HEWLETT hp PACKARD

BENCH BRIEFS

SERVICE INFORMATION FROM HEWLETT-PACKARD

MAY-JUNE 1976

LOGIC SYMBOLS

by Tom Trompeter

This is the second in a series of articles introducing the IEEE Standard 91-1973 Graphic Symbols for Logic Diagrams (two-state devices). The first article covered internal symbols that qualified or specified the logic function of a graphic symbol, and indicator symbols that related to the conditions of inputs and outputs of a logic function. This second article continues with additional qualifiers and their combinations into meaningful and useful logic symbols.

DOT AND/DOT OR

In the last BENCH BRIEFS, the inhibiting-input indicator symbol (+) was shown in a three-state device inhibiting inputs of a wired OR circuit. But how does the new standard represent or define a wired OR or wired AND circuit? The standard calls these circuits a Distributed Connection Function (DOT-AND, DOT-OR, wired logic). A distributed connection is a connection of outputs of two or more elements that are joined together to achieve the effect of an AND or an OR function without the use of an explicit element. The AND Distributed Connection (DOT AND) is shown in Figure 1 and the DOT OR in Figure 2.

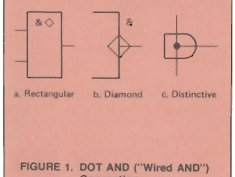


FIGURE 1. DOT AND ("Wired AND") Connection

In using these symbols the standard has two notes. The first is that the lines do not have to be extended into the diamond-shape symbol; the second is that the distinctive-shape symbol should be one half the size (or smaller) of the AND or OR general symbol.

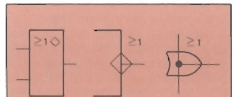


FIGURE 2. Distinctive OR ("Wired OR") Connection

A third note that applies only to the DOT OR Connection in Figure 2 is that the OR is implied if neither the AND nor the OR qualifying symbols appear with the diamond-shape symbol.

An application that shows a combination of four DOT-OR distributed connections is shown in Figure 3. Note the absence of the qualifying symbols in the first example.

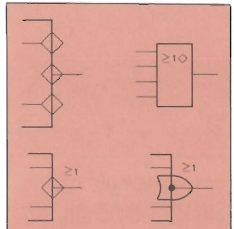


FIGURE 3. Combination of Four DOT-OR Connections

EXCLUSIVE OR

Figure 4 shows two input Exclusive OR gates; one rectangular and one distinctive shaped. The output of the Exclusive OR gate will assume its indicated H-state if and only if, one and only one of the two inputs assumes its indicated H-state.

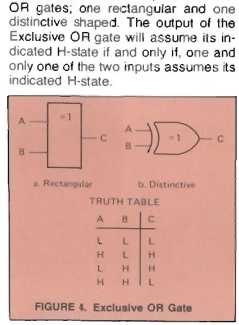


FIGURE 4. Exclusive OR Gate

AMPLIFIER SYMBOLS

Amplifiers can be represented as either a rectangular- or distinctive-shape symbol as shown in Figure 5. The output assumes its indicated H-state if and only if the input assumes its H-state.

IN THIS ISSUE

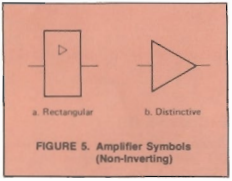


FIGURE 5. Amplifier Symbols (Non-Inverting)

By adding the polarity indicate symbol (=>) shown in the last BENCH BRIEFS, we obtain an inverting amplifier as shown in Figure 6.

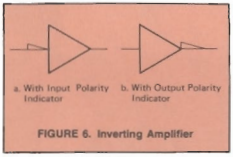


FIGURE 6. Inverting Amplifier

Figure 6a shows that the output will be High (more positive level) when the input is Low (less positive level). Figure 6b shows that the output will be Low when the input is High.

CODER SYMBOL

A coder (converter or translator) is a combinational logic function with multiple inputs and outputs, in which the relationship between the two is described in a table referenced to the symbol, or by an appropriate line-weighting technique using decimal or binary notations. The coder is qualified with the symbol X→Y as shown in Figure 7.

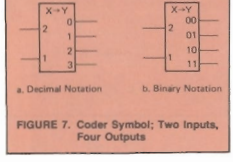


FIGURE 7. Coder Symbol; Two Inputs, Four Outputs

The symbols shown in Figure 7a and 7b represent example coders in which the inputs are weighted by decimal and binary notation. Therefore, the inputs which assume their H-states will equal the output weight shown at that particular output. In other words, no inputs (L-state) mean the output line marked 0 or 00_2 will be High. If both inputs are High ($1+2=3$) then the output line marked 3 or 11_2 (binary 3) will be High.

EXTENDER-CONNECTION INDICATOR

The extender-connection indicator (E) is actually an external qualifier that is used to extend (increase) the number of inputs to another logic function circuit (see Figure 8). Only logic functions that perform the same function may be connected as shown in Figure 8a. Unlike functions such as shown in Figure 8b are not allowed. Also, the polarity indicator is not allowed with the E indicator.

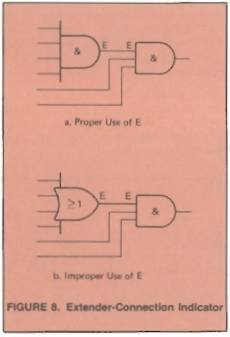


FIGURE 8. Extender-Connection Indicator

DEPENDENCY NOTATION

Dependency notation is a technique for indicating an AND relationship between two or more inputs, or an AND relationship between an output and one or more of the inputs. This method of labeling the inputs and outputs does not require the use of an explicit AND (&) logic element symbol. The AND relationship between two inputs of any logic symbol is shown by labeling one of the inputs with a numeral and the other with the letter "G" followed by that same numeral (see Figure 9).

