check your instrument, perform the following test.

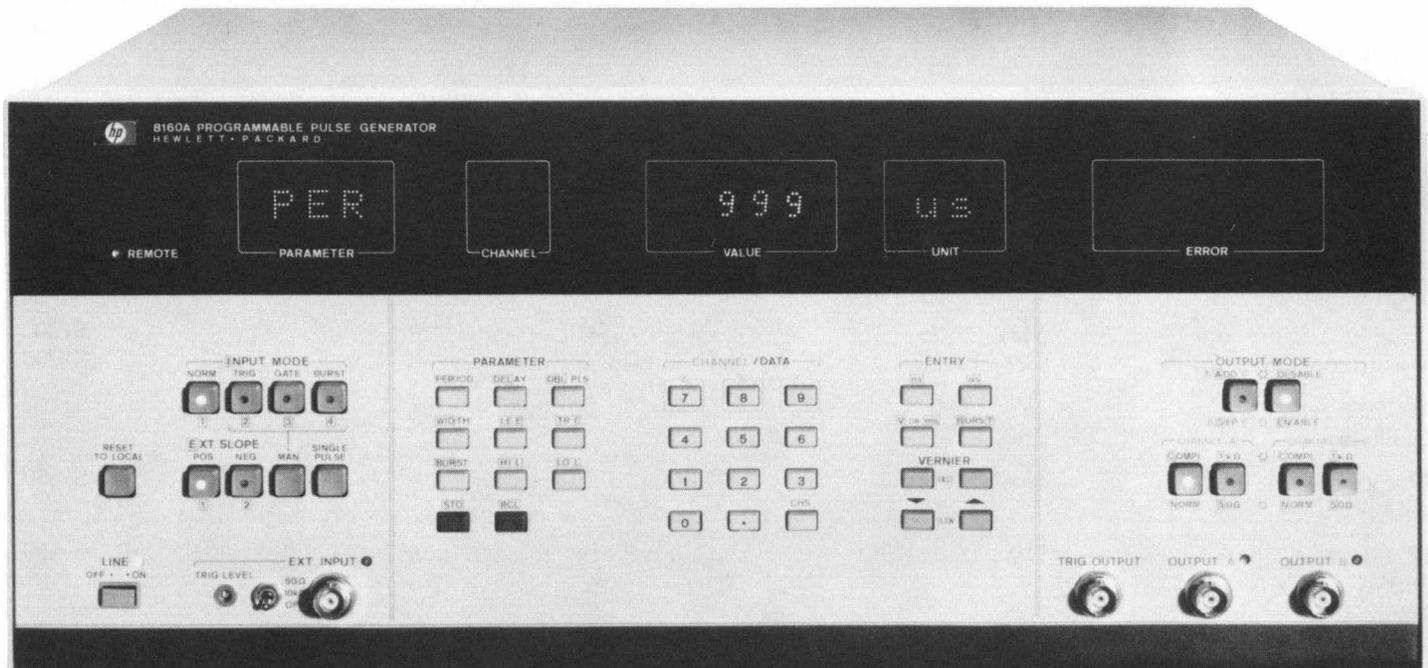
1. Remove the power cord and fuse cover.

Model 419A DC Null Voltmeter



2. Using an ohmmeter, check that there is 0 ohms between the line terminal (L) of the line connector (J1) and the tip of the fuse.
3. If this is correct the instrument is wired correctly and no further action is required.

If your instrument is not wired correctly, order Safety Service Notes 8080A-1-S, 8160A-7-S, and/or 8161A-3-S for the rewiring procedure.



8160A Programmable Pulse Generator



1984 Customer Service Training Calendar

January, 1984

Learn Service Skills Through In-Depth Technical Instruction

Hewlett-Packard service training courses are designed to provide in-depth technical instruction for maintenance personnel seeking the skills needed to troubleshoot, repair, and maintain HP instruments and instrument systems. Course concepts are taught through a balance of theory and practical, hands-on exercises.

Ordering Instrument Service Training is easy. Simply contact your local HP Field Representative and tell him or her which courses you wish to attend. If you require a course on an instrument or instrument system not listed on the calendar below, ask your Field Representative if a special arrangement can be made.

