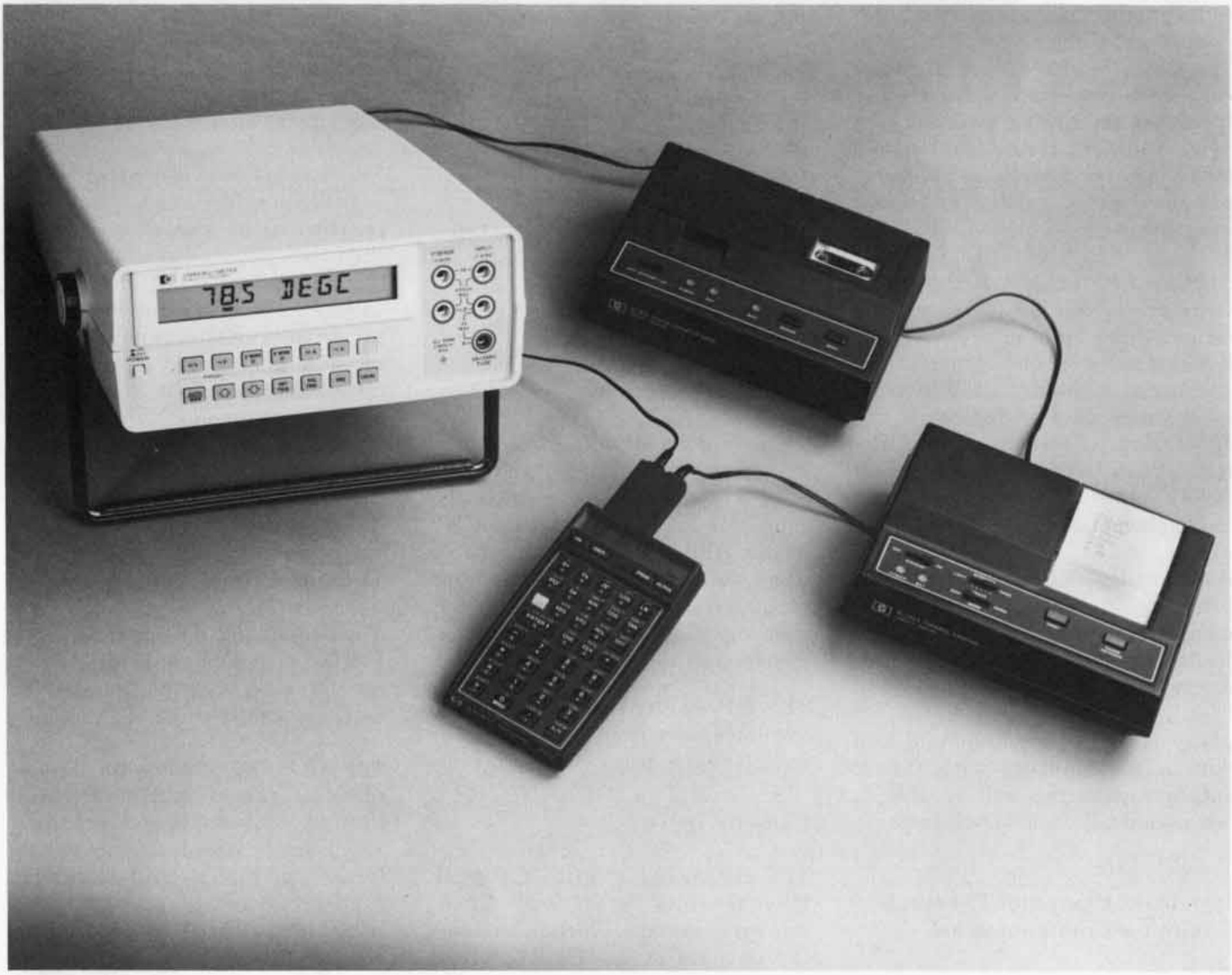
HEWLETT PACKARD

BENCH BRIEFS

SERVICE INFORMATION FROM HEWLETT-PACKARD

MARCH-APRIL 1982

New Interface Lets HP-41 and HP-85 Personal Computers Control Instruments and New Peripherals



Part No. 5952-0109

New HP Interface Called HP-IL

Walt Skowron, Hewlett-Packard

Hewlett-Packard's top-of-the-line HP-41 handheld computer can now control low-cost, battery-operable systems through a new interface called HP-IL; Hewlett-Packard Interface Loop.

The new interface enables HP-41C and HP-41CV handheld computers to control and read data from a new HP digital multimeter, and to interact with a new digital tape cassette drive and with a new thermal printer/plotter. The multimeter is fully programmable and has a 12-character alphanumeric display. The cassette drive uses digitally certified magnetic tape and increases the system's memory by more than 50 times, to 131,000 bytes. The printer/plotter features bar code printing and enhanced graphics.

Another new product is the HP-IL Converter which is a component designed to be built into third-party devices such as measurement instruments. It connects the internal electronics of the device to the HP-IL loop, so a wide variety of digital devices can be controlled by an HP-41 rather than by a much more costly computer.

Additionally, HP is committed to bringing out more HP-IL instruments and peripherals to be controlled by the HP-41 or by other future low-cost controllers.

Many of HP's new handheld and personal computers with input/output capabilities will be able to act as controllers on HP-IL loops.

Handheld Computer/Personal Computer Communication

Communicating between HP-41 handheld computers and HP Series 80 personal computers is now possible with the HP-IL loop and the new HP-IL Interface Card. The interface card plugs into the HP-85 and HP-83, connecting them to the HP-IL loop, enabling the personal computer to do tasks such as storing and analyzing data collected on the handheld machine. This capability makes certain applications easier, such as collecting customer data in the field with an HP-41 then dumping, analyzing and storing data in the personal computer and reloading it into the handheld computer.

Read-only memory modules (ROMs) for HP Series 80 machines, such as the I/O and Plotter/Printer ROM, are compatible with the HP-IL Interface Card.

The new HP 82938A HP-IL Interface Card is available now from HP Series 80 personal computer dealers and from HP.

The HP-IL Module

To use the HP-41 to control instruments or peripherals on an HP-IL loop, it is necessary to connect the computer to the loop with an HP 82160 HP-IL Module. The module plugs into any one of the four input/output ports in the computer, making the HP-41 a general-purpose controller.

The HP 82160 HP-IL Module is available now from HP dealers or from HP. U.S. price is $125.

Cassette Drive

The HP 82161 Digital Cassette Drive provides 131,000 bytes of online mass storage, which is 50 times the memory of the HP-41CV and 200 times the memory of the HP-41C.

The drive is designed to give the HP-41 mass memory unrivaled in size and reliability by other calculators or handheld computers and to make the HP-41 capable of data collection and management applications that previously required a larger computer. The digital quality of the drive and the HP cassettes used is designed to lead to greater performance and reliability than is possible with audio tapes and drives.

Each tape has a capacity of 131,000 bytes of information, which would accommodate, for instance, all the programs from the 26 HP-41 Solutions Books on one tape.

File management using the drive is easy because files can be names and recalled using names selected by the user.

Quick, bi-directional access enables the drive to read at nine inches per second and search at more than 30 inches per second. It is quiet, and battery- or ac-operable. The HP 82161 drive and cassettes are available now from HP dealers or from HP. U.S. price is $550.

Thermal Printer/Plotter

The HP 82162 Thermal Printer/Plotter provides convenient hard copy of data, program listings, bar code, and graphics.

The HP 82162 provides all the features of the HP 82143 Printer/Plotter, plus enhanced graphics, and a larger 101-element buffer for faster printing and plotting. Another advantage is that the new HP 82162, with its HP-IL compatibility, will work with all future HP-IL controllers as well as with the HP-41.

Features of the new printer/plotter include a 24-character line, ASCII standard characters plus special characters, user-definable characters, and easy-to-use plotting capabilities.

The HP 82162 is battery- or ac-operable, and is available now from HP dealers or from HP. U.S. price is $495.

