HEWLETT hp PACKARD

BENCH BRIEFS

SERVICE INFORMATION FROM HEWLETT-PACKARD

SPECIAL REQUALIFICATION ISSUE

JANUARY-APRIL, 1976

LOGIC SYMBOLS

by Tom Trompeter

This is the first of a series of articles introducing the IEEE Standard 91-1973 Graphic Symbols for Logic Diagrams (two-State Devices). This first article covers internal and external indicators with subsequent articles showing how these indicators are combined to form meaningful and useful logic symbols.

The primary purpose of the new standard is hopefully another step toward eliminating the confusion between positive/negative logic levels, and resolving the controversy between"polarity" thinkers and "state" thinkers. Toward this end, the standard allows two general types of logic symbols; rectangular (IEC) and distinctive shaped. Then, for clarity, qualifiers are placed inside and outside the logic symbols that describe the exact function of the circuit, the polarity that is required at the input, and the polarity that results at the output.

INTERNAL QUALIFIERS

An example of the qualifiers used inside the logic symbols to indicate the function of the circuit are shown in Figures 1 and 2. Figure 1 shows two AND gates. The & (ampersand) indicates that all inputs must be activated to obtain an active output. Figure 2 shows two OR gates. The expression $\geqslant 1$ indicates that the output will be active only if the quantity of active inputs is equal to or greater than one.

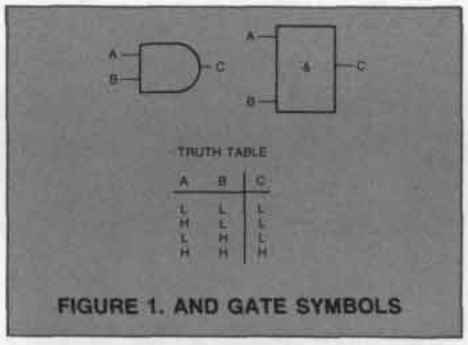


FIGURE 1. AND GATE SYMBOLS

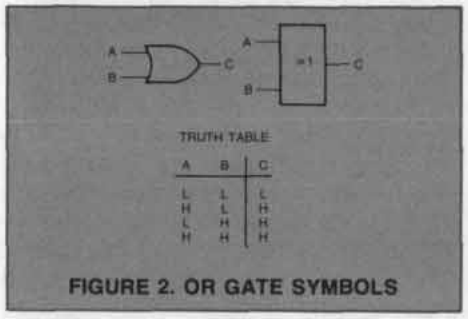


FIGURE 2. OR GATE SYMBOLS

Note the use of H (high) and L (low) in the truth tables. Keep in mind that the device is going to respond to Highs (more positive level) and Lows (least positive) and the operation of the circuit is not going to be changed by the choice of symbology in the documentation. Remember that to use 1's and 0's would lead to confusion because you don't know if a circuit is positive (H=1) or negative (H=0) true logic.

EXTERNAL QUALIFIERS

The old MIL STD 806 used a circle (negation indicator symbol) at input and/or outputs to denote inversion (see Figures 3 and 4). However, an interpretation problem came to fore because of positive and negative logic. Those who interpret the circle as indicating a Low differ in their interpretation from those who interpret the circle as indicating a zero. To solve the controversy between the "polarity" and "state" thinkers, a new indicator called a polarity indicator symbol ( ) was created and is to be used only to indicate polarity (that is, High and Low). The polarity indicator symbol was chosen over the negation indicator symbol because it represents the inputs and outputs in terms of their physical value, the less positive level being the low state. A polarity indicator symbol at an input indicates that a low input is required. A polarity indicator symbol at an output indicates that the output is low. High inputs and high outputs are shown without the polarity indicator symbol. The polarity indicator symbol on the output of the NAND gate shown in Figure 3 can be correctly interpreted only one way: the output will be low when the two inputs are high. The polarity indicator symbol on the output of the NOR gate shown in Figure 4 will be low when either input is high.

IN THIS ISSUE

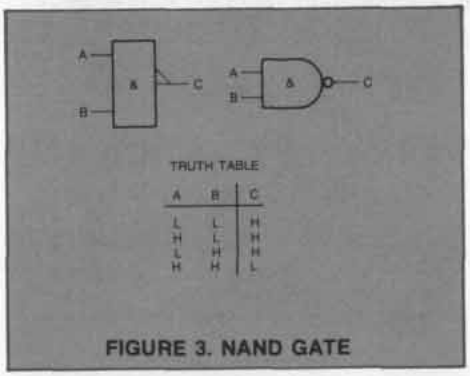


FIGURE 3. NAND GATE

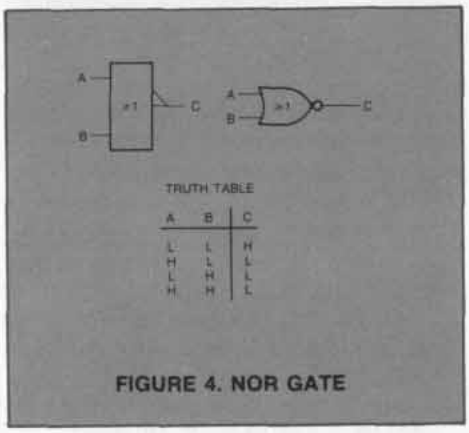


FIGURE 4. NOR GATE

Sensitivity to transition or edge sensitivity, is shown by using the dynamic indicator symbol (⊣▷). Figure 5a shows that the device needs a transition from low to high, and Figure 5b, with the addition of the polarity indicator, requires a transition from high to low. If the dynamic indicator is not present, then the line is level sensitive.

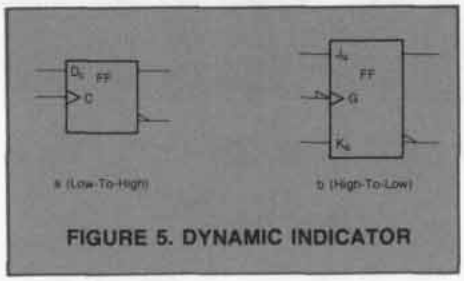


FIGURE 5. DYNAMIC INDICATOR

The output delay indicator symbol (⌝) indicates that the output becomes effective when the signal that initiates the change returns to its opposite state (see Figure 6).