Customer Service Training Calendar

Content	Dates	Location	Tuition per Student
Logic Systems			
HP 64000 Logic Development System	May 7-11	Logic Systems Division Colorado Springs, CO	\$1000
	Oct 22-26		
Scopes & Displays			
HP 1630A/D Logic Analyzer	Mar 7-9	Colorado Springs Division Colorado Springs, CO	\$ 900
	Apr 3-5	Beoblingen, Germany	\$ 900
	Jun 26-28	Colorado Springs Division	\$ 900
	Sep 11-13		
HP 1600 Series Logic Analyzers	Mar 21-25	Winnersh, United Kingdom	\$1200
HP 1980 Oscilloscope Measurement System	May 21-25	Geneva, Switzerland	\$1200
	Oct 29-Nov 2	Colorado Springs Division	\$1200
HP 1700 Series Oscilloscope	Nov 5-9	Colorado Springs Division	\$1100
HP 1300 Series Displays	Nov 12-14	Colorado Springs Division	\$ 650
HP 1351A, 52104A, 52105A, 52106A Graphics Generator	Nov 15-16	Colorado Springs Division	\$ 450

Automatic Test

HP 3060A/61A/62A Board Test Systems	Feb	6-17	Manufacturing Test Division Loveland, CO	\$2100
	Apr	23-May 4		
	Jul	9-20		
	Sep	24-Oct 5		
	Dec	3-14		
HP 3065C Board Test System	Jan	30-Feb 10	Cupertino, CA	\$3400
	Mar	12-23		
	Apr	23-May 4		
	Jun	11-22		
	Jul	23-Aug 3		
	Aug	20-31		
HP 3065H Board Test System	Jan	9-20	Manufacturing Test Division	\$3400
	Mar	5-16		
	Apr	30-May 11		
	Jul	9-20		
	Sep	10-21		
	Nov	5-16		
HP DTS-70 Board Test System	Feb	27-Mar 2	Kirkland, WA	\$1200
	Apr	30-May 4		
	Jul	23-27		
	Oct	1-5		

RF & Microwave

HP 435A/436A	Sep	10	Stanford Park Division, Palo Alto, CA	\$ 225
HP 3047S/R/M	Oct	19	Spokane Division, Spokane, WA	\$ 225
HP 8640A/8640B (Opt. 004)	Oct	8-10	Spokane Division	\$ 675
HP 8656A	Oct	11-12	Spokane Division	\$ 450
HP 8660A/B/C	Oct	1-2	Spokane Division	\$ 450
HP 8662A/8663A	Oct	3-5	Spokane Division	\$ 450
HP 8672A	Sep	11-12	Stanford Park Division	\$ 450
HP 8901A/B/8902A	Oct	15-17	Spokane Division	\$ 675
HP 8903A	Oct	18	Spokane Division	\$ 225
HP 8970A	Sep	13-14	Stanford Park Division	\$ 450

Communications Test

Datacom Concepts	Mar	12-14	Colorado Telecommunications Division Geneva, Switzerland	\$ 675
	Apr	30-May 2		\$ 675
Datacom Concepts (Short Version)	Sep	17-18	Colorado Telecommunications Division Amsterdam, The Netherlands	\$ 450
	Nov	5-6		\$ 450
HP 4955A Protocol Analyzer	Mar	19-23	Colorado Telecommunications Division Geneva, Switzerland	\$1125
	May	7-11		\$1125
HP 4945A TIMS	Jan	16-18	Mountain View, CA Colorado Telecommunications Division	\$ 675
	Mar	12-14		\$ 675

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1820 Embarcadero Road, Palo Alto, CA 94303. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Sugunami-ku, Tokyo 168.

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Specifications subject to change without notice.

supplement to

BENCH BRIEFS SERVICE NOTE INDEX

Need Any Service Notes?

They're free!

Here's the latest listing of Service Notes. They recommend modifications to Hewlett-Packard instruments to increase reliability, improve performance, or extend their usefulness.

