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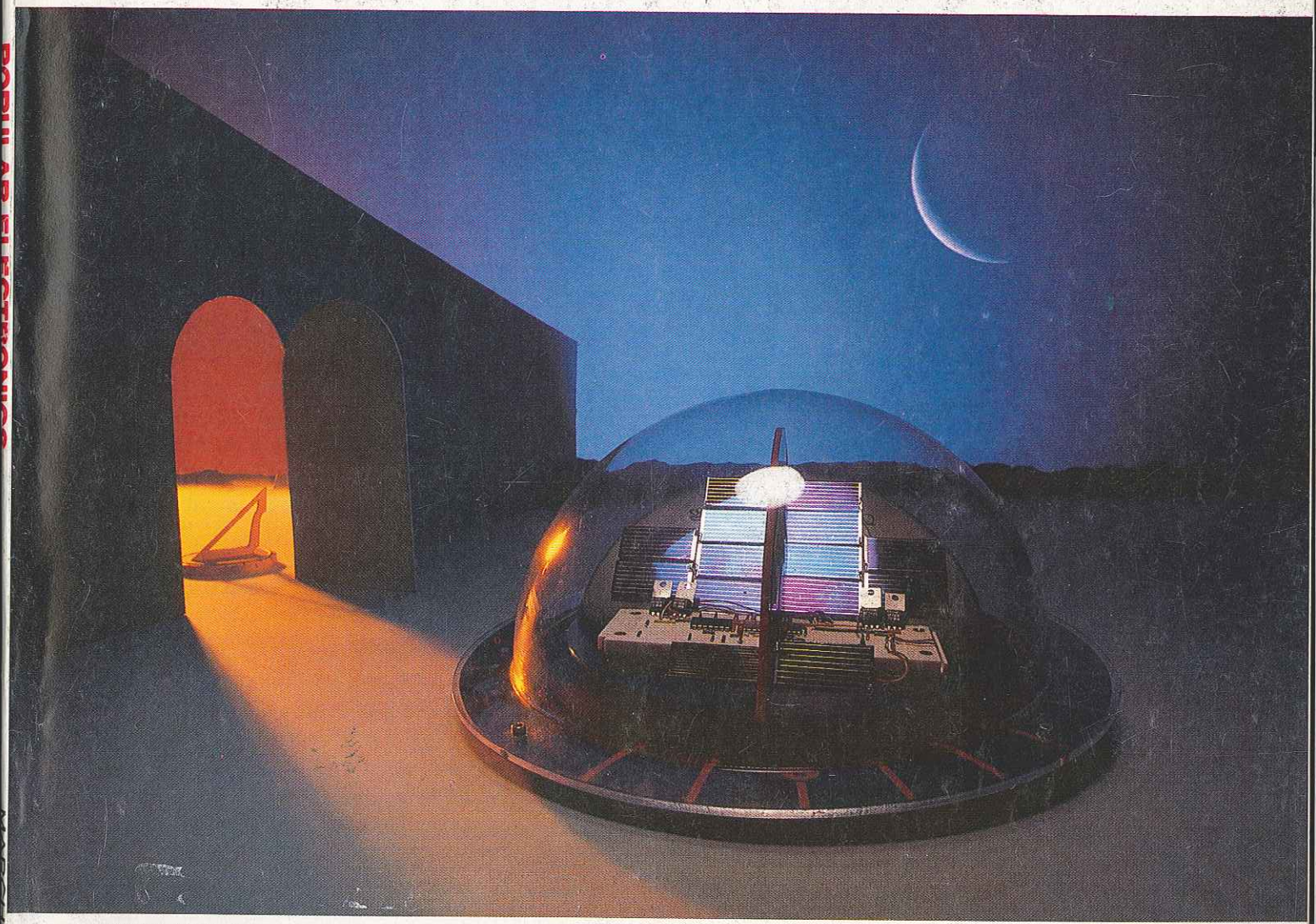
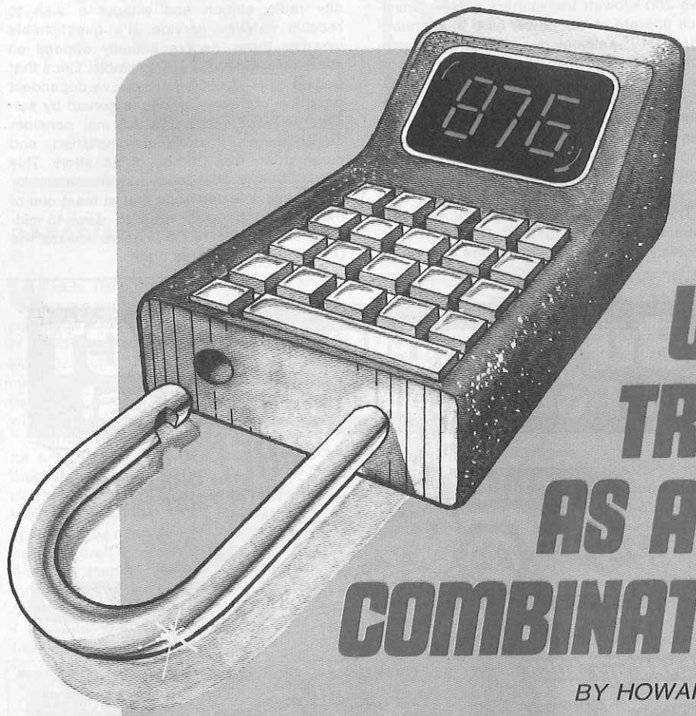
Car Stereo Rating Standards
A Computerized Combination Lock
Planning a Home Electronics Workbench

