ICs. Hence it is well justified to use a low-cost circuit for 4-line to 16-line decoding in the place of IC 74154.

The circuit described here uses three TTL ICs. Though a bit more of wiring effort is involved, the saving in terms of cost is considerable. The circuit should cost about Rs 25 only. (Rs 20 for two numbers of IC 7442 and Rs 5 for IC 7400).

Circuit shows the wiring of two IC 7442s to obtain 4-line to 16-line decoding function. IC1 decodes the 4-bit input in the conventional manner--from 0 to 9. For inputs beyond 9, all the outputs of IC1 remain high. All the outputs of IC2 remain high for inputs from 0 to 9. Inputs beyond 9 are decoded by IC2 giving outputs (LOW) from 10 to 15 on pins 3 to 7 and 9. The drive logic for IC2 is provided by IC3. The truth table for the circuit is also shown.

T.K. LOKABHIRAM

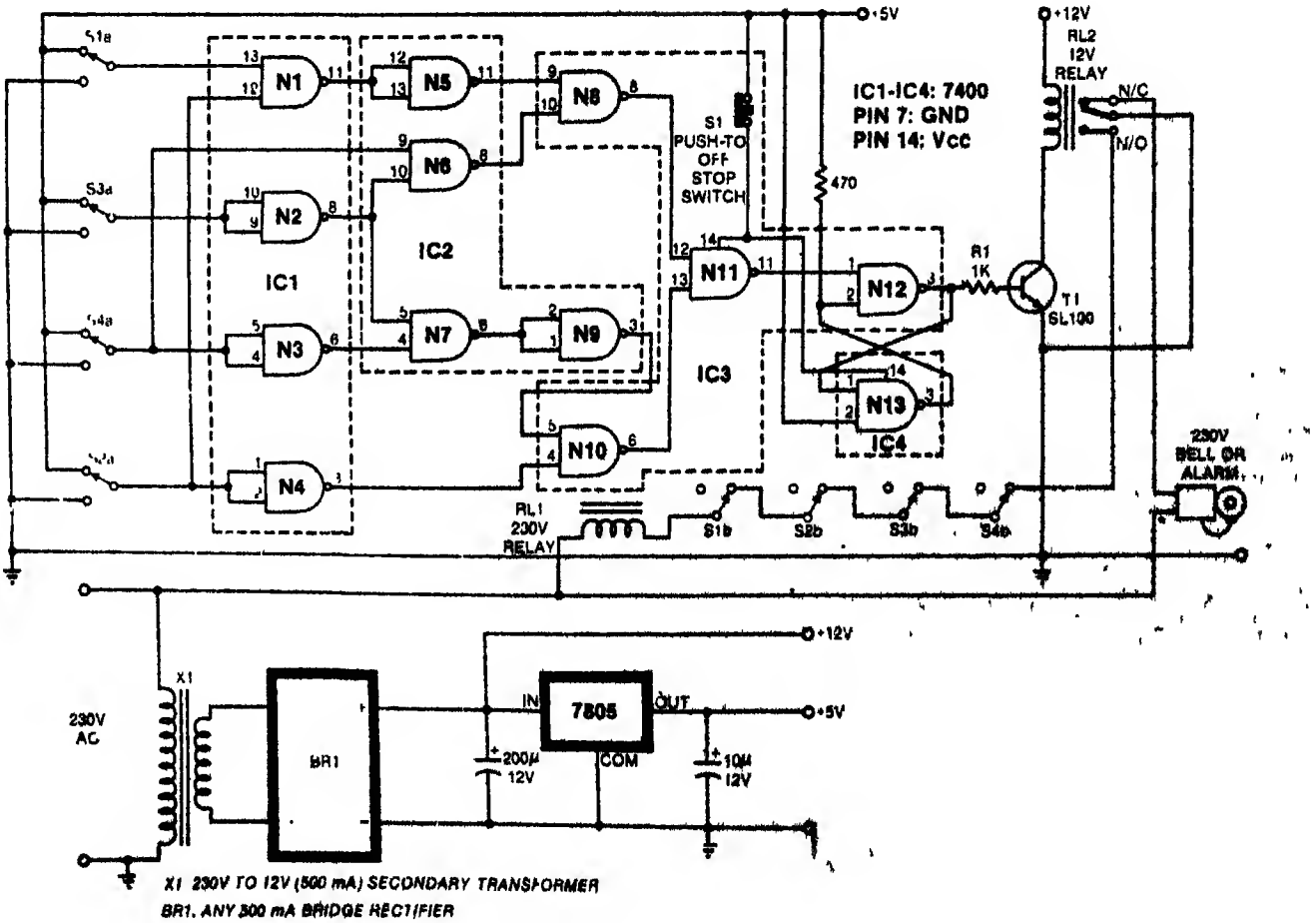
Digital Combination Lock

There are several types of combination locks available but most of them are mechanical. Here is a digital electronic combination lock which is much more reliable than the readily available mechanical combination locks. One can open a mechanical combination lock by trying again and again. But this electronic combination lock gives only one chance to open it as it includes an alarm and an auto-cut-off system.

