

BY JEFF SANDLER

Back-seat listeners

My friend and I spend about 45 minutes a day on a bus going to and from school. Radios aren't allowed to be played, but we can use earphones. Is there some way we can hook two earphones to a radio with only one earphone jack?

P.L., Sheridan, WY

Most radios made today aren't very critical about output impedance. All you have to do is connect the earphones in parallel, making sure the wires don't short out. Your pair of eight-ohm earphones, when paralleled, will



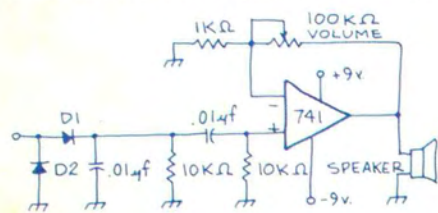
appear to the radio to be a four-ohm earphone, which should be okay. If you want individual volume controls, you use 25-ohm potentiometers, or "pots" as shown in this circuit.

CB sing-along

The other day while four-wheeling, the transmitter went out. The RF meter read okay and the red on-the-air light was on, but I wasn't modulating. Is there some kind of monitor I can make that will let me know if I'm really putting out a CB signal?

V.J., Roseboro, NC

This handy little modulating monitor lets you hear yourself talking. In essence, it is a broad-tuned receiver that picks up your signal and plays it back to you through a built-in 100-ohm speaker. There's even a volume control that lets you set the sound level loud enough to hear, but not loud enough to cause feedback howl. You'll need two nine-volt transistor batteries for power, and enough



NOTE:
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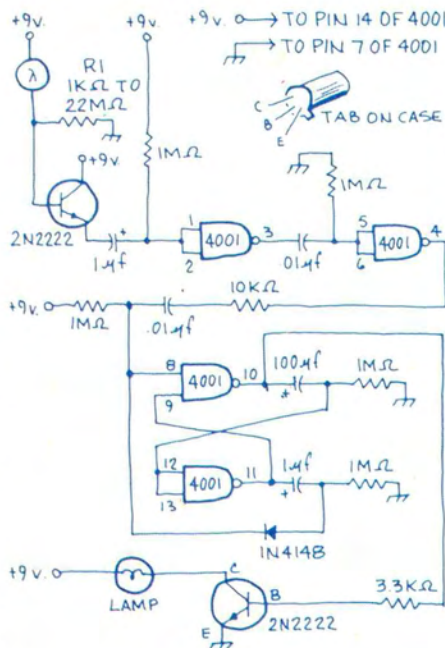
wire to reach the transmitting antenna. You don't need to connect to the antenna—a loose coupling will do fine.

Two-minute basement

My new car has a device that keeps the headlights on for a minute or two after the engine stops. How about a similar circuit I can use in my basement?

M.A., Fort Dodge, IA

This should do the trick, although it uses a small pilot lamp for illumination. You could replace the lamp with a relay that controls a standard 110-volt lamp if you need the illumination. The circuit only activates when the light level changes suddenly, as it does when you turn off the main lighting. The input resistor will have to be selected to work with the photocell you use under the normal ambient lighting in your basement.

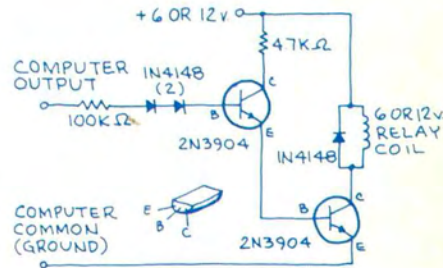


Computer turn on

I've just put together a microcomputer and would like to program it to control electrical appliances. How can I turn these appliances on and off using the computer?

F.L., Santa Rosa, CA

All you need is a relay with contacts rated for the load you have in mind, and a pair of



transistors to energize the relay. The circuit shown here provides a high input impedance and can be connected to any computer with a "low" output state of not more than two volts, and a "high" output state of not less than four volts.