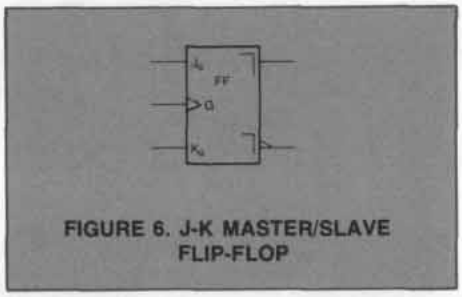


FIGURE 6. J-K MASTER/SLAVE FLIP-FLOP

The inhibiting-input indicator symbol (—|—) indicates that the output is prevented from going to its indicated state as long as the inhibiting input remains at its low state. When an inhibiting-input indicator and a polarity indicator symbol are used together, the output is prevented from going to its indicated state as long as the inhibiting input remains at its high state. The inhibiting input symbol is used mainly with three-state devices to allow the use of the "wired OR" connection of outputs (see Figure 7).

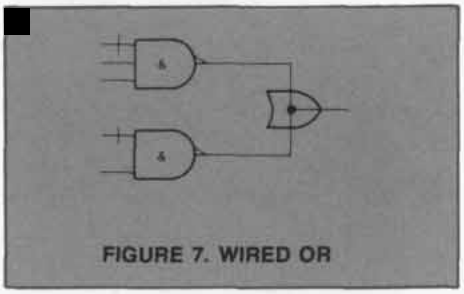


FIGURE 7. WIRED OR

The non-logic indicator symbol (—X—) denotes that the input or output so marked does not carry logic information and has no effect on the logic function. Figure 8 shows applications of this symbol.

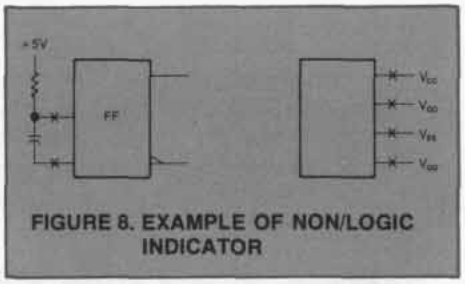


FIGURE 8. EXAMPLE OF NON/LOGIC INDICATOR

The next issue of Bench Briefs will show how some of these symbols are combined to describe complex logic circuits.

Tom Trompeter, who has been with Hewlett-Packard 2 years, is a Senior Technical Writer for the Stanford Park Instrument Division in Palo Alto, California. (The Stanford Park Division primarily manufactures microwave signal generators, power meters, wave guides, and other microwave related hardware.) Tom's latest projects have been manuals for an Educational Television Receiver/Preamplifier and a 4 GHz Portable Microwave Repeater.

Tom is an active Cubmaster and enjoys photography, ham radio and furniture refinishing. He lives in Sunnyvale, California with his wife and six children.

ELECTROLYTIC CAPACITOR DAMAGE BY SOLVENTS

Aluminum electrolytic capacitors may be damaged by halogenated hydrocarbon fluids in cleaning and defluxing solvents. These fluids, when used in a cleaning bath, may leak into the capacitor through the seals and cause failure due to corrosion. Caution should also be exercised by service technicians using circuit coolants for troubleshooting and repair as the aerosol cans use flurocarbon compounds for propellants.

When aluminum electrolytics are replaced in the field, we recommend that any flux residues be removed with isopropyl or methyl alcohol.

3580A/3581A/C SPECTRUM ANALYZER HANDLE MODIFICATION

There is the possibility of the handle assembly of the 3580A/3581A/C becoming loose if it does not have a new self-locking screw installed. On all 3580A units up through serial number 1415A00975, 3581A units up through serial number 1351A00230, and 3581C units up through 1411A00225, there is a possibility that the screws which attach the handle to the instrument will become loose and fall out. This results in the handle coming off the instrument on one or both ends. The old screws should be replaced with a new screw HP Part No. 03580-26001, and locking washer 3050-0426. This new screw has a head shape and size which prevents it from turning and coming loose. For more information, refer to Service Note 3581A/C-2/3580A-3.

8558B SPECTRUM ANALYZER TRANSISTOR PART NUMBER CHANGES

Two transistors in the 8558B have had part number changes. The Second Local Oscillator Transistor, A5A1Q1 (35824A), and the Second IF Bandpass Amplifier Transistor, A10Q2 (1854-0606), have both been changed to 5086-4218.

When ordering replacement transistors, please use the new number to expedite your order.

DELAY LINES

It is possible for a delay line to change its electrical characteristics due to time and heat build-ups. This usually shows up as a degradation of bandwidth and risetime; especially in scopes with a bandwidth of 10 mHz and above. So, if component changes in a unit have failed to correct BW or RT problems, try a new delay line. Note that any soldering performed on or near the delay line should use as little heat as possible.

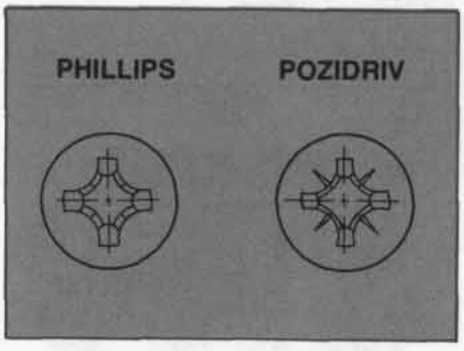
POZIDRIV vs PHILLIPS

Does your Phillips screwdriver keep slipping out of that screw and stripping the head? If so, its quite possible that screw is actually a Pozidriv screw rather than the older Phillips design. Pozidriv is the trade name of Phillips International, who developed this type of screw which is used in many HP instruments.

