Downcounter time your games

As you study the chessboard, your opponent suddenly moves his knight. You can see that, in its new position, it threatens both your queen and rook. You'll have to defense against that next move. But this is blitz and you only have ten seconds to move. There, you can check his queen. Good! Now it's his move.

"You lose," he shouts, "you took more than 10 seconds to make you move!" You insist you made the move in just nine seconds, but he won't listen. And so ends another friendly chess match. If only you had a *timer*.

Well, whether its ten-second blitz chess or three-minute scrabble, here's the super deluxe game timer you've been waiting for: the *Modern Electronics Downcounter*. You can preset it to count down to zero from any time up to 99 minutes and 59 seconds.

Freezing time

Momentarily hitting the *reset* switch automatically recycles the count back to the preset time, which immediately begins counting down again. Or, if you prefer, you can push the *pause* button, freezing the time until you again push the pause button. When you do, the countdown continues from the time remaining when you froze it.

Operation is simplicity itself. Once you've preset the time period you want,

just plug the Downcounter's power cord into a 117 volt outlet. Then hold down the reset button and push the pause button. This locks the count at the preset time. When you begin the game, just push down the pause button again, and the countdown begins.

Built-in buzzer

Once under way, you have the preset time period to make your move. Then, as soon as your move is completed, hit the reset button. Instantly, the timer will recycle and begin counting down the time allowed your opponent to make his move. When his move is made, he'll hit the reset button, and your time will begin counting down again.

If a player, and hopefully that player will be your opponent, fails to make his

move before time runs out, a built-in alarm will sound. In some games, the player will lose the game. In others, he'll only lose his turn. In this case, hitting the reset button stops the alarm sound and recycles the timer to begin counting down again from the preset time.

Because of the complexity of the circuit, the use of a printed circuit board

Here's the ultimate in a colorful timer which will countdown the minutes and seconds while you take a turn at your favorite game.

by Jeff Sandler
Contributing Editor

is a must. And even then, a fair amount of hand wiring will be required.

Although the circuitry is complex, construction of the Downcounter is straightforward. If you take your time, especially when putting in the wire jumpers on the PC board, you should experience no problems in construction or operation.

The printed circuit board shown contains all of the components except those for the audio alarm, the display readouts, power transformer and fuse, and the two switches. If you're into PC design, you can produce a board which contains all of the components.

The board layout shown contains two unused IC locations and several unused pads. These have been included for a future modification converting the countdown counter into an electronic stopwatch providing timing to the hundredth of a second. You can, if you'd like, use that section of the board for other purposes.

Couldn't be easier

Although at first glance the circuit looks very complex to build, it's actually quite simple. For one thing, with just two exceptions, all of the resistors are 10,000 ohm. And with the exception only of the four power supply rectifiers, all of the diodes are 1N4148s. The entire middle row of ICs is filled with 4029s

while the outside row uses 4543s. So, you won't have to spend too much time figuring out which value goes where.

The prototype was built into a Radio Shack number 270-252 metal cabinet, which measures 4 x 2-3/8 x 6 inches. One

nice feature of this cabinet is that the cover can be turned around, back to front. Using a cabinet with a reversible top lets you place the reset and pause buttons at opposite ends. Then, you can position the top so that the appropriate

NOTE:
□ = diode. All diodes 1N4148 unless otherwise noted.

