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Logic probe basics

- a summary or tutorial about the basics of logic probes - what a logic probe is, how a logic probe works and how one may be used.

LOGIC PROBE TUTORIAL INCLUDES

[Logic probe basics \(logic-probe-basics.php\)](#)

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A logic probe is a low cost item of test equipment. As the name indicates, a logic probe tester is used for probing and analyzing logic circuits.

A logic probe tester is normally a small item of test equipment, typically handheld in the form of what could be thought of as a large oscilloscope probe, but without the lead.

This makes logic probes very portable and easy to use for troubleshooting and general simple maintenance work on low complexity logic circuitry.

For most applications, a logic probe would not be used within a laboratory test environment - here more sophisticated test equipment would be used because much closer investigation of problems is required.

Logic probe basics

A logic probe is able to give an indication of the logic state of a line carrying a digital signal The logic probe indicates whether there is a logic state "1" or "0", normally using an LED as the indicator. Often the LED on the logic probe will use different colours to indicate different states.



A logic probe normally may be capable of indicating up to four different states:

- **Logic high :** If the logic circuit is at a logic or digital high voltage, the logic probe will indicate this on its interface - typically this will be a colour red.
- **Logic low:** Again the logic probe will indicate a logic or digital low. The most common colour for this is green.
- **Pulses:** The logic probe is likely to incorporate a pulse detection circuit. When the line is active a third colour, possibly amber will be indicated. The logic probe may well incorporate circuitry to detect very short pulses and in this way indicate when the line is active. Sometimes the length of the pulses may be indicated by the brightness of the LED.
- **Line tri-stated :** Often it is possible for lines to be tri-stated, i.e. the output device has its output turned off and no real state is defined. Many logic probes are able to indicate this state by having all indicators turned off.

Some logic probes may have a control to select the logic family being tested - different logic families have slightly different high and low voltage levels.

Another facility that some logic probes may include is an audible indication of the logic state. This feature is particularly useful when using a probe as eyes may need to be trained on the circuit and not on the logic probe itself.

Logic probe tester advantages and disadvantages

As with any item of test equipment, there are advantages and disadvantages to the use of a logic probe.

Logic probe advantages -

- **Low cost:** A logic probe does not contain much circuitry, and the display is very rudimentary. Therefore the cost of manufacture is very low.
- **Ease of use :** To use a logic probe typically requires the connection of power leads and then connecting the probe to the required point on the circuit.

Logic probe disadvantages -

- **Very rough measurement:** The nature of the logic probe means that only an indication of the presence of a logic signal can be detected.
- **Poor display:** A logic probe only uses a few LEDs to indicate the nature of the logic signal. As a result, little information can be displayed about the nature of the logic signal that is detected.

A logic probe tester is a cheap and relatively simple item of test equipment. It is versatile and very transportable, and it also is able to provide a quick test for many circuits. However it is not nearly as flexible as an oscilloscope or a logic analyzer. A logic probe can be used for quick testing, whereas for more in-depth testing more sophisticated test equipment is needed.

Logic probe typical specifications

While all models of logic probe will vary slightly, it is possible to provide some outline of the typical specifications for a probe.

Generally logic probes are aimed at a basic test only and therefore offer a relatively basic level of performance. Nevertheless they can be invaluable in locating faults in many situations.

A typical specification may be:

TYPICAL LOGIC PROBE SPECIFICATIONS	
PARAMETER	SPECIFICATION
Logic 1 Signal input level	TTL: > 2.3V ±0.02V CMOS: > 70% Vcc ± 10%
Logic 0 Signal input level	TTL: < 0.08V ±0.02V CMOS: < 30% Vcc ± 10%
Power supply range	5 - 15 V
Max supply voltage withstand	20 V
Max input signal frequency	20 MHz
Signal input impedance	1 MΩ
Minimum detectable pulse width	30 ns

While these specifications may vary from probe to probe, they do give an indication of the type of performance that may be expected from most of the low cost varieties of logic probe.

By Ian Poole (<https://plus.google.com/104687638164370436625?rel=author>)

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