

### LIMITED ONE-YEAR WARRANTY

MAXTEC INTERNATIONAL CORPORATION warrants to the original purchaser that its B+K Precision product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

MAXTEC will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized B+K Precision service contractor or the factory service department, accompanied by proof of the purchase date in the form of a sales receipt.

**Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs.**

MAXTEC shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your B+K Precision distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, send the unit to B+K Precision Service Department, 22820 Savi Ranch Parkway Yorba Linda, CA 92887, properly packaged to avoid damage in shipment.

B+K Precision Test Instruments warrants products sold in the U.S.A. and its overseas territories. In other countries, each distributor warrants the B+K Precision products which it sells.

**BK PRECISION®**

B & K PRECISION CORP  
22820 SAVI RANCH PARKWAY  
YORBA LINDA, CA 92887

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**BK PRECISION DP-21**

## INSTRUCTION SHEET

### LOGIC PROBE

#### DESCRIPTION

The B+K Precision Model DP-21 Logic Probe is a powerful troubleshooting tool, including a level detector, pulse detector, and pulse memory. It is compatible with TTL and CMOS logic families. This compact probe is easy to handle in tight spaces. Three colored LED indicators display pulse presence as well as high and low logic states. It responds to pulses as narrow as 30 nS, or pulse trains to 20 MHz. The DP-21 is an indispensable digital troubleshooting tool, and may be used in conjunction with the B+K Precision DP-31A Logic Pulser if desired.

CE

481-198-9-001B

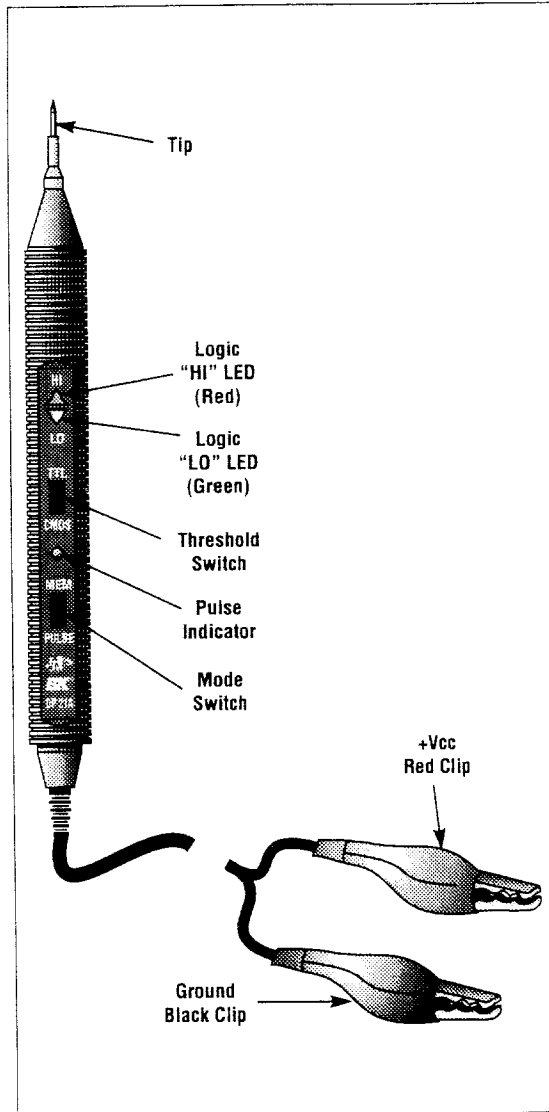


Figure 1.

## OPERATION

### Applying power to the probe

1. Connect the black clip to the power supply ground.
2. Connect the red clip to  $V_{cc}$  (+5 volts for TTL, +4 to +18 volts for CMOS).

### Threshold Setting

The threshold switch can be set to TTL mode for use in +5 V TTL circuits, or to CMOS for use in CMOS circuits of +4 to +18 V. The TTL logic 1 threshold is +2.3 V  $\pm$ 0.2 V, and the logic 0 threshold is +0.8 V  $\pm$ 0.2 V. The CMOS logic 1 threshold is 70%  $\pm$ 10% of  $V_{cc}$ , and the logic 0 threshold is 30%  $\pm$ 10% of  $V_{cc}$ .

