

Electronic Sequential Combination Lock

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Ten years ago I designed the electronic sequential combination lock to protect my classic sportscar. The project is a power control system. If the code is entered within ten seconds, power is sent to the device being protected. If the code is not entered within ten seconds power is routed to the alarm. This project may be used to protect cars, boats, motorcycles, homes, offices, computers, etc.

Circuit Operation

The schematic for this project is shown in FIG. 1. IC1 is configured as a monos-

table multivibrator whose on time is determined by R17 and C1. If the code is not entered within ten seconds, relay K1 is energized and the alarm is powered. The code is entered by pressing S1, S2, S3, S4, S5 and S6 in the proper order, starting with S1. If the code is entered within the time period, relay K2 is energized and the device being protected is powered. When relay K2 is energized, power to the transistor is cut and relay K1 can no longer be energized. The alarm will not sound in the "arm" mode. Switches S1-S6 are normally-open switches and S7 is a normally-closed switch and it serves as a

reset if the user enters the wrong code by mistake. Diodes D1 and D2 protect SCR6 and SCR7, respectively, from inductive spike voltages generated by the relays at switch on. SCR1-SCR6 and associated components are the "heart" of the combination lock.

Construction

The project may be built on a printed-circuit board or on a perf board using point-to-point wiring. Care should be taken to orient capacitor C1 and diodes D1 and D2 properly. The value of capacitor C1 may be increased or decreased to increase or decrease the

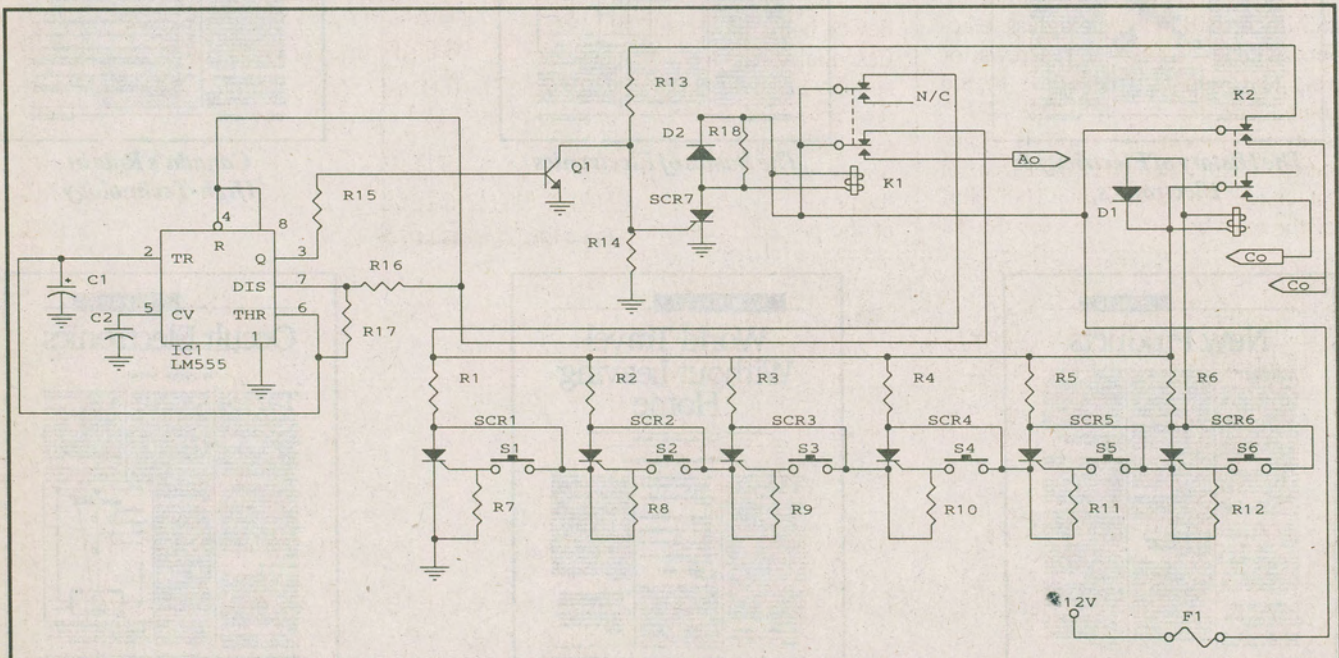


Fig. 1. Schematic of Electronic Sequential Combination Lock

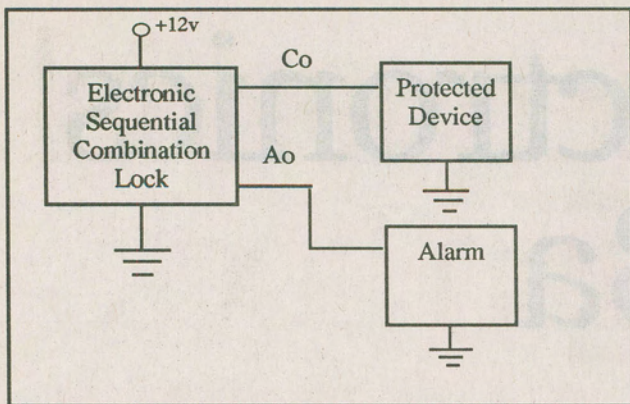


Fig. 2. Installation of Lock

time period, respectively, allowed for entering the code. The component values, except for R17, are not critical, that is, the next standard higher or lower value may be used.

