Think Tank

By Byron G. Wels

THE UBIQUITOUS 555

Before you can play any game, you've got to know the rules—and how to be a winner. *Think Tank* wants you to submit your own favorite schematics and share them with your fellow readers. Now that does not mean that you can freely copy a schematic from another magazine or a book and send it in. That's called plagiarism, and the legal penalties can be pretty stiff.

We also are limited as to space. We can't use circuits with more than one or two solid-state devices. A transistor and an IC are fine. Two transistors are OK, as are two ICs. So don't submit a twenty-transistor amplifier circuit...it will never see the light of the printed page.

We also have to put some text in with your circuit, so always add a description of the circuit's application, why you liked it, and—most important—how it works!

So what do you get for all that? Back in the early days of radio, our founder, Mr. Hugo Gernsback, used to write a special feature article for every April issue. The hero of those articles was one Mohammed Ulysses Fips. To an electronics enthusiast, the "Fips" stories, as they came to be known, resulted in gales of laughter. But so knowledgeable was Gernsback, and such a clever author, that people who didn't have the know-how in the subject often tried to actually duplicate the experiments—with disconcerting results.

We've assembled all of those articles into a book of some of the funniest reading you'll ever do—provided that you know one end of a resistor from another. We sell the book for $12.95 plus postage, but if we use one of your circuits, we'll send you one absolutely free of charge! Now let's get started.

Before the 555 timer arrived on the scene, we had everything from time-delay relays to complex timer-transistor circuits. Nowadays you can hardly see a circuit that doesn't use a 555. We've gotten so many offerings that we assembled all of them here.

Lights-On Warning. How many times have you gotten out of your car and left the lights on? It's really no big deal, because when you get out to the car in the morning, you'll find that the lights are out—because the battery is dead. The circuit in Fig. 1 is designed to help keep that from happening. If you leave the light switch on and turn the ignition off, that little gem sounds an alarm to remind you to turn off the lights.

Because power for the circuit is pirated from the car's side lights, the circuit can't oscillate unless the lights are on. The reset pin on the 555 connects to transistor Q1. The base of Q1 is connected through R1 to the ignition auxiliary terminal on the car's fuse box. When the ignition is turned on, power is supplied to the base of Q1, turning it on. With Q1 turned on, pin 4 of U1 is tied low, disabling the oscillator and inhibiting the alarm.

However, if the ignition is turned off while the lights are on, power is applied to the 555 and Q1 is turned off, and the alarm starts.

Switch S1 is an optional override. If you desire to use the system for parking, for example, you can disable the alarm circuit with that switch.

—Sam Jaffe, Brooklyn, NY

Thanks Sam. This is the sort of thing we're looking for! Your Fips book is on the way.

Continuity Tester A friend who works for a fairly large electronics company went to the stock room to check out a VOM so that he could "ring out" a cable he had just put together, only to find that they were all in use and he'd have to wait for at least another day. So we put this little continuity-tester circuit together in my basement workshop.

The continuity tester has the advantage of an audible indication of continuity, so he doesn't have to take his eyes off his work to read a meter. Now it sits on his bench at work, and he's already been asked for the schematic several times.

The box has two external test leads labelled POSITIVE and NEGATIVE. Put a dead short between them, indicating continuity, and you get a 2-kHz beep; with a 5000-ohm resistance between them, it's a 1-kHz beep; and at 80,000 ohms, it's a 100-kHz signal.

Because the current flowing in the circuit is low, the circuit can be used around semiconductors with no damage. The circuit is seen in Fig. 2. It is

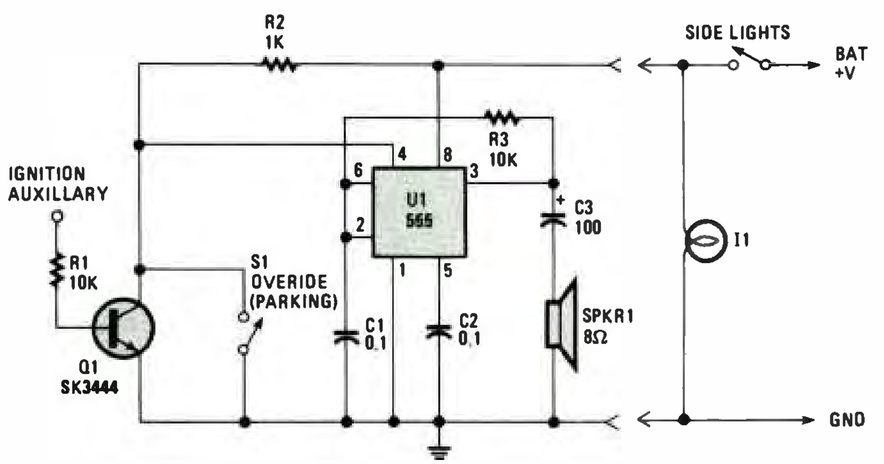

Fig. 1. Power for the Lights-On Warning circuit is pirated from the car's side lights. The heart of the circuit is a 555 oscillator/timer that's activated and de-activated by way of a control signal applied to the base of Q1.

a conventional 555 astable circuit with the test leads in series with the charging resistor. The output drives a small loudspeaker. Because the current at the leads is unidirectional, from positive to negative, you can use this device for testing diodes, or to perform simple diode tests on transistor junctions.