The crossed-slot pattern in the head of the Pozidriv Screw has sharper, squarer corners and presents more driving surface to the screwdriver than the Phillips. If you have a Pozidriv screwdriver, you can put more torque on those stubborn screws without burning or stripping their heads. A regular Phillips screwdriver will work on Pozidriv screws but won't give you the torque advantage because of its tapered tip. It will tend to climb out of the recess under heavy torque. Look at a Pozidriver and you'll see that its tip has straighter sides. As a result, it won't fit Phillips-head screws. The screw will even stay on the end of your driver without a holding device, the fit is so precise.

The following Pozidriv tools are available from HP:

8710-0899	Pozidriver, 3-1/8" for 2 & 4 screws — Stanley tool #2951
8710-0900	Pozidriver, 4" for 6, 8, & 10 screws — Stanley tool #2952
8710-0948	Pozidriver, 10" for 6, 8, & 10 screws — Vermont Tap & Die
8710-0949	Offset Pozidriver, 4" for 2, 4, 6, 8, & 10 screws — Vermont Tap & Die
8710-0945	Screwholder, 7" for 4, 6, 8, & 10 screws — Vaco Products #K-16



How can you tell a Pozidriv screw from a Phillips-head? Fortunately, that's easy. All Pozidrivs have starpoint markings, like those illustrated above.

3480A/B-8A DIGITAL VOLTMETER

If you made the modification suggested in service note 3480A/B-8 to correct random "8000" Bit errors, it probably transposed the problem to a random "1000" Bit error at a slightly higher operating temperature. The modification performed in service note 3480A/B-8 is still good. The new modification for fixing the "1000" Bit errors is replacing integrated circuit A11IC28 with HP Part No. 1820-0094 as per service note 3480A/B-8A.

1740A OSCILLOSCOPE

Do you get oscillations on the sweep when using mixed mode? If so, try changing A9R2 (on the delayed sweep board) from 82 ohms to 150 ohms (HP Part No. 9757-0284) as per service note 1740A-4.

VIDEO PLAYBACK EQUIPMENT FROM HEWLETT-PACKARD

Hewlett-Packard now offers videocassette color playpack equipment that can be used to bring you a wealth of knowledge from HP's videotape library.

The equipment shown in the picture includes:

90167A
Sony VP-2000/RFK videocassette player with RF modulator to permit program playback through a television receiver. 60 Hz, 120 VAC, NTSC color. (50 Hz version coming soon.)

90129B
Sony KV-1910 Trinitron, 19 inch television receiver. 50-60 Hz, 120 VAC, NTSC color.

90140A
Sony GC-4A cart.

Please note that HP video tapes are recorded following the NTSC color standard and are compatible only with equipment that uses that standard.

CLEANING SOLENOID CONTACTS

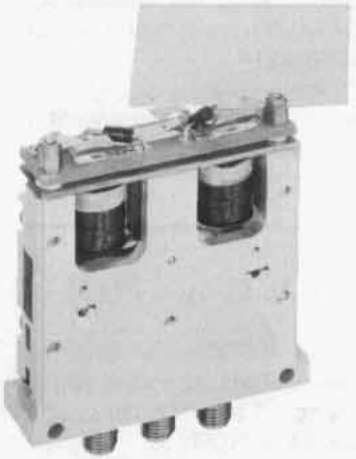
Intermittant or dirty solenoid contacts are easily cleaned by the following method.

1. Saturate the edge of a sheet of writing paper with alcohol.
2. Insert that saturated edge between the contacts, and while pressing gently on the movable contact, slide the paper through. See the Figure. Repeat this several times.

   NOTE

   Do not allow paper to tear or shed.

3. Saturate the edge of another sheet of paper with freon and repeat step 2.
4. Check that no shreds of paper have lodged in contacts.



CONVERTING HP AND FEDERAL STOCK NO'S

A "Replacement Part Cross Reference" is available that converts between HP and Federal (U.S.) Stock Numbers. The cross reference is in microfiche form and can be purchased from HP by ordering part number 5951-6109 (for HP internal order handling, be certain you specify "check digit 4").

SPECIAL NOTICE FOR USERS OF HP-IB PRODUCTS

Hewlett-Packard fully supports IEEE Standard 488-1975, including the provision that ISO metric threads be used on the bus connector lock screw and corresponding stud mount. This means that future HP-IB products will come to you already equipped with the proper metric thread connector hardware.

If you are among the many present users of HP-IB products purchased over the past few years, please note that the connector locking threads on those products are **non-metric** -- and they are therefore not compatible with metric threaded connectors now being produced per the IEEE Standard.

Two different metal finishes are being used by HP to help you tell the difference between metric and non-metric connectors. Whereas the older non-metric parts have a shiny nickel finish, all **metric-threaded** lock screws and stud mounts have a **black** finish and the letter "M" stamped on them.

A special program has been set up by Hewlett-Packard to assist customers in converting the connectors on their older HP-IB products to be compatible with the new standard metric-threaded connector. Until 1 July 1976, we will provide HP-IB Metric Conversion Kits at no charge to customers having HP products (instruments, cables, controller interfaces) with the non-metric connector; after that date a modest charge will be made for the kit.

Please contact your HP field engineer or service representative for details.

PAST SEMINARS

The last Bench Briefs mentioned service seminars being offered at several locations in the U.S. and Canada.

Many readers commented on the short time between the arrival of Bench Briefs and the start of the seminars. Evidently Bench Briefs was delayed in the December mail more than anticipated. To alleviate this, separate mailings are planned for the future when a crowded schedule is anticipated.

If you want to be certain to receive information about future seminars, please indicate so on the requalification form. This will ensure that you are notified about the seminar dates and locations.

Dick Gasperini presented the Digital Troubleshooting seminar in Los Angeles, California and Paramus, New Jersey. This has been one of the more popular seminars, with most sessions filled to capacity.

This photo, taken in Toronto, Canada at the 8555A and 8552A/B Microwave Spectrum Analyzer seminar, shows students checking the bandpass filter on the 8552 Spectrum Analyzer.