### Mode Selection

The mode switch provides pulse detection in either pulse stretch (PULSE) or memory (MEM) modes.

In pulse stretch mode the pulse indicator lights for a minimum of 20 milliseconds in response to each single pulse (positive or negative going) of 20 nanoseconds or greater duration. In this way, a high visibility flash is ensured, even for very fast pulses.

In memory mode, the pulse indicator remains lit after the first pulse or logic transition, until reset by moving the mode

CONDITION	WAVEFORM	LED INDICATIONS LEVEL PULSE		
		(Red)	(Green)	(Yellow)
Logic "1" no pulse activity	1 0	●	○	○
Logic "0" no pulse activity	1 0	○	●	○
Signal level between "1" & "0"	1 0	○	○	○
Logic "1" with pulse (High duty cycle)	1 0	●	○	☆
Logic "0" with pulse (Low duty cycle)	1 0	○	●	☆
Pulse train with freq. <1 MHz	1 0	●	●	☆
Pulse train with freq. >1 MHz	1 0	○	○	☆

● LED On ○ LED Off ☆ LED blinks - - - - - ref. level — signal

Figure 2.

switch to the PULSE position. To use the memory mode, first set the mode switch to the PULSE position, then connect the probe tip to the point of interest. This initial contact will cause the pulse indicator to flash. Following the initial flash, move the mode switch to the MEM position. The probe is now ready to operate in the memory mode.

### Use of the Probe

The HI indicator will remain lit whenever a logic "high" (or "1") is present at the probe tip. Similarly, the LO indicator will remain lit whenever a logic "low" (or "0") is present. The pulse indicator will light as the result of a transition in logic levels. Therefore, typical operating situations likely to be encountered are as follows:

1. With the probe tip touching symmetrical pulses, the HI and LO indicators will both be lit at one-half brilliance, and the pulse indicator will be flashing.
2. With the probe tip touching an unsymmetrical pulse train (duty cycle other than 50%), the pulse indicator will be flashing, and one of the HI and LO indicators will be brightly lit, while the other is faintly lit, or not lit at all. This difference in brightness can be used as a rough indicator of symmetry. The HI indicator just begins to light at a duty cycle of about 5%, becoming brighter with increasing duty cycle. The LO indicator just begins to light at a duty cycle of 99%, becoming brighter with decreasing duty cycle.

Figure 2 shows typical combinations of probe indications.

## APPLICATIONS

### Use of a Logic Probe

When the unit under test has its typical digital inputs applied, a logic probe may be used to probe logic activity in a circuit under test, in a manner similar to analog "signal tracing". Follow the sequence from earlier circuits to later, looking for "dead" outputs along the way. However, bear in mind the note mentioned in the next section: lack of a pulse indication does not necessarily imply a bad device. Check the input activity; schematic diagrams and a knowledge of the circuits under test are invaluable.

### Use With a Logic Pulser

When the unit under test is separated from its typical digital inputs (such as a circuit board removed from its system), or to check circuits which may not have a digital input while testing, a logic probe such as the DP-21 can be used with a logic pulser such as the B+K Precision Model DP-31A. A typical use of this pair of instruments is described below.

1. Connect the DP-21 and the logic pulser to the supply of the circuit to be tested.
2. Hold the tip of the DP-21 on the output of a suspected bad gate, as in Figure 3, or the output of a flip-flop or counter, as in Figure 4.
3. With the logic pulser in the 400 PPS mode, touch the tip to a logic input of the suspected gate or the clock input of the flip-flop or counter.
4. The output(s) of a good device will generally show a pulse indication on the DP-21.