R = 10KΩ resistor.
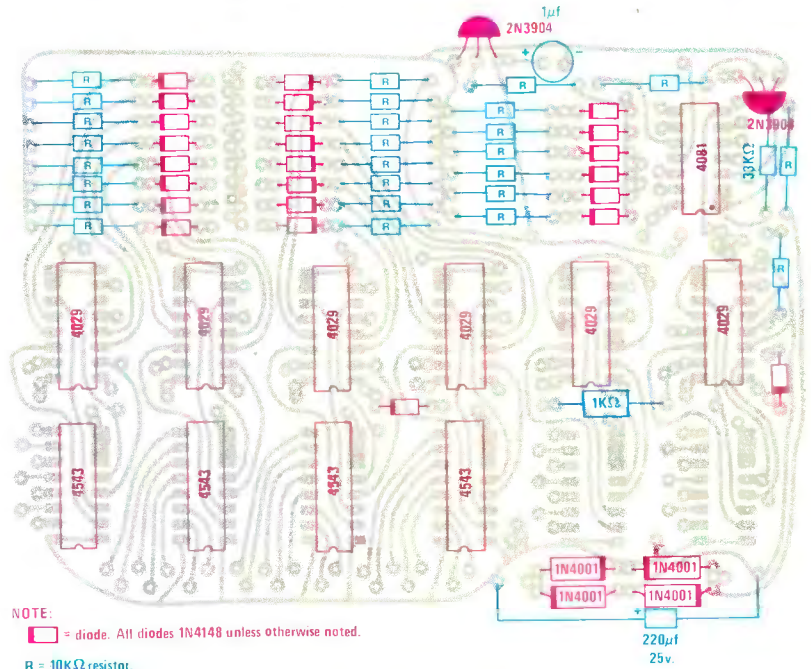
Stuffing the board with solid-state components is easy. All of the diodes except for the rectifiers are 1N4148s. Each horizontal row of ICs is stuffed with the same type device, and both transistors are 2N3904s. With