

BY JEFF SANDLER

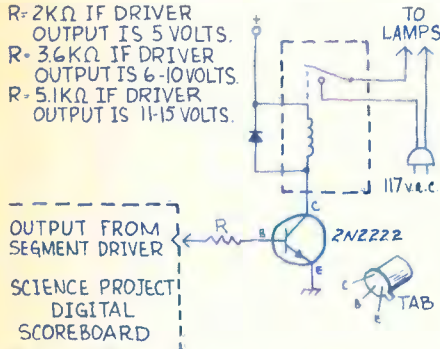
## Big gym turn on

My science class just built a digital scoreboard. It works fine, but the display is only about a half-inch high. Is there some way we can use it to drive the big scoreboard we have in our gym? That one uses strings of ten 15-watt bulbs to make up the number segments.

C.R., Massillon, OH

What you need is an interface capable of switching over an ampere of current for each segment. Although you could use triacs, I prefer to use relays because of the isolation they provide. Each segment is connected to the ac power line through a relay contact.

R = 2KΩ IF DRIVER OUTPUT IS 5 VOLTS.  
R = 3.6KΩ IF DRIVER OUTPUT IS 6-10 VOLTS.  
R = 5.1KΩ IF DRIVER OUTPUT IS 11-15 VOLTS.



The relays are controlled by the segment drive lines of your digital scoreboard. Since the relay coils require much more current than the digital displays you're using, you need to add a transistor switch as shown. The collector voltage required depends on the relay you use. A Radio Shack 275-204 relay, for example, will operate from between six and nine volts. A 275-206 requires 12 volts.

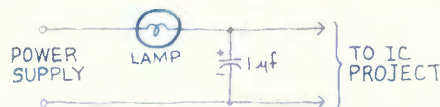
## IC breadboard cooker

A wisp of smoke is usually the first hint I get that I've cooked an IC. Is there some easy way to check out my breadboards so my errors show up before the ICs go south?

P.F., Carlingsford, CA

Obviously, the first thing to do is thoroughly check the wiring for errors and

shorts. About the only way to locate a design fault is to fire up the circuit and see what happens. If you can get your hands on a current-limited supply, you can calculate the maximum current the circuit normally will



draw, and set the supply accordingly. Otherwise, you can use a pilot lamp in series with your circuit, as shown here. Choose the bulb type based on expected current flow from the following table:

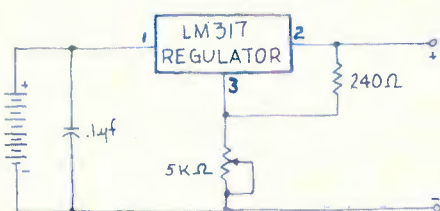
Power supply voltage	Expected current (mA)	Bulb	Radio Shack number
0-3	0-15	-	272-1139
0-3	0-30	49	272-1111
4-7	0-15	-	272-1140
4-7	15-60	40	272-1128
4-7	60-200	PR12	272-1123
7-15	0-15	-	272-1141
7-15	0-60	1487	272-1134

## Hope for an oldie

In my work I have to troubleshoot and repair solid-state circuits out in the field, away from power lines. I carry around a 12-volt battery pack for power, but I find the voltage regulation gets very poor as the batteries get old. Is there some way I can regulate the output voltage of a portable battery pack?

R.S., Belgrade, MT

You didn't state what kind of batteries you were using; some have better regulation than



others. The new rechargeable sintered electrode NiCad batteries supply lots of current with good regulation. If you need really tight regulation, you can use a LM317 voltage

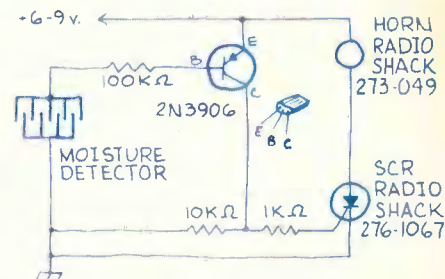
regulator IC as shown to provide a truly regulated variable voltage supply. With 12 NiCads, you'll get from 1.5 to 12 volts output at up to 250 mA for up to two hours before you'll have to recharge.

