Long Delay Timer with Real-Time Clock Display

EFY NITIN KUMAR TESTED

B. RAJ NARAIN AND K.V. KANDASAMY

Often we forget to switch-off the water pump on time and it results in overflow of water from the overhead tank. Fortunately, there are many solutions available for switching-off the motor automatically. Most water-level controllers require a level monitoring system for the tank, which is not so easy to install due to complicated electrical connections.

One of the simplest alternatives is a countdown timer circuit described here. This circuit shows the real-time clock in hours, minutes and seconds, with AM/PM on LCD display. It eliminates the use of additional peripherals like DS1307 RTC and I²C bus programming. Thus, cost of the circuit is reduced significantly as compared to other real-time clock circuits.

Circuit and working

The circuit diagram of a long delay timer with real-time clock display is shown in Fig. 1. The circuit consists of three push-button switches (S1, S2 and S3), one on/off switch (S4) and LCD display. The heart of the circuit is AT89C51 microcontroller (IC2).

AT89C51 microcontroller. AT89C51 is a CMOS 8-bit microcontroller having 4kB Flash memory, 128 bytes of RAM, 32 I/O lines, five-vector two-level interrupt architecture, two 16-bit timers/counters, full duplex serial port, on-chip oscillator and clock circuitry.

It is used to run both the real-time clock and countdown timer. One of its internal timers is used to configure the countdown timer. The four ports of the microcontroller are used as I/O pins. The push-button switches are connected to port pins P1.0, P1.1 and P1.2, respectively. The buzzer is connected to port pin P3.0 through transistor T1 (BC547). On/off switch S4 is connected to port P1.3 for controlling the timer and buzzer. Pins 18 and 19 of IC2 are connected to a 12MHz crystal oscillator and capacitors C1 and C2 (22pF each).