the exception of just two resistors, all are 10,000 ohm units. Two capacitors complete the stuffing of the printed circuit board.
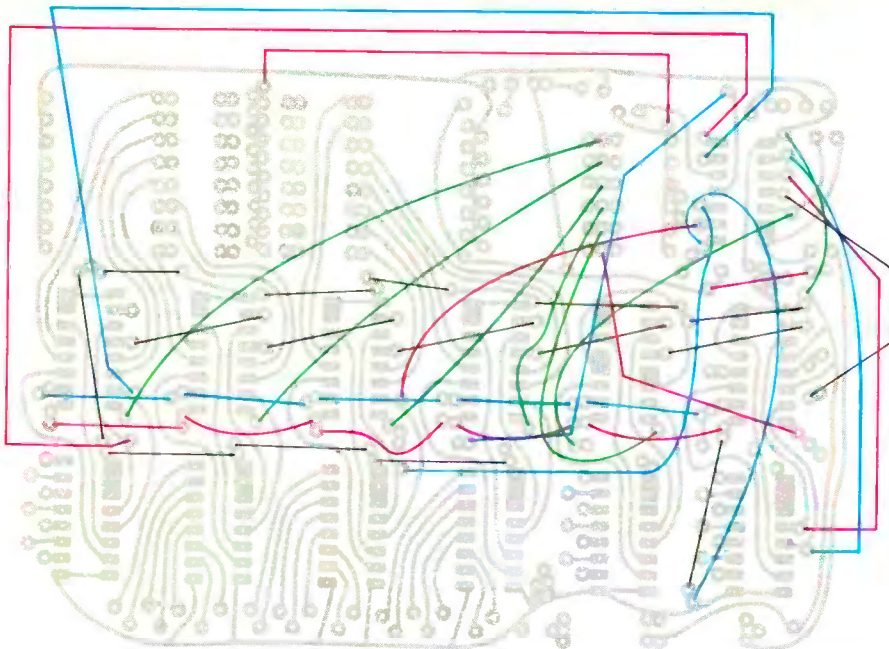
Circuit complexity makes it necessary to use a large number of jumper wires on the printed