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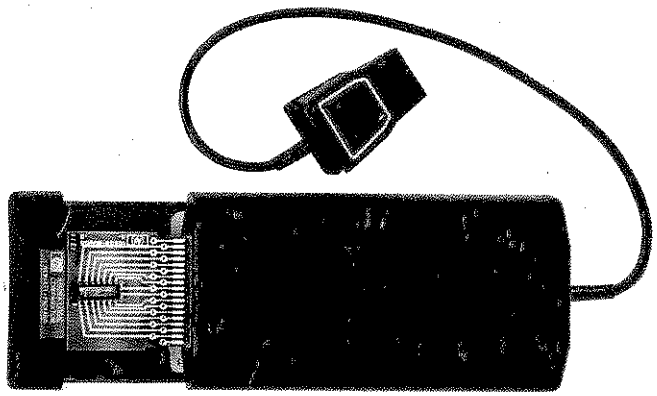
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OPERATING AND SERVICE MANUAL

LOGIC COMPARATOR

10529A



HEWLETT hp PACKARD

LOGIC COMPARATOR

10529A

SERIAL PREFIX: 1112A

This manual applies directly to standard Hewlett-Packard Model 10529A Logic Comparators with serial prefix 1112A.

SPECIAL INSTRUMENTS AND SERIAL PREFIXES NOT LISTED:

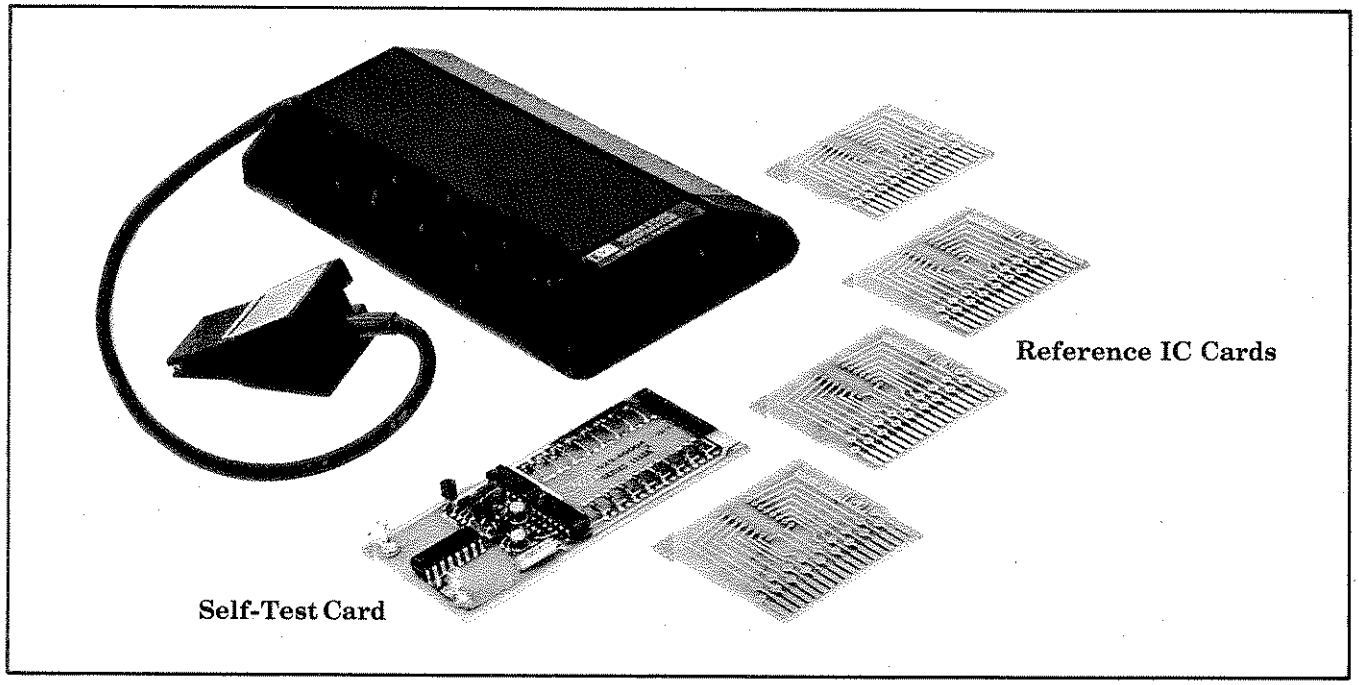
The information required to relate this manual to special modifications, or to newer instruments with serial prefixes not listed, is supplied on special insert sheets. If this information is missing, contact any Hewlett-Packard Sales and Service Office, giving full specification number, instrument name, and serial number.

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Printed: MAY 1971

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Figure 1-1. 10529A Logic Comparator



SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION

1-2. The 10529A Logic Comparator (Figure 1-1) will test the performance of an operating integrated circuit (IC) by comparing it to a reference (known to be good) IC of the same type.

1-3. Seventeen light-emitting diodes (LED's) are the indicators on the comparator. One LED indicates "power on". The other sixteen LED's, arranged in two rows of eight, indicate the comparison of the logic states between a reference IC and an IC under test. The logic state at each IC connecting pin is shown by an LED that matches the position of the IC pin. A lighted LED indicates opposite logic states for that output pin of the reference IC and the in-circuit IC. Therefore a lighted LED indicates a defect.

