DIGITAL CIRCUIT TESTERS

Logic Probe, Logic Pulser, Digital Current Tracer

Models 545A, 546A, 547A

HP 545A TTL/CMOS Logic Probe

The HP 545A Logic Probe contains all the features built into other HP probes, plus switch-selectable, multi-family operation and built-in pulse memory. Employing straightforward one-lamp display the HP 545A operates from 3 to 18 volts in CMOS applications or from 4.5 to 15 Vdc supplies in the TTL mode while maintaining standard TTL thresholds.

The probe's independent, built-in pulse memory and LED display help you capture hard to see, intermittent pulses. Just connect the probe tip to a circuit point, reset the memory, and wait for the probe to catch those hard to find glitches.

The hand-held HP 545A is light, rugged, overload protected, and very fast: 80 MHz in TTL, 40 MHz in CMOS. It also employs handy power supply connectors that enable you to easily hook up to supply voltage almost anywhere in the unit under test.

HP 545A Probe Specifications

Input current: < 15 μA (source or sink).
Input capacitance: < 15 pF.
Logic thresholds
*TTL: Logic one 2.0 + 0.4, -0.2 V. Logic zero 0.8 + 0.2, -0.4 V.
CMOS: 3-10 Vdc supply
Logic one: 0.7 X V_{supply} ±0.5 Vdc.
Logic zero: 0.3 X V_{supply}, ±0.5 Vdc.
CMOS: >10-18 Vdc supply.
Logic one: 0.7 X V_{supply} ±1.0 Vdc.
Logic zero: 0.3 X V_{supply} ±1.0 Vdc.
Input minimum pulse width: 10 ns using ground lead (typically 20 ns without ground lead).
Input maximum pulse repetition frequency:
TTL, 80 MHz. **CMOS,** 40 MHz.
Input overload protection: ±120 V continuous (dc to 1 kHz); ±250 for 15 seconds (dc to 1 kHz).
Pulse memory: indicates first entry into valid logic level: also indicates return to initial valid level from bad level for pulse > 1 µs wide.
Power Requirements
TTL: 4.5 to 15 Vdc*.
CMOS: 3 to 18 Vdc.
Maximum current: 70 mA.
Overload protection: ±25 Vdc for one minute.
Accessory included: ground clip.
*+5±10% Vdc power supply; usable to +15 Vdc with slightly increased logic low threshold.

HP 546A Logic Pulser

The Logic Pulser solves the problem of how to pulse IC's in digital circuits. Merely touch the Pulser to the circuit under test, press the pulse button and all circuits connected to the node (outputs as well as inputs) are briefly driven to their opposite state. No unsoldering of IC outputs is required. Pulse injection is automatic, high nodes are pulsed low and low nodes, high, each time the button is pressed.

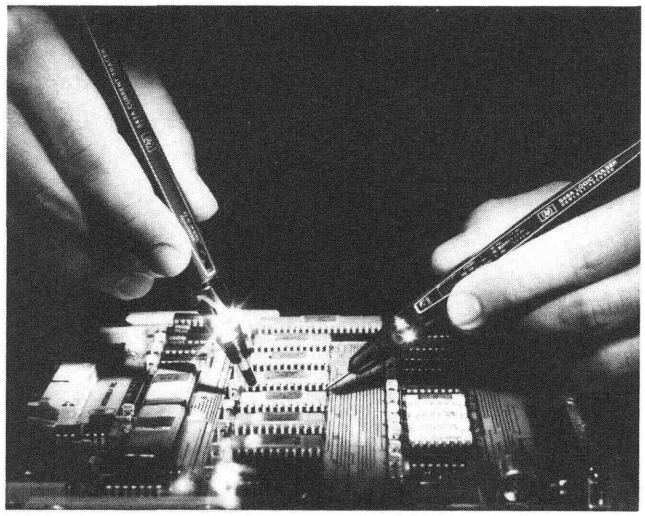
Automatic polarity pulse output, pulse width, and amplitude make for easy multi-family operation when you use the HP 546A Logic Pulser. But, the real surprise comes when you code in one of its six ROM-programmable output patterns (single pulses; pulse streams of either 1, 10, or 100 Hz; or bursts of 10 or 100 Hz; or bursts of 10 or 100 pulses). This feature allows you to continually pulse a circuit when necessary, or it also provides an easy means to put an exact number of pulses into counters and shift registers. Used with our multi-family IC Troubleshooters, the HP 546A acts as both a voltage and current source in digital troubleshooting applications.