## Wee-wee ringer

I just got a puppy for my son. She's a fine animal, but I'm having a real problem housebreaking her. She does fine during the day when we're around to correct her, but at night it's another matter. Do you have a gadget we can use to discourage her from travelling off the newspaper we leave?

T.Q., Vincennes, IN

I'm afraid I can't help you with general housebreaking problems. If you haven't already, check with your vet or an animal trainer. However, if your dog usually does



her thing in one or two places, you might try this moisture sensing alarm. The detector is made of fine wires spaced about one or two inches apart placed under a sheet or other porous cloth. Since it works on six to nine volts, there's little danger to the animal. When the area between a pair of wires becomes moistened, the horn will sound. This should take the place of your scolding and enforce your efforts to train her to paper. If nothing else, it'll let you know there's been an accident. Good luck.

## Pinout pinups work

I recently purchased an assortment of integrated circuits from a national electronics store chain. When I wired them into my circuit following the pinout diagrams that came with them, the circuit

wouldn't work. I found out that the pinouts provided by the chain were wrong for some of the IC types I bought. How can I be sure I have the right data?

W.L., Little Rock, AK

The only way you can be 100 percent sure of the pinouts is to get them from the manufacturer. All of the large IC makers publish data books that give all the available information on every device they make. If you know someone in the industry, you can probably get the book you need free of charge. Otherwise, you'll have to pay up to \$20 each. But, if you're looking for data on only one or two devices, you can write the manufacturer for a free data sheet on each.

### Torch for an old board

I've just obtained a boxful of computer circuit boards, each chuck full of working ICs. How can I salvage them with the least chance of damage? I don't care about the boards at all.

A.Y., Succasunna, NJ

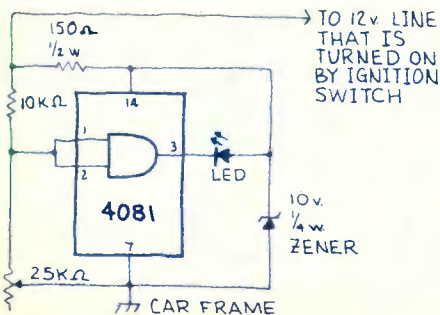
While there are many desoldering tools and aids on the market, I've found this to be the best way to strip large IC boards of valuable parts. Fasten down the board using a bench vise, or even a pair of C clamps. Then play a one-half to 1½ inch flame from a butane or propane torch over the foil side of the board. In just an instant, the solder will melt. As it does, pull the IC off the component side with a pair of pliers or an IC holder. The whole process happens so fast, the ICs don't even get warm.

### Idiot meter

During my vacation last winter, I found myself stranded out on a dirt road in the middle of Nevada with a dead battery. My car doesn't have an ammeter, just an idiot light. Maybe I missed it, but I never saw it light. How can I prevent this situation from happening again?

J.M., St. Paul, MN

This circuit should do the trick. It uses an LED and 4081 CMOS integrated circuit that are very reliable, and short of a collision, shouldn't fail to work. The variable resistor



sets the voltage at which the LED turns on. Using a voltmeter known to be accurate, set the control so that the LED lights when the voltage from the car's ignition switch drops

below 13.8 volts. The LED normally will light every now and then for a short period of time. But, if it stays on for very long, your electrical system is in trouble.

### Solder wick

Every now and then I have to remove an IC from one of my projects' printed circuit board. How can I avoid damaging the board when replacing an IC?