Use the order form at the rear of Bench Briefs to order, free of charge, individual Service Notes documenting several instruments.

If you would like to purchase large quantities of Service Notes covering a wide range of instruments, or if you desire a complete history of all Service Notes documenting all changes to your instruments, Hewlett-Packard offers a microfiche library for a modest, one time charge. There is also a microfiche subscription service available that automatically updates the library on a quarterly schedule.

The part numbers for the microfiche library and subscription service are:

Library of
Service Notes— 5951-6511
Subscription service— 5951-6517

Contact your local HP Sales Office for ordering information.

400E/EL AC VOLTMETERS

400E-14. Serials 1208A29188 and below. Preferred replacement of transistors A2Q14, A2Q15, and A2Q16.

400EL-1. Serials 2214A29268 and below. Preferred replacement of transistors A2Q14, A2Q15, and A2Q16.

400F/FL AC VOLTMETERS

400F/FL-8. Serials 734-01526 and above. Preferred replacement for transistor A2Q1.

410C ELECTRONIC VOLTMETER

410C-24. Serials from 098A22439 to 098A23564.

419A DC NULL VOLTMETER

419A-12. Replacement neon subassembly for photo-chopper assembly.

419A-13-S. All serials. Possible shock hazard when making a floating voltage measurement in battery mode.

436A POWER METER

436A-8. Serials 1938A04951 through 2101A12441. Modification to eliminate ground loop problem.

853A SPECTRUM ANALYZER DISPLAY

853A-4. All serials. Front panel replacement kits.
853A-5. Serials 2244A and below. Firmware revision to make 853A compatible with HP 7475A plotter.
853A-6. Serials 2244A00685 and below. Circuit board modification when replacing transistor A8Q4.
853A-7. All serials. Suppression of power supply oscillations.

1220A OSCILLOSCOPE

1220A-26A. Serials 1341A through 1709A. Recommended replacement for coupler shafts MP25 and intensity and focus potentiometers, A3R9 and R14.

1222A OSCILLOSCOPE

1222A-6. Serials 1341A through 1718A. Recommended replacement for coupler shafts MP25 and intensity and focus potentiometers, A3R9 and R14.

1345 DIGITAL DISPLAY

1345A-3. Serials 2331A and below. Model changes and compatibility between vintages of 1345A's.

1640B SERIAL DATA ANALYZER

1640B-4. Serials 2231A and below. Recommended replacement matrix board assembly.

1645A DATA ERROR ANALYZER

1645A-9. All serials. Modification to adapt 10388A interface to V.35 modems other than Bell type 306.

1803A DIFFERENTIAL/DC OFFSET AMPLIFIER

1803A-1. All serials. Recommended replacement S3 thumbwheel switch assembly.

1965A GATED UNIVERSAL COUNTER

1965A-1. Serials 2310A-00229 and below. Modification to eliminate hard key pressure.

3060A BOARD TEST SYSTEM

3060A-23B. All serials. System support package for 3060A Board Test System.

3065 CIRCUIT TEST SYSTEM

3065-1. Serials 2310-00113 and below. Modification to prevent power-up circuit oscillation.
3065-2. All serials. Recommended relay replacement procedure.
3065-3. New ASRU A/D Board Blue Stripe part number.
3065-4. All serials. 3065C fan speed sensor failures.
3065-5. Serials 2110-00113 and below. Modification of 11352-66507 and 11353-66508 to allow fixture verification.

3253A ANALOG STIMULUS/RESPONSE UNIT

3253A-8. Modification to reduce intermittent and reoccurring ASRU failures.

3335A SYNTHESIZER

3335A-9. Serials 1640A01900 and below. Modification to cure intermittent display blanking and random control.

3400A RMS VOLTMETER

3400A-14. Serials 2225 and below. Recommended replacement for the chopper amplifier.

3421A DATA ACQUISITION/CONTROL UNIT

3421A-1B. All serials. Semi-automated performance verification and calibration procedures.
3421A-2A. All serials. 44462A actuator/multiplexer jumper configuration.
3421A-3A. All serials. Transfer of boards from the United States and Canada.