HP 546A Pulser Specifications

Output

			Typical Output Voltage	
Family	Output Current	Pulse Width	HIGH	LOW
TTL/DTL	≤650 mA	≥0.5 µs	≥3 Vdc	≤0.8 Vdc
CMOS	≤100 mA	≥5.0 µs	≥(V_{supply} − 1 Vdc)	≤0.5 Vdc

Power supply requirements: TTL; 4.5 to 5.5 Vdc at 35 mA, **CMOS;** 3 to 18 Vdc at 35 mA, protected to ±25 Vdc for 1 min.



HP 547A/546A

HP 547A Digital Current Tracer

The HP 547A Current Tracer precisely locates low-impedance faults in digital circuits by locating current sources or sinks. For example, on a bad node the Tracer can verify that the driver is functioning and also show where the problem is by tracing current flow to the source or sink causing the node to be stuck. The Tracer is designed to troubleshoot circuits carrying fast rise-time current pulses. The Tracer senses the magnetic field generated by these signals in the circuit and displays transitions, single pulses, and pulse trains using a simple one-light indicator. Because it is not voltage sensitive, the Tracer operates on all logic families having current pulses exceeding 1 mA, including CMOS, where even lightly loaded outputs can have up to 2 to 3 mA of instantaneous charging current.

To use the Tracer, align the dot on its tip at a reference point, usually the output of a node driver. Set the sensitivity control to indicate the presence of ac current activity. As you probe from point to point or follow traces, the lamp will change intensity; when you find the fault the Tracer will indicate the same brightness found at the reference point.

HP 547A Current Tracer Specifications

Input
Sensitivity: 1 mA to 1 A.
Frequency response: light indicates single-step current transitions; single pulses > 50 ns in width; pulse trains to 10 MHz (typically 20 MHz for current pulses >10 mA).
Risetime: light indicates current transitions with risetime <200 ns at 1 mA.
Power Supply Requirements
Voltage: 4.5 to 18 Vdc.
Input current: <75 mA.
Maximum ripple: ±500 mV above 5 Vdc.
Overvoltage protection: ±25 Vdc for one minute.

Accessories Available	Price
HP 00545-60104: Tip Kit for HP 546A Pulser, 545A Probe	$65 ☎
HP 10526-60002: Multi-Pin Stimulus Kit	$75 ☎
HP 1250-1948 Adapter, Coax Str.	$25

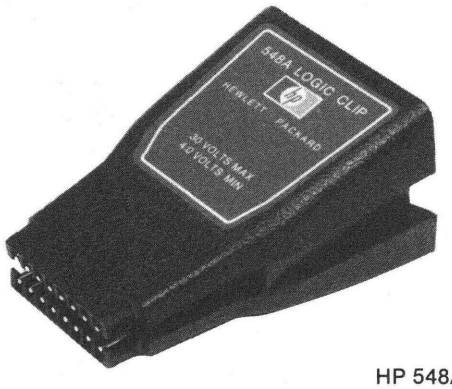
Ordering Information	
HP 545A Logic Probe	$260 ☎
HP 546A Logic Pulser	$350 ☎
HP 547A Digital Current Tracer	$630 ☎

☎ Fast-ship product—see page 734.

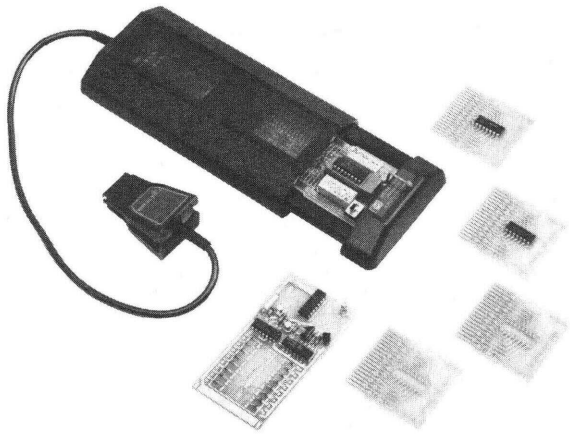
DIGITAL CIRCUIT TESTERS

Logic Clip, Logic Comparator

Models 548A & 10529A



HP 548A



HP 10529A

HP 548A **Logic Clip**

The Logic Clip is an extremely handy service and design tool which clips onto dual-in-line package (DIP) ICs, instantly displaying the states of up to 16 pins. Each of the clip's 16 LEDs independently follows level changes at its associated pin. Lit diodes are logic High, extinguished diodes are Low.

