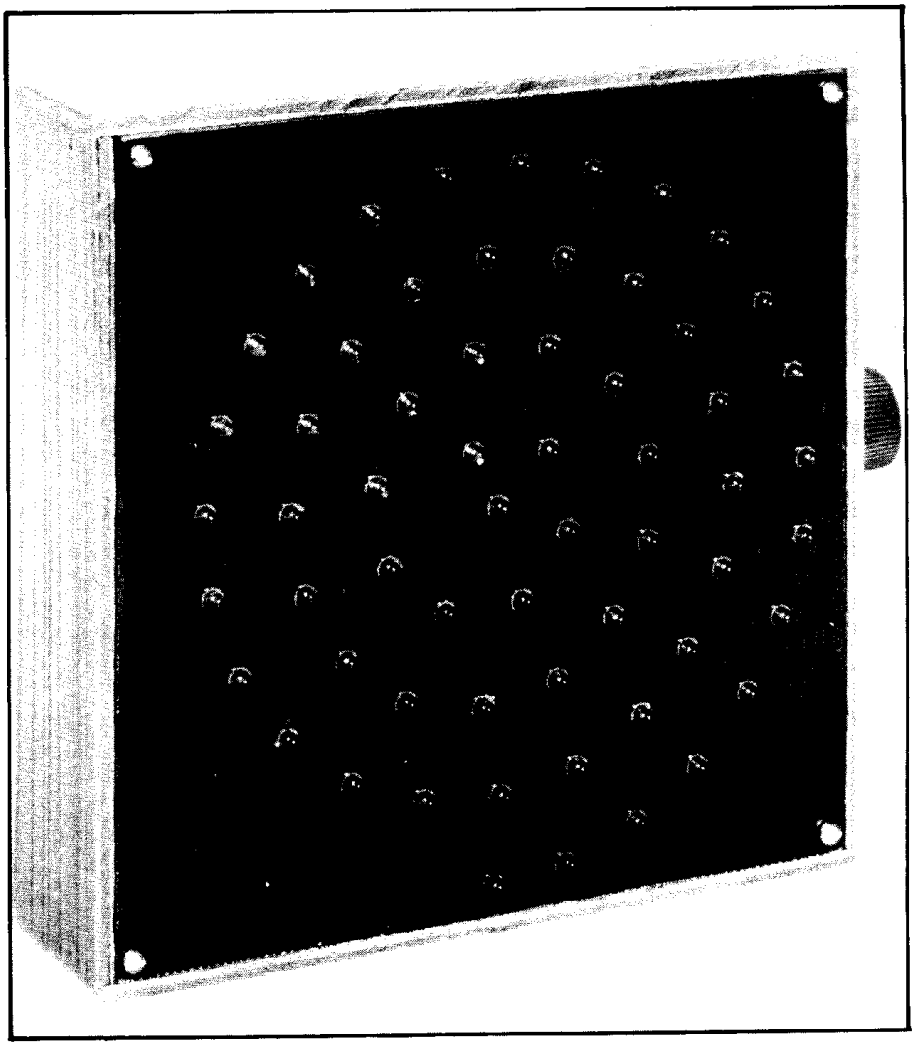
Digi-trance

This clever project manages to simulate motion by electronic means in a way that will keep you fascinated . . . to the point of hypnosis

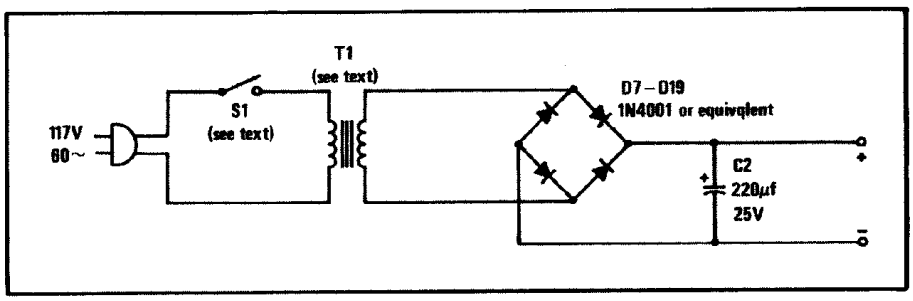


by Fred Blechman

We can't guarantee that this device will hypnotize your friends, but we can't guarantee that it *won't*, either! Sixty light-emitting diodes, LEDs, are arranged in a spiral pattern, and CMOS digital integrated circuitry turns on one LED at a time. You set the speed of apparent movement of the LEDs with a control mounted on the side of the enclosure. As you twist the control clockwise, the movement is quicker. At its most rapid, all the LEDs appear to be lighted at the same time. Twist the control further and all the LEDs except one are off. Since the lighted one is randomly selected by the circuitry, and can't be predicted, you can use the DIGI-TRANCE as a *wheel of fortune* by just assigning a number to each LED! At certain settings of the control, the effect is that of a pulsating spiral, which might be effective as a tool in hypnosis.