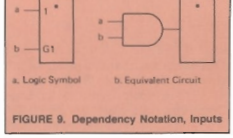


FIGURE 9. Dependency Notation, Inputs

When the logic symbol has a special input (see Figure 10) the AND relationship is shown by labeling that input with a numeral. The other input is then labeled with a "G" and the same numeral used for the special input. Figure 10 shows two examples of how a flip-flop with a reset input labeled "R" is drawn. In Figure 10a the numeral precedes the special input label and in Figure 10b the numeral is subscripted following the special label. Either method can be used.

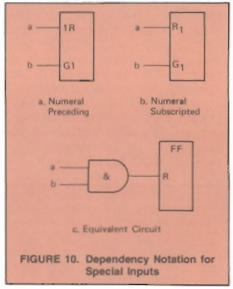


FIGURE 10. Dependency Notation for Special Inputs

When an input or output is dependent on several "G" type inputs, that input or output is labeled with a list of numerals separated by commas. The same numerals are then assigned, one to each of the relevant "G" type inputs. Figure 11 shows an example of a flip-flop where input "a" is labeled 1, 2R; input "b" is labeled "G1", and input "c" G2. This means that "a", "b",

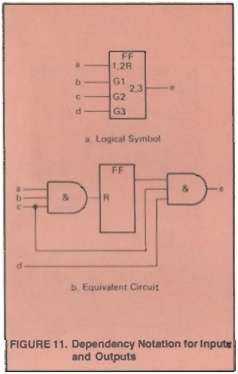


FIGURE 11. Dependency Notation for Inputs and Outputs

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 lives in Sunnyvale, California with his wife and six children.

and "c" are ANDed together and that the special input "R" is dependent on them. The output "e" is dependent on inputs "c" and "d" plus "R". This is shown by "e" being labeled 2,3 which stands for "G2", "G3"

The next issue of BENCH BRIEFS will continue with more combinations of symbols to form more logic circuits such as J-K flip-flops, D flip-flops, counters, latches, and shift registers.

SPECTRUM ANALYZERS SANTA ROSA, CALIFORNIA AUGUST 23 - 27, 1976

This one-week customer seminar on Spectrum Analyzers takes place at the HP manufacturing facility in Santa Rosa, California which is approximately 60 miles north of San Francisco. Attendance is limited to 20 participants so file your applications early (registration cut-off date is August 2) to avoid disappointment. The application form is on the last page of BENCH BRIEFS.

The course objective is to teach front panel control operations, circuit theory, interrelation of signal waveforms and voltage levels at test points, how to efficiently perform critical adjustments during calibration, and how to isolate troubles to individual circuits.

MONDAY, AUGUST 23
8620C SWEEP OSCILLATOR

1. Introduction to the 8620C Sweep Oscillator mainframe
   - — Detailed Block Diagram
2. 8620C Detailed Circuit Descriptions
   - — Sweep Generator
   - — Frequency Control
   - — Logic
   - — Operation Control
   - — D/A Converter (option 001)
   - — D/A Converter (option 011, HP-IB)

8620C/86290A, 2-18 GHz
Sweep Oscillator

PREREQUISITES

Knowledge of the operation of the HP Model 9830A Calculator and HP BASIC programming language.

Knowledge of HP-IB (IEEE Standard 488-1975)

PRESTUDY

Special HP-IB study material (HP Part No. 5952-0043).

8620C option 011 manual supplement (HP Part No. 08620-90060).

3. Laboratory

The lab will make use of the HP Model 9830A Calculator and demonstrate its use in making 8620C performance checks and adjustments

TUESDAY, AUGUST 24
86290A 2-18 GHz PLUG-IN

1. Introduction to the 86290A Plug-In
   - RF Section Block Diagram
   - YIG Tuned Multiplier Description
   - YIG Tuned Oscillator Description
2. 8620 Mainframe Compatibility Modifications
3. More Detailed Circuit Descriptions
   - YIG Tuned Oscillator Driver
   - YIG Tuned Multiplier Driver
   - Sweep Control
   - FM Board
   - Automatic Level Control Board
4. Laboratory
   - Automatic Level Control Adjustments
   - YIG Tuned Multiplier Adjustments
   - YIG Tuned Oscillator Adjustments

WEDNESDAY, AUGUST 25
8555A SPECTRUM ANALYZER

1. Introduction To HP 140 Series Displays, HP 8552A/B IF Sections, HP 8555A RF Sections

HP 8555A And 8552A/B Microwave Spectrum Analyzer

PRESTUDY

Application Notes AN150, pages 1-34, and AN136, pages 1-24.

   - System Block Diagram
   - Front Panel Controls related to the Instruments Detailed Block Diagrams
   - Laboratory - Front Panel Operation, Check-Out, and Calibration
2. 8555A Detailed Circuit Descriptions
   - Input Attenuator and Driver
   - First, Second, Third Mixers and IF
   - YIG Drivers
   - Laboratory - Perform 1st L.O., 2nd L.O. (1500 MHz), and 3rd L.O. (500 MHz) adjustments
3. Continued Detailed Circuit Descriptions, IF Amplifiers, and Phase-Lock Loop

THURSDAY, AUGUST 26
8552A/B SPECTRUM ANALYZER, IF SECTION

1. HP 8555A and HP 8552A/B System Block Diagram and Check-Out Review
2. HP 8552B Detailed Circuit Descriptions
   - 50 MHz Converter
   - Automatic Phase Control and 2 MHz Voltage Tuned Oscillator
   - 2 MHz VTO Shaping
   - Laboratory - Reinforce Circuit Theory and Operation with Hands-On Measurement of Signal Waveforms and Voltage Levels in these Converter Circuits
3. Continued Detailed Circuit Descriptions
   - 3 MHz Amplifier
   - LC Bandwidth Filters and Crystal Bandwidth Filters
   - Laboratory - Make Signal Waveform and Voltage Measurements on the 3 MHz Amplifier and Perform Bandwidth Filter Adjustments
4. Continued Detailed Circuit Descriptions

HP 8558B RF Spectrum Analyzer

PRESTUDY

Understand Basic Spectrum Analysis Methods and Measurements

Read Application Note 150A, "Using The 8558B Spectrum Analyzer"