The Logic Clips's real value is in its ease of use. It has no controls to set, needs no power connections, and requires practically no explanation as to how it is used. The clip has its own gating logic for locating ground and V_{cc} pins and its buffered inputs reduce circuit loading.

The Logic Clip is much easier to use than either an oscilloscope or a voltmeter when you are interested in whether a circuit is in the high or low state, rather than its actual voltage. The Clip, in effect, is 16 binary voltmeters, and the user does not have to shift his eyes away from his circuit to make the readings.

The intuitive relationship of the input to the output—lighted diode corresponding a high logic state—greatly simplifies the troubleshooting procedure. The user is free to concentrate his attention on his circuits, rather than on measurement techniques. Also, timing relationships become especially apparent when clock rates can be slowed to about 1 pulse per second.

When used in conjunction with the Logic Pulser, the Logic Clip offers unparalleled analysis capability for troubleshooting sequential Logic Devices used to inject pulses between gates allowing it to supply signals to the IC under test absolutely independent of gates connected to the IC. All outputs may then be observed simultaneously on the Logic Clip. Deviations from expected results are immediately apparent as the Pulser steps the IC through its truth table.

HP 548A **Multi-Family Logic** Clip

Fully automatic and protected to 30 Vdc, and employing bright individual LEDs in its display, the HP 548A brings multi-family operation to the HP line of IC Troubleshooters. The Clip can be externally powered, if desired, using a simple power connector.

HP 548A Specifications

Input threshold: (>0.4 ±0.06 x Supply Voltage) = Logic High.
Input impedance; 1 CMOS load per input.
Input protection: 30 Vdc for 1 minute.
Supply voltage: 4-18 Vdc across any two pins.
Auxiliary supply input: 4.5 to 20 Vdc applied via connector. Supply must be >1.5 Vdc more positive than any pin of IC under test.
Supply current: <55 mA.

HP 548A Logic **Clip** **$320** ☎
☎ Fast-ship product—see page 734.

HP 10529A Logic Comparator

The HP 10529A Logic Comparator clips onto powered TTL or DTL ICs and detects functional failures by comparing the in-circuit test IC with a known good reference IC inserted in the Comparator. 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 inputs and which are outputs. Any logic state difference between the test IC and reference IC is identified to the specific pin(s) on 14- or 16-pin dual in-line packages on the Comparator's display. A lighted LED corresponds to a logic difference. Intermittent errors as short as 300 nanoseconds (using the socket board) are detected, and the error indication on the Comparator's display is stretched for a visual indication. A failure on an input pin, such as an internal short, will appear as a failure on the IC driving the failed IC; thus a failure indication actually pinpoints a malfunctioning node. A test board is supplied to exercise all of the circuitry, test leads, and display elements to verify proper operation.

HP 10541 A: twenty additional blank reference boards; identical to the 10 boards provided with the Logic Comparator.

HP 10541B: twenty preprogrammed reference boards. The 10541B includes the following ICs: 7400,7402, 7404, 7408, 7410, 7420, 7430, 7440, 7451, 7454, 7473, 7474, 7475, 7476, 7483, 7486, 7490, 7493, 74121, 9601.

HP 10529A Specifications

Input threshold: 1.4 V nominal (1.8 V nominal with socket board), TTL or DTL compatible.
Test IC loading: outputs driving Test C inputs are loaded by 5 low-power TTL loads plus input of Reference C. Test C outputs are loaded by 2 low-power TTL loads.
Input protection: voltages <—1 V or > 7 V must be current limited to 10 mA.
Supply voltage: 5 V ±5%, at 300 mA.

Supply protection: supply voltage must be limited to 7 V.
Maximum current consumption: 300 mA.
Sensitivity
Error sensitivity: 200 ns with reference board or 300 ns with socket board. Errors greater than this are detected and stretched to at least 0.1 second.
Delayed variation immunity: 50 ns. Errors shorter than this value are considered spurious and ignored.

Frequency range: maximum operational frequency varies with duty cycle. An error existing for a full clock cycle will be detected if the cycle rate is less than 3 MHz.
Accessories included: 1 test board; 10 blank reference boards; 1 programmable socket board; 1 carrying case.

Accessories Available	**Price**
HP 10541A: Twenty Blank Reference Boards	$140 ☎
HP 10541B: Twenty Pre-programmed Boards	$440 ☎

HP 10529A Logic Comparator **$1100** ☎
☎ Fast-ship product—see page 734.