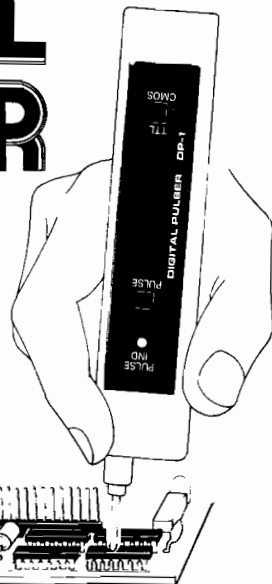


DP-1 DIGITAL PULSER

INSTRUCTION MANUAL



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351 California Street, San Francisco, CA 94104
Shire Hill Industrial Estate, Units 1 and 2,
Saffron Walden, Essex, CB 11 3Q

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SPECIFICATIONS

OPERATING MODES:	<p>ONE SHOT. Occurs when <i>Pulse</i> pushbutton is depressed for less than one second. Single pulse to logic level opposite that appearing at the Pulser probe tip is injected.</p> <p>RUN. Occurs automatically when <i>Pulse</i> pushbutton is held depressed for more than one second. 100 pps train of pulses, as above, is injected.</p> <p>TRI-STATE. Occurs whenever <i>Pulse</i> pushbutton is not depressed. Provides minimum 300K Ohm high impedance to isolate DP-1 from circuit under test.</p>	PULSE OUTPUT:	100 mA sink or source, either TTL or CMOS selected; can pulse into short circuit continuously without damage.
PULSE LEVELS:	Controlled by TTL/CMOS logic family selector switch.	PULSE POLARITY:	Automatically monitors logic level present at Pulser probe tip, and presets appropriate half of complementary output to provide opposite-going output pulse.
PULSE WIDTH:	1.5 $\mu\text{sec} \pm 30\%$ with TTL selected; 10 $\mu\text{sec} \pm 30\%$ with CMOS selected.	PULSE INDICATOR:	Single LED blinks once for single pulse in ONE SHOT mode, flashes continuously in RUN MODE, remains dark in TRI-STATE MODE.
RISE TIME:	100 nsec	POWER:	5-25 VDC, circuit powered through 36" alligator (provided) or easy-clip (optional) leads. Overvoltage protected to 25 VDC; reverse Voltage protected to 40 VDC. Draws maximum 30 mA. Alternate ground connector near tip for cleaner high current pulses.
FALL TIME:	500 nsec @ 1 TTL load with TTL selected; 8 μsec @ 100K load with CMOS selected. Fall time is directly proportional to load resistance.	OPERATING TEMPERATURE:	0° - 50° C
		DIMENSIONS (LxWxD):	5.8x1.0x0.7 in (147x25x18 mm)
		WEIGHT:	3 oz (85 gm)

CONGRATULATIONS!

Welcome to the growing family of Global Specialties Corporation test equipment owners. You have selected a versatile and unique piece of equipment designed for full professional performance. To get the most out of this instrument, please read this manual carefully.

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CAUTION

DO NOT UNDER ANY CIRCUMSTANCES CONNECT THE ALLIGATOR CLIP POWER LEADS OF THIS INSTRUMENT TO MORE THAN 30VDC. DO NOT CONNECT THEM TO ANY SOURCE OF AC POWER, AND ESPECIALLY, DO NOT CONNECT THEM TO AC LINE VOLTAGES! FAILURE TO COMPLY WITH THESE INSTRUCTIONS RESULTS IN DESTRUCTION OF YOUR INSTRUMENT AND POTENTIAL HAZARD TO YOU. NO FACTORY SERVICE OR WARRANTY SERVICE CLAIMS WILL BE HONORED FOR UNITS WHICH HAVE BEEN CONNECTED TO THE AC LINE.

INTRODUCTION

The DP-1 was designed to fill a long neglected need in the digital service industry.

A completely automatic pulse generator in a pencil-sized probe, tailored for both the lab and field service. The DP-1 allows the user to conveniently pulse any family of digital circuits.