   - Log Linear and Deflection Amplifiers
   - Scan Generator and Trigger Circuit
   - Scan Driver and Penlift Driver
   - Laboratory - HP 8552B and 8555A System Troubleshooting - Common Failures Inserted

FRIDAY, AUGUST 27
8558B SPECTRUM ANALYZER

1. Introduction to HP 180 Series Displays and HP 8558B Spectrum Analyzer
   - Block Diagram Related to Front Panel Controls
2. 8558B Detailed Circuit Descriptions
   - Sweep Generator
   - Log Amplifier
   - Bandwidth Filters

3. Laboratory
   - — Calibration Adjustment Procedure, Application Note 150A, pages 18-20
   - — Residual FM Test
   - — Sweep Time Calibration
   - — Log Amplifier Alignment
   - — Bandwidth Filter Adjustment

The Instructors for this seminar are:

JIM BOYER - Jim has been with HP for 5 years at HP Microwave Division in Santa Rosa, California working on Spectrum Analyzers. Jim has a BSEE and is continuing his educational program working towards his MBA degree. Prior to joining HP, Jim worked as a Design Engineer at Boeing in Seattle.

JIM ARNOLD - Jim joined HP 13 years ago at Microwave Division in Santa Rosa, California. Most of his experience lies in production areas and 4 years in product support. He taught several seminars on the 8620/8690 family. Jim is a graduate from Oregon Technical Institute (OTI).

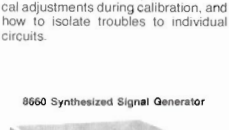
SIGNAL GENERATORS PALO ALTO, CALIFORNIA AUGUST 30 - SEPTEMBER 3, 1976

This one-week customer seminar on Signal Generators takes place at the HP manufacturing facility in Palo Alto, California which is approximately 30 miles south of San Francisco, or 20 miles north of San Jose, both having a major airport and car rental facilities.

Attendance is limited to 20 participants so file your applications early (registration cut-off date is August 2) to avoid disappointment. The application form is on the last page of BENCH BRIEFS.

The course objective is to teach front panel control operations, circuit theory, interpretation of signal waveforms and voltage levels at test points, how to efficiently perform critical adjustments during calibration, and how to isolate troubles to individual circuits.

8660 Synthesized Signal Generator



PRESTUDY

8660 data sheet, 8660 manual, general theory (HP Part No. 08660-90045)

MONDAY, AUGUST 30 8660 SYNTHESIZED SIGNAL GENERATOR

1. Introduction
   - — Description of Products
   - — General Specifications
   - — Service Accessories
2. Instrument Operation
   - — Front Panel Operation
   - — Performance Test Methods (General)
3. System Block Diagram
   - — Basic Signal Flow in High Frequency-Low Frequency Systems
4. Basic Laboratory
   - — Measuring, Analyzing Section Output Signals
   - — Troubleshooting to Section and to Assembly
   - — Service and Calibration Aids

TUESDAY, AUGUST 31 8660 SYNTHESIZED SIGNAL GENERATOR

5. Digital Control Unit
   - — Basic Block Flow Discussion
   - — Servicing
6. Modulation Plug-Ins
   - — General Information & Specifications
   - — Basic Block Diagram Understanding
7. High Frequency Circuits
   - — 11661A/B Block Diagram Understanding and Servicing
   - — 86602/86603 Block Diagram Understanding and Servicing

WEDNESDAY, SEPTEMBER 1 OPTIONAL DAY

You have your choice on Wednesday to either continue with an advanced session on the 8660 Signal Generator or move into a 1-day seminar on the 435A, 436A Power Meters.

8660 SYNTHESIZED SIGNAL GENERATOR ADVANCED SESSION (OPTIONAL)

8. Basic Maintenance Checks
   - — Phase-Lock Errors
   - — Power Supply Checks
   - — Critical Output Levels
9. Rapid Troubleshooting
   - — Systematic Isolation of Faults
   - — Critical Test Points
10. Labs
    - — Troubleshooting
    - — Calibration

435A, 436A POWER METERS (OPTIONAL)

This one-day seminar will discuss the 8480 Series Power Sensors, 11683A Calibrator, and 435A and 436A Power Meters. Prestudy – 435A/436A Manuals (HP Part Nos. 00435-90011 and 00436-90001).

1. Operation of 8480's, 435A, and 436A
   - — Front Panel
   - — Calibration
   - — Power Sensor Disassembly
2. 11683A Calibration Application
3. 435A Theory
   - — Block Diagram
   - — Circuits

4. 436A Theory
   - — Block Diagram
   - — Circuits
5. 436A Options
6. Lab
   - — Performance Tests
   - — Adjustments
   - — Troubleshooting
   - — 436A w/Calculator

8640A And 8640B AM-FM Signal Generators

PRESTUDY

Block theory in 8640 manual (HP Part No. 08640-90017)

THURSDAY, SEPTEMBER 2 8640A/8640B AM-FM SIGNAL GENERATORS

1. Introduction
   - — Description
   - — Options
   - — New Features
   - — Operating and Service Manual
2. Instrument Operation
   - — Front Panel
   - — Video Tape
   - — Specifications
3. Block Diagram Theory
   - — RF Generation
   - — Leveling, AM, and Pulse Modulation
   - — FM
   - — Counter and Phase Lock
4. Fault Isolation
   - — RF Circuits
   - — Leveling Circuits
   - — Counter
5. Instrument Repair
   - — Oscillator Replacement
   - — Divider/Filter Access
   - — Counter Access

FRIDAY, SEPTEMBER 3 8640A/8640B AM-FM SIGNAL GENERATORS

6. Selected Circuit Theory
   - — FM
   - — Leveling, AM, and Pulse Modulation
   - — Counter
7. Troubleshooting Laboratory
   - — RF Circuits
   - — AM and Leveling Circuits
   - — Counter
8. Instrument Calibration
   - — AM
   - — FM

The Instructors for this seminar are:

STEVE THOMAS - Steve has been with HP for over 4 years and has spent 2 years as a Product Support Engineer for the Stanford Park Division. Previously, Steve worked as a System Design Engineer and a Component Sales Engineer. He has taught several seminars on the 8660. He received his BS from San Diego State in 1969.