My PCB was designed to accept the Magnecraft W67RPCX-2 relay. However, any relay may be used if point-to-point wiring is used. The relay contacts must be able to handle the current requirements of the device being protected and the alarm used in your system.

Cabinet Preparation

The front of the cabinet is used as a template to cut a piece of plexiglass. The cabinet front is then cut. Holes are carefully drilled in the plexiglass to accept switches S1-S7 and screws or rivets to fasten the plexiglass to the cabinet. Bulb L1 is used to "backlight" the system when the code is being entered. If the original cabinet front is kept, an LED in series with a 1000 ohm resistor may be substituted for the 12

volt bulb. The bulb remains lit until either the code is entered or the alarm is triggered.

Testing And Installation

This project requires no calibration and testing is easy. A voltmeter should be connected to Co and a second voltmeter should be connected to Ao. A twelve volt power supply is connected to the +12 V

and ground leads of the project. Turn on the power supply and do not enter any code, after about ten seconds, you should hear a relay click and measure twelve volts only on the voltmeter connected to the Ao lead. Press the reset switch and enter the code. You should hear a relay click and measure twelve volts only on the voltmeter connected to the Co lead. If problems occur, check for poor solder connections and for solder shorts. Make sure that capacitor C1 is a tantalum capacitor and that it is properly oriented. Fig. 2 shows how to install the project into the device being protected. Essentially, the power supply lead of the device to be protected is now connected to the power supply lead of the project. The Co lead of the project becomes

the new power supply lead of the device being protected. The Ao lead is used to power an alarm.

For example, to protect a car, connect the electronic ignition twelve volt lead to the power lead of this project. The Co lead is now connected to the twelve volt terminal of the ignition unit. The Ao lead can be connected to an alarm. This is clarified if you look at FIG. 2 and consider the electronic ignition module as the device being protected.

The home can be protected in a similar way if you consider an electric lock as the device being protected.

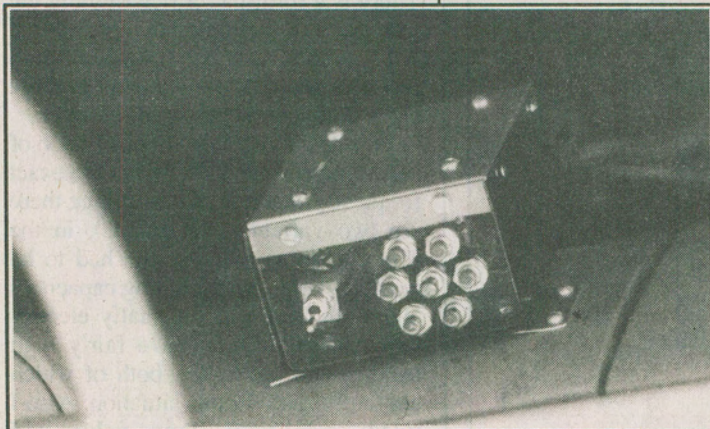
Conclusion

The project has provided me with peace of mind knowing that my classic sportscar is protected twenty-four hours a day. The project has worked flawlessly for ten years whether it is -30 degrees or +30 degrees outside. □

Parts List

R1-R6,R18:	2700 ohms
R7-R12,R14:	1000 ohms
R13,R15:	510 ohms
R16:	30,000 ohms
R17:	1,000,000 ohms
C1:	6.8 μ F tantalum
C2:	0.01 μ F ceramic disk
IC1:	LM 555 timer
Q1:	2N2222A
SCR1-SCR7:	C106D
D1-D2:	1N4148 or 1N914
K1-K2:	12 volt DPDT relay, Magnecraft W67RPCX-2
S1-S6:	normally-open switch
S7:	normally-closed switch
L1:	12 volt bulb

Available from Kamtronics, c/o Stephen Kamichik, 1460 Montcalm St., Laval, P.Q., H7W 1X1
 Assembled and tested board: \$49.95 plus \$5.00 S&H (order #B1)
 Assembled and tested in cabinet ready for installation: \$69.95 plus \$7.50 S&H (order #C1)
 Additional installation information for most autos: \$5.00 (order #I1)



Completed Unit Installed in Author's Car