By obtaining its power from the circuit it is testing, the DP-1 self adjusts the amplitude of its output pulse to the input requirements of the circuit under test.

When the pulser tip is connected to the circuit node to be tested, the DP-1's "auto polarity sensing system" selects the sink or source pulse required to activate the test point.

Simply depress the push button once to produce a clean, bounce-free pulse. When the push button is held down for more than one second, the DP-1 produces a pulse train at a 100 pps rep rate.

The DP-1 is capable of sinking or sourcing 100 mA or 60 TTL loads at a 1.5 microsecond pulse width. If a wider pulse is required simply move the TTL/CMOS slide switch to the CMOS position to increase the pulse width to 10 microseconds. This allows reliable triggering of even the slowest CMOS devices at the lowest V_{cc} 's.

The DP-1 has a "Fail-Safe" feature, which permits an overvoltage condition up to 25 Volts. Further built-in protection will withstand a reverse Voltage to 50 Volts, and allows the DP-1 to pulse continuously into a short circuit.

The DP-1 now gives the field service technician all the versatility of a lab quality pulse generator, without the need to set pulse levels or switch to complement the output pulse.

FUNCTIONS AND OPERATIONS

AUTO POLARITY SENSING

The DP-1 contains a circuit that automatically selects the sink or source pulse needed by the circuit under test.

By comparing the test point Voltage (between pulses) to the center of the dead zone Voltage for the family being tested, the DP-1 senses whether a "0" level is present and outputs a "1" pulse, if a "1" level is present it outputs a "0" pulse.

The auto polarity sensing level is checked after each pulse to allow for changes of state after a trigger pulse.

This permits the DP-1 to trigger an RS flip-flop supplying alternate, sink and source pulses to the cross-coupled junction to keep the flip-flop toggling.

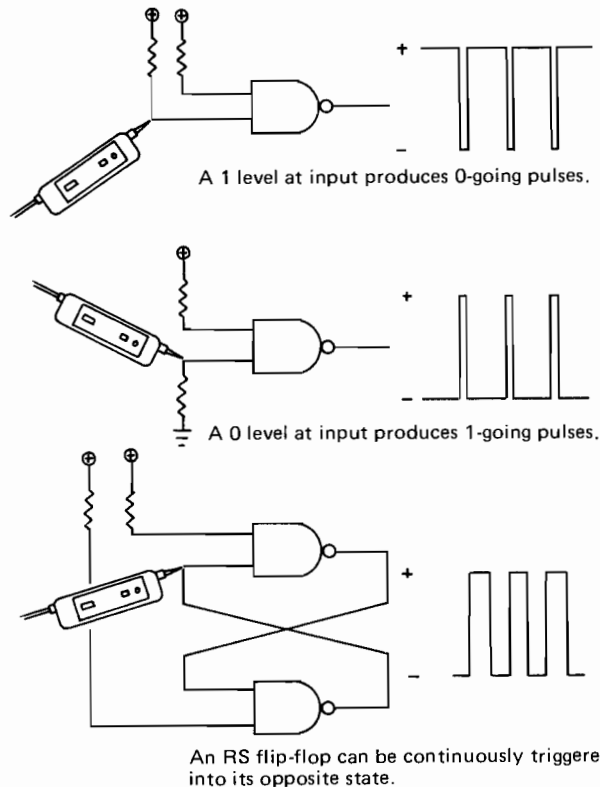


Figure 1

AUTO-SENSING

This feature allows the user to jump from point to point on a circuit board without regard to the logic state of the test point.

TRI STATE OUTPUT

The DP-1 has a Tri-State Output, which provides a minimum of 300K impedance when not being pulsed. This allows all logic families, including CMOS, to be unaffected by circuit loading between pulses.

SINGLE SHOT MODE

By depressing and releasing the pushbutton, a single, debounced pulse is produced at the output. The pushbutton may be depressed as rapidly as needed to produce a controlled stream of single pulses.

The pushbutton must be released within 1 second in order to remain in the single shot mode. The LED flashes once for each single shot pulse that is produced.