1-4. INSTRUMENT IDENTIFICATION

1-5. Each Hewlett-Packard instrument has a ten-character serial number (e.g., 1234A56789). The four-digit serial number prefix identifies a group of identical instruments, and the five-digit suffix is a serial number unique to each instrument. If the serial prefix on your instrument is not on the title page of this manual, your instrument is different from this manual. A supplement included with the manual describes the differences. If the supplement is missing, request one from the nearest Hewlett-Packard Sales and Service Office listed at the back of this manual.

1-6. EQUIPMENT SUPPLIED AND AVAILABLE ACCESSORIES

1-7. The logic comparator is supplied with:

Self Test Card 10529-60004* (one)

Reference IC Card (empty) 10529-20005* (ten)

Accessories available:

10528A* HP Logic Clip (complementary instrument)

10525A* HP Logic Probe (complementary in-instrument)

60063B* HP Power Supply (must be adjusted to 5 volts dc for self test card)

10541A* Reference IC Card Kit (includes 20 reference IC cards in storage case.

*Hewlett-Packard model or part numbers

1-8. APPLICATIONS

1-9. The logic comparator is useful for quick troubleshooting in equipment with digital integrated circuits, especially for troubles in a long chain of integrated circuits. The comparator is a useful production, service and design-troubleshooting tool. This unit clips onto powered TTL or DTL IC's and instantly displays any logic state differences between the test IC and a reference IC. Logic differences are identified to the specific pin(s) on 14 or 16 pin dual in-line packages with the comparator's display of 16 light emitting diodes. A lighted diode corresponds to a logic difference. The logic comparator can save time in locating a faulty IC. It requires no knowledge of the circuit operation under test. There are no controls to be set, and it needs no power connections. A suspected IC is located. A reference card loaded with good IC of the same type is then inserted in the comparator. The comparator is clipped onto the suspected IC, and an immediate indication is given as to whether the suspected IC is good or bad.

1-10. SPECIFICATIONS

1-11. Specifications for the Hewlett-Packard Model 10529A Logic Comparator are given in Table 1-1.

Table 1-1. Specifications

Input Threshold: 1.4 volts nominal, TTL or DTL compatible.

Input Impedance: "Test IC" inputs loaded by three low-power TTL loads (-360 microamperes typical) plus input of "Reference IC." "Test IC" outputs loaded by two low-power TTL loads.

Input Protection: Voltages <-1V or >7V must be current limited to 10 milliamperes.

Supply Voltage: 5 volts ± 10%

Supply Protection: Supply voltage must be limited to 7 volts.

Maximum Current Required:
300 milliamperes

Sensitivity:
Error Sensitivity: 200 nanoseconds. Errors greater than this are detected and stretched to at least 0.1 second.

Delay Variation Immunity: 50 nanoseconds. Errors shorter than this value are considered spurious and ignored.

Temperature: 0° to 55° Centigrade

Dimensions: 1.4 inches deep, 3.375 inches wide, 7.15 inches long (3.56 × 8.55 × 18.2 cm).

Weight: Net, 2 lbs. 6 oz. (1.14 kg). Shipping, 2 lbs, 6 oz. (1.62 kg).

Accessories Included:
1 test board
10 blank reference boards
1 carrying case

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section explains how to set up the logic comparator. Instructions for unpacking, inspecting, preparing, and testing the comparator are included. Read the entire section before starting to use the comparator.

2-3. ENVIRONMENT

2-4. Permissible environmental ambient conditions are given in the specifications table of Section I.

2-5. UNPACKING AND INSPECTING FOR DAMAGE

2-6. If the comparator shipping carton is damaged, inspect the comparator for visible damage (scratches, dents, etc.). If the comparator is damaged, notify the nearest Hewlett-Packard sales and service office immediately. (Offices are listed at the end of this manual.) Keep the shipping carton and packing material for the carrier's inspection. The HP Sales and Service Office will arrange for repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

2-7. REPACKING FOR SHIPMENT

2-8. If it is necessary to reship a comparator, good commercial packing methods and materials should be used.

NOTE

Before returning a comparator to Hewlett-Packard, contact the nearest Hewlett-Packard Sales and Service office for instructions.

2-9. POWER REQUIREMENTS

2-10. All operating power for the logic comparator is drawn from the circuit being tested through the IC clip. No batteries or line power is used. The reference IC card has solderable connections to provide operating power to the comparator from the circuit being tested. Integrated circuits in the logic comparator are low-power TTL units to keep power consumption low.

2-11. REFERENCE IC (INTEGRATED CIRCUIT) MOUNTING

2-12. Before the comparator is used to test an IC in operating equipment, one reference IC must be installed on a 10529-20005 reference IC card. The reference IC must be the same type as the IC to be tested, and it must be good. (See Figure 2-1.) Ten reference cards are supplied with a new comparator. Extra cards are available from Hewlett-Packard. Contact your nearest Hewlett-Packard Sales and Service Office for price and delivery of blank reference IC cards.