FUTURE SEMINARS

OBJECTIVE

Provide the electronic repair technician with the training needed to:

- — Understand all panel control operations as they relate to the functional block diagram.
- — Interpret signal waveforms and voltage levels at test points.
- — Efficiently perform critical adjustments.
- — Isolate troubles to the individual circuits.

PREREQUISITES

These seminars are intended for repair and calibration technicians who have some knowledge of analog circuits, digital circuits, and phase lock loops.

LOCATIONS

Both seminars will be held in California. The first is at the Santa Rosa facility where most of our spectrum analyzers are manufactured. The second is at Palo Alto which primarily manufactures microwave signal generators.

SANTA ROSA, CALIF
AUG. 23 — 27

8620C Sweep Oscillator
86290A 2-18 6 Hz Plug-in
8555A Spectrum Analyzer
8552B Spectrum Analyzer, IF Section
8558B Spectrum Analyzer

PALO ALTO, CALIF
AUG. 30 — SEPT. 3

8640A/B AM-FM Signal Generator
8660 Synthesized Signal Generator

Tuition will be $350.00 per week.

Other particulars such as course outline and registration information will be printed in the next issue of Bench Briefs.

SAFETY RELATED SERVICE NOTES

Service Notes from HP relating to personal safety and possible equipment damage are of vital importance. To make you more aware of these important notes, HP has recently modified the Safety Service Note format. The note is now printed on paper with a red border, and a "-S" suffix has been added to the note's number. In order to make you immediately aware of any potential safety problems, we are highlighting safety related Service Notes in this section of Bench Briefs 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 rear of Bench Briefs, each appropriate number is printed in color.

VOLTMETERS — OSCILLATORS

Some older voltmeter/oscillator-type instruments have a POTENTIAL SHOCK HAZARD. If the instrument is floated above ground, control shafts (and control knob set screws) are above ground potential. In order to test your instrument for this potential shock hazard, refer to one of the abbreviated procedures below. Please note that more detailed instructions are available on the service note.

If the instrument fails the test it can be made to conform to current safety standards with one of the appropriate modification kits from Table 1.

TEST PROCEDURES

The instruments are grouped into five basic tests; look for your model number and perform the steps given with an ohmmeter to determine if your instrument needs the modification.

a. Set the ohmmeter to the 1K ohm range.

b. Turn the power switch OFF, disconnect all power cords, cables, and grounding straps from the instrument.

1. 204C, 204D, 209A,

1. (Cont'd) 331A/332A, 333A/334A

a. Check for continuity between inner chassis ground and the set screws of each control knob.

Infinity = OK

2. 241A, 410C, 419A, 741A/B, 3460A/B

a. These instruments all have a terminal or lead marked LOW, COMMON or – (minus). Check for continuity between this negative side terminal and the set screws of each control knob.

Infinity = OK

3. 740A/B

a. This instrument requires the input cable assembly be connected. Check for continuity between the low (middle) terminal and the set screws of each control knob.

Infinity = OK

4. 3300A

a. Connect one ohmmeter lead to shield ground. Check for continuity to power line ground and then output ground.

Continuity = OK

5. 3302A, 3304A, 3305A

a. Remove the plug-in from the 3300A mainframe. Connect one ohmmeter lead to the end plate on the rear of the plug-in. Refer to one of the following steps for your particular plug-in.

b. For the 3302A — check for continuity to the set screws in the START/STOP PHASE, MODE,

TABLE 1. VOLTMETER/OSCILLATOR-TYPE INSTRUMENTS

INSTRUMENT		MODIFICATION KIT
204C	Oscillator	00204-69506
204D	Oscillator	00204-69507
209A	Oscillator	00209-69503
241A	Oscillator	00241-69501
331A/332A	Distortion Analyzers	00331-69500
333A/334A	Distortion Analyzers	00333-69500
410C	Voltmeter	00410-69503
419A	Voltmeter	00419-69500
740A/B	DC Standard Differential Voltmeter	00740-87901
741A/B	AC-DC Differential Voltmeter DC Standard	00741-87901
3300A	Function Generator	03300-69501
3302A	Trigger/Phase Lock Plug-In	03302-69501
3304A	Sweep/Offset Plug-In	03304-69501
3305A	Sweep Plug-In	03305-69501
3460A/B	Digital Voltmeter	03460-87901

and INPUT PHASE controls.

Infinity = OK

c. For the 3304A — check for continuity to the set screws on all control knobs except the frequency control.

Infinity = OK

d. For the 3305A — check for continuity to the set screws on the red and black SWEEP TIME and SWEEP MODE controls.

Infinity = OK

1331A/C CRT

Several 1331A/C CRT Display-type instruments have a potential shock hazard. It is required that instruments with double pole power switches have the "hot" side of the AC line connected through the fuse. The possibility exists that some of the Displays have the wires between the AC power receptacle and power switch reversed. To check your instrument, remove the power cord and fuse and check for continuity between the power receptacle pin "L" and the center post of the fuse holder. It may be necessary to remove the bottom cover and inspect the back side of the power receptacle for the "L" designation.

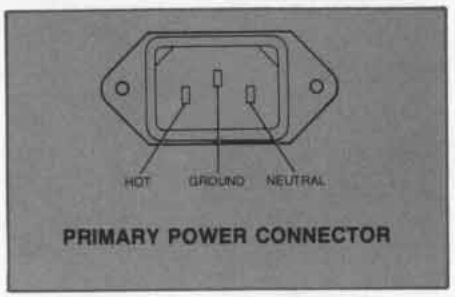
If continuity exists, the wiring is correct. If the wiring is not correct, unsolder the wires from the line (L) and neutral (N) connectors of the AC power receptacle and reverse them. If the wires are not long enough, replace them with longer wires of the same gauge and color code. If for any reason it is inconvenient to perform this modification, the instrument may be returned to your nearest HP office where it will be done at no cost.

SIGNAL GENERATORS

Several of the following signal generator-type instruments may have a potential shock hazard at the transformer primary due to the hot and neutral primary power leads being reversed at the input receptacle.