JM flusher

I live near an am radio station that plays top-40 music 24 hours a day. The problem is that I get "JM on the am" 24 hours a day on my stereo, which wouldn't be so bad except I prefer classical music. What can I do to keep "JM" out of my life?

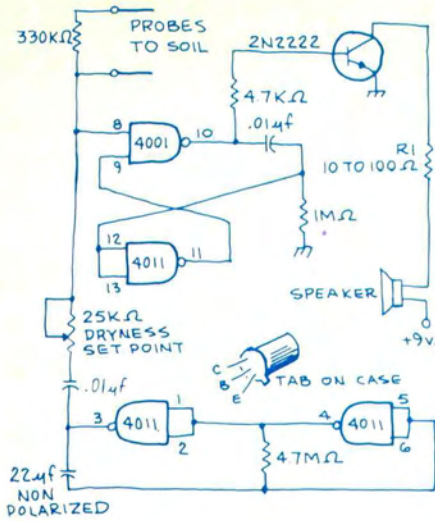
E.P., Hazelton, PA

The problem you've described, as well as most other interference reception in audio systems results from pickup of rf at the input of the amplifier. To solve the problem you have to minimize that pickup and filter what does get through. First, make sure all audio lines are shielded, with the shielding braid grounded at the amplifier end only—this prevents so-called "ground loops." You can usually filter out residual rf with a small capacitor between the input line and ground as close to the first amplifier stage as possible. Use a high quality disc ceramic or silver mica capacitor of between 10 and 1000 pF. The actual value will depend on the circuitry in your amplifier, but use the largest value you can without degrading the program material.

Clicking life saver

I like plants, but unfortunately I also tend to be a little forgetful. The result is that I occasionally forget to water them for long periods of time. I've actually had some die from lack of moisture. Is there an alarm I could build to monitor the soil moisture?

C.Z., Boise, ID



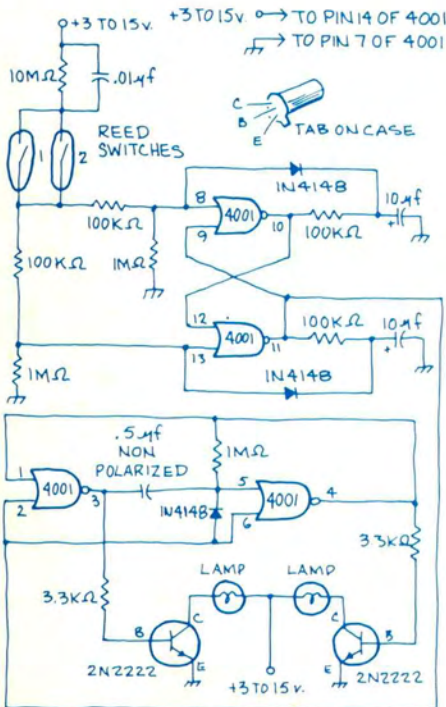
I think you'll like this circuit—it will remind you to get the water can by sounding a "click" every second or two when the soil moisture falls below a preset level, controlled by a variable resistor. You can vary the loudness of the clicks by selecting the value of R1—lower resistance values produce louder clicks. A standard nine-volt transistor battery should last a year.

Magnet flasher

I've just built an HO gauge train layout with a single-track mainline. I'd like to install a working highway crossing flashing signal turned on and off by the train. The flasher uses "grain of wheat" bulbs.

W.B., Conneaut Lake, PA

Since your layout is relatively small, all of your trains will be about the same length. If you'll place a reed relay between the rails on each side of the crossing at distances equal to the longest trains you run, your flasher will