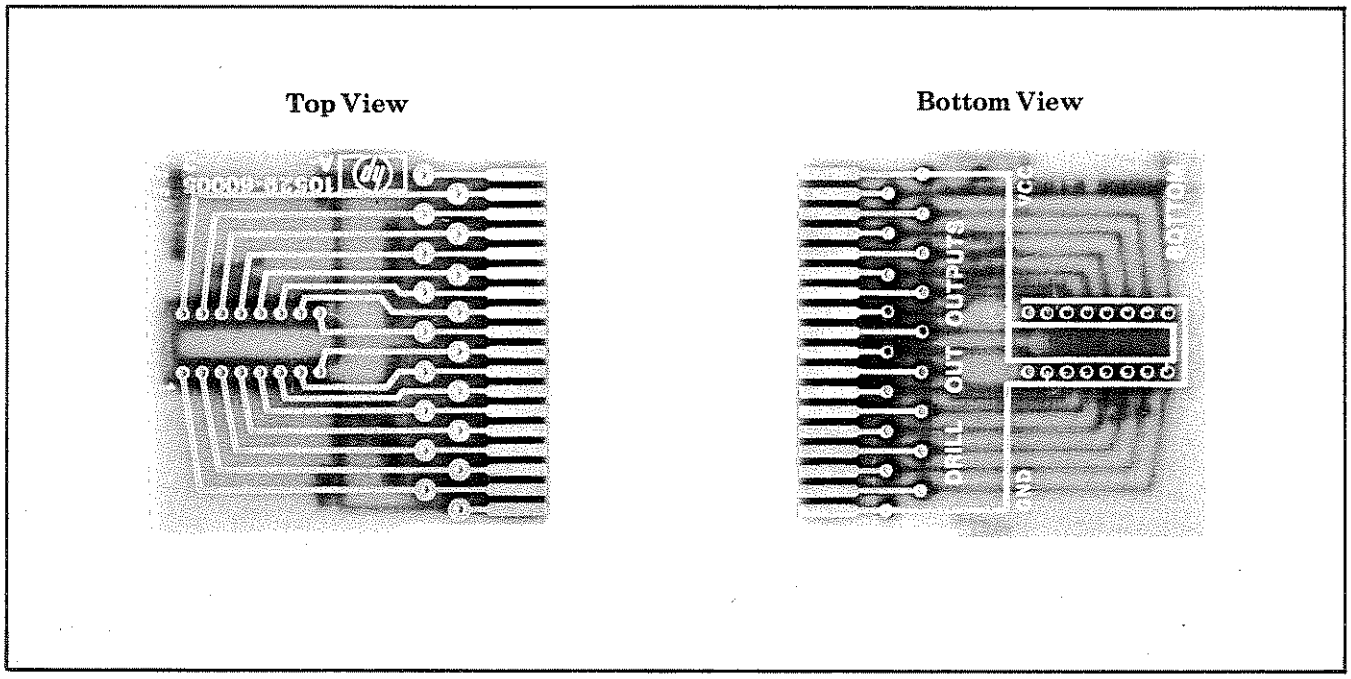
2-13. Check the location of pin 1 on the reference IC and match it to the pin "1" on the reference IC card. Put the reference IC pins into the correct holes of the card. Note the metal pattern on the "BOTTOM" of the reference IC card. The line marked GND will be connected to the ground pin of the reference IC, and the line marked Vcc will be connected to the Vcc pin of the reference IC.

a. At the bottom of the IC reference card, bend the reference IC "ground" pin over on the card "GND" line and solder the pin and line together.

b. Bend the reference IC "Vcc" pin over on the card 'Vcc" line and solder the pin and line together.

c. Solder the remaining reference IC pins in the respective holes. Do NOT short any pins together, and do NOT short any pins to the GND or Vcc line except the correct pins.

Figure 2-1. Reference IC Card, Top and Bottom



NOTE

The holes on the reference IC card next to the card connector (P1) pins have metal foil connecting through the card to the P1 pins on the other side.

d. Identify the output pins on the reference IC. Disconnect the reference IC outputs between the top and bottom of the reference card P1 pins. Use a number 50 twist drill to enlarge the holes. (This procedure breaks the plated through electrical connection and sends the outputs of the reference IC and the IC under test to separate inputs of the same exclusive OR gate.) Use an ohmmeter to be sure the correct pins on the top and bottom have been disconnected.

e. The reference IC card is ready for use in the comparator.

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section tells how to use and operate the 10529A Logic Comparator.

3-3. OPERATING MODES

3-4. Three modes of operation are possible with the logic comparator:

a. IC logic comparison test

b. Electronic self-test

c. Cable continuity self-test

3-5. IC Logic Comparison Testing

3-6. In this mode an operating in-circuit IC is output-compared to a good reference IC of the same type mounted on a printed circuit card installed in the comparator.

3-7. Electronic Self-Test

3-8. In this mode the comparator self-test card with + Vdc power connected is installed in the comparator, and the LED display is observed for indications of comparator condition. All of the LED's will blink on and off about twice-per-second if the comparator is working properly. If any or all LED's do not blink, something is wrong.