circuit board. Take your time when connecting the jumpers. Make certain each is in its proper location before applying power to the counter.
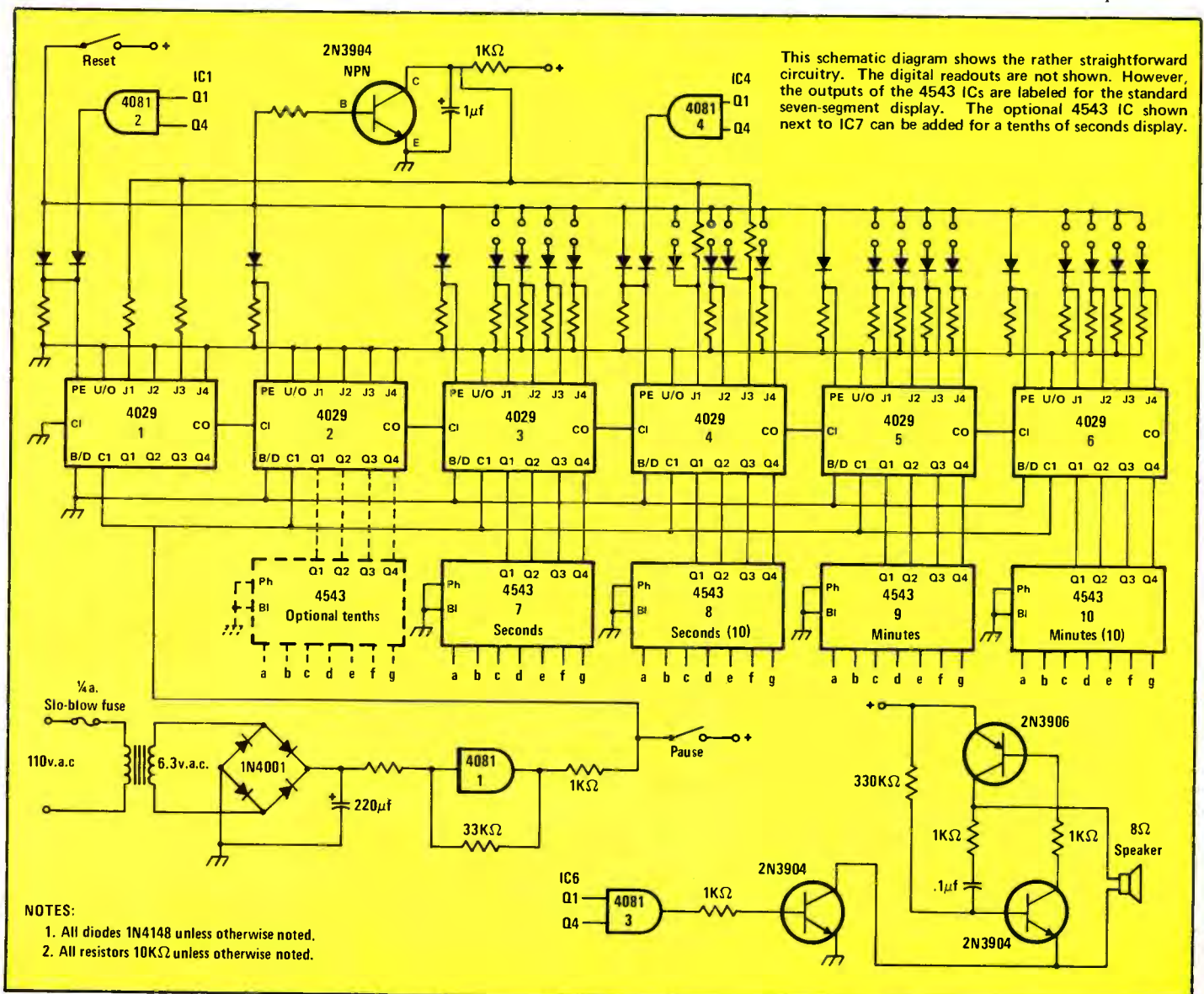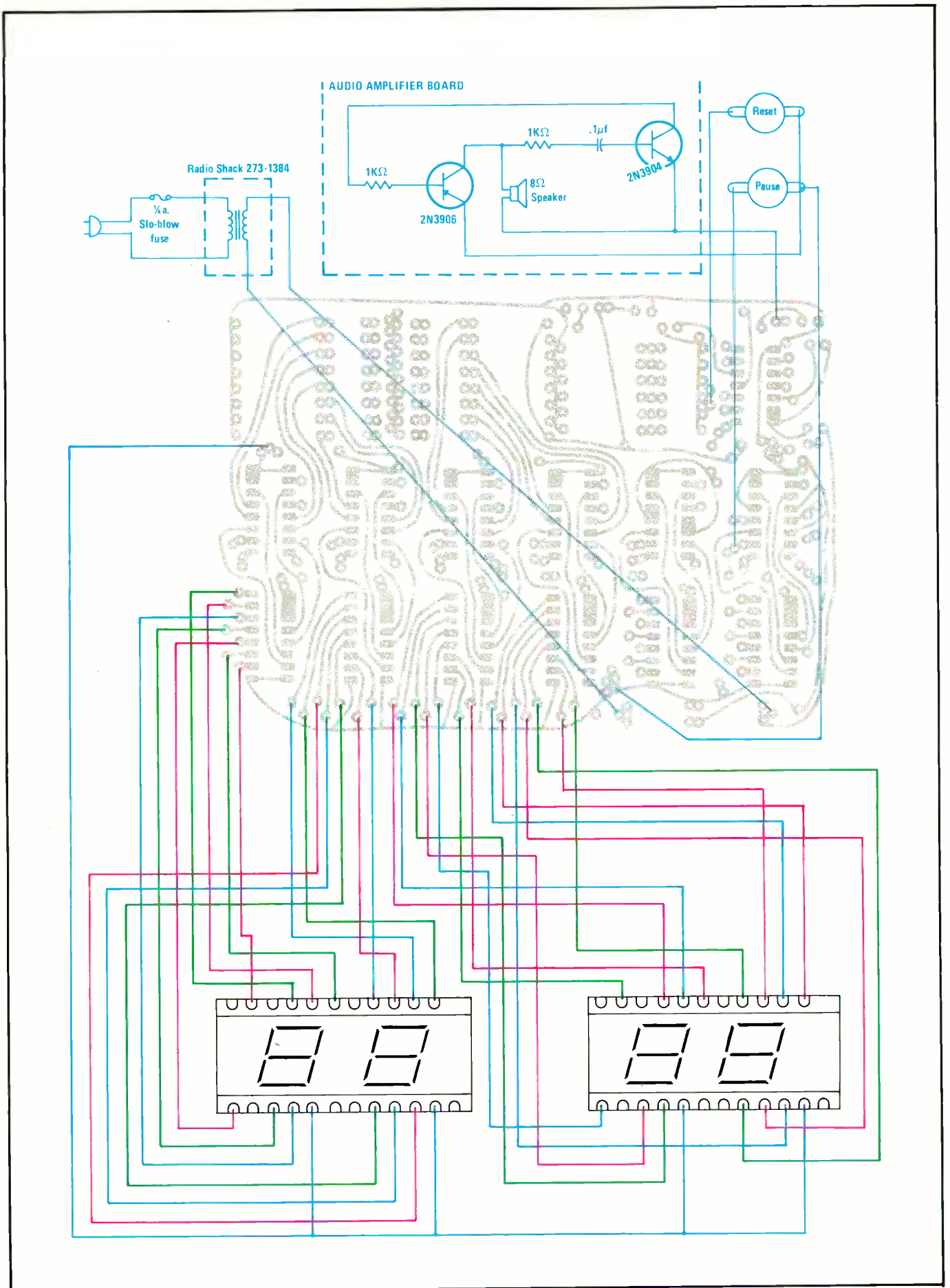
button for the game you're playing is at the front.