CONTINUOUS MODE

When the pushbutton is depressed, a single pulse is instantly produced. If the pushbutton is held down more than one second, the output switches from single shot to continuous mode producing a train of pulses at 100 pulse per second rep rate. The LED stays lit for continuous mode operation.

Figure 2

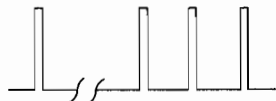


ILLUSTRATION OF SINGLE SHOT
MODE & CONTINUOUS MODE

TTL MODE

When the slide switch is in the TTL position, the output pulse width is 1.5 microseconds.

The pulse rise time is less than 100 nanoseconds with a maximum 500 nanosecond storage and fall time for a 1 TTL load. Storage and fall time decreases as TTL loading increases.

In the TTL mode the output pulse can sink or source 100 mA or 60 TTL loads.

CMOS MODE

When the slide switch is in the CMOS position, the output pulse width is 10 microseconds. This allows ample time for the slowest CMOS devices to be activated. The pulse rise time is less than 100 nanoseconds, with an 8 microsecond storage and fall time for 100K Ohm load resistance.

In the CMOS mode the output pulse can sink or source 50 milliAmps to a logic "1" or a logic "0" level for any Vcc from +4 to +18 Volts.

HOOKING UP

The DP-1's power cable not only supplies power to the unit, it also acts as the return path for the output pulse.

In order to decrease common moding and ground loops, clip the power cable lead as close to the pulsing point as possible.

When power is first applied to the pulser the LED will light and stay on for approximately 1 second. After the LED has gone off, the pulser is ready to use.

The DP-1 comes complete with power cable and ground clip. In most cases there is no need to use the ground clip; the DP-1 produces a crisp pulse under normal conditions. However the ground lead does help the pulser sink larger currents and can reduce the pulse storage time.

If the ground clip lead is used, **do not hook up the black power lead**. Using both ground returns can cause common moding and ground loops, which may produce false triggering in the circuit under test.

APPLICATIONS

TROUBLE SHOOTING

The DP-1 in combination with the LP-1 Logic Probe or the LM-1 Logic Monitor, produces an

extremely effective method of troubleshooting, in many cases more useful than an oscilloscope.

Figure 3 shows the hook-up for checking out a 7490 decade counter using a pulser and a Logic Monitor.

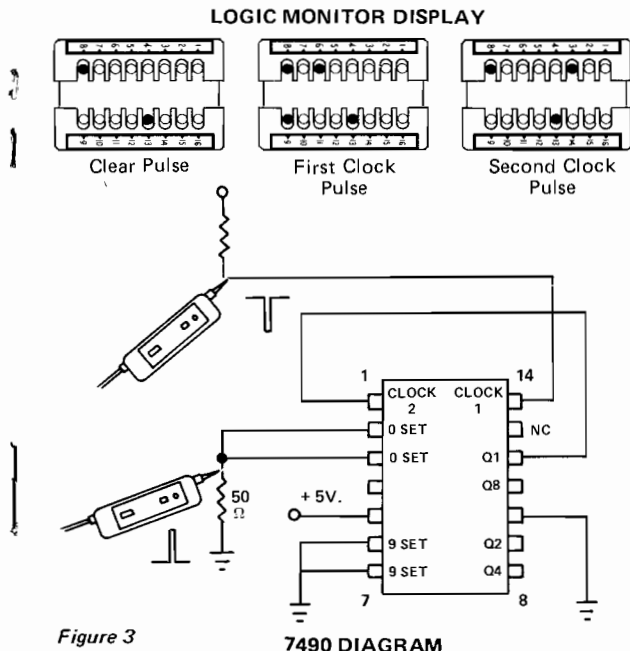


Figure 3

The pulser CMOS/TTL slide switch is set to TTL and the pulser tip connected to the R(0) input of the 7490. The Logic Monitor is clamped onto the 7490 to display all the logic states of the counter simultaneously.

Depressing the DP-1 pushbutton once puts a zero pulse into the 7490 and clears all the outputs to zero.