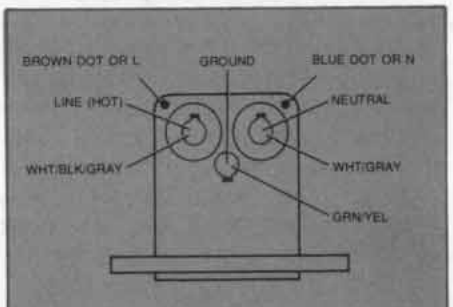
606B	Signal Generator
614A/616B	VHF Signal Generator
8403A	Modulator
8798A	Synchronizer

To check your instrument, remove the power cord and fuse and check for continuity between the "hot" contact of the power receptacle and the rear terminal of the fuse holder. Refer to the figure below.



PRIMARY POWER CONNECTOR

If continuity exists, the wiring is correct. If the wiring is not correct, unsolder the wires at the hot and neutral contacts on the primary power line filter (see the figure below).



PRIMARY LINE FILTER

Make certain that the markings on the line filter are the same as shown in the figure above. If they are not, remove the marks with solvent or by scraping and remark with a black felt-tip pen ("L" is hot and "N" is neutral). If for any reason it is inconvenient to perform this modification, the instrument may be returned to your nearest HP office where it will be done at no cost.

AUTOMATIC MICROWAVE POWER MEASUREMENTS

By controlling a microwave power meter with a scientific calculator and manipulating the measured data, a microwave engineer can gain a considerable increase in capability over traditional power measurements. Hewlett-Packard Application Note 196, "Automatic Power Measurements Using the HP 436A Power Meter" describes five practical measurements with block diagrams and accuracy considerations, where improved accuracy or speed is obtained using such a mini-system. Annotated listings of demonstration software examples are included, so the interested user can get a mini-system running quickly.

One example, of special interest to calibration labs, is calibration of coaxial attenuators up to 18 GHz with typical accuracies of ±0.2 dB at 20 dB. Another is a procedure for rapidly transferring calibration factor for thermocouple power sensors. Usually a tedious and expensive process for cal labs. Other topics include signal generator calibration, 50-dB dynamic-range X-Y plots of absolute power, and remote power monitoring over phone lines.

For a copy of Application Note 196, please contact your local HP office.

supplement to

BENCH BRIEFS SERVICE NOTE INDEX

NEED ANY SERVICE NOTES?

Here's the latest listing of Service Notes available for Hewlett-Packard products. In order to make you aware of any potential safety problems, we are highlighting safety related Service Notes on a preceding page with a brief description of each problem. Also in order to draw your attention to safety related Service Notes here, each one is marked by a "-S" suffix. On the Service Note Order Form, safety related Service Note numbers are printed in color. To obtain information for instruments you own, remove the order form and mail it to the nearest HP distribution center.

HP 13XX SERIES OSCILLOSCOPES

M-56. All serials. Cross reference of Light Filters and their applications in use on HP 13XX display oscilloscopes.

141T STORAGE OSCILLOSCOPES

141T-5. Serials 1502A10545 and below. Revision to improve baseline clipper operation.

204C OSCILLATOR

204C-2-S.Revisions to minimize shock potentials.

204D OSCILLATOR

204D-2-S. Revisions to minimize shock potentials.

209A OSCILLATOR

209A-7-S. Revisions to minimize shock potentials.

241A PUSHBUTTON OSCILLATOR

241A-2-S. Revisions to minimize shock potentials.

310A WAVE ANALYZER

310A-9A. Serials 0948A03309 and below. New inductor on local oscillator assembly.

331A/332A DISTORTION ANALYZERS

331A/332A-10-S. Serials below 1149A07206 for the 331A and below 1140A06311 for the 332A. Elimination of a potential shock hazard.

333A/334A DISTORTION ANALYZERS

333A/334A-9-S. Serials below 1137A03316 for the 333A and below 1140A06311 for the 334A. Elimination of a potential shock hazard.

410C ELECTRONIC VOLTMETER

410C-14A-S. Serials below 0982A17729. Elimination of a potential shock hazard.

419A DC NULL VOLTMETER

419A-7-S. Revisions to minimize shock potentials.

432B DIGITAL POWER METER

432B-2A. Serials 1528A and below. Modification to improve operation with digital recorder.

606B SIGNAL GENERATOR

606B-11-S. Serials 1401A03959 thru 1518A04461. Elimination of potential shock hazard.

608E/F SIGNAL GENERATORS

608E/F-19. All serials. Recommended replacement for CR22.

614A UHF SIGNAL GENERATOR

614A-6-S. Serials 1311A04516 thru 1447A04540. Elimination of potential shock hazard.

616B UHF SIGNAL GENERATOR

616B-8-S. Serials 1317A03291 thru 1438A03329. Elimination of potential shock hazard.

740A/B DC STANDARD/DIFFERENTIAL VOLTMETER

740A-6-S/740B-8-S. Revisions to minimize shock potentials.

741A/B AC—DC DIFFERENTIAL VOLTMETER DC STANDARD

741A-9A-S/741B-10A-S. Revisions to minimize shock potentials.

MODEL 745A-H18 AC CALIBRATOR

745A-H18-16. Serials below 1319A01671. Improvements to the reliability of the 745A-H18.

895A POWER SUPPLY

895A-1. Serials 1501A01153 and below. Modification to replace SCR's with Triac.

1220A/1221A/1222A OSCILLOSCOPES

1220A-21/1221A-9/1222A-1. Service procedures to replace CRT.

1310A/1311A/1317A/1321A DISPLAYS

1310A/1311A-16. 1310A serials 1520A and below; 1311A serials 1449A and below. Replacement part numbers for A1U1 and/or A3U1.
1317A/1321A-4. 1317A serials 1510A and below; 1321A serials 1525A and below. Replacement part numbers for A1U1 and/or A3U1.

1331A/C DISPLAY

1331A/C-18-S. 1331A serials 1426A thru 1520A; 1331C serials 1024A thru 1513A. Elimination of potential shock hazard.