If the button position isn't critical, the circuitry can be mounted in any enclosure large enough to hold the PC board you're using. You might also attach a large plate, perhaps a poker chip, to the top of the reset switch, making it easier for a player to hit it in the heat of the game.

A good method for attaching the plate is filing the button flat and bonding the plate to it with ACC-type instant glue. But, be very careful. ACC glue will bond skin together better and faster than any other glue you're likely to come across. Read the instructions accompanying the glue before you use it.

The prototype was designed to have jumper wires soldered into the timing matrix. This arrangement produces a non-adjustable countdown time—say, three minutes. If you plan to use your counter for just one game, scrabble perhaps, then having a fixed time period should be ideal.

If you'd prefer to use your counter to time games requiring different periods,

This schematic diagram shows the rather straightforward circuitry. The digital readouts are not shown. However, the outputs of the 4543 ICs are labeled for the standard seven-segment display. The optional 4543 IC shown next to IC7 can be added for a tenths of seconds display.

NOTES:
1. All diodes 1N4148 unless otherwise noted.
2. All resistors 10KΩ unless otherwise noted.

I AUDIO AMPLIFIER BOARD

Radio Shack 273-1384

¼ a. Slo-blow fuse

1KΩ

1KΩ

.1µf
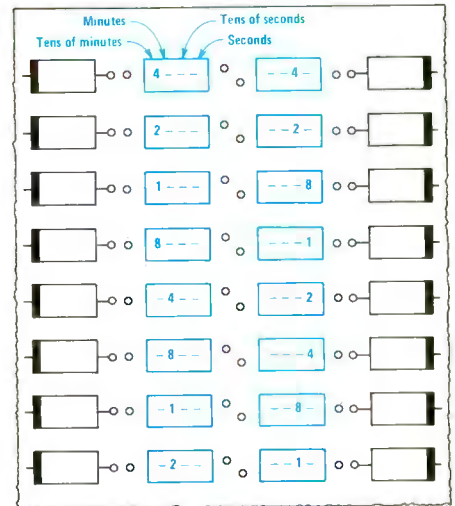
2N3906

8Ω Speaker

2N3904

Reset

Pause

Circuitry external to the printed circuit board is connected to it by wire. The diagram shows these connections and the circuitry, which can be built on a perfboard. Because of the large number of connections required, be certain each is in its proper location.
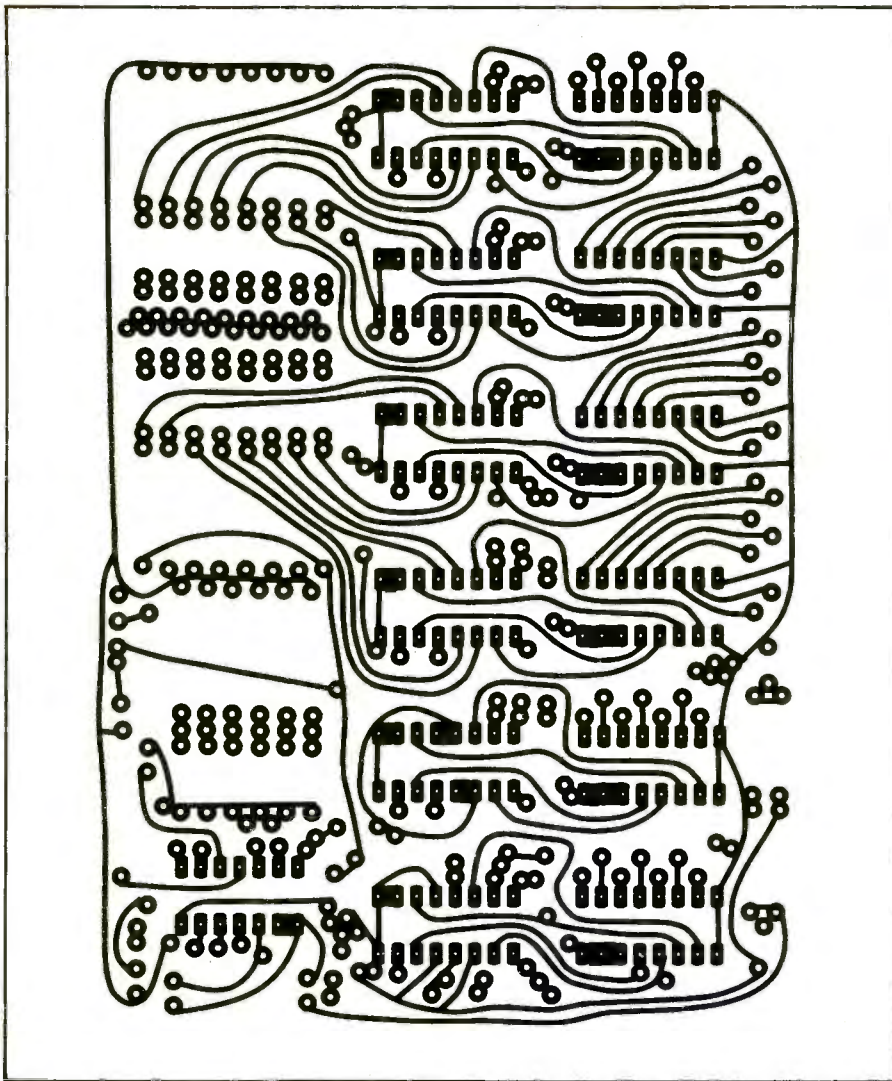
Printed circuit board foil layout template, foil side.