J.P., Butler, MO

If the IC is known to be bad, you can clip the leads with a pair of fine cutters as close to the IC as possible. Then, it's just a matter of removing one lead at a time from the board. If the IC is good, and you want to reuse it, you can use a desoldering wick, such as Radio Shack 64-2090. You can also make your own wick from a length of coax shield braiding, or even stranded wire from a lamp cord. Just dip the wire into liquid soldering rosin and let dry. Then place the rosin coated wire over the pad on your board and heat with your soldering iron. When the solder melts, it will flow into the wire and off the pad. When all of the pads have been cleaned of solder, the IC should slip out of the board easily. You may have to use the soldering iron on a solder bridge still left between an IC lead and the pad, but the hard work will be done.

### Electric chips

I recently constructed a timer built around a 555 IC. The entire circuit only used 4 parts, yet I couldn't get it to work. What did I do wrong?

G.Y., Muncie, IN

It's impossible to diagnose all individual circuits. But, based on your letter and the diagram you sent, my guess is that you failed to connect the 555 to the power supply. Most schematic diagrams of circuits using ICs show only the logic symbols. Some may also include pin numbers on the leads going to the symbols, but few show power supply connections. It is understood that the IC will be powered. Newcomers to the hobby who aren't aware of those conventions in diagramming, often overlook providing power to the IC itself. However, Modern Electronics now provides IC powering information in project diagrams. If you're building projects from other sources, you may have to write the IC manufacturer for data sheets on the devices you're using.

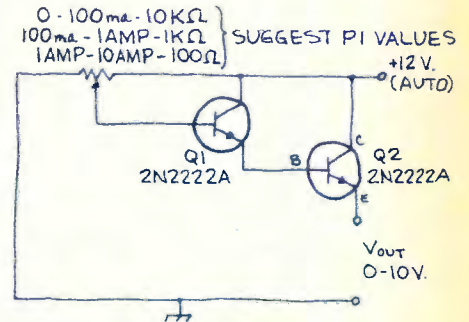
### 6 to 12 converter

My job requires me to spend a lot of time on the road in a company car that doesn't have a radio. I've been using a portable radio propped up on the dashboard, but it runs through batteries faster than I can replace them. Is there some way I can

connect this six-volt radio to my 12-volt electrical system?

A.R., Warwick, RI

The easiest way to power a six-volt circuit from an automobile's 12-volt system is to buy a commercial adapter. Radio Shack, for example, sells a universal adapter (270-1561) for \$8.95. Although these adapters do the job, they do have some drawbacks. The voltage is fixed at one or two preset levels, and there is a relatively high no-load current drain. You can get around these, and save some money too, by building your own



NOTE: THE LOWER THE VALUE OF PI, THE HIGHER THE STANDBY POWER CONSUMPTION

adapter. The circuit shown here uses just two transistors and a control. Q1 can be any low power NPN such as the 2N2222. If the load current is 40 ma or less, a 2N2222 can also be used for Q2. Higher load currents will require higher power transistors mounted in a heat sink. For loads of up to 100 ma, a 10,000 ohm linear control is ideal. The output voltage will be equal to the voltage between the control output and ground.

### Turn it up

Every now and then the sound coming out of my radio becomes distorted, and sometimes, gets very soft. Can you tell me how to fix this problem?

L.T., Conalville, IA

Your radio is suffering from the most aggravating problem in electronics—the intermittent. Finding the cause of the intermittent in your radio may take a few minutes, or a few hours, even for a competent service technician. The first step is to tap the components and circuit board with the eraser-end of a pencil. If your trouble appears, the cause is in the area just tapped. If nothing happens, get a can of freeze spray, such as Radio Shack Freeze Mist 64-2321. Spray the components, one at a time until frost appears. If the intermittent appears, the last component sprayed is probably at fault. If this doesn't work, try heating each component with the tip of a soldering iron. Be careful not to over do it. To be safe, place a drop of water on the tip and plug in the iron. When it gets hot enough to boil off the water, unplug it—it's at the right temperature. If you still haven't found the trouble, a swift kick may help.