LEO STEPHENS - Leo has been with HP for 20 years with a variety of work experience. He spent several years in production assembly, test, and management before joining the Stanford Park Division product support staff. Leo has worked as a Product Support Engineer for the past 5 years. His responsibility includes microwave passive devices and RF power meters.

JIM HARMON - Jim joined HP 8 years ago at Stanford Park division in Palo Alto, California and has spent 5 years in R & D and 3 years in Product Support. He has presented seminars 20 times in training personnel in five countries. Jim received a BSEE from Utah State in 1967 and an MSEE from Stanford in 1970.

8640A/B SIGNAL GENERATOR REVERSE POWER PROTECTION

A reverse power protection kit is available to eliminate 8640A/B damage due to accidental transmitter keying. The kit, which is concealed inside the instrument, consists mainly of an RF relay (driven from a power sensor) which opens the RF path when too much power (up to 25 watts) is sensed. When the applied power is removed the relay automatically resets.

Once the kit is installed, the 8640A/B becomes the same as the factory version 8640A/B-Option 003.

The retrofit kits can be ordered from your HP Sales and Service office by specifying HP Model 11699A for a standard 8640A/B, or 11699A-Option 004 for an 8640B-Option 004 (the avionics version).

USE YOUR SPECTRUM ANALYZER FOR NOISE MEASUREMENTS

Application Note 150-9 shows how noise figure measurements can easily be accomplished with spectrum analyzers; an approach that has several advantages over conventional noise figure meters. For example: Noise figure can be measured at any frequency within a spectrum analyzer's multi-decade frequency range. This enables measurement at the device's operating frequency without changes in the test set-up.

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 high-lighting 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 highlighted by being printed in color.

WE GOOFED

January-April BB listed several Signal Generator-type instruments with a potential shock hazard at the transformer primary. One instrument was listed incorrectly: 8798A Synchronizer should be 8708A. Also, two instruments were not on the list; the 618C and 620B Signal Generators. The safety service notes are 618C-9 and 620B-12.

VOLTMETERS

Some voltmeter 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 test procedures below. Please note that more detailed instructions are available on the applicable 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 two basic tests; look for your model number and perform the steps given with an ohmmeter to determine if your instrument needs the modification.

TABLE 1. VOLTMETER TYPE INSTRUMENTS

INSTRUMENT		MODIFICATION KIT
412A/AR	DC VTVM	00412-69503
413A/AR	DC Null Voltmeter	00413-69500
414A	Autovoltmeter	00414-87901
425A/AR	DC Microvolt-Ammeter	None
463A	Precision AC Amplifier	00463-89501
735A	DC Transfer Standard	00735-69501
3420A/B	Differential Voltmeter	03420-89501
3430A	Digital Voltmeter	03430-69501

1. 412A DC VTVM

a. Since this instrument is an ohmmeter, it can be used to test itself.

b. Turn instrument on, place FUNCTION to OHMS, RANGE to 1K, and POLARITY to – (minus).

c. Connect a needle probe (or paper clip) to the OHMS lead and check for continuity by touching it to the set screws of each control knob plus exposed rear inner chassis.

Infinity = OK

d. Check for continuity between this negative-side terminal and the set screws of each control knob.

Infinity = OK

2. 413A/AR, 414A, 425A/AR, 463, 735A, 3420A/B, 3430A

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

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

c. These instruments all have a terminal or lead marked:

LOW

COMMON

GUARD

– (minus)

⏚ (common)

7402A RECORDER

This safety-related Service Note is to call your attention to the possibility of the handle coming loose from the recorder. The modification consists of removing the shorter 6-32 x .500 in. Posidriv screws from each end of the handle, and replacing them with longer 6-32 x .625 in. (HP Part No. 2630-0203) screws and lock nuts (HP Part No. 0590-0381). For more information refer to Service Note 7402A-5-S. If this modification cannot be conviently performed, the instrument may be taken to any HP Sales/Service Office where the modification will be made at no charge.

supplement to

BENCH BRIEFS SERVICE NOTE INDEX

NEED ANY SERVICE NOTES?

Here's the latest listing of Service Notes available for Hewlett-Packard products. To obtain information for instruments you own, remove the order form and mail it to the nearest HP distribution center.

332A DISTORTION ANALYZER
332A-11. Serials 1145A22870 and below. Recommended replacement for R.F. Detector.

334A DISTORTION ANALYZER
334A-10. Serials 1145A05870 and below. Recommended replacement for R.F. Detector.

412A DC VACUUM TUBE VOLTMETER
412A/AR-5-S. Serials below 978-19484 for the 412A and below 0978-20458 for the 412AR. Revisions to minimize shock potentials.

413A/AR DC NULL VOLTMETER
413A/AR-2-S. Revisions to minimize shock potentials.

414A AUTOVOLTMETER
414A-7-S. Revisions to minimize shock potentials.

425A/AR DC MICROVOLT-AMMETER
425A-7-S. Elimination of potential shock hazard.

463A PRECISION AC AMPLIFIER
463A-7A-S. Revisions to minimize shock potentials.

735A DC TRANSFER STANDARD
735A-3-S. Revisions to minimize shock potentials.

3320A/B FREQUENCY SYNTHESIZER
3320A/B-2. 3320A Serials 1524A00459 and below. 3320B Serials 1532A01239 and below. Fuse installation to prevent A8C4 failure from damaging A8 board.
3320A/B-3. All serials. Replacement procedure for air capacitors.
3320A/B-4. 3320A Serials 1138A00336 to 1524A00450; 3320B Serials 1319A00891 to 1532A01235. Air capacitor failure.

3320C LEVEL GENERATOR
3320C-1. All serials. Replacement procedure for air capacitors.
3320C-2. Serials 1526A00201 and below. Fuse installation to prevent A8C4 failure from damaging A8 board.
3320C-3. Serials 1314A00172 to 1526A00201. Air capacitor failure.