The pulser can now be applied to the clock input and single step or jog the 7490 through its decade cycle.

When the counter is pulsed, all four outputs can be seen changing state, while simultaneously monitoring the power supply input, clock inputs, and clear lines.

This shows the great advantage of the Logic Monitor pulser approach over the oscilloscope which at best can only monitor one or two points at a time.

TROUBLE SHOOTING GATES

Although logic monitors work very well on counters, latches and flip-flops, they are basically static devices and cannot display the DP-1's narrow output pulse.

Figure 4 shows this method of troubleshooting:

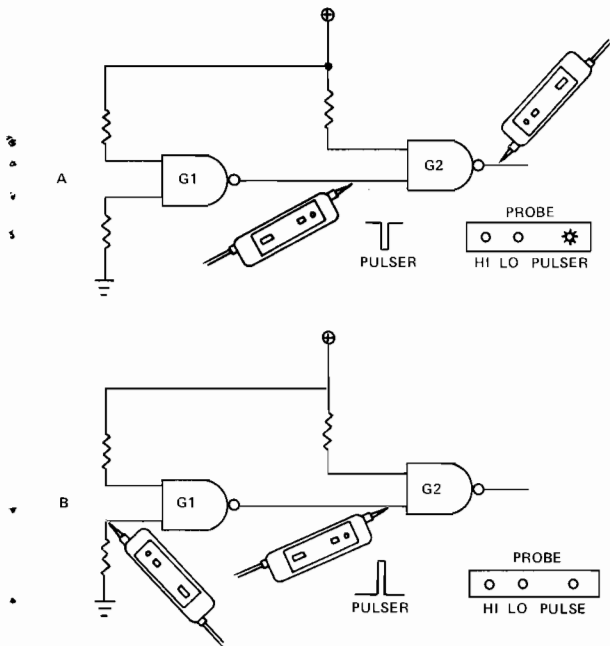


Figure 4

TROUBLE SHOOTING GATES

When troubleshooting gates and decoders, the use of a logic probe such as the LP-1, LP-2, LP-3 or LPK-1 is recommended. These probes incorporate pulse stretchers to aid in viewing even the fastest pulses of the DP-1. In addition, they can be used to indicate logic states and pulse polarity, as well as estimate duty cycles. (See Logic Probe manuals for details.)

In Figure 4 (A) a two gate circuit is being tested. G1's output is held high, causing G2's output to be low. By applying the pulser to the output of G1, the pulser overrides the out state of G1 and puts a train of "zero" pulses into the gate of G2. The logic probe connected to the output of G2 has its low LED on but now the pulse LED starts flashing. This shows the gate is passing the input pulses in proper polarity.

In Figure 4 (B) the probe is moved to the output of G1 and the pulser is applied to the low gate input. The pulser now produces a series of (one) pulses when the pushbutton is held down. However the probes pulse LED does not respond, indicating a defective gate.

OVERRIDING A LOGIC STATE

With the DP-1's high fanout it has the unique ability of overriding the output level set by a gate, by applying the needed input pulse to the circuitry under test.

This sets the stage for system troubleshooting:

using the jogging method. A digital system can be deactivated by disconnecting the system clock and replacing it with the DP-1. The complete system may now be jogged through its cycle, while different points of interest in the system may be displayed with Logic Probes or Logic Monitors.

Several Logic Monitors may be used simultaneously to display the movement of a pulse from IC to IC, or show the response of several circuits to the same stimuli. The distinct advantages of this method becomes self-evident once it has been tried.