The unit shown in the photos was built in a home-made wooden box. Any enclosure could be used if it has enough frontal size for your spiral layout. The spiral shown in figure 2 is a suggested layout, but you can have a larger or smaller spiral if you prefer. You can make your own spiral pattern with a pencil, string and a small-diameter hub. The hub can be, for example, a piece of ¼-inch dowel.

Place the hub at the center of a piece of paper and attach one end of the string to it. Attach the pencil to the other end of the string. The string length determines the maximum size of the spiral. Now, holding the hub so it does not turn, move the pencil point around, either clockwise or counterclockwise. The string will wrap itself around the hub, slowly pulling the pencil toward the center, generating a spiral! Use the paper as a template and mark the positions of the LEDs at equal distances along the spiral, starting from the center.



You can power your Digi-trance from a 12-volt latern battery if you'd like, but for prolonged operation an ac power supply is recommended.

Building your Digi-trance

Use a piece of wood or masonite for the display board, with holes drilled at each LED location. Make the holes slightly under the LED diameter size, so the LEDs can be installed by simply pressing them into place from the rear of the board. Orient each LED so that the cathode lead, usually marked by a flat or notch on the base, faces the outside of the spiral.

Starting with the outermost LED, solder a bare wire to the cathodes of the first 10 LEDs. Do the same with the second group of ten LEDs, then the third group, and so on. You'll end up with six groups of 10 LEDs—these are the six horizontal

lines on the schematic.

Now, using insulated wires, connect together the first LED in each of the six groups. Then do the same with the second LED in each group, and so on. These are shown in the schematic as the ten common-anode vertical lines connected to IC1. Put this sub-assembly aside temporarily and wire the digital counting board next.

You can use perforated board for the counting circuitry, but it's a lot easier with *prototype board*—that's perfboard with printed circuit traces or pads on one or both sides. This makes construction much easier. If a trace appears between two points and you don't want it there, just cut it with a razor blade or sharp knife. By careful planning, you can construct this circuit with very few jumper wires on a prototype board. The author's counting board is small and crowded, but you can make yours larger. Sockets for the ICs are recommended.

The counting board should include the four ICs, diodes D1 through D6, R1 and C1. You'll probably want to mount potentiometer R2 and the optional switch, S1, on the cabinet.

All that remains is to connect the counting board to the display panel, potentiometer, switch and a power source. The wiring between the board and panel can be done with any flexible, stranded, insulated wire, but small-diameter color-coded ribbon cable is best. Using one group of six wires, and another group of ten wires, connect the six common-cathode wires and the ten common-anode wires as shown on the schematic. Note that the LED anodes run from "0" to "9" and the cathodes from "0" to "5". This can be confusing, so proceed slowly and carefully. It's easi-