3420A/B DC DIFFERENTIAL VOLTMETER/RATIOMETER
3420A/B-5-S. Revisions to minimize shock potentials.

3430A DIGITAL VOLTMETER
3430A-7-S. Elimination of potential shock hazard.

3556A PHSOPHOMETER
3556A-U-1002. Serials 1348U01785 and below. Modification to eliminate an on-scale reading on the lower four ranges with no input applied.

3570A NETWORK ANALYZER
3570A-6A. All serials. Replacement procedure for air capacitors.
3570A-7. Serials 1331A00386 to 1331A00670. Air capacitor failure.

3575A GAIN—PHASE METER
3575A-4. All serials. Panel meter identification.
3575A-6. Serials 1450A01368 to 01370; 1450A01372 to 01374; 1450A01376, 1450A01383, 1450A01390 to 01393; and 1450A01395. Instruments with incorrect part numbers on the A16B and A16C boards.

3960A PORTABLE INSTRUMENTATION TAPE RECORDER
3960A-26. Serials 1605A and below. Procedure for adding diodes for servo amplifier protection.

5255A/5256A FREQUENCY CONVERTER
5255A-2. Serials 1124A and below. Recommended replacements for transistors A7A1Q2, 4, 6, 8, 10.
5256A-1. Serials 1124A and below. Recommended replacements for transistors A7A1Q2, 4, 6, 8, 10.

5312 ASCII INTERFACE
5312A-1. New troubleshooting procedure for operating and service manual.

5382A FREQUENCY COUNTER
5382A-1. Serials 1532A and below. Preferred replacement for transistors A1Q9, 10, and 11.

7402A OSCILLOGRAPHIC RECORDER
7402A-5-S. Serials 1760 and below. Carrying handle modification.

8640B SIGNAL GENERATOR
8640B-29. New troubleshooting procedures for instruments covered by 08640-90017 and 08640-90073 operating and service manuals.

8690A/B SWEEP OSCILLATORS
8690A-14. All serials. New thermal cutout switch in case cooling fan fails.
8690B-10. Serials 1349A and below. New thermal cutout switch in case cooling fan fails.

1600A/1607A/1620A LOGIC STATE ANALYZERS
10230B-1. 10230B Clock Probe Accessory Modification to improve low level threshold recognition with high level input signals.

59301A ASCII TO PARALLEL CONVERTER
59301A-1. All serials. New HP-IB verification program using 9820A or 9830A.

626xxJ SERIES 200-600W MODULAR SWITCHING POWER SUPPLIES
626xxJ-2. Modifications to improve reliability of J-series switching power supplies.

86601A RF SECTION FOR 8660A/C
86601A-8A. Serials between 1551A01021 and 1443A00782. Correction to prevent intermittent attenuation.

86602B RF SECTION FOR 8660A/C
86602B-2A. Serials 1551A00281 and below. Correction to prevent intermittent attenuation.

86603A RF SECTION FOR 8660A/C
86603A-4A. Serials 1551A00311 and below. Correction to prevent intermittent attenuation.

MICROWAVE CATALOG AVAILABLE

A Coaxial Waveguide Catalog and Microwave Measurement Handbook is available from Hewlett-Packard that features microwave measuring techniques, specifications, and suggestions for selecting microwave measurement equipment.

If you are selecting equipment for microwave measurements, you might find this a useful reference.

This catalog has HP part number 5952-8139 and is available by contacting your local HP Sales and Service Office.

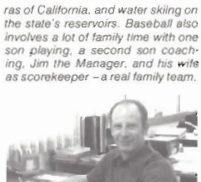
MEET JIM BECHTOLD

BENCH BRIEFS has a new editor!

After three years of successful leadership, Dick Gasperini is turning over the Editor's chair so he can devote full time to service training for customers and HP people.

Jim joined HP in 1968 as a technical writer working at the Automatic Measurement Division in Sunnyvale, and then Data Systems in Cupertino, Ca.

Topping his list of favored recreational pursuits are duck hunting, cross-country skiing in the high Sierras of California, and water skiing on the state's reservoirs. Baseball also involves a lot of family time with one son playing, a second son coaching, Jim the Manager, and his wife as scorekeeper – a real family team.



REPLACEMENT PART CROSS REFERENCE

When selecting replacement parts for your HP products, you may notice that many manuals list only an HP part number for the part, even though it appears that this part is manufactured by one of the large semiconductor manufacturers. Service personnel often ask why only HP part numbers are listed.

It is recommended that HP replacement parts be used to ensure that the original performance of the product will be obtained. While some parts used in HP instruments are identical to that which can be purchased at a local electronics distributor, many times parts will be selected for certain characteristics, such as gain, bandwidth, capacitance, etc. There may also be slight mechanical differences, such as the shaping or length of leads. In some cases special quality orders are employed to ensure that high reliability parts are used at the factory and at HP field offices.

Therefore, we suggest obtaining replacement parts from HP to maintain the quality that you have paid for in your instrument. There may be situations however where HP replacement parts are not in stock and substituting parts will allow you to return the product to service immediately. In these cases it may be worthwhile to see if a substitute part will work in the circuit. Perhaps an HP part could be ordered and installed at some later date.

To help you in these situations, here's a cross-reference of HP integrated circuit part numbers to manufacturers "generic type" part numbers (whom in most cases is the originator of the part). Even though the cross-reference only lists one manufacturer, there may actually be several approved sources for an HP part. While every attempt was made to ensure the accuracy of the list, it is advisable to compare the description of the device being replaced with the description of the substituted part. For example, if the service manual describes the device being replaced as a "dual J-K flip-flop", check this against the description of the replacement part.