MAINTENANCE AND CALIBRATION

TEST EQUIPMENT NEEDED

4-20 VDC variable power supply
Oscilloscope, input 1 MegOhm + 10pF or better

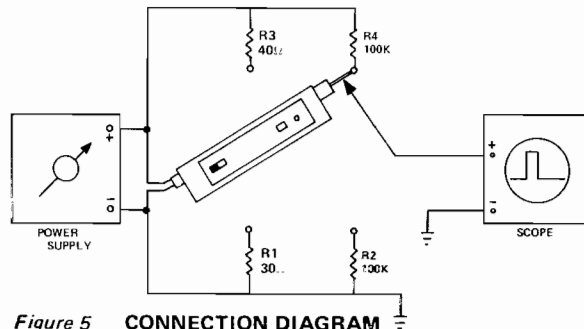
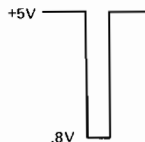
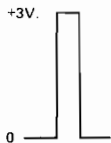


Figure 5 CONNECTION DIAGRAM

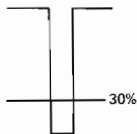
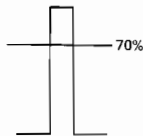
TTL TEST

1. TTL/CMOS slide switch in the TTL mode
2. Set power supply for 5 VDC
3. Set scope for 1 Volt/cm vertical sensitivity
4. Set scope for internal trigger, + slope
5. Set scope for 1 $\mu\text{sec}/\text{cm}$ horizontal sweep.
6. Touch the pulser tip to R1 and hold the pulser pushbutton down. (The trace may be difficult to see due to the low pulser rep rate.) Pulse amplitude should be greater than 3 Volts.
7. Switch scope to minus trigger slope
8. Touch the pulser tip to R3. Pulse should be less than .8V.



CMOS TEST

1. TTL/CMOS slide switch to the CMOS mode
2. Set power supply to 15 VDC
3. Set scope to 5 Volts/cm vertical sensitivity
4. Set scope to internal trigger, + slope.
5. Set scope to 5 $\mu\text{sec}/\text{cm}$ horizontal sweep.
6. Touch the DP-1 tip to R2 and hold the pushbutton down. Pulses should be greater than 70% of V_{CC}
7. Switch scope trigger to minus slope.
8. Touch pulser tip to R4. Pulse should be less than 0.8 Volts.



ACCESSORIES

- LDA-1 1.5" Long Tip - Standard.
- *LDA-2 2.5" Long Tip - Optional.
- *LDA-3 3" Long E-Z Hook and Adapter for use in place of tip - Optional.
- *LDA-4 3" Long Ground Clip with E-Z Hook - Optional.
- *LDA-5 3" Long Ground Alligator Clip with LP-3 only - Standard. Optional.
- *LDA-6 Test Prod Tip Adapter (Converts tip to E-Z Hook) - Optional.
- *LDA-7 Standard Banana Plug (Converts tip for insertion into Banana Plug) - Optional.
- LDA-8 36" Power/Ground Leads with Alligator Clips - Standard.
- *LDA-9 36" Power/Ground Leads with E-Z Hooks - Optional.
- *LDA-A All asterisked items available in kit form.

FACTORY SERVICE AND REPAIR

Global Specialties Corporation will service and repair this instrument free of charge for a period of one full year (see Warranty). Please return it, shipping charges prepaid, in its original box with a copy of sales slip or original invoice to:

GLOBAL SPECIALTIES CORPORATION
70 FULTON TERRACE
P.O. BOX 1942
NEW HAVEN, CONNECTICUT 06509

ATTN: SERVICE DEPARTMENT

Your instrument will be repaired, retested and promptly returned to you. If it needs servicing and is out of warranty, follow the above instructions and enclose \$35.00 for Factory Service. This amount covers most routine repairs; if damage to your unit is more extensive, we will advise you of additional costs before proceeding.

WARRANTY

Global Specialties Corporation warrants this device to be free from defective material or workmanship for a period of one full year from date of original purchase.

Global Specialties Corporation under this warranty is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within one full year from date of original purchase.

Units returned to Global Specialties Corporation that have been subject to abuse, misuse, damage or accident; have been connected, installed or adjusted contrary to the instructions furnished by Global Specialties Corporation or repaired by unauthorized persons will not be covered by this warranty.

Global Specialties Corporation reserves the right to discontinue models; change specifications, price or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

Global Specialties Corporation shall not be liable in any way for consequential damages resulting from use of this device.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Global Specialties Corporation is authorized to assume any other obligation in connection with the sale and purchase of this device.