3-9. Cable Continuity Self-Test

3-10. In this mode the LED display indicates electrical continuity of the IC test clip and its cable. The comparator self-test card with +5 dc power connected is installed in the comparator, and the IC test clip is attached to the dummy IC on the self test card. All LED's should blink on for alternately long and short periods. If one or more LED's blink the same as in test mode one, this indicates an open circuit somewhere from that IC clip pin to the corresponding logic channel on the main board or LED board.

3-11. OPERATING CONTROLS

3-12. There are no operating controls in the comparator.

3-13. OPERATOR CONTROLLED ASSEMBLIES

3-14. The comparator has the following four operator controlled assemblies.

a. Reference IC card (See Figure 3-1.)

b. Reference IC drawer (See Figure 3-2.)

c. IC test clip (See Figure 3-2.)

d. Comparator self-test card (See Figure 3-1.)

3-15. Reference IC Cards

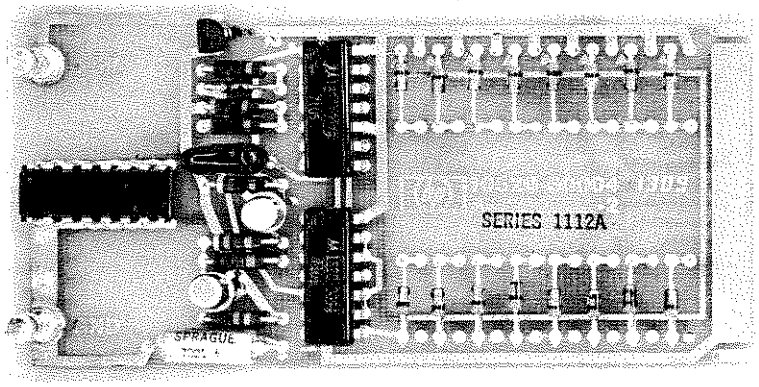
3-16. One of the ten reference IC cards, included with each logic comparator is installed in the reference IC drawer of the comparator (see Figure 3-3), and the drawer is closed. See Section II for reference IC installation.

3-17. Reference IC Drawer

3-18. The reference IC drawer holds either a reference IC on a card or the comparator test card. When you open the drawer be careful not to drop the reference IC card.

Figure 3-1. Operator Controlled Assemblies

Comparator Self-Test Card



Reference IC Card

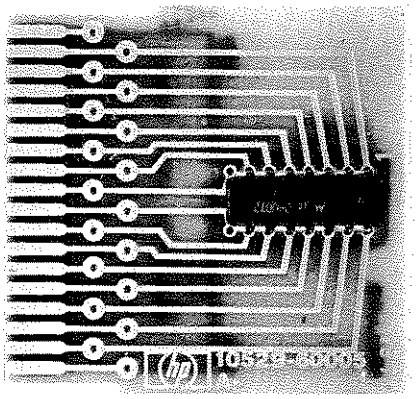


Figure 3-2. Reference IC Drawer and IC Test Clip

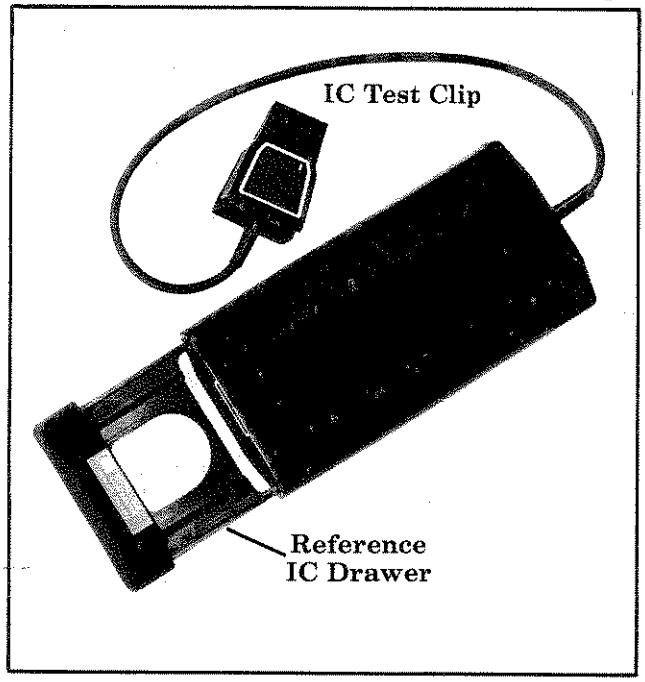
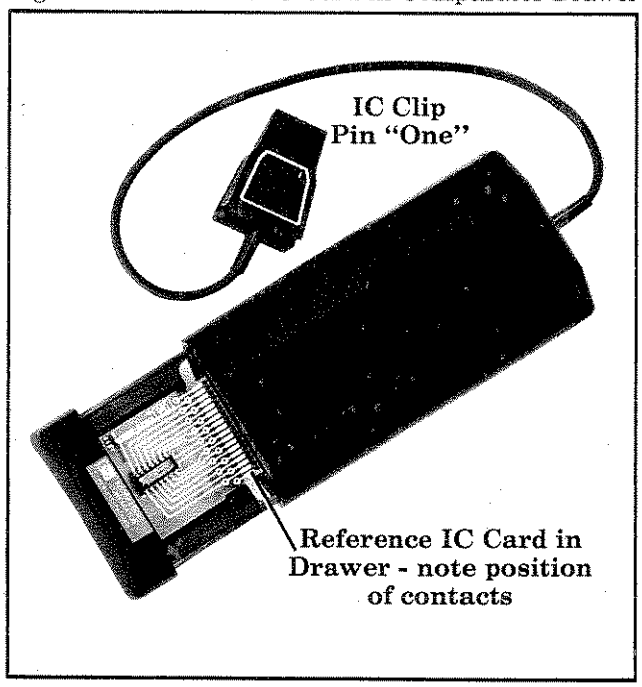