3455A DIGITAL VOLTMETER

3455A-22A. Serials 1622A12900 and below. Recommended replacement of terminal assemblies.

3456A DIGITAL VOLTMETER

3456A-18. Serials 2201A08690 and below. Recommended replacement washers on A20 assembly.

3495A SCANNER

3495A-8B. Notification to obsolete service note 3495A-8.
3495A-9A. All serials. 20 channel test connector operation.

3497A DATA ACQUISITION/CONTROL UNIT

3497A-8B. All serials. Customer spare parts recommendations.
3497A-13. Modifications to prevent intermittent turn-on failures and/or front panel/interface lock-ups.
3497A-14. Recommended fuse replacement for 50 Hz operation.
3497A-15. Recommended input relay replacements for voltmeter option.

3581A/C WAVE ANALYZER

3581A/C-10. 3581A serials 1351A02699 and below; 3581C serials 2114A01834 and below. Modification to prevent digital display failures.

3710A IF/BB TRANSMITTER

3710A-23A. Serials 1849U-02471 and below. Improved cooling by retrofitting larger fan.

3712A IF/BB RECEIVER

3712A-9. All serials. EHT derived baseband ripple on 55kHz options (210, 211, 212 and 221).
3712A-10. Serials 2243U-00492 and below. Recommended insulator to prevent possible shorting between A30 assembly and CRT shield.

3717A 70MHZ MODULATOR/DEMODULATOR

3717A-3. All serials. Preferred replacement for A6U1.
3717A-4. All serials. Preferred replacement for A14 U5.

3746A SELECTIVE LEVEL MEASURING SET

3746A-7. All serials. Preferred replacement for A68 bus transceiver HP part number 1820-1689.
3746A-8. Serials 2320U-00371 and below. Preferred replacement for capacitor C3 to prevent irregular resets to the 3746A processor.
3746A-9. All serials. Preferred replacement for diode CR3.
3746A-10. All option 013 instruments. Preferred replacement for A41E1.

3747A/B SELECTIVE LEVEL MEASURING SET

3747A/B-25A. Serials 2143U-00136 and below. A315 broadband power detector—Thermopile Protection Retrofit Kit.
3747A/B-28. All serials. Preferred replacement for A203IC1 or A202A2IC2.

3763A ERROR DETECTOR

3763A-7A. Serials 2150U-00800 and below. Preferred replacement for A14IC27 (1820-1755) and 03763-60114 (timer assy.).

3771B DATA LINE ANALYZER

3771A/B-27. 3771A serials 2332U-00450 and below; 3771B serials 2332U-00178 and below. Possible HP-IB intermittent type problems caused by instruments overheating.
3771B-26. Serials 2227U-00168 and below. Modification to prevent possible frequency count error at -40dBm when set in the freq. measurement mode.

3777A CHANNEL SELECTOR

3777A-1A. All serials. Recommended replacement relay to improve reliability.
3777A-2A. All serials. Preferred replacement for assemblies A4, A5, A6, A7, A8.

3779A/B PRIMARY MULTIPLEX ANALYSER

3779A-26A. All serials. Modification to prevent intermittent incorrect operation of frame alignment measurement.
3779A-28. All serials. Preferred replacement of Horizontal Sweep Sync Driver I.C. A32 U2.
3779B-29. All serials. Preferred replacement of Horizontal Sweep Sync Driver I.C. A32 U2.

3779C/D PRIMARY MULTIPLEX ANALYSER

3779C-5. All serials. Service accessories for performance tests.
3779C-12. Serials 2235U-00308 and below. Preferred replacements—A1/A9/A15/A16/A18/A31/A37.
3779D-12. Serials 2235U-00243 and below. Preferred replacements—A1/A9/A15/A16/A18/A31/A37.

3782B ERROR DETECTOR

3782B-2-A. Serials 2218U-00266 and below. Preferred replacement for A32 assembly.

3793B DIFFERENTIAL PHASE DETECTOR

3793B-5. Serials 2309U00456 and below. Modification to reduce ripple on differential phase displays at low signal levels.