Build a Solar-Powered Sundial



Tested
Pioneer SR-303 Reverberation Amplifier
Crown SA2 Stereo Power Amplifier
Harrard GT350ap Record Player



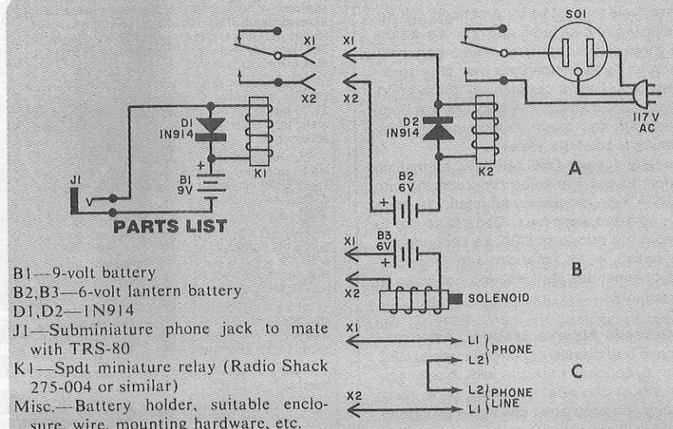
USE YOUR TRS-80 AS A COMBINATION LOCK

BY HOWARD BERENBON

Program plus simple circuit control doors, appliances, and telephone lines

IF YOU own a TRS-80 microcomputer, here is a very simple control application that will enable it to "guard" electrically operated devices such as lights, radio or TV receivers, the telephone line, or a spare-parts cabinet with an electric lock. Although breaking the combination would be very difficult, accessibility of control lines from the computer would leave the system vulnerable to a determined intruder. So where the ultimate in security is required, the foregoing problem should be addressed.

The TRS-80 combination lock program allows you to enter a unique numerical sequence into your computer. When that combination is entered again later, the program activates the TRS-80 cassette remote control plug. A simple external circuit (Fig. 1) connected to this plug then triggers the electric lock circuit. The external control circuit remains



PARTS LIST

B1—9-volt battery
B2,B3—6-volt lantern battery
D1,D2—1N914
J1—Subminiature phone jack to mate with TRS-80
K1—Spdt miniature relay (Radio Shack 275-004 or similar)
Misc.—Battery holder, suitable enclosure, wire, mounting hardware, etc.

Fig. 1. When computer gets correct combination, it sends a signal to energize K1, which can control other circuits as in A, B, and C.

TABLE I—LEVEL-I BASIC PROGRAM

```
0100 PRINT "TRS-80 COMBINATION LOCK"
0110 PRINT "FOR LEVEL I BASIC"
0120 PRINT
0130 PRINT "COPYRIGHT (C) 1979 BY HOWARD BERENBON"
0140 PRINT
0150 PRINT "ENTER MODE (1) LOAD NEW COMBINATION"
0160 PRINT TAB(11);"(2) ACCESS COMBINATION LOCK"
0170 INPUT A
0180 IF A=1 THEN 210
0190 IF A=2 THEN 270
0200 GOTO 150
0210 PRINT "LOAD NEW COMBINATION"
0220 PRINT "ENTER UP TO 6 DIGITS PER VARIABLE"
0230 PRINT "IN THE FORM: X,Y,Z"
0240 INPUT X,Y,Z
0250 PRINT "COMBINATION LOADED"
0260 GOTO 150
0270  CLS
0280 PRINT "ACCESS MODE"
0290 PRINT
0300 PRINT "ENTER COMBINATION"
0310  N=5
0320 INPUT U,V,W
0330  N=N-1
0350 IF (X=U) * (Y=V) * (Z=W) THEN 380
0360 GOTO 550
0380 GOSUB 600
0390 INPUT #A
0500 PRINT "NO ENTRY"
0510 GOTO 510
0550 IF N=0 THEN 500
0560 PRINT "RE-ENTER"
0570 GOTO 320
0600 PRINT "OPEN"
0610 RETURN
```