Manufacturers Code Number Cross Reference

Number	Manufacturer
IT001	SGS Ates (Milan, Italy)
00020	Unitrode Computer Products
0016E	Exar Integrated Systems, Inc
0026W	Western Digital Corporation
0066G	GTE Sylvania Electric
01-00	Hewlett-Packard
0108P	Plessey Semiconductors
01295	Texas Instruments
02735	RCA Corporation
03508	General Electric Co
03877	Transitron Electric Corporation
03911	Clarinx Corporation
04713	Motorola Corporation
05277	Westinghouse Electric Corporation
06665	Precision Monolithics Inc
07263	Fairchild Semiconductors
07933	Raytheon Company
18546	Varo Semiconductor Division
11961	Semicon Inc
12498	Teledyne Inc
12735	Computer Microtechnology Inc
12954	Dickson Electronics Corp
12969	Unitrode Corporation
13327	Solitron Devices, Inc
14099	Semtech Corporation
14433	ITT Semiconductor Division
14936	General Instrument Corporation
15818	Teledyne
17191	Dynamic Measurement Corporation
17540	Alpha Industries Inc
17850	Zeltex, Inc
17856	Siliconex Inc
18324	Signetics Corporation
24355	Analog Devices, Inc
27014	National Semiconductor Corporation
27318	Stewart-Warner Microcircuits, Inc
27832	Teledyne Philbrick Nexus
34003	General Electric Company
34371	American Micro Systems, Inc
37718	Fairchild
38293	Intersil, Inc
32694	Opteron, Inc
33256	Hybrid Systems Corporation
33867	Intech, Inc
34333	Silicon General, Inc
34335	Advanced Microdevices, Inc
34344	Motorola
34371	Harris Semicon Division
34649	Intel Corporation
37327	Microsystems International, Ltd
50088	Mostek Corporation
50347	Opcoa, Inc
50364	Monolithic Memories, Inc
50522	Monsanto Company
50560	Republic Steel Corporation
50579	Litronic, Inc
56289	Sprague Electric Company
58849	F M C Corporation
81483	International Rectifier Corporation
83701	Electronic Devices, Inc
98341	Microwave Associates, Inc

0122-0005	04713	1N4810	0122-0254	04713	1N5143A	1813-0057	27014	LH0024CH	1818-0124	01295	SN74S189N
0122-0017	04713	1N4804	0122-0255	04713	1N5144	1813-0058	27014	LH0021CK	1818-0128	18324	825091
0122-0025	04713	1N4811A	0122-0256	04713	1N5144A	1813-0061	04713	K11004-6.389 MHZ	1818-0182	34371	HM-7611-5
0122-0026	04713	MV2101	0122-0257	04713	1N5145	1813-0062	04713	K11004-10.486MHZ	1818-0187	01295	SN74S289N
0122-0060	04713	MV2308	0122-0258	04713	1N5145A	1813-0067	04713	K1115A-10MHZ	1818-0191	27014	MM5241ABLN
0122-0062	04713	1N5468A	0122-0259	04713	1N5146	1816-0015	34371	HPROM-1024	1818-0093	07263	3410C
0122-0064	04713	MV1860D	0122-0260	04713	1N5146A	1816-0016	50364	MM6331	1818-0094	0026W	PR14728
0122-0070	04713	1N5456A	0122-0261	04713	1N5147	1816-0042	04713	MCM4004A	1818-0102	01295	TMS4103NC
0122-0071	04713	MV2107	0122-0262	04713	1N5147A	1816-0043	04713	MCM4004A	1818-0103	01295	TMS4030JC
0122-0072	04713	MV2209	0122-0263	04713	1N5148	1816-0044	04713	MCM4004A	1818-0106	27014	MM5261N
0122-0074	96341	MA46646	0122-0264	04713	1N5148A	1816-0045	04713	MCM4004A	1818-0107	32293	IM7512CPE
0122-0077	04713	MV2201	1813-0015	33867	A-2419	1816-0217	32293	IM5610CPE	1818-0108	04713	6605L-1
0122-0245	04713	1N5139	1813-0034	32293	IM5010CPD	1816-0348	50364	MM6330	1818-0114	50088	4098-3
0122-0246	04713	1N5139A	1813-0036	18256	DAC372-12-BCD	1816-0355	50088	MK2302P	1818-0115	34649	L1034
0122-0247	04713	1N5140	1813-0039	17850	ZD441	1816-0409	34371	HPROM-8256-50	1818-0128	34649	P21078
0122-0248	04713	1N5140A	1813-0040	17850	ZD440	1816-0439	50364	63400	1818-0134	27014	MM1101AJ/AIN
0122-0249	04713	1N5141	1813-0041	27014	LH0042CH	1816-0598	01295	SN74S220N	1818-0135	04713	MC6810L-1
0122-0250	04713	1N5141A	1813-0048	24355	75IN	1816-0605	18324	8251151	1818-0146	01295	TMS4050JL
0122-0251	04713	1N5142	1813-0049	15818	2740CF	1816-0640	50364	6561N	1818-0147	01295	TMS4050NL
0122-0252	04713	1N5142A	1813-0054	27014	AH01540	1816-0710	34371	HM1-7621-5	1818-0155	18324	26068
0122-0253	04713	1N5143	1813-0056	17850	ZD3945I	1816-0723	07263	93L415PC	1818-0181	01295	TMS4052-12L