Figure 3-3. Reference IC Card in Comparator Drawer



3-19. IC Test Clip

3-20. The IC test clip clamps on the in-circuit IC to be tested. Be sure "1" on the clip matches pin one of the IC.

3-21. Comparator Self-Test Card

3-22. The comparator self-test card is installed in the reference IC drawer to test the operation of the comparator. See Section V for use of this card.

3-23. IC COMPARISON TEST INSTRUCTIONS

3-24. This is how to use the logic comparator:

a. Pull the drawer out of the comparator case, and put the correct reference IC card in the opening (see Figure 3-3 for correct position of IC card). Push the drawer back in the case.

b. Put the IC connector clip on the IC to be tested. Be sure to position the IC connector clip pin one index mark with pin one of the IC to be tested. (See Figure 3-3.)

c. The comparator middle ("ON") LED will light if the Vcc and "ground" connections are correct on reference IC, and the IC clip is clamped correctly on the IC to be tested.

d. If any of the sixteen LED's lights, the logic levels at that pin of the reference IC and the IC being tested are different. If a logic output of a reference and in-circuit IC are different it indicates one of the two IC's may be defective.

3-25. OPERATING NOTES

3-26. The following paragraphs give important operating notes.

3-27. Reset Before Testing

3-28. When sequential or memory circuits (counters or flip-flops) are tested with the logic comparator, the reference IC and the IC being compared must be set to the same logic state or an LED may indicate a legitimate logic state difference. (The outputs of counters and flip-flops depend not only on their inputs but also on what the previous input states were.)

3-29. Non-TTL Rise Time

3-30. If the comparator is used to check a circuit that has a pulse waveform with a relatively slow rise-time, the two IC's (reference and circuit being tested) may trigger at different times and give a false LED "on" indication. Slight differences in rise time between two IC's of the same type are normal and must be considered when slow waveforms occur in the circuit being tested.

3-31. Circuit Output Loading

3-32. Normal operation of the comparator has the inputs of the in-circuit and reference IC's in parallel and their outputs are separated. If the in-circuit IC output is shorted (possibly by the next circuit), the comparator LED would indicate a defect. Such a defect can be in the IC under test or a following circuit.

3-33. Wired "OR" Logic Testing

3-34. Check the logic diagram of the equipment being tested with the logic comparator. Some IC logic circuits may defeat the logic comparator fault detection because of interconnection of logic elements. For example, a "wired OR" connection if tested by the logic comparator may have its output pulled low by an associated wired gate while the reference IC output in the logic comparator will follow the input logic levels.

MANUAL CHANGES

CHANGE DATE: May 5, 1983

This change supersedes all earlier dated changes.

*** Make all corrections listed under ERRATA before making other changes.

*** Check following table for your instrument's serial prefix or series number and make listed change(s) to manual.

MANUAL DESCRIPTION

INSTRUMENT: 10529A
Logic Comparator
Operating and Service Manual

SERIAL PREFIX: 1240A

DATE PRINTED: AUG 1973
HP PART NO: 10529-90005
MICROFICHE NO: 10529-90009

# INDICATES NEW OR REVISED ITEM

> INDICATES ACTION TO BE TAKEN

SERIAL PREFIX, SERIES NUMBER OR DATE CODE	MANUAL CHANGE(S)
1424A	1
1444A	1,2
1940A	1,2,3
1940A	1,2,3,4
#2204A	1,2,3,4,5

SERIAL PREFIX, SERIES NUMBER OR DATE CODE	MANUAL CHANGE(S)

(C10529AS) 5225-5804/8945/E=12387/4=12419/5=12378-14869

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Insert this Warning after the Certification/Warranty and Assistance which is on the inside front cover.

WARNING

This product should be connected to a power source that is sufficiently isolated from the main supply to prevent the risk of electric shock.

To further reduce the risk of electric shock, refer to the service manual for the equipment under test (when applicable) and follow the manufacturer's service and safety precautions particularly when voltages exceeding 30 VRMS or 50 VDC are present.

ERRATA

Inside Cover:

>Change manual part number, if necessary to agree with correct part number (10529-90005) on outside rear cover.

Page 2, Accessories Available List:

>Change 10529A (Option 002) to K01-10541B*.

Page 3:

>Change the Supply Voltage specification from 5 volts +-10% to 5 volts +-5%.

>Change the Weight specification from Net, 2 lbs, 6 oz (1.14kg) to 2 lbs, 8 oz (1.14kg); and shipping from 2 lbs, 6 oz (1.65 kg) to 3 lbs (1.35 kg).

Page 18, paragraphs 4-20. and 4-21.:

>Change all references of U1 to U2; and U2 to U1 .