4955A PROTOCOL ANALYSER

4955A-1A. Firmware upgrade to revision 1.2 Operating Sys/1.0 Basic from revision 1.0 and 1.1 Operating Systems.

5061A CESIUM BEAM

5061A-14. Serials 2132A01870 to 2216A02078. Enhancing the reliability of A15 power regulator assembly.

5150A THERMAL PRINTER SPECIAL OPTION H01

5150A-6. All serials. Improvement of circuit triggering midnight print-out.

5180A WAVEFORM RECORDER

5180A-6B. Serials 2220A00300 and below. Input amplifier static protection and frequency bandwidth modifications.
5180A-8A. Serials 2224A00350 and below. Addition of wires to the -5.2V motherboard supply lines to improve reliability.
5180A-10A. Serial numbers: see table in body of the note. Firmware (ROM) revision 1.4 procedures.
5180A-17. All serials. Modification to prevent multiple cursor/display glitches.
5180A-18. All serials. 05180-60100/60500 hybrid shield exchange policy.

5245L ELECTRONIC COUNTER

5245L-11. All serials. Replacement kit for 10544-60536 oscillator part number 5061-6004.

5314A UNIVERSAL COUNTER

5314A-4. 05314-60004 assembly series 2016. Modification to improve option 001 (TCXO) performance.

5328A UNIVERSAL COUNTER

5328A-36. List of obsolete service notes.
5328A-37. All serials. Modification to correct intermittent miscounting in standard 5328A universal counters using HP P/N 1820-2317.

5335A UNIVERSAL COUNTER

5335A-16. List of obsolete service notes.
5335A-17. All serials. Replacing front end Schmitt amplifiers.

5420A/B DIGITAL SIGNAL ANALYZERS

5420A-29. All serials. 5420A cartridge tape incompatibility.
5420B-2. Serials 2304 and below. 5420B cartridge tape incompatibility.

5423A DIGITAL SIGNAL ANALYSER

5423A-3. Serials 2304 and below. 5423A cartridge tape incompatibility.

8080A DATA GENERATOR

8080A-1-S. All serials. Modification to prevent possible shock hazard; L1 line filter wiring.

8160A PROG. PULSE GENERATOR

8160A-3. Serials 1804G00181 and below, and serials 1903G00211 and below. Power supply modification to improve performance.
8160A-4. All serials. Section troubleshooting.
8160A-6. Serials 2047G00596 and above. New driver transformer for power supply regulator board A11 T101 HP P/N 08160-61103.
8160A-7-S. All serials. Modification to prevent possible shock hazard; L1 line filter wiring.

8161A PROG. PULSE GENERATOR

8161A-2. Serials 2202G00256 and above. New driver transformer for power supply regulator board A11 T101 HP P/N 08160-61103.
8161A-3-S. All serials. Modification to prevent possible shock hazard; L1 line filter wiring.

8165A PROGRAMMABLE SIGNAL GENERATOR

8165A-9. All instruments. Possibility of damaged relays in the event of excessive external voltage.

8444A TRACKING GENERATOR

8444A-5. Serials 2126A and below. Reduction of residual FM.

8557A SPECTRUM ANALYSER

8557A-8. Serials 2106A and below. Front panel retrofit kit.

8558B SPECTRUM ANALYSER

8558B-30. Serials 2245A09060 and below. Preferred replacement of A15Q17 and improved adjustment range of A14 LIN Gain pot.
8558B-31. Serials 2245A and below. Modification to prevent frequency shift due to resolution bandwidth switching.

8559A SPECTRUM ANALYSER

8559A-21. Serials 2340A02565 and below. Prevention of short circuits in ribbon cable A2W1.
8559A-22. Serials 2320A03015 and below. Preferred replacements for A5C1, A5C2, A5C5, and A5C6.

8565A SPECTRUM ANALYSER

8565A-9A. Serials 2220A and below. Preferred replacement of ROM A39U6.

8569A SPECTRUM ANALYSER

8569A-3B. Serials 2105A00141 and below. "A" series firmware revision.

8656A SIGNAL GENERATOR

8656A-1A. All serials. Addition of high stability time base.

