

Letterbox with Letter-Counting Facility



**VANDANA SAWANT, RACHNA PATIL,
RATUJA PATIL, KIRTI PAWAR AND
GREESHMA PILLAI**

Here is a circuit that starts counting when you insert a letter in the letterbox at your home or office. It is designed to save your time from going to the letterbox to check if there are letters inside. The number of letters present in the box is indicated by a seven-segment display. The block diagram of the circuit is shown in Fig. 1.

Circuit and working

Fig. 2 shows the circuit diagram of

the electronic letterbox with letter-counting facility. It is built around a white LED (LED1) and an LDR (LDR1), popular timer NE555 (IC1) in monostable mode, a counter, seven-segment driver CD4033 (IC2) and a few other components. LED1 and LDR1 together work as a sensor.

The resistance of LDR1 changes in accordance with the intensity of light incident on it. When light from LED1 falls on LDR1, its resistance is low.

Voltage at pin 2 of IC1 depends on the light falling on LDR1. In the dark, voltage at pin 2 is low, and vice-versa.

When a letter is inserted into the letterbox, it passes between LED1 and LDR1. This interrupts the light falling from LED1 to LDR1. As a result, resistance of LDR1 increases.

This change in resistance provides

a triggering pulse to pin 2 of IC1, generating a short-duration square-

PARTS LIST	
<i>Semiconductors:</i>	
IC1	- NE555 timer
IC2	- CD4033 counter-cum-driver
LED1	- 5mm white LED
LED2	- 5mm LED
DIS1	- LTS543 seven-segment
<i>Resistors (all 1/4-watt, ±5% carbon):</i>	
R1, R6	- 470-ohm
R2	- 220-ohm
R3	- 470-kilo-ohm
R4	- 680-ohm
R5	- 10-kilo-ohm
<i>Capacitors:</i>	
C1	- 100µF, 25V electrolytic
C2	- 1µF, 25V electrolytic
C3	- 0.01µF ceramic disk
<i>Miscellaneous:</i>	
CON1	- 2-pin connector terminal
S1	- Tactile switch
LDR1	- LDR (light dependant resistor)
	- 12V regulated power supply