HP-IL Converter

The HP 82166 HP-IL Converter is a component designed to be built into other devices, such as measurement instruments. It connects the internal electronics of the machine to the HP-IL loop, thereby letting the machine communicate with other devices on the loop and be controlled by an HP-41.

The converter makes it easy to enhance a wide variety of electronic instruments so they can be controlled by an HP-41, rather than by a much more costly computer.

The HP 82166 HP-IL Converter is available now from HP dealers or from HP. The 82166A Prototyping Kit contains two 82166 converters, documentation and cables. U.S. price is $395. A package of ten 82166 converters only (Prototyping Kit not included) is $1250.

Two other new products are the Extended I/O ROM and the Time Module:

Extended I/O ROM

The HP 82183A Extended I/O ROM plugs into the HP-41 and gives it several extended capabilities pertaining to the cassette drive, printer/plotter, and other devices. Included are a routine that enables programs to be printed in bar code and a routine to copy a cassette tape from drive to drive on the HP-IL loop.

The HP 82183A will be available in mid-1982 from HP dealers and from HP.

Time Module

The new HP 82182A Time Module plugs into any of the ports of the HP-41, providing it with a precise clock. This makes possible jobs such as controlling devices, turning devices on and off, and collecting data at specific times. It is available now. U.S. price $75.

HP-IL Cable

Cables for HP-IL loops come in lengths of 0.5, 1, and 5 meters (5-meter cables are available only in U.S.A.). Cable is available now from HP dealers or from HP: 82167A 0.5m cable $12 U.S., 82167B 1m cable $15 U.S., 82167D 5m cable $20 U.S.

Background on HP-41C and HP-41CV

The top-of-the-line HP-41Cs and HP-41CVs feature alphanumeric liquid-crystal display, 58 keyboard functions, 130 total functions available, user-definable keyboard, and continuous memory. Powerful programming tools such as looping, branching, and 56 internal flags are included in both models.

Four input/output ports give the HP-41s system capability. Peripherals such as the bar-code-reading Optical Wand plug into the ports, as do additional memory modules and software modules.

The HP-41CV is an HP-41C with five times the memory — enough to accommodate about 2,000 program lines or 319 data storage registers.

The HP-41C sells for a suggested retail price of $250 U.S.; the HP-41CV sells for $325 U.S.

Hewlett-Packard Interface Loop Facts

Technical Background on the HP Interface Loop

Why a new interface? Hewlett-Packard is committed to designing highly portable computational and information management systems. In these systems, power consumption, size, unit cost, and obsolescence must be minimized. HP-IL combines low power, small size, and low cost with an HP commitment to continued support and new product development.

HP-IL Designed to Match the Needs of Portable Systems

The Hewlett-Packard Interface Loop (HP-IL) was designed to match the needs of portable computational devices, to make them system-oriented. Fundamentally, HP-IL is a bit-serial, unidirectional loop. This loop design allows for a fixed number of connectors at each product regardless of system size.

Information on the loop is retransmitted by each device; each device supplies only enough power to drive the message on to the next device. This "pay-as-you-go" power distribution balances — and minimizes — requirements for each participant in the loop.

The loop's design also permits simple, uniform cables, which in turn reduce cost.

Finally, HP-IL protocol provides for excellent error detection. Commands and data make a complete circuit of the loop. The originating device receives the information back after all other loop devices have received and retransmitted it. By comparing returning information with what was sent out, errors along the loop are automatically detected.

Transmission Speed and Cable Length

Current HP-IL configurations permit a transmission speed of up to 5,000 bytes per second (equivalent to about one printed page per second). This exceeds transmission speed requirements for today's battery-operated computers.

HP-IL's transmission speed is also well suited to many instrumentation and test systems, particularly in view of the current trend towards distributed intelligence.

HP-IL is capable of driving up to 10 meters (33 feet) of zip cord between each device. When shielded twisted-pair cable is used, the maximum distance between devices is 100 meters (328 feet).

Roles of Different Devices in the Loop

In order for HP-IL to operate in an orderly manner, all devices in the loop must function according to their assigned roles. The role of each device is changed to suit the operation being performed. Three different roles are defined for HP-IL devices: controller, talker, and listener. Any device not assigned one of these roles is inactive.

The controller is the *one* device in the loop that can designate the roles of devices and control the loop's operation. The system controller (e.g., an HP-41 handheld computer) is the device that controls and initiates loop communication. It can transfer control to another device, which then becomes the controller on the loop — the *active* controller. Similarly, an active controller can transfer control to another device. (In the case of the HP 82160A HP-IL Module, the HP-41 computer is always the system controller and the active controller.)

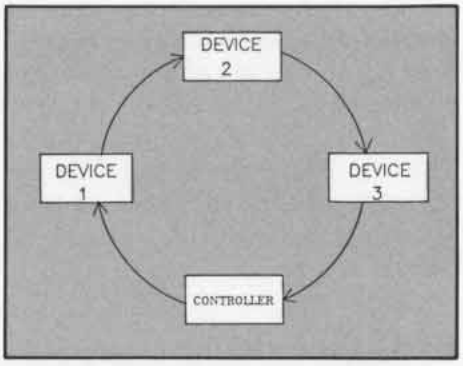
A talker is a device that *sends* information to the interface loop. It is designated and enabled by the controller. At any time, there can be no more than one talker. The controller may be a talker. Other examples of talkers are a mass-storage device sending data from a tape file and a voltmeter sending voltage measurements.

A listener is a device that *receives* information on the loop. There may be multiple listeners in the loop at the same time. Listeners are designated by the controller. The controller may be a listener. (A device cannot be a listener and a talker at the same time, although it can have these roles at *different* times.) Examples of listeners are a mass-storage device receiving and storing data in a file and a printer receiving and printing information.

Device Addresses

In order to distinguish between devices in the loop, each device must have an address — a number from one to 30. (A maximum of 31 devices on the loop is based on one-byte addresses; up to 961 devices are possible with two-byte addresses.) The controller uses the addresses to specify and control the devices.

Even though each HP-IL device has a built-in address, the system controller always assigns new sequential addresses to each loop member. These addresses begin with address "one" for the device that follows the controller. Each device then stores its assigned address internally.



Information Flow in the Interface Loop

Information transmitted in the interface loop can be separated into two categories: commands and data.

Commands are initiated by the controller and are monitored by all devices in the loop. Using commands, the controller can initiate loop communication, assign or unassign devices as talkers and listeners, initiate the transfer of data, and — if it is the system controller — interrupt the operation of the loop.

Data is sent by a talker and is processed by all listeners. Data is ignored by the remaining, inactive devices. The talker begins sending data when enabled by the controller; the talker informs the controller when all requested data has been sent.

Each piece of information, a command or data, is initiated by a device and sent around the loop. Each subsequent device, in turn, receives the information and does one of the following:

- Sends the information to the next device, or
- Processes (acts on) the information and *then* sends the information on to the next device.

The action a device takes depends upon the type of information received and the role of the device in the loop. The talker eventually receives the information after it has

made the complete circuit around the loop (Figure 1). It then checks for transmission errors by comparing the received information with the original transmission. The next piece of information may then be sent.

HP-IL Protocol

Each message consists of one or more 11-bit "frames." How does the source and destination perform the handshake function?

On HP-IL, in most cases, the recipient simply delays the frame (i.e., does not pass it along to the next device) until it is ready to receive the next frame. The source, in turn, doesn't send another frame until it has received the previous one back.

This "Hold-until-ready" handshake works well for data transmission with only one recipient. Because the loop is serial, however, this handshake is too slow with multiple recipients (e.g., in the case of command messages).

Solution: a special handshake is used for commands. All devices pass along commands as rapidly as possible but, in passing, make a "copy" of it. By the time the command returns to the controller, recipients are busy executing the command simultaneously. The controller then sends a special frame called "ready for command." Devices in the loop pass along the ready-for-command frame as they finish executing the previous command. When the ready-for-command frame returns to the controller, it knows all recipients have executed the previous command and are ready for the next message.