One has to close four switches in a definite sequence to open the lock. (In the circuit shown here, the switch closing sequence has been pre-set as S1, S2, S3 and S4 respectively.) In case a wrong switch is closed, i.e., if this sequence is not

TRUTH TABLE

INPUT				OUTPUT
A	B	C	D	
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1



X1 230V TO 12V (500 mA) SECONDARY TRANSFORMER
BR1. ANY 500 mA BRIDGE RECTIFIER

followed strictly, the alarm will start ringing and alert everyone nearby. The alarm will continue until the stop switch S1 is pressed. And the lock will not open even if the right sequence is followed immediately thereafter This will definitely scare away any thief.

The circuit is built with four SN7400 NAND gate ICs. These TTL ICs are cheap and easily available in the market

The truth table is also shown. By using K-map, we get the logic function

$$F = A.B(C+\overline{D}) + \overline{B}.\overline{C}.\overline{D}$$

Here it is evident that there are five combinations of inputs for which output becomes '1'. That means for these combinations, the alarm will not ring.

The four SN7400 ICs may be soldered on a veroboard and connected as shown in the circuit diagram. Four input cords with jack pin on one side are needed. The jack pins should be of different colours. Switches S1a, S2a, S3a, S4a and S1b, S2b, S3b, S4b are ganged respectively. Switches S1b, S2b, S3b, S4b are in series with relay RL1 which opens the lock Different identification numbers (or letters) may be put on all the switches

The output is available at pin 3 of IC3. The SL100 transistor activates the relay as soon as it gets an input at its base. The flip-flop built by NAND gates N12 and N13, once activated, remains in the same state. Hence T1 and RL2 also remain active until switch S1 is pressed. The alarm will continue to ring and relay RL1 remains disconnected from the mains.

The power supply circuit is also shown in circuit diagram. A 230V/12V, 500mA power supply transformer and IC 7805 voltage regulator have been used to get a steady 5V DC supply. When activated, the alarm gets connected to 230V mains. Total cost of the unit is around Rs 85.

NILANJAN BHOWMIK

Automatic Brightness Control for Seven-Segment Digital Displays

Here is a circuit which exercises automatic brightness control on LED displays of digital clocks, and for that matter on

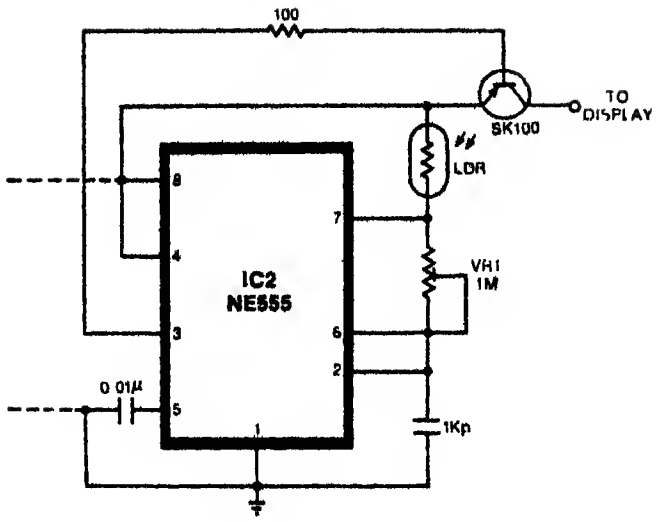


Fig. 2:

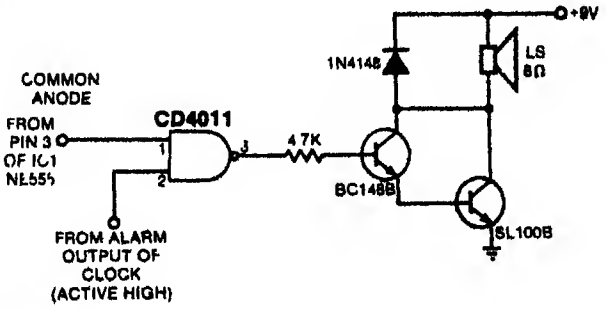


Fig. 3:

any seven-segment display unit depending on the ambient lighting conditions.

The basic principle underlying this circuit is the 'on-off control' method of regulating the voltage and hence the brightness. The relationship portraying this is given by:

$$V_{OUT} = V_{IN}\frac{T_{on}}{T_{on}+T_{off}} = VD$$

where V_{OUT}—average/DC output voltage

V_{IN} –input voltage

D --duty-cycle