Parts List

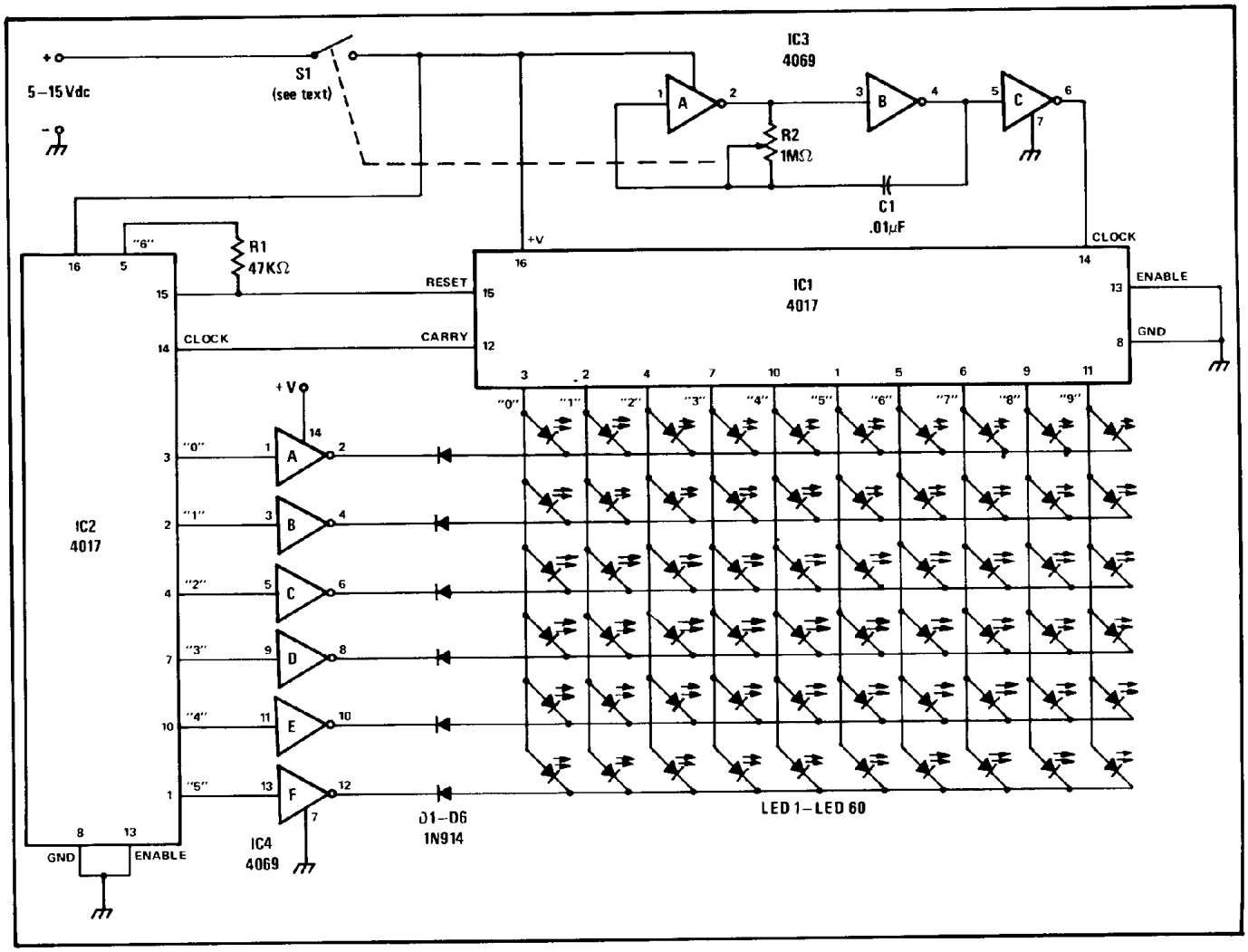
	DESCRIPTION		Calectro	Radio Shack
	IC1, IC2	CMOS 4017 Counter	See text	See text
	IC3, IC4	CMOS 4069 Hex inverter	See text	See text
	R1	47K, ½ W carbon resistor	B1-404	271-000 47K
	R2	1 megohm potentiometer	B1-692	271-211
*	S1	Switch (see text)	Part of B1-692	271-1740
	C1	.01 mfd disc capacitor	A1-029	272-131
	LED1-LED60	Jumbo red LEDs	See text	See text
	D1-D6	1N914 signal diode		276-1122
*	1 each	Perforated board	J4-601	276-1395
*	1 each	Prototype board	J4-610	276-152
	1 each	Knob	E2-705	274-407
*	2 each	14 pin DIP sockets		276-1999
*	2 each	16 pin DIP sockets		276-1998

Misc.: Cabinet, front panel, screws, nuts, wire, solder and ribbon cable (see text).

Optional Power Supply

*	T1	Transformer (see text)	D1-742	273-1384
*	D7-D10	Rectifier diodes, 50V @ 1A		276-1101
*	C2	Electrolytic capacitor 220 mfd @ 25 V	A1-131	272-1017
*	1 each	Line cord	L3-717	278-1255

* These are optional items. See text.