1335A X-Y DISPLAY

1335A-1. Serials 1514A and below (all options inclusive). Modifications to improve reliability.

1645A RS232 INTERFACE

1645A-3. New circuit board (01645-66517) provides a transmit data inhibit circuit.

1710A/B OSCILLOSCOPES

1710A-5. All serials. Preferred replacement for A3C1.
1710B-4. All serials. Replacement for attenuator detent wheel.

1712A OSCILLOSCOPES

1712A-2. All serials. Replacing attenuator termination resistors.
1712A-3. All serials. Replacement for attenuator detent wheel.

1720A OSCILLOSCOPES

1720A-7. All serials. Replacement for attenuator detent wheel.

1722A OSCILLOSCOPE

1722A-3. Serials 1429A and below. Replacement for channel A position control.
1722A-4. All serials. New extender board kit.
1722A-5. All serials. Replacing attenuator termination resistors.
1722A-6. All serials. Replacement for attenuator detent wheel.
1772A-7. All serials. Digital board interchangeability.

1740A OSCILLOSCOPE

1740A-2. All serials. Care of vertical preamplifier integrated circuit.
1740A-4. Serials 1526A and below. Mixed sweep oscillations.

3300A FUNCTION GENERATOR

3300A-10-S. Serials below 0939A06726. Elimination of a potential shock hazard.

3302A TRIGGER/PHASE LOCK PLUG-IN

3302A-5-S. Serials below 0720A02761. Elimination of a potential shock hazard.

3304A SWEEP/OFFSET PLUG-IN

3304A-2-S. All serials. Elimination of a potential shock hazard.

3305A SWEEP PLUG-IN

3305A-1-S. Serials below 0835A01306. Elimination of a potential shock hazard.

3310A/B FUNCTION GENERATOR

3310A/B-6. All serials. Correct replacements for Q_1 and Q_2 output transistors.

3460A/B DIGITAL VOLTMETER

3460A-16A-S/3460B-11-S. Revisions to minimize shock potentials.

3480A/B DIGITAL VOLTMETER

3480A/B-8A. Serial numbers. All that have been retrofitted with Optically Isolated BCD 03480-66525/03480-69525 Rev. A or Rev. B) assemblies. Reduction of errors in the thousands digit in optically isolated BCD boards.

3480C/D DIGITAL VOLTMETER

3480C/D-4. All serials. Recommended replacement for power supply capacitors A6C2 thru A6C7.
3480C/D-5. Serial numbers. All with Option 004 BCD Output Assemblies (HP Part Number 03480-66525 or 03480-69525, Revision A or Revision B). Improved operation with 9800 series calculators.

3490A MULTIMETER

3490A-1B. All serials. Improvement of reliability in optical isolation assemblies.
3490A-11. All serials. Replacement part number for the rebuilt HP-IB optical isolation assembly.

3551A/3552A TRANSMISSION TEST SET

3551A/3552A-3. Modifications to improve performance.

3556A PSOPHOMETER

3556A-U-1001. Serials 1348U01725 and below. Replacement part numbers for A3Q1, 2, 3, and 7.

3570A FREQUENCY SYNTHESIZER

3570A-6. All serials. Air capacitor to PC board alignment to improve reliability.

3580A/3581A/C ANALYZERS

3580A-2. Standard serials 1415A01414 and below; 3580A-Option 002 serials 1415A01215 and below. New overload specifications.
3580A-3. Serials 1415A00975 and below. Repair of loose or broken carrying handles.
3580A-4. Modifications to reduce repair costs.
3581A/C-1. 3581A serials 1351A00375 and below; 3581C serials 1411A00440 and below. New overload specifications.
3581A/C-2. 3581A serials 1351A00230 and below; 3581C serials 1411A00225 and below. Repair of loose or broken carry handles.

5060A/5061A CESIUM BEAM FREQUENCY STANDARD

5061A-7. Recommended engineering improvements.

5301A/5302A/5303A/5304A/5305A/ 5307A/5308A COUNTER MODULES

5300A-1B-S. All serials. Elimination of potential shock hazards.

5328A UNIVERSAL COUNTER

5328A-1. Serials below 1548. Modification to prevent loss of displayed reading with sample rate in hold.
5328A-2. Serials below 1548. Modifications to prevent extra counts in start clock "phantom function".

6940A MULTIPROGRAMMER

6940A-2. Serials 1321A00538 and below. Increasing drive capability of the 1 MHz oscillator.

7004A/B X-Y RECORDERS

7004B-1B. Serials below 1020A. Recommended integrated circuit replacement.
7004B-8. Serials 1544A and below. Recommended new Y-axis wiper plate assembly and pen carriage block.

7034A X-Y RECORDER

7034A-8. Serials 1542A and below. Recommended new Y-axis wiper plate assembly and pen carriage block.

7035B X-Y RECORDER

7035B-3. Serials 1543A and below. Recommended new Y-axis wiper plate assembly and pen carriage block.

7046A X-Y RECORDER

7046A-3A. Serials 1503 and below. Improved Y-slider block assembly.

7202A/7203A/7210A/9862A X-Y RECORDERS

7202A-13/7203A-14/7210A-14/9862A-17. 7202A serials 1541 and below; 7203A/7210A/9862A serials 1540 and below. Recommended new Y-axis wiper plate assembly and pen carriage block.

8011A PULSE GENERATOR

8011A-G6. Serials 1411G00910 and below. Modification to prevent incorrect burst function at low trigger frequency or single cycle.

8403A MODULATOR

8403A-9-S. Serials 1431A02856 thru 1526A03089. Elimination of potential shock hazard.

8481A POWER SENSOR

8481A-2. Serials 1234A and below. Recommended replacement for input amplifier assembly.

8553B/8553L SPECTRUM ANALYZER — RF SECTION

8553B-2. All serials. Procedure for intensity limit adjustment of 141T display section.
8553L-7. All serials. Recommended replacement for scan width switch assembly.

8554B/8555A SPECTRUM ANALYZER — RF SECTION

8554B-1. All serials. Procedure for intensity lamp adjustment of 141T display section.
8555A-5. All serials. Procedure for intensity lamp adjustment of 141T display section.