Page 37, Table 6-1. A3 (10529-60004) Replaceable Parts:

>Change reference designator U1 to U2 ; and U2 to U1.

Page 39, Paragraph 7-5, Option 002:

>Add "These boards are referenced to the following IC's:

7400 Quad 2-input NAND	7420 Dual 4-input NAND
7402 Quad 2-input NOR	7430 8-input NAND
7404 Hex inverter	7440 Dual 4-input NAND buffer
7408 Quad 2-input AND	7451 Dual 2-wide, 2-input AND-OR-INVERT
7410 Triple 3-input NAND	

ERRATA (cont'd)
Page 39, Paragraph 7-5, Option 002 (cont'd):

7454 4-wide, 2-input AND-OR-INVERT
7473 Dual J-K master-slave flip-flop
7474 Dual D flip-flop
7475 Quad bistable D latch
7476 Dual J-K flip-flop with preset and clear
7483 4-bit binary full adder
7486 Quad 2-input exlusive-OR
7490 Decade counter
7493 4-bit binary counter
74121 Monostable vibrator
9601 Monostable multivibrator

Page 48, Figure 8-5, Self-Test Card Component
>Change designation on resistor between C2 and Q3 from R11 to R5.
>Change designator U1 to U2; and U2 to U1.

Page 50, Table of Active Elements:
>Change A3U2 to 1820-0075.
>Change A3U1 to 1820-0054.

CHANGE 1

Page 1, Paragraph 1-7:
>Add the following to Equipment supplied:
10529-60014 SOCKET CARD:PROGRAMMABLE
10529-90007 MANUAL:OPERATING AND SERVICE SUPPLEMENT.

Page 38, Table 6-1, Replaceable Parts:
>Add 10529-60014 SOCKET CARD:PROGRAMMABLE.
>Add 10529-90007 MANUAL:OPERATING AND SERVICE SUPPLEMENT.

CHANGE 2

Page 17, Figure 4-2. Comparator Logic Channel Schematic:
>Change 10K resistor in input circuit from 10K to 47K.

Page 21, Table 5-1. Assembly Designations:
>Change HP Part No. 10529-60003 to 10529-60015.

Page 32, Table 6-1. Replaceable Parts:
>Change A1 part number from 10529-60003 to 10529-60015 in "HP Part No." and "Mfr Part Number" columns.

Page 35 and 36, Table 6-1. Replaceable Parts:
>Change A2R1, R3, R5, R7, R9, R11, R13, R15, R18-22, R24, R26, and R28 Part Numbers in HP and Mfr Part Number columns from 0698-5426 to 0698-6294 and resistor values from 10K to 47K ohm in "Description" column.

CHANGE 2 (cont.)
Page 37, Table 6-1. "Miscellaneous Parts":
>Change 10529-00002 to 10529-00003 in HP and Mfr Part Number columns.
>Change 10529-20003 (A1 Blank Board) to 10529-20016 in HP and Mfr Part Number columns.

Page 50, A1 Schematic Diagram Tables:
>Change "DS1-16" for A1 in "Reference Designations" table to DS1-17.
>Change DS1 for A1 in second "TABLE" to DS1-17 ; HP Part No. to 1990-0416.

Page 51, Figure 8-6, A1 Schematic Diagram:
>Change 10529-60003 for A1 DISPLAY ASSEMBLY to 10529-60015 (Series 1444).
>Change A2R1, R5, R7, R3, R9, R11, R13, R15, R18, R20, R21, R22, R24, R26, and R28 from 10K to 47K ohms.
>Add "(Series 1444)" after part number for A2 MAIN BOARD.

For instruments with serial numbers 1444A7440 and above, make the following changes:

Page 37, Table 6-1. Replaceable Parts:
>Change A3R3 from 200 ohms to 51 ohms, new HP Part Number is 0683-5105.

Page 51, Figure 8-7. A3 Schematic Disgram:
>Change A3R3 value from 200 ohms to 51 ohms.
>Change A3 series number to 1444.

CHANGE 3

Page 32, Table 6-1, A1 Replaceable Parts:
>Add "(SERIES 1940)" to A1 "Description".
>Change A1DS1 through A1DS17 from part number 1990-0416 to 1990-0547 in HP and Mfr Part Number columns.

Page 51, Figure 8-6, A1 Schematic Diagram:
>Change A1 series number from 1444 to 1940.

Page 50, Table of Active Elements:
>Change A1DS1 through A1DS17 part number from 1990-0416 to 1990-0547.

CHANGE 4

Page 38, Table 6-1. Replaceable Parts:
>Change, under Description, Spring part number to 10528-20018, and Qty to 2.

#CHANGE 5

In the 10529A OPERATING AND SERVICE MANUAL SUPPLEMENT:
Page 1, DESCRIPTION, first sentence:
>Change Programmable Socket Card part number to 10529-60017.

Page 6, Table 1. Replaceable Parts:
>Change SOCKET-TEST HP Part No. to 1200-0975.

#CHANGE 5 (cont'd)
Page 7, Figure 2. 10529A Component Locator and Schematic Diagram:
>Change PROGRAMMABLE SOCKET part number to 10529-60017.
>Change SERIES to 2204.