HP-IL Vs. HP-IB

Although HP-IB and HP-IL serve the same basic function — interfacing controllers, instruments, and peripherals — they differ in many respects:

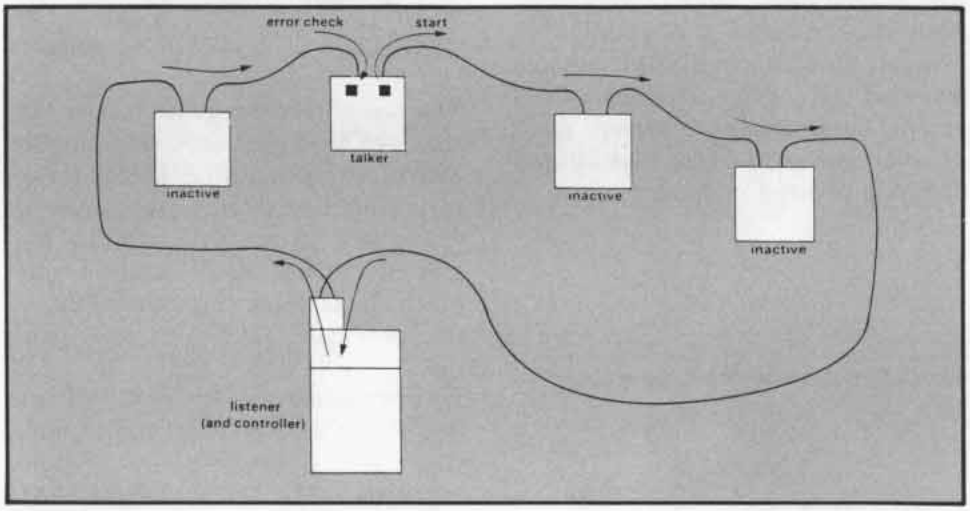


Figure 1.

1. Because of HP-IL's lower power consumption, it is usable with portable, battery-powered systems. Generally speaking, HP-IB is not.

2. HP-IL system components will generally be low cost and have moderate performance. HP-IB system components are at the medium-to-high end of the performance spectrum and generally cost more.

3. HP-IL systems work at relatively low data rates; HP-IB systems work at relatively high data rates.

4. HP-IL allows device separations of up to 100 meters with shielded twisted pairs (10 meters with zip cord). HP-IB requires extender hardware for long distance connections.

HP-IL is not intended as a replacement for HP-IB but rather as a low cost, lower power alternative extending below the traditional scope of HP-IB in price and performance.

HP-IL adds a new dimension to Hewlett-Packard's instrumentation and computing capability. New HP-IL controllers, peripherals, and instruments will be added to HP's product line on a continuing basis. For more information contact your local HP sales office.

Customer Training Calendar Corrections

The January-February issue of Bench Briefs carried the Customer Service Training Calendar for 1982 on page 8. Please make the following corrections to the indicated months. The rest of the schedule is unchanged.

Under Automatic Test,
Model 3060A

May 17-28
July 26-August 6
September 27-October 8
November 29-December 10

Cost per student $2100

DTS-70

May 17-21
July 19-23
October 25-29

Cost per student $1050

Safety-Related Service Notes

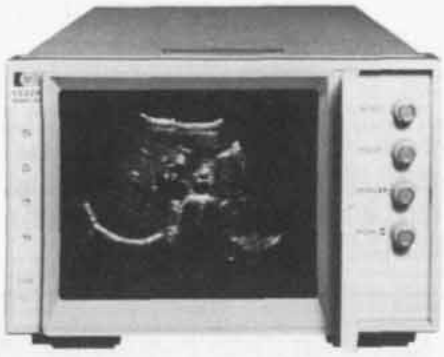
Service Notes from HP relating to personal safety and possible equipment damage are of vital importance to our customers. To make you more aware of these important notes, they are printed on paper with a red border, and the service note number has a "-S" suffix. In order to make you immediately aware 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.

410C Electronic Voltmeter

A shock hazard may exist in units with serial numbers 0982A22339 thru 0982A22718. These voltmeters may have the floating guard connected to the chassis ground.

A new circuit board support, with a plastic insert to insulate the board traces (guard) from the chassis, is available from HP under part number 410C-66A. Complete instructions are provided in Safety Service Note 410C-21.

1332A/C39 and C50 X-Y Displays



The screw (H43) used to fasten U2, the −15 V Regulator, to the chassis (MP22) is nonmetallic. If this screw is replaced with a metal screw it may come in contact with the hot side of the line filter, which would place the chassis, through MP22, at line potential.

If, during service, the U2 −15 V Regulator is replaced, make sure that the fastening screw is nonmetallic (HP P/N 2200-0728). Details are provided in Safety Service Note 1332A/C39 and C50-1-S.

8569A Spectrum Analyzer

There is a potential personnel and equipment shock hazard in Analyzers with serial numbers 2128A00340 and below. When a new CRT (5083-6176) is installed in these units, approximately 2500 volts is applied via CRT pin 13 (deleted on older CRT's) through the CRT cable assembly and the motherboard assembly to the Z-axis assembly. This is not only a possible source of damage to the mother board and Z-axis assemblies, but constitutes an extreme hazard to the technician working on the instrument as well.

Safety Service Note 8569A-4-S provides instructions for modifying the analyzer to eliminate this hazard.

8903A Audio Analyzer

When front handles, rack flanges, or rack flange and front handle combinations are installed in units with serial number prefix 2118A and below, there is the possibility that the mounting screw on the lower-left corner may contact a solder terminal on the LINE switch. The chassis will then be at line potential creating a shock hazard.

Note that normal installation of the front handles or rack flanges does not create the hazard. The hazard is created only when a longer than normal screw is used or the handle/flange is removed and the screw replaced.

Safety Service Note 8903A-3-S provides instructions for modifying the analyzer to eliminate this hazard.

Use the service note order form at the rear of *Bench Briefs* to order any of the above safety notes, or any of the other listed notes.

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 select the notes that relate to your instruments.

331A/332A DISTORTION ANALYZER

331A/332A-14. All serials. Troubleshooting procedure to test an intermittent meter circuit.

333A/334A DISTORTION ANALYZER

333A/334A-14. All serials. Troubleshooting procedure to test an intermittent meter circuit.

400E/EL/F/FL/GL AC VOLTMETER

400E-12. Serials 1208A27069 to 1208A27405. Troubleshooting procedure to test an intermittent meter circuit.

400EL-12. Serials 1208A26214 to 1208A27393. Troubleshooting procedure to test an intermittent meter circuit.

400F-6. Serials 0950A13388 to 0950A13597. Troubleshooting procedure to test an intermittent meter circuit.

400FL-6. Serials 0950A13360 to 0950A13657. Troubleshooting procedure to test an intermittent meter circuit.

400GL-2. Serials 0943A03686 to 0943A03708. Troubleshooting procedure to test an intermittent meter circuit.

403B AC VOLTMETER

403B-12. Serials 0986A25253 to 0986A25461. Troubleshooting procedure to test an intermittent meter circuit.

410C VOLTMETER

410C-20. Serials 0982A22277 to 0982A22462. Troubleshooting procedure to test an intermittent meter circuit.

410C-21. Serials 0982A22339 through 0982A22718. Modification to eliminate potential shock hazard.

410C-22. Serials with solid state amplifier board (A3) P/N 00410-66502. Correction in amplifier current adjustment procedure in operating and service manual (P/N 00410-90009)

419A DC NULL VOLTMETER

419A-11. Serials 0948A06923 to 0948A07006. Troubleshooting procedcure to test an intermittent meter circuit.

427A VOLTMETER

427A-6. Serials 0947A20851 to 0947A20972. Troubleshooting procedure to test an intermittent meter circuit.

428B CLIP-ON DC MILLIAMETER

428B-1. Serials 0995A13884 to 0995A14023. Troubleshooting procedure to test an intermittent meter circuit.

1302A X-Y DISPLAY (78309)

1302A-4A. Serials 1920A and 1951A. +158 Volt Power supply and HV feedback Modification Kit.

1302A-5. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1304A X-Y DISPLAY

1304A-4A. Serials 1715A and 1920A. Modification kit that improves reliability of the +158V power supply.