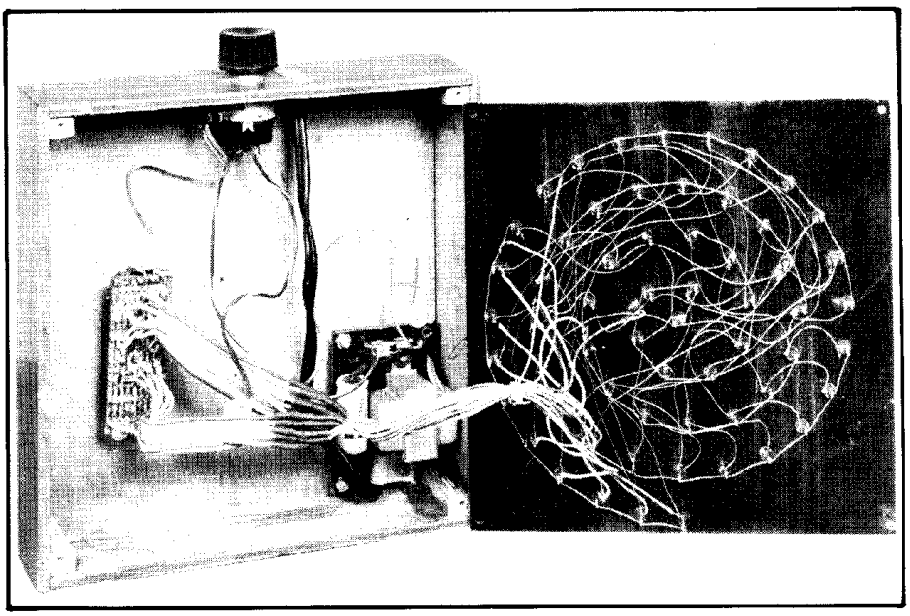


HOW IT WORKS

Although there are 60 LED's used in this circuit, there are very few other parts. The LED's are wired in a matrix as shown in figure 1. One output of IC1 provides a positive voltage to the anodes of six LED's at any given time. At the same time, only one output of IC2 is high, and this is inverted to a low state by a section of C4, providing a ground to the cathodes of ten LEDs. However, only the one LED with the positive anode voltage lights! In this manner, each LED is lighted in sequence as IC1 and IC2 *count*.

How do they count? Well, C3 is wired as a square-wave oscillator, with the frequency determined by the value of C1 and the setting of R2. The output of this oscillator is buffered by section C of IC3, and the pulses used to *clock*, or trigger, IC1 to advance count, with the *carry* output of IC1 clocking IC2 every 10th count. At the end of 60 counts, the "6" output of IC2, through R1, resets both IC1 and IC2 to zero, starting a new counting sequence. Since the LEDs can only tolerate a small reverse voltage, diodes D1 through D6 are used to block high-state IC4 outputs from the LED cathodes.

You may wonder why the LEDs seem to be running wide-open, that is, without dropping resistors. That's because the ICs have inherent current limiting, so the LEDs can't avalanche. However, it's a good idea not let any one LED stay on for more than 10 seconds. This will prevent the ICs from overheatting.



er if you follow the standard color code where 0 is black, 1 is brown, 2 is red, 3 is orange and so on, when connecting each colored wire in sequence to the six groups of LED's, and the ten LED's in each group.

Use two more wires to join the positive and ground points, and another two wires to the center and right terminal potentiometer terminals, looking from the rear of R2. You may use a separate switch, or one mounted on the back of the potentiometer, as in the author's unit. The location of the switch in the circuit depends on your method of powering the unit.

You can use four C or D batteries wired in series to provide six volts. Since the average battery drain at 6 volts is only 12 milliamperes, four C cells will last over 200 hours, and four D cells will run the unit for over 400 hours. You can also use a typical 9-volt transistor radio battery, but since the drain is about 30 milliamperes at 9 volts, this battery would last less than an hour! If you use batteries, connect the switch to the circuit as shown in figure 1.

110-volt version

If you wish to use the unit for long periods, it makes sense to power the unit from the AC line. You can either build-in a small power supply as shown in figure 3 or use a typical tape-recorder wall-plug AC adaptor that supplies dc at 6, 7½ or 9 volts.

If you build your own power supply, wire switch S1 as shown in figure 3. Use the smallest filament transformer you can find—even at 12 volts the unit only draws 60 milliamperes. *Do not,* however, *exceed 15 volts dc,* or you can destroy the ICs. If you use a transformer rated at 6.3 volts at 300 mA, for example, you'll probably find you have 8-9 volts at the output because of the low current drain.

You can be very liberal with parts substitutions, except for the ICs. Calectro and Radio Shack part numbers are given for most items. If you don't have access to parts this way, a good mail-order source for digital projects is JAMECO Electronics, 1021 Howard Ave., San Carlos, CA 94070. They sell 10 V at 50 mA JE-100 transformer which costs only 99¢.

The DIGI-TRANCE is intended to be used for entertainment purposes only, and not for medical use or gambling. However, it's a simple but challenging construction project, and it's certain to be a great conversation piece at your next party . . . or seance!