Page 37,Table 6-1. A3 (10529-60004) Replaceable Parts:
>Change the HP Part Number for Q1 from 1855-0010 to 1855-0479.

OPERATING AND SERVICE MANUAL SUPPLEMENT

SUPPLEMENT FOR 10529A LOGIC COMPARATOR

Programmable Socket Card 10529-60014 Series 1424A

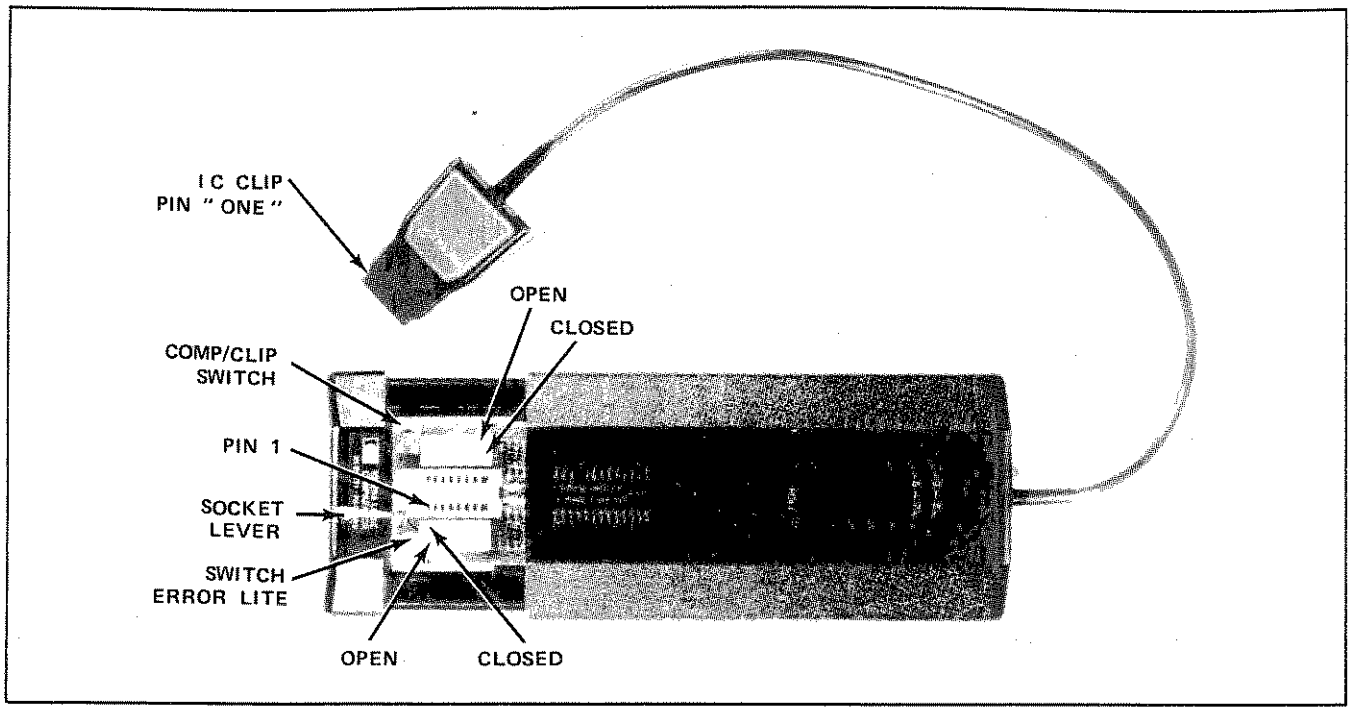
For use with Logic Comparator Operating and Service Manual 10529-90005.

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MANUAL PART NUMBER 10529-90007
MICROFICHE PART NUMBER 10529-90008
Printed: APR 1974
PRINTED IN U.S.A.

HEWLETT PACKARD

Figure 1. Socket Card



INTRODUCTION

This supplement covers specifications, operating instructions, theory, and service information for Programmable Socket Card 10529-60014. Use this supplement with the 10529A Operating and Service Manual (part number 10529-90005).

SPECIFICATIONS

The following specifications change when the socket card is used with the 10529A Logic Comparator. All other specifications are as listed in Table 1-1 of the 10529A manual.

Input Threshold:
1.8 volts nominal, TTL or DTL compatible.

Sensitivity:
Error Sensitivity: 300 nanoseconds, errors greater than this are detected and stretched to at least 0.1 seconds.

DESCRIPTION

The 10529-60014 Programmable Socket Card extends the usefulness of the 10529A Logic Comparator by allowing rapid test set-ups for seldom used IC's. The socket card also provides a Logic Clip function by displaying the status of each of the 14 or 16 pins of an IC under test.

Programming for a specific IC is easily accomplished. Two different methods are available. First the socket card included with the Comparator is inserted in the Comparator drawer. Outputs of the particular IC to be tested are selected via 16 miniature switches which tell the comparator which pins of the reference IC are to be allowed to respond freely. The reference IC is then inserted into the socket and locked into place. Any new IC may be set up in seconds. Alternatively, if specific IC types are to be tested repeatedly, the reference IC may be soldered into one of the reference cards provided with the Comparator. The reference card is programmed in minutes by opening the connections between the test and reference IC's outputs and solder bridging Vcc and ground. The socket card automatically seeks Vcc and ground. Ten blank

reference cards and the socket card are included with each Comparator.