1818-0197	34335	AM9114IPC	1820-0212	04713	MC1020P	1820-0379	01295	SN74H52N	1820-0536	18324	N82846
1818-0199	34335	AM9112APC	1820-0213	04713	MC1014P	1820-0380	01295	SN74H53N	1820-0537	01295	SN74131N
1820-0001	03508	4JX19A555	1820-0214	01295	SN7442N	1820-0381	01295	SN74H54N	1820-0538	01295	SN7423N
1820-0006	03508	4JX19A519	1820-0216	24355	1068	1820-0382	01295	SN74H55N	1820-0539	01295	SN7437N
1820-0044	03508	RA1A	1820-0223	27014	LM301AH	1820-0383	01295	SN74H60N	1820-0542	18324	N82346
1820-0046	02735	CA3005	1820-0224	27014	LH0002CH	1820-0384	01295	SN74H61N	1820-0543	18324	N82338
1820-0047	02735	CA3010	1820-0225	27014	LM103-2.4	1820-0385	01295	SN74H62N	1820-0544	01295	SN74H103N
1820-0051	07263	702HC	1820-0231	07263	9314DC	1820-0386	01295	SN74H71N	1820-0545	01295	SN74191N
1820-0052	07263	923HC	1820-0233	01295	SN74193N	1820-0387	01295	SN74H72N	1820-0546	01295	SN74192N
1820-0054	01295	SN7400N	1820-0235	27014	DM74193N	1820-0391	01295	SN74H73N	1820-0567	04713	MC4024P
1820-0055	01295	SN7490N	1820-0237	01295	MC1013P	1820-0392	01295	SN74H74N	1820-0568	18324	N82439N
1820-0056	01295	SN7492N	1820-0238	04713	MC1810P	1820-0397	01295	SN72709N	1820-0569	18324	N82439
1820-0058	07263	709HC	1820-0238	27815	SN1810N	1820-0398	01295	SN72710N	1820-0574	27014	DM8551N
1820-0064	01295	SN7415N	1820-0238	07263	1810PC	1820-0400	18324	N82814	1820-0575	18324	N82358
1820-0065	01295	SN7470N	1820-0239	04713	MC3002P	1820-0401	07263	727HL	1820-0577	01295	SN74116N
1820-0067	18324	SP631A	1820-0247	27014	LM305	1820-0410	27014	MM5OT	1820-0578	04713	MC1024P
1820-0068	01295	SN7410N	1820-0249	02735	CA3051	1820-0411	04713	MC817P	1820-0579	01295	SN74123N
1820-0069	01295	SN7420N	1820-0252	04713	MC1026P	1820-0417	02735	CA3002	1820-0581	04713	MC1032P
1820-0070	01295	SN7430N	1820-0253	04713	MC1035P	1820-0418	04713	MC1812P	1820-0582	04713	MC1011P
1820-0071	01295	SN7440N	1820-0256	04713	MC858P	1820-0419	18324	SB290A	1820-0583	27014	DM74L00N
1820-0072	01295	SN7450N	1820-0257	04713	MC857P	1820-0424	01295	SN74H04N	1820-0584	27014	DM74L02N
1820-0074	01295	SN7454N	1820-0258	04713	MC852P	1820-0425	01295	SN74100N	1820-0585	27014	DM74L03N
1820-0075	01295	SN7473N	1820-0259	04713	MC860P	1820-0427	04713	MC1496G	1820-0586	27014	DM74L04N
1820-0076	01295	SN7476N	1820-0260	04713	MC839P	1820-0429	27014	LM339H	1820-0587	27014	DM74L10N
1820-0077	01295	SN7476N	1820-0261	01295	SN74121N	1820-0430	27014	LM339K	1820-0588	27014	DM74L20N
1820-0078	18324	SP620A	1820-0262	27014	DM8590N	1820-0433	02735	CA3023	1820-0589	27014	DM74L30N
1820-0081	01295	SN7510L	1820-0269	03917	TIC62D18W	1820-0435	01295	SN74180N	1820-0590	27014	DM74L51N
1820-0084	01295	SN7451N	1820-0270	01295	SN74031N	1820-0437	04713	MC4015P	1820-0591	27014	DM74L55N
1820-0085	01295	SN7460N	1820-0270	07263	733HC	1820-0439	07263	723PC	1820-0592	27014	DM74L95N
1820-0086	01295	SN15830N	1820-0272	04713	MC1022P	1820-0440	04713	MC1016P	1820-0593	27014	DM74L71N
1820-0087	04713	MC850P	1820-0273	04713	MC1009P	1820-0441	04713	MC1801P	1820-0594	27014	DM74L72N
1820-0088	04713	MC851P	1820-0274	04713	MC1808P	1820-0443	01295	SN74L93N	1820-0595	27014	DM74L73N
1820-0094	04713	MC846P	1820-0275	04713	MC1039P	1820-0444	04713	MC1025P	1820-0596	27014	DM74L74N
1820-0095	04713	MC849P	1820-0276	04713	MC1013P	1820-0445	01295	SN5402N	1820-0597	27014	DM74L78N
1820-0096	04713	MC832P	1820-0277	04713	MC1468R	1820-0446	01295	SN5474N	1820-0598	27014	DM74L86N
1820-0099	01295	SN7493N	1820-0279	01295	TTXL105	1820-0447	01295	SN5410N	1820-0599	27014	DM74L95N
1820-0100	27014	DM7441AN	1820-0281	01295	SN74107N	1820-0448	01295	SN5400N	1820-0600	27014	DM74L90N
1820-0101	04713	MC1034P	1820-0282	01295	SN74H86N	1820-0449	04713	MC1006P	1820-0601	27014	DM74L93N
1820-0102	04713	MC1013P	1820-0287	04713	MC672P	1820-0450	18324	N82904	1820-0602	27014	DM74L170N
1820-0104	27014	LM201H	1820-0288	04713	MC662P	1820-0451	04713	MC3062P	1820-0603	27014	DM74L85N
1820-0106	04713	MC816P	1820-0289	27014	DM8570N	1820-0454	04713	MC1805P	1820-0604	04713	MC3025P
1820-0110	07263	959DC	1820-0297	24355	CA3000	1820-0455	27014	DM8289N	1820-0605	01295	SN74H101N
1820-0111	07263	930IDC	1820-0301	01295	SN74I5N	1820-0456	18324	N8855A	1820-0606	01295	SN74181N
1820-0113	33677	IOA3709W	1820-0304	18324	SP670A	1820-0457	18324	N8162A	1820-0607	04713	MC4006P