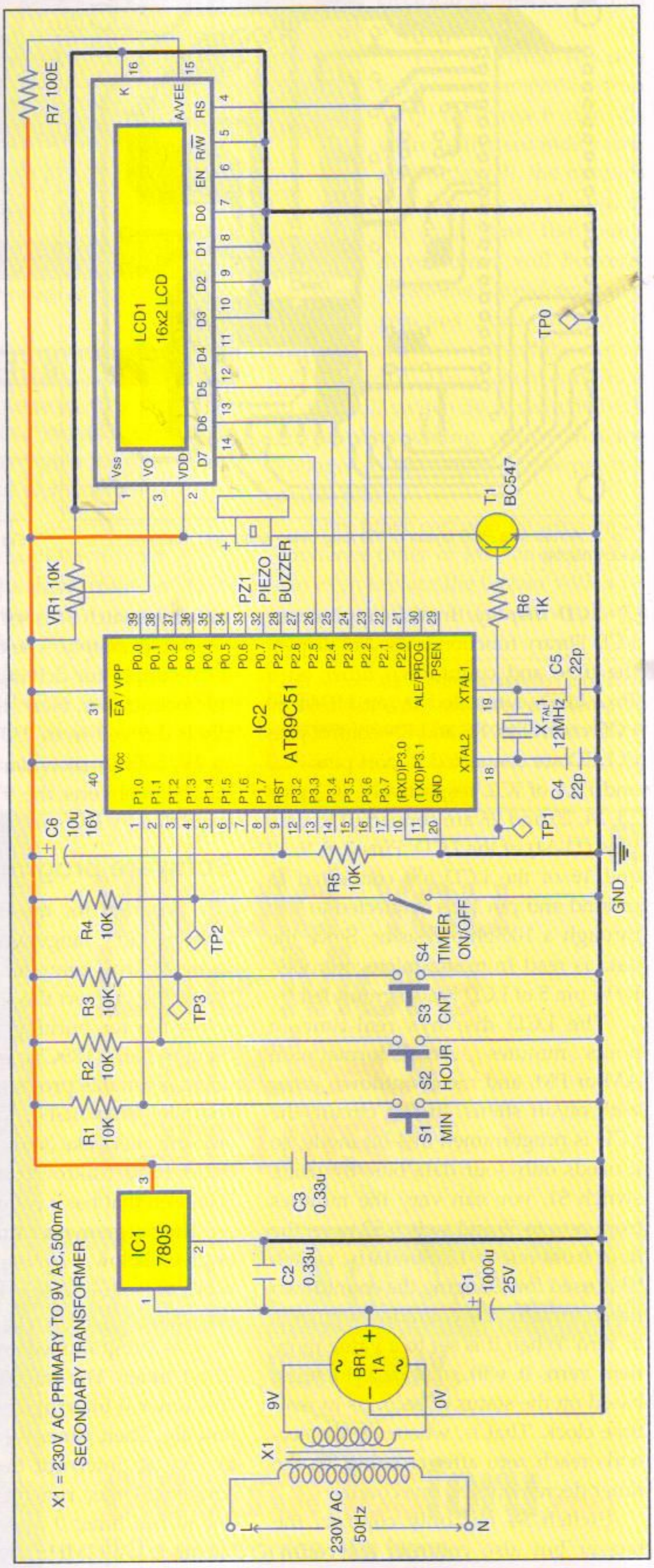

Fig. 1: Circuit of the long delay timer with real-time clock display

Wireless Gesture-Controlled Robot

AQUIB JAVED KHAN

In this project we are going to control a robot wirelessly using hand gestures. This is an easy, user-friendly way to interact with robotic systems and robots. An accelerometer is used to detect the tilting position of your hand, and a microcontroller gets different analogue values and generates command signals to control the robot. This concept can be implemented in a robotic arm used for welding or handling hazardous materials, such as in nuclear plants. The author's prototype is shown in Fig. 1.

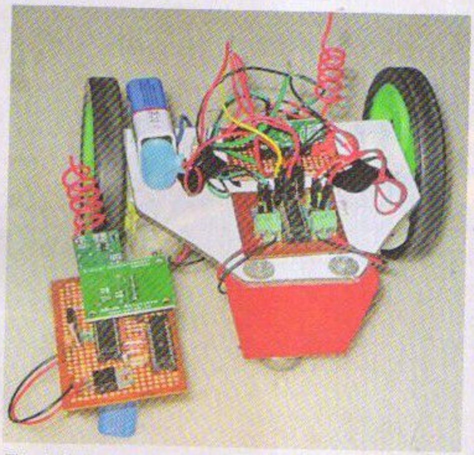

Fig. 1: Author's prototype

Circuit and working

The block diagram of the wireless gesture-controlled robot is shown in Fig. 2. The circuit diagram of the transmitter section of the wireless gesture-controlled robot is shown in Fig. 3 and of the receiver section in Fig. 4.

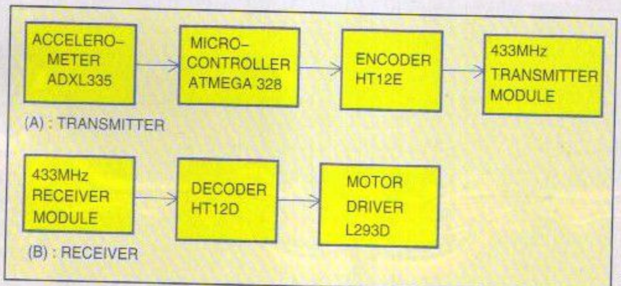

Fig. 2: Block diagram of the wireless gesture-controlled robot

ATmega328. ATmega328 is a single-chip microcontroller from Atmel and belongs to the mega AVR series. The Atmel 8-bit AVR RISC based microcontroller combines 32kB ISP flash memory with read-while-write capabilities, 1kB EEPROM, 2kB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, three flexible timers/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 10-bit A/D converter, programmable watch-dog timer with an internal oscillator and five software-selectable power-saving modes.

The device operates between 1.8 and 5.5 volts. It achieves throughputs approaching one MIPS per MHz. An alternative to ATmega328 is ATmega328p.

ADXL335. This is a complete three-axis acceleration measurement system. ADXL335 has a minimum measurement range of ±3g. It contains a poly-silicon-surface micro-machined sensor and signal-conditioning circuitry to implement open-loop acceleration measurement architecture. Output signals are analogue voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from motion, shock or vibration.

The sensor is a poly-silicon-surface micro-machined structure built on top of a silicon wafer. Poly-silicon springs suspend the structure over the surface of the wafer and