1304A-5A. Serial 1920A for Option C15. Preferred Replacement for A1 Motherboard 01304-93020.

1304A-6. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1310A/B X-Y DISPLAY

1310A-21. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1310B-1. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1311A/B X-Y DISPLAY

1311A-21. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1311B-5. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1317A/B X-Y DISPLAY

1317A-8. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1317B-1. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1321A/B X-Y DISPLAY

1321A-8. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1321B-1. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1332A/C39 AND C50 X-Y DISPLAY

1332A/C39 and C50-1-S. All serials. Service alert to prevent possibility of placing chassis at line potential after servicing.

1332A X-Y DISPLAY

1332A-13. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1332A-14. All serials. Replacement part number for the model 1332A motherboards.

1333A X-Y DISPLAY

1333A-8. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1333A-9. All serials. Replacement part number for the model 1333A motherboards.

1335A X-Y DISPLAY

1335A-13. All serials. Replacement part number for the model 1335A motherboards.

1335A-14. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1336A X-Y DISPLAY

1336A-2. All serials. Arc protection kit when a new CRT is installed.

1340A X-Y DISPLAY

1340A-1. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1340A-2. All serials. Improved CRT for model 1340A X-Y displays.

1340A-3. All serials. Modification to improve −15V and −7.5V supply performance.

1345A X-Y DISPLAY

1345A-1. All serials. Application of HV grease to prevent arcing/breakdown of the post accelerator connector.

1351S GRAPHICS GENERATOR SYSTEM

1351S-1. All serials. List of rebuilt assemblies available on the blue stripe board exchange program.

1600A LOGIC STATE ANALYZER

1600A-0. Service note index.

1600A-4. Serials 2009A-05604 and below. Recommended replacement procedure for IC AIU80.

1607A LOGIC ANALYZER

1607A-0. Service note index.

1607A-2. Serials 2005A-04086 and below. Recommended replacement procedure for IC AIU80.

1610A/B LOGIC STATE ANALYZER

1610A-13. Serials 2134A-02062 to 2134A-02071. Recommended modification to correct spurious signals on the TRIGGER OUT, MEAS ENABLE OUT POS and MEAS ENABLE OUT NEG rear panel BNC connectors.

1610B-3. Serials 2111A-00954 to 2111A-01164. Recommended modification to correct spurious signals on the TRIGGER OUT, MEAS ENABLE OUT POS and MEAS ENABLE OUT NEG rear panel BNC connectors.

1611A LOGIC ANALYZER

1611A-10. Serials 2017A-03322 and below. Recommended replacement flyback transformer.

1615A LOGIC ANALYZER

1615A-0. Service note index.

1615A-5. Serials 2032A-06259 and below. Recommended replacement flyback transformer.

1640B SERIAL DATA ANALYZER

1640B-3. Serials 2044A. (Units shipped between June 1st and August 1st, 1981) Possible defective matrix panel shorting pins for test probes.

1740A OSCILLOSCOPE

1740A-18. Serials 2026A12642 through 2026A16282. Preferred replacement for capacitor A16C21 in the +120V power supply.

1741A OSCILLOSCOPE

1741A-11. Serials 2017A05096 through 2017A07535. Modification to reduce low voltage power transformer failure caused by capacitor shorting.

1742A OSCILLOSCOPE

1742A-4. Serials 2021A01121 through 2021A01952. Preferred replacement for capacitor A16C21 in the +120V power supply.

1743A OSCILLOSCOPE

1743A-5. Serials 2034A01220 through 2034A01512. Preferred replacement for capacitor A16C22 in the +120V power supply.

1744A OSCILLOSCOPE

1744A-4. Serials 2019A01149 through 2019A01199; 2014A01200 through 2014A01448; 2052A01449 through 2052A01548; 2109A01549 through 2109A01948. Modification to reduce low voltage power transformer failure caused by capacitor shorting.

1980A/B OSCILLOSCOPE MEASUREMENT SYSTEM

1980A/B-5A. Serials 2131A- and below. Recommended HP-IB Talk/Listen and HP-IB ROM replacement.

1980A/B-6. Serials 2131A- and below. Recommended replacement operating ROMs.

1980A/B-7. Serials 2131A- and below. Modification to update older 1980Bs to the same operating configuration as those prefix 2142A- and above. No resulting improvement in performance or measurement capability.

1980A/B-8. Serials 2131A and below. Preferred replacement A4 board assembly.

1980A/B-9 All serials. Preferred replacement for reference amplifier A1U1 in the +15VDC supply.

3054A DATA ACQUISITION/CONTROL SYSTEM

3054A-1. All serials. Program modification to prevent 3054A/DL (85A) hangup.

3060A BOARD TEST SYSTEM

3060A-20A. All serials. ASRU A/D board redesign.

3060A-27B. All serials. Revision 2128 of 3060A system configuration/confirmation/diagnostic software.

3060A-32. All serials. Notification of two "features" in revision 2128 configuration/confirmation/diagnostic software.

3060A-33. All serials. 3060A system software pack contents.

3060A-34. All serials. Testing driver general purpose relays.

3060A-35. All serials. CCD revision 2128 modification for proper testing of scanner general purpose relays if Option 008 or 100 is not installed.

3060A-36. All serials. DFT software revision 2141.

3060A-37. All serials. Configuration/confirmation/diagnostic software revision 2128.

3060A-38A. All serials. Improved Option 008 (signature analysis) confirmation test.

3253A ANALOG STIMULUS/RESPONSE UNIT

3253A-5. Serials 1814A00742 and above. Reducing offset at the output of A13 source amplifier.

3253A-6. All serials. Reducing noise injected into ASRU external source/detectors.

3310A/B FUNCTION GENERATORS

3310A/B-7A. 3310A serials 1151A11370 and below; 3310B serials 1201A05020 and below. Modification to eliminate distortion in triangle and ramp modes.

3336A/B/C SYNTHESIZER/LEVEL GENERATOR

3336A/B/C-4. 3336A serials 1930A00409 and below; 3336B serials 1931A00396 and below; 3336C serials 1932A00276 and below. Procedure for replacing 3336A/B/C Rev A, Rev B or Rev C power supplies (A2 PC board) with the 3336A/B/C Rev D power supply.

3336A/B/C-5. 3336A serials 1930A00480 and below; 3336B serials 1931A00485 and below; 3336C serials 1932A00313 and below. Modification to enhance the amplitude stability of the 3336A/B/C synthesizer/level generator.

3336A/B/C-6. All serials. Installation of Option 004 retrofit kit (HP part number 03336-68702).

3400A RMS VOLTMETER

3400A-12. Serials 1218A26678 to 1218A26870. Troubleshooting procedure to test an intermittent meter circuit.

3406A BROADBAND SAMPLING VOLTMETER

3406A-10. Serials 1722A06222 to 1722A06322. Troubleshooting procedure to test an intermittent meter circuit.

3435A DIGITAL MULTIMETER

3435A-6A. Serials 1606A07700 and below. Modification to improve high frequency response.

3456A DIGITAL VOLTMETER

3456A-8. Serials below 2015A00381. Modification to improve A4 main controller board.

3456A-10. All serials. Procedure to select the correct value of resistance for A20R150.

3456A-11. All serials. HP-IB Signature Analysis modules.

3490A MULTIMETER WITH OPTION 030

3490A-17. All serials. Spare parts and troubleshooting information.

3496A SCANNER

3496B-4B. All serials. Improved Option 008 (Signature Analysis) confirmation test.

3497A DATA ACQUISITION/CONTROL UNIT

3497A-5A. All serials. Product support package 03497-69900.

3497A-7B. All serials. New crystal handling procedure during blue stripe board exchange for the 03497-69502 Mainframe Inguard Controller Board.

3570A NETWORK ANALYZER

3570A-13. All serials. Recalibration of phase vs frequency after repair.

3570A-14. Serials 1331A02076 and greater. New preferred replacement A14 phase detector board.