1820-0121	18926	N8190A	1820-0305	18324	SP680A	1820-0458	18324	N8816A	1820-0608	04713	MC4006P
1820-0122	04713	MC853P	1820-0306	01295	SN74I2N	1820-0459	18324	N8440A	1820-0609	04713	MC3061P
1820-0123	27014	LM300H	1820-0307	01295	SN74H8N	1820-0460	18324	N8480A	1820-0610	04713	MC8309P
1820-0125	07263	711HC	1820-0307	02735	CA3028A	1820-0461	18324	N8880A	1820-0611	01295	SN74182N
1820-0127	07263	902DC	1820-0307	07263	936DC	1820-0462	18324	N8251B	1820-0612	07263	913DC
1820-0128	07263	937DC	1820-0308	01295	SN15845N	1820-0463	18324	N8H70A	1820-0613	01295	SN74H05N
1820-0128	01295	SN15837N	1820-0309	07263	960DC	1820-0464	18324	N8H90A	1820-0614	07263	931.08DC
1820-0129	07263	930JDC	1820-0310	01295	SN74H86ZN	1820-0465	18324	N8H80A	1820-0615	04713	MC4039P
1820-0130	07263	9006DC	1820-0315	07263	931HC	1820-0466	18324	N8825A	1820-0616	07263	9322DC
1820-0131	07263	9009DC	1820-0316	04713	MC1433G	1820-0467	18324	N8891A	1820-0617	04713	MC3022P
1820-0132	07263	9016DC	1820-0317	04713	MC1494P	1820-0468	01295	SN7445N	1820-0618	01295	SN74117N
1820-0134	07263	9300DC	1820-0318	18324	SP616A	1820-0469	01295	SN74H102N	1820-0619	01295	SN74H72N
1820-0137	02735	CA3028B	1820-0319	18324	SP629A	1820-0471	01295	SN7406N	1820-0620	01295	SN74153N
1820-0138	24932	552	1820-0320	18324	SP659A	1820-0472	04713	MC1001P	1820-0621	01295	SN7438N
1820-0140	04713	MC3026P	1820-0321	27014	710HC	1820-0473	04713	MC1048P	1820-0622	01295	SN74151AN
1820-0141	27014	DM74H08N	1820-0322	18324	N8280A	1820-0474	02735	CA3012	1820-0623	27014	DM8200N
1820-0142	04713	MC1004P	1820-0323	04713	MC889P	1820-0475	27014	LM306H	1820-0625	04713	MC6669P
1820-0143	04713	MC1027P	1820-0324	04713	MC874P	1820-0476	07263	715HC	1820-0626	07263	9314DC
1820-0144	04713	MC1018P	1820-0325	04713	MC815P	1820-0477	27014	LM301AN	1820-0627	07263	931.01DC
1820-0145	04713	MC1010P	1820-0326	02735	CA3029	1820-0478	27014	LM308H	1820-0628	01295	SN74H89N
1820-0146	04713	MC1017P	1820-0327	01295	SN74O1N	1820-0479	04713	MC855P	1820-0629	01295	SN74S112N
1820-0147	04713	MC1007P	1820-0328	01295	SN74O2N	1820-0482	07263	9838DC	1820-0630	04713	MC4044P
1820-0157	04713	MC1023P	1820-0334	07263	9094DC	1820-0484	01295	SN74H94N	1820-0631	01295	SN74H108N
1820-0158	27014	LM302H	1820-0346	07263	933DC	1820-0485	07263	9816DC	1820-0636	18324	N82814DC
1820-0162	27014	MM79HN	1820-0348	27014	904HC	1820-0491	01295	SN74165N	1820-0637	18324	N8875A
1820-0174	01295	SN74O4N	1820-0349	07263	949PC	1820-0492	18324	N8291A	1820-0639	04713	MC4001P
1820-0175	01295	SN74O5N	1820-0351	07263	961DC	1820-0493	27014	LM30TN	1820-0640	01295	SN74150N
1820-0180	04713	MC1015P	1820-0357	07263	9304DC	1820-0494	84049	C3101	1820-0655	01295	SN74251N
1820-0181	04713	MC1431L	1820-0362	18324	N8780N	1820-0496	07263	911DC	1820-0656	01295	SN74S124N
1820-0186	07263	9856DC	1820-0363	01295	SN74I2N	1820-0497	01295	SN74L95N	1820-0657	07263	9318DC
1820-0187	07263	9852DC	1820-0364	01295	SN74911N	1820-0498	56289	UM1500	1820-0658	07263	9312DC
1820-0192	02735	CA1001	1820-0365	01295	SN74I1N	1820-0499	27014	DM8220N	1820-0659	07263	931.00DC
1820-0195	18324	SB180A	1820-0366	01295	SN74I4N	1820-0500	18324	N8260B	1820-0661	01295	SN74I3N
1820-0196	07263	723HC	1820-0367	01295	SN74I5AN	1820-0507	18324	N8263B	1820-0665	04713	MC1814P
1820-0197	27014	LM709AH	1820-0368	01295	SN74I6N	1820-0508	18324	N8420A	1820-0666	04713	MC1006P
1820-0200	34713	MC1030P	1820-0370	01295	SN74H00N	1820-0509	04713	MC1488L	1820-0667	04713	MC1040P
1820-0201	04713	MC1439G	1820-0371	01295	SN74H10N	1820-0510	04713	MC1489L	1820-0668	01295	SN74O7N
1820-0202	18324	SP3728	1820-0372	01295	SN74H11N	1820-0511	01295	SN7408N	1820-0669	07263	931.10DC
1820-0203	15818	741CE00V	1820-0373	01295	SN74H20N	1820-0512	01295	SN74H74N	1820-0681	01295	SN74S00N
1820-0204	04713	MC3006P	1820-0374	01295	SN74H21N	1820-0513	01295	SN7409N	1820-0682	01295	SN74S03N
1820-0205	04713	MC3003P	1820-0375	01295	SN74H30V	1820-0514	01295	SN7426N	1820-0682	07263	74S03DC
1820-0207	07263	9801PC	1820-0376	01295	SN74H40N	1820-0515	07263	9602PC	1820-0683	01295	SN74S04N
1820-0208	18324	N8026A	1820-0377	01295	SN74H50N	1820-0516	07263	9112DC	1820-0684	01295	SN74S05N
1820-0211	01295	TMS3002LR	1820-0378	01295	SN74H51N	1820-0535	01295	SN75451BP	1820-0685	01295	SN74S10N

1820-0686 01295 SN74S11N
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