8672A SYNTHESIZED SIGNAL GENERATOR

8672A-16. Serials 2311A03100 to 2311A03200. Misloaded power supply filter capacitors.

8691 THROUGH 8699 RF UNITS

H89-8693A/B-2, H89-8694A/B-1, H89-8695A/B-1. For H89-8693A/B, H89-8694A/B and H89-8695A/B RF units. Special replacement BWO.

8956A SYSTEM INTERFACE

8956A-2. Serials 2322A and below. Preferred replacement of relay A5K16.

8970A NOISE FIGURE METER

8970A-3. Serials 2222A and below. Preferred replacement for driver board and battery.

9111A GRAPHICS TABLET MAIN PCA REVISION

9111A-2. Serials 2251A and below. Extended warranty policy.

9571 DTS-70

9415A-2. All serials. 94151A programmable driver/comparator (PRGH) card. OP-AMP history and warranty status of U1-U15.

37201A HP-IB EXTENDER

37201A-5. Serials 2232U-01891 and below. Modification to eliminate oscillator start-up problem.

37214A SYSTEMS MODEM CARD CAGE

37214A-1. Firmware update

64000 LOGIC DEVELOPMENT SYSTEM

64000-0E. Service note index.

64242A 68000 EMULATOR SUBSYSTEM

64242A-5. Serials 2124A and below. 68000 emulator enhancement for 10 MHz operation.

64251A Z80 EMULATOR CONTROL BOARD

64251A-6. Z80 Emulation control board repair number 2120A1558 and below. Modification to prevent opcode omission upon exit from background.

64500S POSITIVE PROM PROGRAMMER

64500S-3. All 64501A's shipped prior to 1 Nov. 1983. READ errors corrected with improved interface cable.

64602A TIMING ANALYSER CONTROL BOARD

64602A-1. Serials 2148A00580 and below. Preferred replacement of glitch detector—1NB4-5007.

64622A 40 CHANNEL STATE ACQUISITION BOARD

64622A-1. Board number 64622-66501 only. Modification to make threshold voltage independent of data inputs.

64623A 20 CHANNEL STATE ACQUISITION BOARD

64623A-1. Board numbers 64623-66501 and 64623-66502 only. Modification to make threshold voltage independent of data inputs.

64650A GENERAL PURPOSE PREPROCESSOR

64650A-1. Serials 2315, 2224, 2218, 2207. Modification to eliminate noise on the ground sense lines.

64653A 8086/8088 INTERFACE CARD

64653A-1. Serial prefix 2310A. Modification to prevent MIN MODE or MAX MODE decode errors.

64670A 68000 INTERFACE CARD

64670A-1. Serial prefix 2222. Modification to operate with the 1630D Logic Analyzer.

69750A SCAN CONTROL/PACER CARD

69750A-1. Serials 2204A-00406 and below. 6942A multiprogrammer I/O card. Reprogrammed logic sequencer to correct potential skips in channel selections.
69750A-2. Serials 2204A-00605 and below. 6942A multiprogrammer I/O card. Modification to correct a shortened first pulse out of the card's pacer.

86602B RF SECTION

86602B-3. Serials 1920A01980 and below. A7 mixer assembly change.

86603A RF SECTION

86603A-5. Serials 2119A02640 and below. A7 mixer assembly change.

Service Note Order Form

If you want service notes, please check the appropriate boxes below and return this form separately to one of the following addresses.

Hewlett-Packard
1820 Embarcadero Road
Palo Alto, California 94303

For European customers (ONLY)

Hewlett-Packard
Central Mailing Dept.
P. O. Box 529
Van Hueven Goedhartlaan 121
AMSTELVEEN—1134
Netherlands

Name _____

Firm _____

Address _____

City _____

State _____ Zip _____

- | | | | | | |
|------------------------------------|-------------------------------------|--|------------------------------------|--|--|
| <input type="checkbox"/> 400E-14 | <input type="checkbox"/> 3065-2 | <input type="checkbox"/> 3712A-9 | <input type="checkbox"/> 3779D-12 | <input type="checkbox"/> 8080A-1-S | <input type="checkbox"/> 8956A-2 |
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