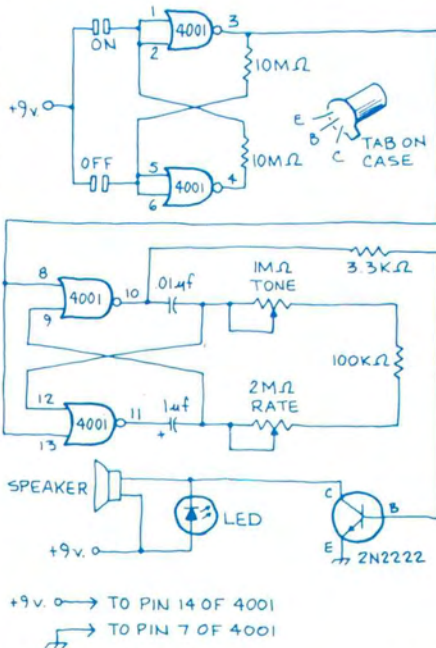
work just like the prototype—start flashing before the train arrives and stop just after the last car passes, regardless of which direction it travels. The relays are activated by small permanent magnets glued to the bottom of your locomotives.

Micrometronome

My daughter just began taking music lessons. The mechanical metronome she uses is too large for her to carry around. Can you come up with a compact unit she can take wherever she goes?

C.J., Ferndale, MI

Here's a compact electrical metronome that will run for years on a single nine-volt transistor battery, has both tone and pulse rate controls, and uses touch plates to start and



stop it. The whole thing, including battery and speaker, can be built in a case no larger than a pack of cigarettes. The touch plates consist of two strips of metal about 1/16-inch apart mounted on, but insulated from, the case. When your daughter bridges the gap, she in effect closes the switch.

Jet flutter-by

I live about 20 miles from the local television transmitting antennas and usually get a really great picture—no ghosting or anything. But, every few minutes the picture seems to shake or jump back and forth. A friend says it's because there's an airport near here. Is that true? Is there anything I can do about it?

V.M., Arlington, TX

Your friend is right. What you're seeing is called "flutter." It's caused by some of the tv signal being reflected off those airplanes landing and taking off nearby. When your tv set gets two signals, it will lock onto the strongest one, with the other appearing as a ghost. But with flutter, sometimes the

reflected signal is stronger, sometimes the direct signal is stronger. So, your tv alternately locks onto the real picture and onto the ghost. There's nothing you can do about it now. In 10 years or so, broadcasting methods may change enough to eliminate the problem.

How's a gqzlxbg work?

One of the most frequently asked questions is: "How does a ---- work?" While we'd like to answer these questions, there just isn't enough room in *Clinic* to do an adequate job. You'll find answers to some of these questions in our *Handbook* series, and in occasional articles, such as one on digital gates elsewhere in this issue.

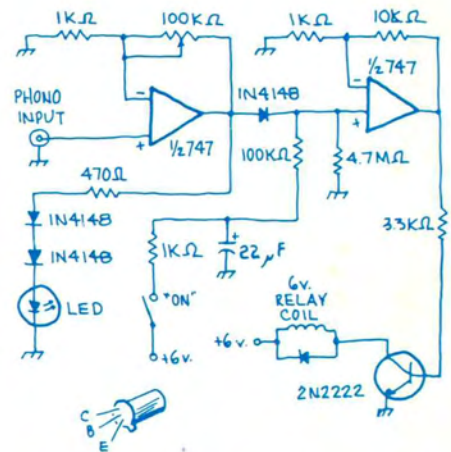
A much better source of such information, however, is in specialized books on the subject. One such book is the recently released *The Design of Operational Amplifier Circuits, with Experiments* by H.M. Berlin, published by E&L Instruments, 61 First St., Derby, CT 06418. This 155-page book covers just about everything you'll ever need to know about op-amps, and at \$8.50 it's a must for your technical library.

Y music

I have a manual turntable in my stereo set up. I'd like to install an automatic shut-off switch that kills the amplifier as well as the turntable when the record has finished playing. I'd rather not get into the internal wiring of either unit if I can help it.

S.D., Atlanta, GA

The circuit shown here requires only a connection to the phono output. You can even use a "Y" connector at the amplifier input for the connection. Make sure that the relay contacts are rated to handle the combined load of both the turntable and the amplifier. Two minutes or so after you depress the



"on" pushbutton, or after the music ends, the amplifier and turntable will automatically turn off. You can change the delay by changing R1 and C1; larger values provide more time delay.