The time from which the counter runs down as it is reset is programmed by connecting jumpers in this diode matrix. Connecting a jumper between a diode and the center row of pads gives you the number shown in the corresponding box in the diagram. The time set is the sum of the numbers for each second and minute position. Connecting a jumper at the 4—and 2—positions, for example, will give you 60 minutes.
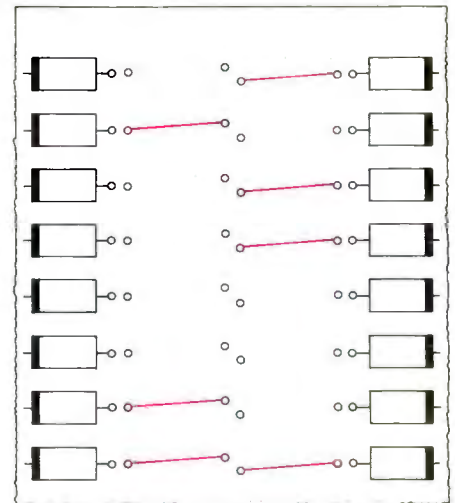
An example of time programming is shown in the diagram. The jumpers shown provide a running time of 23:59. If you prefer, you can connect an SPST switch across each jumper location. Then, choosing a time would involve nothing more than closing the appropriate switches.

you can substitute SPST switches for the jumpers. Then all you have to do is close the appropriate switches to get the time you want. Altogether, you'll need 16 switches. You can use miniature or subminiature switches, or two eight-switch dual-inline IC switch packs, or DIP switches as they're called. If you don't mind reworking PC boards, you can mount the DIP switches in the area now reserved for the future stopwatch modification.

Pull the plug

The prototype counter has no on-off switch, since it is designed for occasional use as a game timer. However, you can easily add your own on-off switch.

The *ME* countdown timer is not a trivial project. But, if you take your time, it's fairly easy to build. And, in addition to providing a rewarding challenge in its construction, the *Downcounter* will add immeasureably to the challenge of your game competition. 🖳

Parts list

Component	Quantity required	Component	Quantity required
1 K ohm, ¼ watt resistor	5	2N3904 NPN transistor	2
10 K ohm, ¼ watt resistor	24	2N3906 PNP transistor	1
33 K ohm, ¼ watt resistor	1		
330 K ohm, ¼ watt resistor	1	Seven segment LED dual display	2
0.1 mfd capacitor	1	6.3 vac transformer	1
1.0 mfd capacitor	1	SPST momentary contact switch	1
220 mfd electrolytic cap	1	SPST switch	1
		½ amp slo-blo fuse and holder	1
1N4001 silicon diode	4	8 ohm miniature speaker	1
1N4148 switching diode	24		
4029 integrated circuit	6	Additional hardware, cabinet, and printed circuit board supplies as needed to finish project.	
4081 integrated circuit	1		
4543 integrated circuit	4		