8558B SPECTRUM ANALYZER

8558B-10. Serials 1420A and below. A7 frequency board compatibility with dot matrix LED and seven segment LED digital panel meters.

8640A/B SIGNAL GENERATOR

8640A-27. Serials 1536A and below. "Reduce Peak Power" lamp drive modification.
8640B-28. Serials 1526A and below. "Reduce Peak Power" lamp drive modification.

8660A SYNTHESIZED SIGNAL GENERATOR

8660A-16B. All serials. Internal crystal oscillator installation.
8660A-21B. Serials 1519A00760 and below. Improved 100 MHz reference filtering.
8660A-27. Serials 1539A00850 and below. Improved power supply reliability.
8660A-28. Serials 1620A00911 and below. Increased supply current and increased rating of A4A2R11.

8660B/C SYNTHESIZED SIGNAL GENERATOR

8660B-18A. Serials 1343A and below. Recommended replacement for A-7 power line module.
8660B-19B. All serials. 100 MHz reference filtering.
8660B-31. All serials. Improved power supply reliability.
8660C-5. All serials. Internal crystal oscillator installation.
8660C-6. Serials 1538A00340 and below. Improved power supply reliability.
8660C-7. Serials 1615A00541 and below. Increased supply current and increased rating of A4A2R11.

8690A/B SWEEP OSCILLATORS

8690A-14A. All serials. 8690B-10A serials 1349A and below. Thermal protective switch modification kit.
8690A-15. All serials. Modification to prevent oscillation in +275V and −300V power supplies.
8690B-11. Serials 1445A and below. Modification to prevent oscillation in +275V and −300V power supplies.

8691-8695A/B AND 8696A/8697A RF UNITS

8691-94A-8A; 8695-97A-7A; 8691-95B-6A. All serials. Recommended BWO replacement.

8708A SYNCHRONIZER

8708A-4-S. Serials 1220A01671 thru 1220A01685. Elimination of potential shock hazard.

10631A/B/C HP-IB CABLES

10631A/B/C-2. Recommended replacement parts.

11661A/B FREQUENCY EXTENSION MODULE

11661A-12. All serials. Prevention of false lock of YIG phase lock loop.
11661B-4. Serials 1538A00480 and below. Improved 4.43 oscillator stability.
11661B-5A. Serials 1543A00520 and below. Prevention of false lock of YIG phase lock loop.

33311B COAXIAL SWITCH

33311B-1. All serials. Cleaning of solenoid contacts.

86290A RF PLUG-IN

86290A-1. Serials 1450A and below. Coupler/ Modulator replacement kit.

86320A 0.1-2.0 GHz HETERODYNE MODULE

86320A-3. All serials. Improved amplifier kit.
86320A-4. All serials. Improved frequency converter kit.

86601A RF SECTION

86601A-8. Serials 1551A01021 thru 1443A00782. Modification to prevent intermittent attenuation.

86602B RF SECTION

86602B-1. Serial 1519A00180 and below. Modification to improve output power flatness.
86602B-2. Serials 1551A00201 and below. Modification to prevent intermittent attenuation.

86603A RF SECTION

86603A-2A. Serials 1533A00240 and below. Modifications to prevent 2 MHz noise on +20V supply, and to improve output power flatness.
86603A-4. Serials below 1551A00311. Modification to prevent intermittent attenuation.

86632A MODULATION SECTION

86632A-6. All serials. Suppression of spurious oscillation.

READERS CORNER

Here's your chance to share your ideas and views with other *Bench Briefs* recipients. In Reader's Corner, we will print letters to the Editor, troubleshooting tips, modification information, and new tools and products that have made your job easier. In short, Reader's Corner will feature anything from readers that is of general interest to electronic service personnel.

If there is something you have to share with other *Bench Briefs* readers, let us hear from you.

Editor:

This may be worthwhile for service technicians that wish to use their HP-21 to convert dB to Volts and Volts to dB in 50 ohm systems.

dB to Volts	Volts to dB
1) Key dB number	1) Key Volts number
2) Press ENTER	2) Press ENTER
3) Key in 10	3) Press $\times$
4) Press $\div$	4) Key in .05
5) Press 10^x	5) Press $\div$
6) Key in .05	6) Press LOG
7) Press $\times$	7) Key in 10
8) Press $\sqrt{\times}$	8) Press $\times$
9) Read Volts	9) Read dB

Craig Voss
Hewlett-Packard
Bellevue, WA.

Editor:

The quiz "Batter Up", reprinted from "Games for the Superintelligent" proved that I am not superintelligent. However, after a few false starts and a night dreaming of baseball players, I came up with an acceptable team.

I would like to submit the following quiz. I hope you enjoy it as much as I enjoyed yours.

Six people work in one office. They are: Mr. Able, Mr. Baker, Miss Jones, Mrs. Smith, Mr. Cook, and Miss Fitt. There are six positions in the office: Manager, Assistant Manager, Cashier, Stenographer, Typist, and Clerk.

Use the following clues to complete an organization chart of the office.

a) The Assistant Manager is the Manager's grandson.

b) The Cashier is the Stenographer's son-in-law.

c) Mr. Able is a bachelor.

d) Mr. Cook is 25 years old.

e) Miss Jones is the Typist's step-sister.

f) Mr. Baker is a neighbor of the Manager.

Betty Haines
Hewlett-Packard Company
Palo Alto, California

Dear Sir:

I have gone through the article on "MTBF" by Rod Parks in the May-June 1975 issue of BENCH BRIEFS. May I suggest you publish a similar article on "LTPD" (Lot Tolerance Percent Defective) how it is calculated etc. This will enable to clarify this term also. Shall I hope that such an article will appear shortly?

Thanking you,

Yours faithfully,

S. Gopakumar
Satellite Systems Division
Vikram Sarabhai Space Centre
Trivandrum, 695022, India

An article on reliability and related topics is planned in the near future.