The socket card also provides a Logic Clip function. In addition to the display of the instantaneous states of the 14 or 16 pins of the IC in the circuit via the Comparator's 16 LED's (one per pin), the Comparator-Clip also provides stretching on each pin. Thus intermittent highs and lows of 300 nanoseconds or longer may be detected. (See Logic Clip Operation.)

All operating power for the logic comparator is drawn from the circuit under test through the IC clip. No batteries or line power is used. The reference IC card has solderable connections to provide operating power to the comparator from the circuit being tested. The programmable socket card powers the logic comparator from the circuit under test by automatically locating Vcc and ground pins of the IC. Integrated circuits in the logic comparator are low-power TTL units to keep power consumption low.

Before the comparator is used to test an IC in operating equipment, one reference IC must be installed on a 10529-20005 reference IC card, or into the reference socket of the programmable socket card 10529-60014. The reference IC must be the same type as the IC to be tested, and a known good IC.

OPERATION

The following procedure describes how to use the Logic Comparator with the Programmable Socket Card.

Logic Comparator Operation

a. Pull drawer out of comparator case until drawer stops are reached - then put socket board in opening (see Figure 1 for correct position of socket card). Push drawer back into comparator case. Set the COMP/CLIP switch to the COMP position.

b. Check location of Pin 1 of the reference IC and match it to Pin 1 on the socket card (see Figure 1). The socket lever must be put in the vertical position while installing the IC in the socket. Put reference IC pins into the correct holes of the socket. To lock the

IC into the socket, push the socket lever into the horizontal position.

c. Identify the output pins of the reference IC. Set all output pin program switches to the open position (away from the socket). Place all other switches to the closed position (towards the socket).

d. The reference IC is now ready for use in the comparator.

e. Put the IC connector clip on the IC to be tested. Be sure to position the IC connector clip pin 1 index mark with pin 1 of the IC to be tested (see Figure 1).

f. The compartor "ON" light should illuminate.

g. If any of the 16 LED's light, the logic levels at that pin of the reference IC and the IC being tested are different. Since the reference IC is "known good" the fault is in the IC being tested.

Logic Clip Operation

The following is the procedure for using the Logic Comparator as a Logic Clip:

a. Pull drawer out of comparator case until drawer stops are reached - then put socket board in opening (see Figure 1 for correct position of socket card). Push drawer back into comparator case.

b. Set the COMP/CLIP switch to the CLIP position.

c. Set all program switches to the open position (away from the socket).

d. Put the connector clip on IC to be tested. Be sure to position the IC connector clip pin 1 index mark with pin 1 of the IC to be tested.

NOTE

If the SWITCH ERROR light on the Socket Card illuminates, check that all switches are set to the open position. The light ON indicates a short between Vcc and common through one of the switches.

e. The comparator "ON" LED should illuminate. The 16 LED's now display the "high" and "low" logic levels of the corresponding IC pins. An "ON" LED

represents a logic "high" while an "off" LED represents a logic "low". Positive pulses will be stretched and displayed as an "ON" LED for a minimum of 50 ms. Negative pulses will not be stretched. If a pin is pulsing, the corresponding LED will flash "ON" and "OFF" or appear as a static "High" depending on the frequency. These two conditions are differentiated in step "f".

f. With the COMP/CLIP switch set to the COMP position, all "low" logic levels will be displayed as "ON" LED's and all "high" logic levels will be displayed as "OFF" LED's. Negative pulses will be stretched and displayed as "ON" LED's for a minimum of 50 ms. Positive pulses will not be stretched. If a pin is pulsing, the corresponding LED will flash "ON" and "OFF" or appear as a static "low" depending on the frequency. These two conditions are differentiated in "e" above.

Failure Detection

The following procedure is useful in determining the nature of the failure detected by the comparator:

There are two general types of Logic Circuit failure: a static failure and a dynamic failure.

The static failure is the result of a node continuously held high or low. This is caused by an output gate failure or the failure of an input gate tied to the node. Other static failures occur when the node is loaded down by circuits that are not intended to draw current from that node. These faults are typically caused by problems such as a solder bridge or external wiring faults.

The dynamic failure is typified by a node with signal activity that does not follow some prescribed truth table. This type failure is normally identified by a deviation of IC operation from the truth table. Two other possibilities however must be considered before any IC's are replaced: the failure of an input gate on the node and the unwanted connection to the node.

Use the following procedure to determine the nature of the failure.

a. Use the comparator as explained above (see section Logic Comparator operation). Note all failed pin numbers.

b. Use the comparator with socket card as a Logic Clip and observe failed pin numbers of step a. All LED's that are off represent pins that are stuck low indicating a probable static type failure. All that are pulsing or flashing have pulse activity which may indicate a dynamic failure. All pins that are high may be high or have pulse activity.

To differentiate between the last two states, set the COMP/CLIP switch to COMP. All failed pins that are now pulsing have pulse activity (which may indicate a dynamic failure), while all others are high.

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