3581A/C WAVE ANALYZER

3581A-8. 3581A serials 1351A01391 to 1351A02035; 3581C serials 1411A00176 to 2114A01495. Recommended procedure for replacing bandwidth switch (S2) on the Rev A board.

3582A SPECTRUM ANALYZER

3582A-8A. All serials. How to identify and retrofit replacement fans.

3582A-10B. All serials. Notification of availability of field service kit 03582-69800 for 3582A Spectrum Analyzer.

3582A-11. All serials. Notification of availability of field Product Support Package 03582-69900.

3582A-12. Serials 1809A03092 and above. Preferred replacement RAM board.

3585A SPECTRUM ANALYZER

3585A-6A. All serials. Notification of availability of Product Support Package 03585-69900 for 3585A Spectrum Analyzer.

3585A-7. All serials. Notification of availability of service kit 03585-69800 for 3585A Spectrum Analyzer.

3586A/B/C SELECTIVE LEVEL METERS

3586A/B/C-2B. Serials 1927A00231 and below (3586A); 1928A00284 and below (3586B); 1929A00195 and below (3586C). Retrofit kit for Revision B software.

3730B DOWN CONVERTER

3730B-1. Serials below 00228. Modification to improve AFC lock-up.

3745A/B SELECTIVE LEVEL MEASURING SET

3745A/B-30C. 3745A serials 2032U and below; 3745B serials 2030U and below. Preferred replacement of A109 Memory Assembly.

3762A DATA GENERATOR

3762A-4. All serials. Preferred replacement for line input thermistor.

3762A-5. Serials 2142U and below. Preferred replacement for line input thyristor.

3763A ERROR DETECTOR

3763A-4. All serials. Preferred replacement for line input thermistor.

3763A-5. Serials 2150U and below. Preferred replacement for line input thyristor.

3771A/B DATA LINE ANALYZER

3771A/B-21. 3771A serials 2121U-00320 and below; 3771B serials 2127U-00148 and below. Modification to prevent possible resetting of the transient counters when changing the control switch from RUN to STOP.

3771A/B-22. Serials below 2207U-00365 (3771A); 2206U-00158 (3771B). Modification to prevent possible HP-IB malfunction in the parallel poll mode.

3771A/B-23. Serials below 2148U-00350 (3771A); 2206U-00158 (3771B) (excluding 3771A serials 2121U-00345, 00346, 00347, 00348). Modification to prevent possible prevention of phase hits being registered on the phase hits display.

3779B PRIMARY MULTIPLEX ANALYZER

3779B-13A. Serials 1941U-00220 and below. Preferred replacements for relays A1K1-K6; A8K1; A9K1-K5, K7, K9, K10; A31K1; A37K1-K4.

3779B-24. Instructions on the installation of 3779B Opt H04.

3780A PATTERN GENERATOR/ERROR DETECTOR

3780A-10D. Serials between 1605U00158 and 1804U-00531. Modification to reduce the susceptibility of the 3780A to conducted mains supply interference.

3780A-21A. All serials. Preventive maintenance to minimize possibility of intermittent failures.

3780A-22. All serials. Instrument Rack Mount Retrofit Kit.

3780A-23. All serials. Preferred replacement of thermistor (A25R1).

3781A/B PATTERN GENERATOR

3781A-1. All serials. Preferred replacement for thermistor (A25R1).

3781B-3. All serials. Preferred replacement for auxiliary transformer.

3781B-4. Serials 2049U00201 and below. Reduction of power dissipation of thermistor (A25R1).

3782A/B ERROR DETECTOR

3782A-1. All serials. Preferred replacement of thermistor (A25R1).

3782B-3. All serials. Preferred replacement for auxiliary transformer.

3782B-4. Serials 2123U00201 and below. Reduction of power dissipation of thermistor (A25R1).

3793B DIFFERENTIAL PHASE DETECTOR

3793B-2. Serials below 00256 (STD, Opt 013, 018 and 019 instruments). Preferred replacement for A3E1 12.140 MHz TCXO.

4191A RF IMPEDANCE ANALYZER

4191A-5. Serials 1930J00127 and below. Modification to improve IF signal channel balance.

4191A-6. Serials 1930J00123 to 00127; 1930J00120 and below. Modification to eliminate display fluctuation (Option 002 only).

4191A-7. Serials 1930J00127 and below. Modification to improve the A18 clock Generator/Doubler.

4191A-8. Serials 1930J00168, 1930J00166 and below. Modification to improve stability against physical shocks.

4191A-9. Serials 1930J00174, 00175, 1930J00171 and below. Modification to improve internal DC bias.
4191A-10. Serials 1930J00240 and below. Modification to the A1 VTO Board (and the A33 VTO Board for Option 002) to improve the output signal level at A1P2 or P1.
4191A-11. Serials 1930J00240 and below. Modification to the A2 Divider Board to improve performance.

4192A LF IMPEDANCE ANALYZER

4192A-6. Serials 2045J00113 through 2045J00202, and 2045J00204 through 2045J00207. Modification to the bias fuse (A1F1) on the A1 Range Resistor/Null Detector Board to improve performance.

4935A TRANSMISSION IMPAIRMENT MEASURING SET

4935A-1. Serials 2115A00905 and below. Modification to eliminate a potential switchboard trace problem.

4942A TRANSMISSION IMPAIRMENT MEASURING SET

4942A-7. All serials. Modification to the A8 Modem Assembly to ensure valid modem self-check.

4943A TRANSMISSION IMPAIRMENT MEASURING SET

4943A-10. Serials 2015A-00446 and below. Modification to the A8 Modem Assembly to ensure valid modem self-check.

4944A TRANSMISSION IMPAIRMENT MEASURING SET

4944A-9. Serials 2027A-01021 and below. Modification to the A8 Modem Assembly to ensure valid modem self-check.

5001A MICROPROCESSOR EXERCISER

5001A-2. Serials 2040A00321 and below. Power Fuse (F1) replacement.

5001C MICROPROCESSOR EXERCISER

5001C-2. Serials 2104A0011 to 2104A00125 and 2128A00126 to 2128A00140. Modification to prevent shorting the clock driver switch with crystal oscillator.

5045A DIGITAL IC TESTER

5045A-23A. All serials. New DAC (A11) Adjustment specifications.

5245L ELECTRONIC COUNTER

5245L-9. Serials 2004A and below. Preferred replacement (HP P/N 2100-3891) for the power switch/sample rate control (old HP P/N 2100-0318).

5300A MEASURING SYSTEM

5300A-6. Serials 1940A and below. Preferred replacement (HP P/N 2100-3891) for the power switch/sample rate control (old HP P/N 2100-0318).

5312A HP-IB INTERFACE

5312A-4. All serials. Operational verification using the HP 85A controller.

5316A UNIVERSAL COUNTER

5316A-2. Serials 1924A through 2052A. Modification to prevent intermittent E1 errors not caused by microcomputer.
5316A-3A. All serials. HP-IB verification program using the HP 85A controller.

5328A UNIVERSAL COUNTER

5328A-33. All serials. HP-IB verification program using the HP 85A controller.

5328A/H99, 5328AF/096, 5328AF/098, 5328A/H42, C96-5328A MHz UNIVERSAL COUNTER

5328A-34. All serials. HP-IB verification program using the HP 85A controller.

5328A UNIVERSAL COUNTER

5328A-35. All serials. Option 021 performance test update.

5335A UNIVERSAL COUNTER

5335A-5A. All serials. Modification to prevent Input Buffer/Amplifier failures.
5335A-6A. All serials. Revision of A1 Power Supply Adjustments.
5335A-7. All serials. 5335A HP-IB verification program using the HP 85A controller.
5335A-8. All serials. Key Cap part number replacements.
5335A-9. All serials. Performance test for the 5335A and all Options.

5340A MICROWAVE FREQUENCY COUNTER

5340A-21. All serials. Option 006 Microwave Limiter Retrofit.

5342A MICROWAVE FREQUENCY COUNTER

5342A-31. All serials. Option 006 Microwave Limiter Retrofit.
5342A-32. All serials. HP-IB verification program using the HP 85A controller.
5342A-33. All serials before 2125A for line filter and varistor upgrade; all serials before 2142A05041 for power transistor upgrade. Power supply reliability improvement.