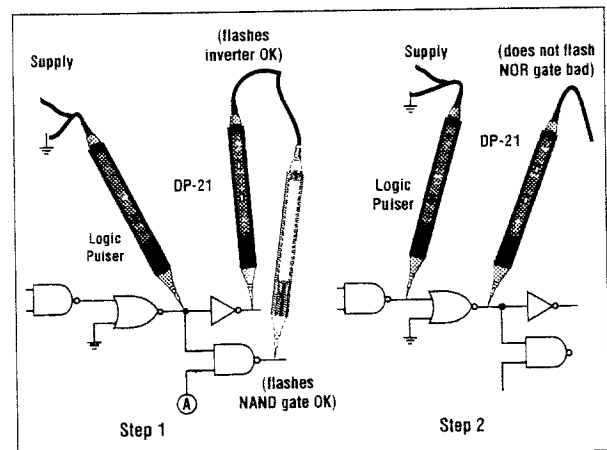


Figure 3.

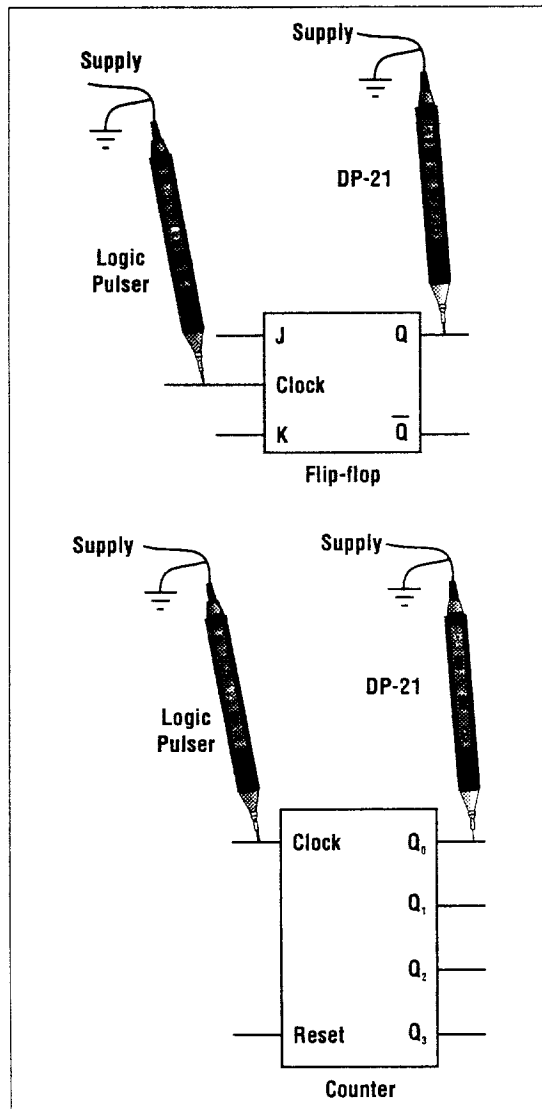


Figure 4.

**NOTE**

Devices in-circuit are usually affected by other circuits. For example, in Figure 3, if input A of the NAND gate is brought low by some other circuit, the output cannot toggle. Similarly, in Figure 4, inputs J and K must be high for the flip-flop to toggle, and an active Reset input on the counter will prevent it from counting. Other circuits may also be affecting the inputs dynamically while you are testing the device. The inputs should be checked with the logic probe to see if such conditions exist.

5. The 0.5 PPS mode of the logic pulser may be used to investigate logic activity at a slower rate; for example, each successive stage of a counter should toggle at half the rate of the previous stage. Again, these conditions may vary due to the dynamic influence of other circuits.

**SPECIFICATIONS**

Frequency response	DC to 20 MHz
Min. detectable pulse width	30 nS
Logic threshold	TTL CMOS
Logic 1	2.3 V ±0.2 V 70% V <sub>cc</sub> ±10% (red LED lights)
Logic 0	0.8 V ±0.2 V 30% V <sub>cc</sub> ±10% (green LED lights)
Operating supply voltage range	4 to 18 V
Input impedance	1 MΩ
Pulse LED flashing time	500 mS
Input overvoltage protection	±220 VDC/AC, 15 sec.
Power supply protection	±20 V
Operating temperature	0-50°C, <80% R.H.
Storage temperature	-20° to +65°C, <75% R.H.
Size (H x W x D)	0.7" x 0.7" x 8.2" (18 x 18 x 210 mm)
Weight	1.6 oz (45 g)