Be careful when doing on-board tests. Sometimes you can get strange results due to sneak paths through power supplies and the like. Anyway, my friend is happy with his continuity tester and so are some of his friends. I hope you are too!

—James Condon, Ft. Smith, AK

Good going Jim. All circuits don't have to be complex to be good. In fact, we figure that by putting in a three-way rotary switch and adding the necessary resistors, this would make a fine code-practice oscillator with a choice of three different tones! You've earned your copy of the Fips book. Hope you like it!

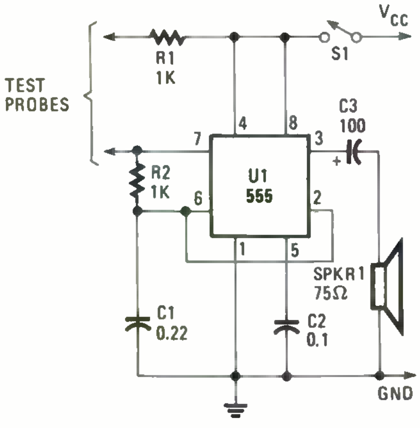

Fig. 2. The Continuity Tester feeds a voltage through the positive probe to the circuit-under-test, while the negative probe serves as the return line. Voltage returning to the Tester through the negative probe triggers the circuit, giving an audible indication of continuity.

Courteous Courtesy Light. The so-called "courtesy" light in a typical car is a misnomer. Sure, when you open the door to get in, the light inside comes on. But after you close the door, when you need the light the most, to find the ignition switch, etc., the light goes out, leaving you in the dark. The circuit shown in Fig. 3 keeps the courtesy light on for 30 seconds after you close the door.

The lead from the door switch is removed and connected to the 555 cir-

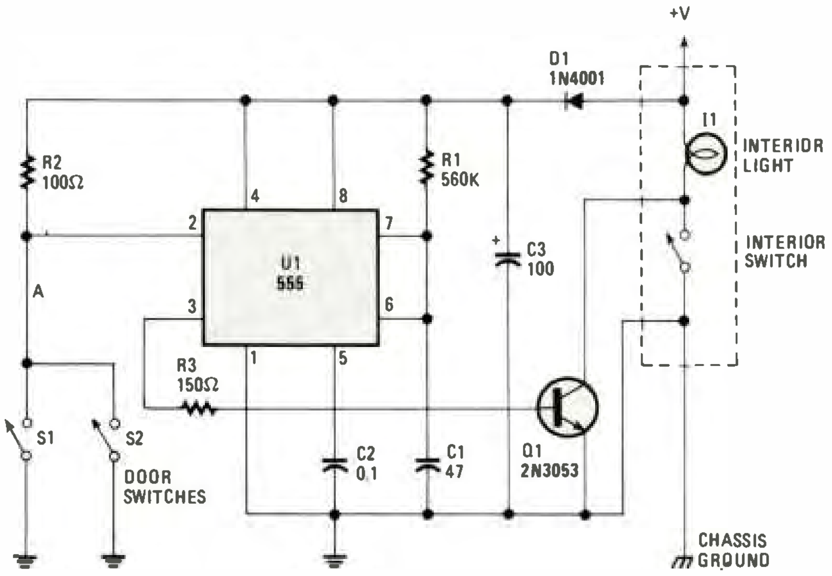

Fig. 3. The Courteous Courtesy Light circuit—built around a 555 (configured as monostable multivibrator) that's controlled by the auto's door switches—keeps the courtesy light on for 30 seconds after the door is closed.

cuit. The 555 is arranged in a monostable mode, and is triggered by the door switches. The output drives Q1, which is connected across the interior light switch. The interior light is turned on for 30 seconds after the door is opened. If the door(s) are held open for longer than 30 seconds, it will not reset until after the doors are closed. In that case, the lights go out immediately.

One additional advantage also becomes apparent. Door switches often fail because of dirt, which can cause the lights to go dim or flicker. This circuit needs only the shortest momentary contact to operate, meaning that it works even with dirty door switches. And with a bit of careful designing, the circuit can be made small enough to fit inside most interior car-light fixtures.

—Fred Mullins, Madison, WI

Good thinking Fred! Keep on the lookout for your copy of the Fips book. It's on the way.

Signal Injector. In the early days of radio, it was customary to simply put a finger on the grid caps of the tubes in a receiver. That way, you could hear the 60-cycle hum. As the circuit in Fig. 4 indicates, we've come a long way, baby!

The unit is great for checking amplifiers of all sorts. It provides a square-wave output that is rich in harmonic content. The circuit's output frequency can be varied from 50 Hz to 15 kHz. The heart of the circuit is a 555 astable connected in its equal mark/space mode. The frequency is controlled by potentiometer R2 and capacitor C1.