Editor

Dear Mr. Gasperini:

In regard to the letter from Leon Fink (May-June BENCH BRIEFS) about the unusual transistor failure. Here at Cincinnati Electronics we have had the same type of failure at least once in the last six months.

Could BENCH BRIEFS possibly publish an explanation for the bias voltage increase.

Sincerely,

Allan Cooper
Senior Technical Specialist
Cincinnati Electronic Corp. Inc.

I have not encountered one of these personally and am at a loss to explain why it happens. Does anyone have a transistor like this that can be analyzed?

Editor

Dear Mr. Gasperini:

As per our telephone conversation, we are forwarding to you for your evaluation one transistor/diode checker similar to the one used by George Stanley, Troubleshooting Transistorized Circuits Faster, in the September-October 1974 BENCH BRIEFS.

The "Tester In-Circuit" would be $19.95 each in quantities from 1-200 and $14.80 each in quanties of 200 or more.

Sincerely,

C. M. Barber
The Barber Corporation
Box 271
Waynesville, Ohio 45068

Thank you Mr. Barber. We pass this along to our readers as a further aid in troubleshooting transistor circuits.

Editor

Dear Sir:

As a long-time recipient of BENCH BRIEFS we have been using the dBm-to-Voltage Chart published in BB of April 1973 ever since, it is a bit worn now!

Would it be possible that we get 2 more copies of this April 1973 issue of BB? We should have copied it but it is too worn now.

If I may make the suggestion perhaps a new graph going down to 0.01 microwatts and Atto watts for use into 50-600 ohms would be really useful for readers of BB.

All in all, BB is one of the few publications we keep on file. I think it means something!

Yours truly,

Robert H. Fransen
Omnitek Electronics
Sherwood Park,
Alberta, Canada

Glad to accommodate your request, it should be in the mail and on its way.

We are looking at the graph now and will consider your suggestion for a future issue.

Editor

Dear Mr. Gasperini:

I wanted to let you know that we certainly enjoy BENCH BRIEFS. I hope you are not too busy and can answer some questions regarding HP instruments.

1. What is an acceptable level of power supply ripple and regulation for HP oscilloscopes such as the 180A/182A/182C/1200 series?
2. Are you (or any of your readers) aware of a solid state device called a "Fetron" manufactured by Teledyne, used to replace vacuum tubes in older tube-type instruments? Have any of your readers modified an HP 540B Transfer Oscillator or HP 524C/D Counter with a "Fetron"?
3. I have noticed that HP says it sweep frequency tests crystal detectors, but none of the operating notes I have suggest the method HP uses. Any suggestions?

Sincerely yours,

Dan Brooks
Service Manager
Leger Laboratories, Inc.
E. Pepperell, Mass., 01437

1. *The product expert at the Oscilloscope Manufacturing Division suggests that a measurement less than 5 mV rms would be acceptable. The power supply ripple will actually be in the microvolt region, but most attempts at measuring the ripple will induce ripple in the supply.*

   There is no specification on ripple. Generally speaking, the power supply either works well or not at all.

2. *The use of solid state replacements for tubes, including Teledyne's Fetron and a F.E.T., has received a great deal of attention here at HP. However, you must remember that the gain of some of these devices is very high and that sometimes the instrument's calibrating controls may not have sufficient range to recalibrate the circuit. This usually means some resistor changes which can be bothersome.*

   An example of this comes to mind where one of our customers substituted a F.E.T. for the detector tube in the Boonton Model 260 Q Meter. He relocated the Tube socket, and changed some resistors. He claims that years of additional life have been added to this venerable instrument by making this substitution after the detector tube fails. As soon as we investigate his suggestions and prove them out they will be published here.

3. *I talked with one of our microwave experts and he recommended using the setup shown below taken from the 1976 HP catalog, page 350, Figure 3. He did recommend using a standard detector characterized at your particular frequency for system calibration.*

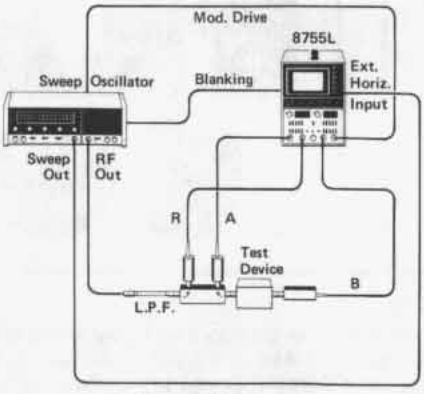


Figure 3

Editor

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- ☐ 11661B-5A
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- ☐ 86320A-3
- ☐ 86320A-4
- ☐ 86601A-8
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As people change jobs and move around we find it necessary to periodically verify that you are still interested in receiving Bench Briefs, and that your mailing address is correct. Also, we want to give you the opportunity of passing this requalification notice along to other service people so that they may also benefit from Bench Briefs. So please take a moment and answer the questionnaire; we must hear from you if you are to continue to receive Bench Briefs.

We are considering removing the Service Note list from Bench Briefs to make room for more articles and service-related information. Remember that Service Notes are recommendations from the HP factories on modifications or other recommended procedures for improving specific HP products (see pages 7-9 this issue).

For those interested in Service Notes, we would like to automatically mail you the Service Note list and Order Form on a regular basis.

If you are interested in receiving a separate Service Note listing, could you handle it on Microfiche viewing cards? There are several questions on the form that will help us make some decisions on what form Service Notes will take.

The next question concerns a periodic mailing, separate from Bench Briefs and Service Notes, that outlines HP seminars for service technicians on digital troubleshooting, training sessions on specific instruments, new textbooks, and other instrument training aids available from HP. Refer to the September-December, 1975 issue of Bench Briefs for an example.

The rest of the questions are required for our computer mailing list.

Thank you for your assistance and interest in Hewlett-Packard products. We'll look forward to hearing from you. Remember, we must hear from you if you are to continue to receive Bench Briefs.

HEWLETT-PACKARD COMPANY
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JANUARY-APRIL 1976
Volume 16 Number 1

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