5343A MICROWAVE FREQUENCY COUNTER

5343A-10. All serials. Option 006 Microwave Limiter Retrofit.
5343A-11. All serials. HP-IB verification program using the HP 85A controller.

5345A ELECTRONIC COUNTER

5345A-18. All serials. ROM part number changes.
5345A-19. All serials. HP-IB verification program for 5345A Option 011.
5345A-20A. All serials. HP-IB verification program for 5345A Option 012 using the HP 85A controller.
5345A-21. All serials. HP-IB modification for Option 012 compatibility with HP 1000L series computers.

5355A AUTOMATIC FREQUENCY CONVERTER

5355A-1. Serials 2016 and earlier — method to correct 5355A miscounting by the attenuating output of A14 VCO. Serials 2020 and later — procedure to adjust A14 VCO output level after A14 servicing.

5356A/B MICROWAVE FREQUENCY CONVERTER HEAD

5356A-1. All serials. Option 006 Microwave Limiter Retrofit.
5356B-1. All serials. Option 006 Microwave Limiter Retrofit.

5420A DIGITAL SIGNAL ANALYZER

5420A-0. All serials. Service note index.
5420A-4A. 5440B Plug-in Module Mainframe, serials 1728 and below. 5441A display, serials 1652 and below. 5443A Keyboard/Controller, serials prefixed 1655 and below. Modification to improve system performance.
5420A-7A. MIOB controller (05440-60035). Serials below 1804. Modification to eliminate a race condition.
5420A-9A. 5443A Keyboard/Controller. Serials 1636 and below. Modification to improve performance.
5420A-11A. 54451A Display Unit, 5443A Keyboard/Control Unit. Serials 1821 and below. Modifications to improve performance.
5420A-14A. 54470B Digital Filter. All serials. Modification to improve self-test.
5420A-15B. 5420A Digital Signal Analyzer, all serials. 5441A Display, all serials. 5443A Keyboard/Control, serials 1850A00366 and below. 54410A Analog-to-Digital Converter, all serials. Modifications to improve performance.
5420A-21B. All serials. List of all modifications that are important to the (reliability) of the 5420A.
5420A-22A. 5441A Display Transport Assembly. Modification to improve performance.
5420A-27. Serials 2116A00766 and below. New HP 5443A ON/OFF Power Switch P/N 3101-2329.

5423A STRUCTURAL DYNAMICS ANALYZER

5423A-0. All serials. Service note index.
5423A-1. Serials 2116A00548 and below. New HP 5443A ON/OFF Power Switch P/N 3101-2329.

5427A VIBRATION CONTROL SYSTEM

5427A-6. All serials. How to use and interpret the 5427A self-check program.
5427A-7. All serials. 5427A Self-Check hookup.
5427A-08. All serials. 54451B switch register cable modification.

5451C FOURIER ANALYZER SYSTEM

5451C-0. All serials. Service note index.

5501A LASER TRANSDUCER SYSTEM

5501A-0. ALL SERIALS. Service note index.

6012A AUTORANGING POWER SUPPLY

6012A-1. Serials 1946A00140 and below. Current monitor resistor change to improve performance.
6012A-2. Serials 2116A00300 and below. New fan installation hardware.
6012A-3. Serials 2121A-00380 and below. Modification to stabilize control board in PCB edge connector.

6034A HP-IB POWER SOURCE

6034A-1. Serials 2115A-00220 and below. Board modification to delete MICA insulator.
6034A-3. Serials 2134A-02200 and below. Modification to eliminate power-on hang-up.

6256B, 6263B, 6264B, 6266B, 6267B, 6271B, 6274B DC POWER SUPPLIES

6256B-3/6263B-4/6264B-3/6266B-4/6267B-3/6271B-5/6274B-2. All serials. Improved reliability change in RFI filter assembly.

6259B, 6260B, 6261B, 6268B, 6269B DC POWER SUPPLIES

6259B-4/6260B-3/6261B-3/6268B-3/6269B-4. All serials. Improved reliability change in RFI filter assembly.
6259B-5/6260B-4/6261B-4/6268B-4/6269B-6. Serials 2035A-01215 and below (6259B); serials 2031A-2495 and below (6260B); serials 2034A-01590 and below (6261B); serials 2034A-04150 and below (6268B); serials 2033A-05820 and below (6269B). Fan changes for improved reliability.
6259B-6/6260B-5/6261B-5/6268B-5/6269B-7. Serials 2039A-01386 and below (6259B); serials 2035A-02756 and below (660B); serials 2037A-01831 and below (6261B); serials 2043A-04901 and below (6268B); serials 2038A-07021 and below (6269B). Tunnel assembly insulation standoffs — reliability change.

6825A, 6826A, 6827A DC POWER SUPPLY/AMPLIFIER

6825A-2/6826A-2/6827A-2. 6825A serials 2048A-00880 and below; 6826A serials 2047A-00750 and below; 6827A serials 2047A-00920 and below. Modification to improve low line operation.

6942A MULTIPROGRAMMER

6942A-4A. Serials below 2013A00321. Modification to prevent "cold start" syndrome.

7044B X-Y RECORDER

7044B-1. Serials 2129A and above. Improved X and Y axis attenuator assemblies.

7045B X-Y RECORDER

7045B-1. Serials 2129A and above. Improved X and Y axis attenuator assemblies.

7046A/B X-Y RECORDERS

7046A-9/7046B-2. All serials. Precautions when cleaning the table with alcohol.

7046B-1. Serials 2129A and above. Improved X and Y axis attenuator assemblies.

7130A/B STRIP CHART RECORDER

7130A/B-5A. Serials 2033 and below. New AC line switch assembly.

7131A/B STRIP CHART RECORDER

7131A/B-5A. Serials 2033 and below. New AC line switch assembly.

7132A STRIP CHART RECORDER

7132A-1. Serials 2033 and below. New AC line switch assembly.

7133A STRIP CHART RECORDER

7133A-1. Serials 203 and below. New AC line switch assembly.

7220C/T GRAPHIC PLOTTER

7220C/T-1. All serials. Recommended procedure for repairing Power Supply PCA failure P/N 09872-60508 or P/N 09872-66508.

7221C/T GRAPHIC PLOTTER

7221C/T-1. All serials. Recommended procedure for repairing Power Supply PCA failure P/N 09872-60508 or P/N 09872-66508.

7580A DRAFTING PLOTTER

7580A-2. Serials 2051A (early production). Recommended replacement of U2 and U3 on the Processor PCA.
7580A-3. Serials 2051A. Replacement of carriage cover interlock switch.
7580A-4. Serials 2143A and earlier. Replacement of paper stops.

8405A VECTOR VOLTMETER

8405A-8A. Serials 2014A and below. Preferred replacement for "APC UNLOCKED" indicator light.

8552B SPECTRUM ANALYZER, IF SECTION

8552B-13. Serials 1613A and below. Modification to A8 Log Amplifier Assembly for improved operation in 2 dB Log Mode

8554B SPECTRUM ANALYZER

8554B-8. All serials. Precaution on changing A7 YIG Oscillator Assembly.

8558B SPECTRUM ANALYZER

8558B-17. Serials 1707A 03360 and below. Modification to prevent A14 Log Board Oscillations.

8559A SPECTRUM ANALYZER

8559A-10. Serials 2019A01259 and below. Modification to eliminate noise sidebands in 100 kHz resolution bandwidth.

8565A SPECTRUM ANALYZER

8565A-12. All serials. Improved Log Amplifier Assembly.
8565A-15. Serials 2107A01945 and below. Improved Third Converter operation.
8565A-16. All serials. Log Amplifier adjustment.

8566A SPECTRUM ANALYZER

8566A-17. All serials. Preventing attenuator damage when performing conducted EMI measurements.

8568A SPECTRUM ANALYZER

8568A-41. All serials. Preventing attenuator damage when performing conducted EMI measurements.
8568A-42. IF-Display section serials 2106A and below. Modification to improve frequency zero adjustment.