TABLE II—LEVEL-II BASIC PROGRAM

```
0100 PRINT "TRS-80 COMBINATION LOCK"
0110 PRINT "FOR LEVEL II BASIC"
0120 PRINT
0130 PRINT "COPYRIGHT (C) 1979 BY HOWARD BERENBON"
0140 PRINT
0150 PRINT "ENTER MODE (1) LOAD NEW COMBINATION"
0160 PRINT TAB(11)"(2) ACCESS COMBINATION LOCK"
0170 INPUT A
0180 IF A=1 THEN 210
0190 IF A=2 THEN 270
0200 GOTO 150
0210 PRINT "LOAD NEW COMBINATION"
0220 PRINT "ENTER UP TO 25 CHARACTERS"
0230 PRINT "LETTERS AND/OR NUMBERS"
0240 INPUT A$
0250 PRINT "COMBINATION LOADED"
0260 GOTO 150
0270  CLS
0280 PRINT "ACCESS MODE"
0290 PRINT
0300 PRINT "ENTER COMBINATION"
0310  N=5
0320  N=N-1
0330 INPUT B$
0340 IF A$<>B$ THEN 550
0360 GOSUB 600
0370 INPUT #-1,A
0500 PRINT "NO ENTRY"
0510 GOTO 510
0550 IF N=0 THEN 500
0560 PRINT "RE-ENTER"
0570 GOTO 320
0600 PRINT "OPEN"
0610 RETURN
```

activated until the TRS-80 RESET pushbutton is depressed.

Software. Programs for the lock combination are illustrated for Level-I and Level-II BASIC. The Level-I program (Table I) permits up to 18 digits to be used for the combination. After running the program, the computer will request a mode entry. Entering a "1" allows the loading of a new combination. The entry is in the form: x, y, z, with entry limited to 6 digits per variable. Entering a "2" will allow access to the entry mode for operating the control circuit. As an example, assume that, for x,y,z, we use 19034,001,1705 the two commas being required to separate the variables. If the size of the combination is limited to 12 digits and variables x and y are filled with 6 digits each, a 0 must be entered for variable z. Thus, a correct entry might be 190340,170501,0.

After the access mode is entered, the program is locked into that mode. Now the correct combination will activate the control circuit, and OPEN will be displayed on the monitor screen. If there is an error in entry, the program will print RE-ENTER, calling for re-entry of the combination. After five unsuccessful attempts to match the stored combination, the program will print NO ENTRY and loop at line #510. Depress the BREAK key to return to READY.

The Level-II version allows entry of numbers and letters for the combination and is limited to 25 characters. After the program is loaded, you are requested to select the mode (1 or 2). To enter a new combination, type a "1." Entering a "2" will allow access to the entry mode for operating the control circuit. The combination of 25 characters (using no commas) or less can be entered. An example of a suitable combination is: 19034ABCDEFXYZ.

As before, the program locks into the access mode once it is entered. Entering the correct combination will activate the control circuit, and OPEN will be displayed on the monitor screen. If there are errors in entry, the Level-II program behaves exactly as does the Level-I version.

Hardware. The remote control plug from the TRS-80 cassette interface is inserted into jack *J1* shown in Fig. 1. When the correct combination is entered, relay *K1* will be activated. The contacts of *K1* can be used to control a wide variety of other circuits as the examples in Fig. 1 show.

In example A, relay *K1* is used to activate a relay with a higher power rating (*K2*) to control lighting or appliances connected to *SO1*. In example B, a solenoid (*K3*) is used to create a computer-activated door lock. The plunger of the solenoid then operates the latch on the door of a room or safe.

For a phone lock, example C, the normally open contacts of *K1* are connected in series with *L1* of the phone. (Note: Any connection made to the phone line must be approved by your local telephone company.) The phone will be totally inactive when this circuit is connected. When the correct combination is entered and the signal is received from the computer, the phone will be connected to the line as in normal use. This arrangement is most useful if one phone is left active for receiving incoming calls, and extension phones are controlled by the computer lock.

The examples given serve only to demonstrate how the TRS-80 combination lock program might be applied. Any device or system that can be relay-controlled can be kept under security by the program. If means can be developed for attaching a remote keypad (with secure leads) to the TRS-80 to allow entry of the combination, the computer could be kept in the secured area. The program would then represent a sophisticated electronic locking system. ◇