Resistor R3 controls the output level with the output AC coupled through C3.

To prevent stray radiation from getting into the circuit, it should be housed in a metal box and the output fed through a length of coaxial cable. Since the current drain is small, the unit should run for months (depending on use) with a nine-volt transistor-radio battery.

—Frank Pierce, Sioux Falls, SD

Thanks to you, Frank. This is exactly the sort of thing we're looking for. Simple, short, and sweet—and useful.

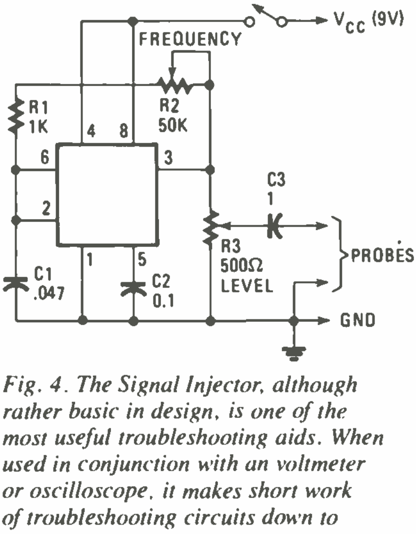

Fig. 4. The Signal Injector, although rather basic in design, is one of the most useful troubleshooting aids. When used in conjunction with an voltmeter or oscilloscope, it makes short work of troubleshooting circuits down to the component level.

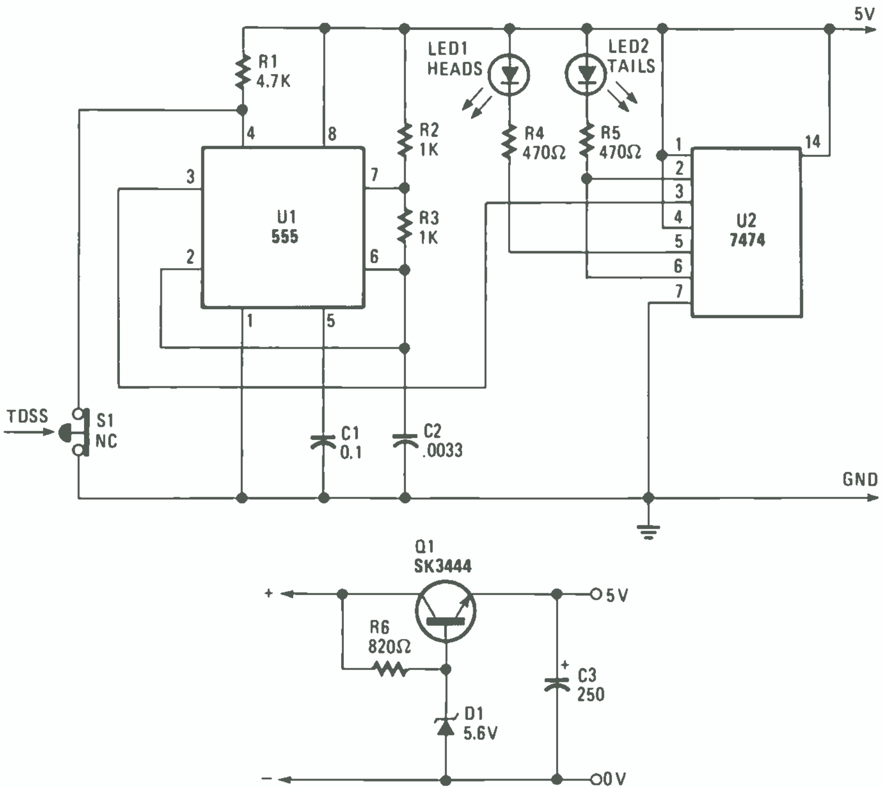

Fig. 5—The Coin Tosser consists of a 555 oscillator/timer feeding a 7474 dual J-K master/slave flip-flop that's configured as a divide-by-two counter.

Coin Tosser. Sure, you could sit there flicking a coin into the air then catching it and slapping it on your wrist—that's the traditional way. But this is an age where we live on the cutting edge of technology. The box in which the circuit is built has a pair of LED's labelled HEADS and TAILS. There's also a push-button switch (see Fig. 5) labelled TOSS. When you press the TOSS button, one of the two lights randomly lights, indicating heads or tails.

Integrated U1 is a 555 configured as a free-running oscillator. The oscillator is enabled or inhibited by S1, the TOSS switch, which is connected to the reset terminal of U1 at pin 4. The frequency is set for about 100 kHz, so that in the 0.5 second that the button may be pressed, about 50,000 pulses are produced.

Those pulses are fed to U2, a 7474 J-K master-slave flip-flop, with complementary outputs. Connected as shown, it becomes a divide-by-two counter, so one and only one of its outputs will be at binary 1; the other at binary 0. Which output is at binary 1 depends on whether the number of

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