8569A SPECTRUM ANALYZER

8569A-2. All serials. Procedure for repair or replacement of HP-IB assembly.
8569A-3A. Serials 2105A00141 and below. "A" series firmware revision.
8569A-4-S. Serials 2128A00340 and below. Modification to prevent potential instrument damage and personal hazard when installing a CRT replacement.

8620C SWEEP OSCILLATOR

8602C-4B. Serials 1933A and below; serials 1641J and below; serials 1905U and below. Option 011 HP-IB installation kit, HP part number 08620-60154.
8620C-5B. Serials 1933A and below; serials 1641J and below; serials 1905U and below. Option 011 HP-IB exchange replacement kit HP part number 08620-60157.
8620C-8. Serials 1933A and below; serials 1641J and below; serials 1905U and below. Option 001 BCD installation kit, HP part number 08620-60172.

8656A SIGNAL GENERATOR

8656A-10A. Serials 2124A and below. Modification to correct for spurious sidebands 60–110 MHz VCO.
8656A-15. Serials 2127A and below. Modification to improve +24 Vdc fuse, A10F1, failure rate.

8662A SYNTHESIZED SIGNAL GENERATOR

8662A-5. Serials 1946A and below. Attenuator correction modification.

8903A AUDIO ANALYZER

8903A-3-S. Serials 2118A and below. Modification to prevent rack mount and handle shock hazard.
8903A-4. Serials 2016A and below. Wiring check for replacement of power transformers.
8903A-5. All serials. Changing the input and output protection fuses.
8903A-6. Serials 2126A and below. Correcting low-frequency error in audio counter.

9111A GRAPHICS TABLET

9111A-1. All serials. Possible voltage regulator miswire.

9571A DTS-70 SYSTEM

91075D/E/F/J/K/L-1. Software serial numbers 2126A00100 and above. Notification of 91075D/E/F/J/K/L System Software Revision 2126.
9571A-11. All serials. Thermal cutout modification.
9571A-12A. All serials. Modifications to correct system power supply wiring.
9571A-13A. Serials 1752A00325 and above. 9571A changes for ECL testing.
9571A-14. All serials. How to provide high current −5.2 volt UUT power when testing ECL Logic.
9571A-15. All serials. The SFTs and SPTs have been updated to be compatible with the ECL D/C cards.
9571A-16. All serials. List of manual changes.
9571A-17A. All serials. Recommended procedure for ECL modification.
9571A-18A. All serials. Contents of the product support package for the 9571A revised June 1980.
9571A-20. Serials 1752A00314 and below. Programmable rate generator pulse count modification.
9571A-21. Serials 1752A00388 and below. Modification to prevent intermittent HP-IB timeouts.

9872C/T GRAPHIC PLOTTER

9872C/T-1. All serials. Recommended procedure for repairing Power Supply PCA failure P/N 09872-60508 or P/N 09872-66508.

10286A NRZI OPTION INTERFACE

10286A-1. All units. Clarification of operating instructions.

17603A GRAPHICS PLOTTER PERSONALITY MODULE

17603A-1. Serials 2134A and below. Preferred replacement of ROMs U29 and U30.

34702A MULTIMETER

34702A-1A/34740A-1A/34750A-1A. 34702A all serials; 34750A display serials 1213A03935 and below; 34750A display serials 1304A00750 and below. Modification to reduce AC zero offset.

37201A HP-IB EXTENDER

37201A-3. All serials. Preferred replacement of A1Y100.

59300-10002 HP 85A HP-IB TEST TAPE (REV. C)

59300A-2A. All serials. New HP-IB test tape for HP 85A controller available as HP P/N 59300-10002.

59301A ASCII/PARALLEL CONVERTER

59301A-3. Serials 2012A02468 to 2012A02630. Jumper to correct improper output level on J1(1).

59309A HP-IB CLOCK

59309A-7. Serials 1920A-02871 and below. Correction of HP-IB talk operation when used with 37201A HP-IB extender.

59403A COMMON CARRIER INTERFACE

59403A-6. All serials. Modification to increase −12 volt reliability.

59500A MULTIPROGRAMMER INTERFACE

59500A-2. Serials 2133A-02633 and below. Modification to prevent intermittent HP-IB bus hangup.

62605L/62605L-OPT P05 POWER SUPPLY

62605L-3/62605M-4. 62605L serials 211A-05611 and below; Option P05 serials 2111A-05654 and below. Procedure for installing new A1-control board.

62605M/62605M-OPT 106 POWER SUPPLY

62605L-3/62605M-4. Serials 2033A-09575 and below. Procedure for installing new A1-control board.

64000 LOGIC DEVELOPMENT SYSTEM

64000-0C. Service note index.
64000-2. Firmware/Software/Disc compatibility.

64100A LOGIC DEVELOPMENT SYSTEM MAINFRAME

64100A-4. Modifications to prevent damaging the flyback transformer and otherwise increase reliability. Change 64100-66506 Rev. E to Rev. F.
64100A-5. Serials 2149 and above. Power supply label corrections.
64100A-6. Serials 2136 and below. Modification to prevent display driver failures.
64100A-7. Serials 2149 and below. CPU/ROM Signature Analysis Tables according to U25 and U27.
64202A-3A. 64202A 8080 Emulator Subsystem. Emulator Pod all repair numbers with prefix 2013A and below. Modification to prevent user wait state failures.
64203A-6. 64203A 8085 Emulation Probe. All repair numbers. Parts list for "User Cable with Active Assembly".
64242A-1. 64242A 68000 Emulator Subsystem. Emulator Pod Repair Number Prefix 2124A and below. Modification to improve DMA exit operation.
64250A Z80 Emulator Subsystem. 64251A-5. All Z80 Emulator Pod Board Repair Numbers. Illegal OP codes detected following halt instruction.
64271A-1. 64271A GP Controller. Serials 2124A00317 and below. Modification to correct last address timing circuit.

86290A/B/C RF PLUG-IN

86290A-5/86290B-3/86290C-2. All serials. Frequency tracking adjustment.

84811A PEAK POWER SENSOR

84811A-1. All serials. Recommended Diode Module Replacement Assembly in the Peak Power Sensor.

85650A QUASI-PEAK ADAPTER

85650A-1. All serials. Preventing spectrum analyzer attenuator damage when peforming conducted EMI measurements.
85650A-2. All serials. Apparent out-of-specification performance at low pulse repetition frequencies.
86290A-6/86290B-4/86290C-3. 86290A serials 21007A and below; 86290B serials 2109A and below; 86290C serials 2101A and below. ALC overshoot reduced with recommended modification.