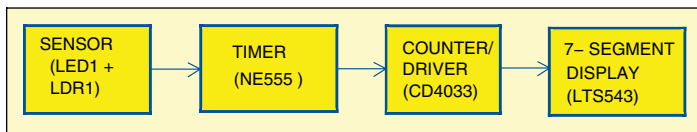


Fig. 1: Block diagram of the circuit

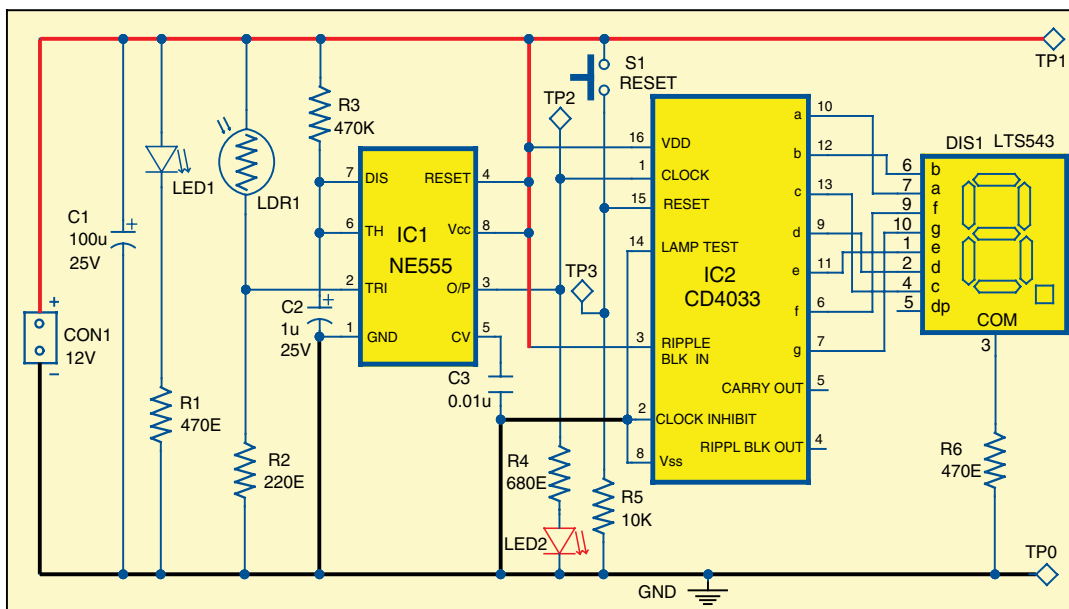


Fig. 2: Circuit diagram of the electronic letterbox with letter-counting facility

wave pulse at its output pin 3. This pulse acts as clock input for the counter and display driver CD4033 (IC2). Output pins of IC2 are connected to various segments a, b, c, d, e, f and g pins of seven-segment display (DIS1) as shown in the circuit.

Its common pin 3 is connected to ground through current-limiting resistor R6. Alternatively, you can also provide a resistor each for each segment after removing resistor R6. Seven-segment display DIS1 displays the number of letters present in the box up to nine.

When a letter is delivered to the letterbox, LED2 momentarily glows, which indicates that a letter is received

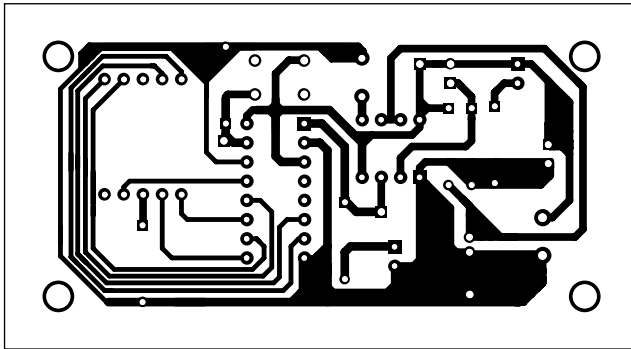


Fig. 3: Actual-size, single-side PCB of the letterbox

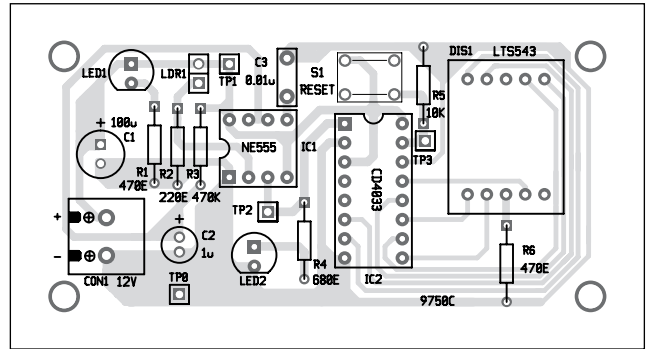


Fig. 4: Component layout of the letterbox

Test Points

Test point	Details
TP0	0V, GND
TP1	12V
TP2	High when light is blocked from LDR1
TP3	High when S1 is pressed

and DIS1 increments the display by one count. That is, for each pulse received at input pin 1 of IC2, its

output advances by one count, which is reflected in the seven-segment display. When the counter reaches nine, it automatically resets to zero and the cycle repeats. Switch S1 is used to reset the counting.

After collecting the letter from the letterbox, always reset the counter using switch S1.

Construction and testing

An actual-size, single-side PCB for the letterbox circuit is shown in

Fig. 3 and its component layout in Fig. 4. Enclose the PCB in a suitable box in such a way that light from LED1 falls on LDR1. Ensure proper wiring to avoid any mistake. For troubleshooting, check the voltages at various test points as listed in the table. ●

Vandana Sawant is assistant professor (electronics and telecommunication), and Rachna Patil, Ratuja Patil, Kirti Pawar and Greeshma Pillai are third-year engineering students at SIES Graduate School of Technology, Navi Mumbai



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