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 _____

- ☐ 331A/332A-14
- ☐ 333A/334A-14
- ☐ 400E-12
- ☐ 400EL-12
- ☐ 400F-6
- ☐ 400FL-6
- ☐ 400GL-2
- ☐ 403B-12
- ☐ 410C-20
- ☐ 410C-21
- ☐ 410C-22
- ☐ 419A-11
- ☐ 427A-6
- ☐ 428B-1
- ☐ 1302A-4A
- ☐ 1302A-5
- ☐ 1304A-4A
- ☐ 1304A-5A
- ☐ 1304A-6
- ☐ 1310A-21
- ☐ 1310B-1
- ☐ 1311A-21
- ☐ 1311B-5
- ☐ 1317A-8
- ☐ 1317B-1
- ☐ 1321A-8
- ☐ 1321B-1
- ☐ 1332A-13
- ☐ 1332A-14
- ☐ 1332A/C39/C50-1-S
- ☐ 1333A-8
- ☐ 1333A-9
- ☐ 1335A-13
- ☐ 1335A-14
- ☐ 1336A-2
- ☐ 1340A-1
- ☐ 1340A-2
- ☐ 1340A-3
- ☐ 1345A-1
- ☐ 1351S-1
- ☐ 1600A-0
- ☐ 1600A-4
- ☐ 1607A-0
- ☐ 1607A-2
- ☐ 1610A-13
- ☐ 1610B-3
- ☐ 1611A-10
- ☐ 1615A-0
- ☐ 1615A-5
- ☐ 1640B-3
- ☐ 1740A-18
- ☐ 1741A-11
- ☐ 1742A-4
- ☐ 1743A-5
- ☐ 1744A-4
- ☐ 1980A/B-5A
- ☐ 1980A/B-6
- ☐ 1980A/B-7
- ☐ 1980A/B-8
- ☐ 1980A/B-9
- ☐ 3054A-1
- ☐ 3060A-20A
- ☐ 3060A-27B
- ☐ 3060A-32
- ☐ 3060A-33
- ☐ 3060A-34
- ☐ 3060A-35
- ☐ 3060A-36
- ☐ 3060A-37
- ☐ 3060A-38A
- ☐ 3253A-5
- ☐ 3253A-6
- ☐ 3310A/B-7A
- ☐ 3336A/B/C-4
- ☐ 3336A/B/C-5
- ☐ 3336A/B/C-6
- ☐ 3400A-12
- ☐ 3406A-10
- ☐ 3435A-6A
- ☐ 3456A-8
- ☐ 3456A-10
- ☐ 3456A-11
- ☐ 3490A-17
- ☐ 3496B-4B
- ☐ 3497A-5A
- ☐ 3497A-7B
- ☐ 3570A-13
- ☐ 3570A-14
- ☐ 3581A-8
- ☐ 3582A-8A
- ☐ 3582A-10B
- ☐ 3582A-11
- ☐ 3582A-12
- ☐ 3585A-6A
- ☐ 3585A-7
- ☐ 3586A/B/C-2B
- ☐ 3730B-1
- ☐ 3745A/B-30C
- ☐ 3762A-4
- ☐ 3762A-5
- ☐ 3763A-4
- ☐ 3763A-5
- ☐ 3771A/B-21
- ☐ 3771A/B-22
- ☐ 3771A/B-23
- ☐ 3779B-13A
- ☐ 3779B-24
- ☐ 3780A-10D
- ☐ 3780A-21A
- ☐ 3780A-22
- ☐ 3780A-23
- ☐ 3781A-1
- ☐ 3781B-3
- ☐ 3781B-4
- ☐ 3782A-1
- ☐ 3782B-3
- ☐ 3782B-4
- ☐ 3793B-2
- ☐ 4191A-5
- ☐ 4191A-6
- ☐ 4191A-7
- ☐ 4191A-8
- ☐ 4191A-9
- ☐ 4191A-10
- ☐ 4191A-11
- ☐ 4192A-6
- ☐ 4935A-1
- ☐ 4942A-7
- ☐ 4943A-10
- ☐ 4944A-9
- ☐ 5001A-2
- ☐ 5001C-2
- ☐ 5045A-23A
- ☐ 5245L-9
- ☐ 5300A-6
- ☐ 5312A-4
- ☐ 5316A-2
- ☐ 5316A-3A
- ☐ 5328A-33
- ☐ 5328A-34
- ☐ 5328A-35
- ☐ 5335A-5A
- ☐ 5335A-6A
- ☐ 5335A-7
- ☐ 5335A-8
- ☐ 5335A-9
- ☐ 5340A-21
- ☐ 5342A-31
- ☐ 5342A-32
- ☐ 5342A-33
- ☐ 5343A-10
- ☐ 5343A-11
- ☐ 5345A-18
- ☐ 5345A-19
- ☐ 5345A-20A
- ☐ 5345A-21
- ☐ 5355A-1
- ☐ 5356A-1
- ☐ 5356B-1
- ☐ 5420A-0
- ☐ 5420A-4A
- ☐ 5420A-7A
- ☐ 5420A-9A
- ☐ 5420A-11A
- ☐ 5420A-14A
- ☐ 5420A-15B
- ☐ 5420A-21B
- ☐ 5420A-22A
- ☐ 5420A-27
- ☐ 5423A-0
- ☐ 5423A-1
- ☐ 5427A-6
- ☐ 5427A-7
- ☐ 5427A-08
- ☐ 5451C-0
- ☐ 5451C-05
- ☐ 5501A-0
- ☐ 5526A-0
- ☐ 6012A-1
- ☐ 6012A-2

Please photocopy this order form if you do not want to cut off the page

Service Note Order Form (Cont.)

- ☐ 6012A-3
- ☐ 6034A-1
- ☐ 6034A-3
- ☐ 6256B-3/6263B-4/ 6264B-3/6266B-4/ 6267B-3/6271B-5/ 6274B-2
- ☐ 6259B-4/6260B-3/ 6261B-3/6268B-3/ 6269B-4
- ☐ 6259B-5/6260B-4/ 6261B-4/6268B-4/ 6269B-6
- ☐ 6259B-6/6260B-5/ 6261B-5/6268B-5/ 6269B-7
- ☐ 6825A-2/6826A-2/ 6827A-2
- ☐ 6942A-4A
- ☐ 7044B-1
- ☐ 7045B-1
- ☐ 7046A-9/ 7046B-2
- ☐ 7046B-1
- ☐ 7130A/B-5A
- ☐ 7131A/B-5A
- ☐ 7132A-1
- ☐ 7133A-1
- ☐ 7220C/T-1
- ☐ 7221C/T-1
- ☐ 7580A-2
- ☐ 7580A-3
- ☐ 7580A-4
- ☐ 8405A-8A
- ☐ 8552B-13
- ☐ 8554B-8
- ☐ 8558B-17
- ☐ 8559A-10
- ☐ 8565A-12
- ☐ 8565A-15
- ☐ 8565A-16
- ☐ 8566A-17
- ☐ 8568A-41
- ☐ 8568A-42
- ☐ 8569A-2
- ☐ 8569A-3A
- ☐ 8569A-4-S
- ☐ 8620C-4B
- ☐ 8620C-5B
- ☐ 8620C-8
- ☐ 8656A-10A
- ☐ 8656-15
- ☐ 8662A-5
- ☐ 8903A-3-S
- ☐ 8903A-4
- ☐ 8903A-5
- ☐ 8903A-6
- ☐ 9111A-1
- ☐ 9571A-11
- ☐ 9571A-12A
- ☐ 9571A-13A
- ☐ 9571A-14
- ☐ 9571A-15
- ☐ 9571A-16
- ☐ 9571A-17A
- ☐ 9571A-18A
- ☐ 9571A-20
- ☐ 9571A-21
- ☐ 9872C/T-1
- ☐ 10286A-1
- ☐ 17603A-1
- ☐ 34702A-1A/ 34740A-1A 34750A-1A
- ☐ 37201A-3
- ☐ 59300A-2A
- ☐ 59301A-3
- ☐ 59309A-7
- ☐ 59403A-6
- ☐ 59500A-2
- ☐ 62605L-3/ 62605M-4
- ☐ 64000-0B
- ☐ 64000-2
- ☐ 64100A-4
- ☐ 64100A-5
- ☐ 64100A-6
- ☐ 64100A-7
- ☐ 64202A-3A
- ☐ 64203A-6
- ☐ 64242A-1
- ☐ 64251A-5
- ☐ 64271A-1
- ☐ 84811A-1
- ☐ 85650A-1
- ☐ 85650A-2
- ☐ 86290A-5/ 86290B-3/ 86290C-2
- ☐ 86290A-6/ 86290B-4/ 86290C-3
- ☐ 91075D/E/F/ J/K/L-1

Please photocopy this order form if you do not want to cut off the page.

HEWLETT-PACKARD COMPANY
1820 Embarcadero Road
Palo Alto, California 94303

BENCH BRIEFS
MARCH-APRIL 1982
Volume 22 Number 2

Service information from Hewlett-Packard Company

To obtain a qualification form for a free subscription, send your request to the above address.

Reader comments or technical article contributions are welcomed. Please send them to the Bench Briefs Editor.

Editor: Jim Bechtold
Hewlett-Packard
690 E. Middlefield Rd.
Mt. View, CA 94042

Bulk Rate
U.S. Postage
PAID
Sunnyvale, CA.
Permit No.
317

Printed in U.S.A.