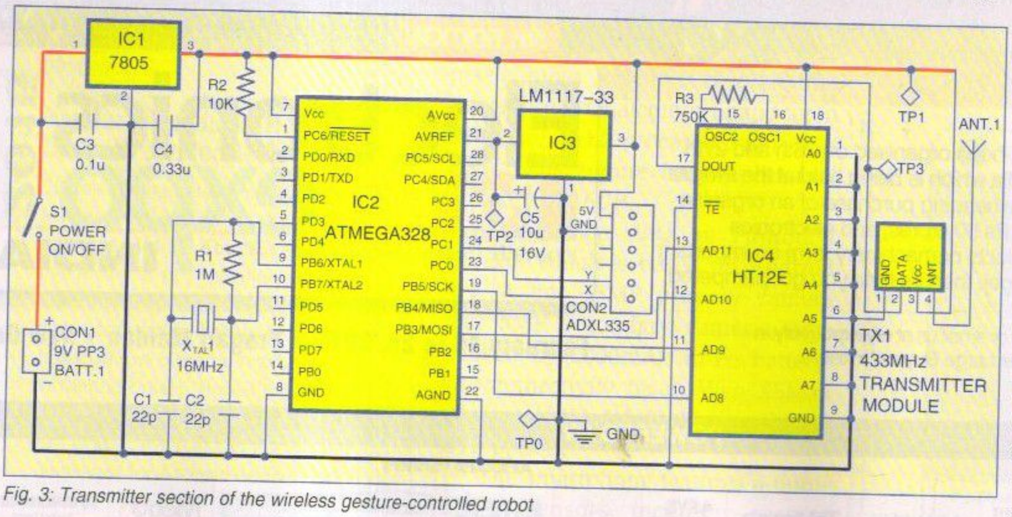

Fig. 3: Transmitter section of the wireless gesture-controlled robot

Wireless Hotel Ordering System

EFY TESTED AMAR DEEP & NITIN KUMAR

AJITH MEMANA AND FAISAL RASAK

Traditional ordering systems consist of waiters handing over the menu to customers and taking orders from them. The waiter's performance is defined by the speed at which the order gets processed, and it might get delayed at times.

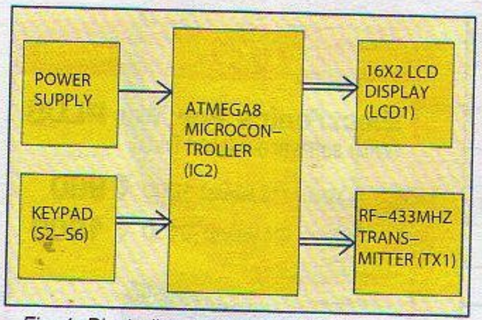

Fig. 1: Block diagram of the wireless hotel ordering system—transmitter side

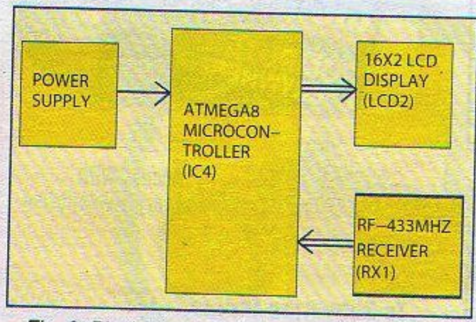

Fig. 2: Block diagram of the wireless hotel ordering system—receiver side

In the wireless ordering system, there is no waiter to take the order. Everything related to the waiter is done by the microcontroller (MCU) and a wireless transmitter. The customer can start ordering as soon as he or she is seated comfortably at the table. The delay caused by the waiter is eliminated in this system.

Circuit and working

The wireless hotel ordering system consists of a transmitter and a receiver section. The block diagram of the transmitter unit is shown in Fig. 1 and the receiver unit in Fig. 2.

The complete circuit diagram of the transmitter is shown in Fig. 3 and of the receiver is shown in Fig. 4.

Microcontroller. The heart of this circuit is an 8-bit AVR ATmega8 MCU that controls, stores and coordinates the activities of the system. The software program stored in the MCU controls the functions of the system.

AVR combines the most code-efficient architecture for C language and assembly programming with the ability to tune system parameters throughout its life cycle. ATmega8 provides the following features: 8k bytes of in-system programmable flash with read-while-write capabilities, 1k byte of SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, three flexible timers/counters with compare modes, internal and external interrupts, a serial programmable universal synchronous asynchronous receiver transmitter (USART), an SPI serial port and five software-selectable power saving modes.

The flash program memory can be reprogrammed in-system through an SPI serial interface by a conventional non-volatile memory programmer or an on-chip boot program running on AVR core. With AVR's USART you just need to write the data to one of the registers of USART and you are free to do other things, while USART is transmitting the bytes.

Test Points

Test point	Details
TP0, TP4	0V (GND)
TP1, TP5	5V
TP2-TP3	Train of pulse when S4 button is pressed
TP6-TP7	Train of pulse when S4 button is pressed

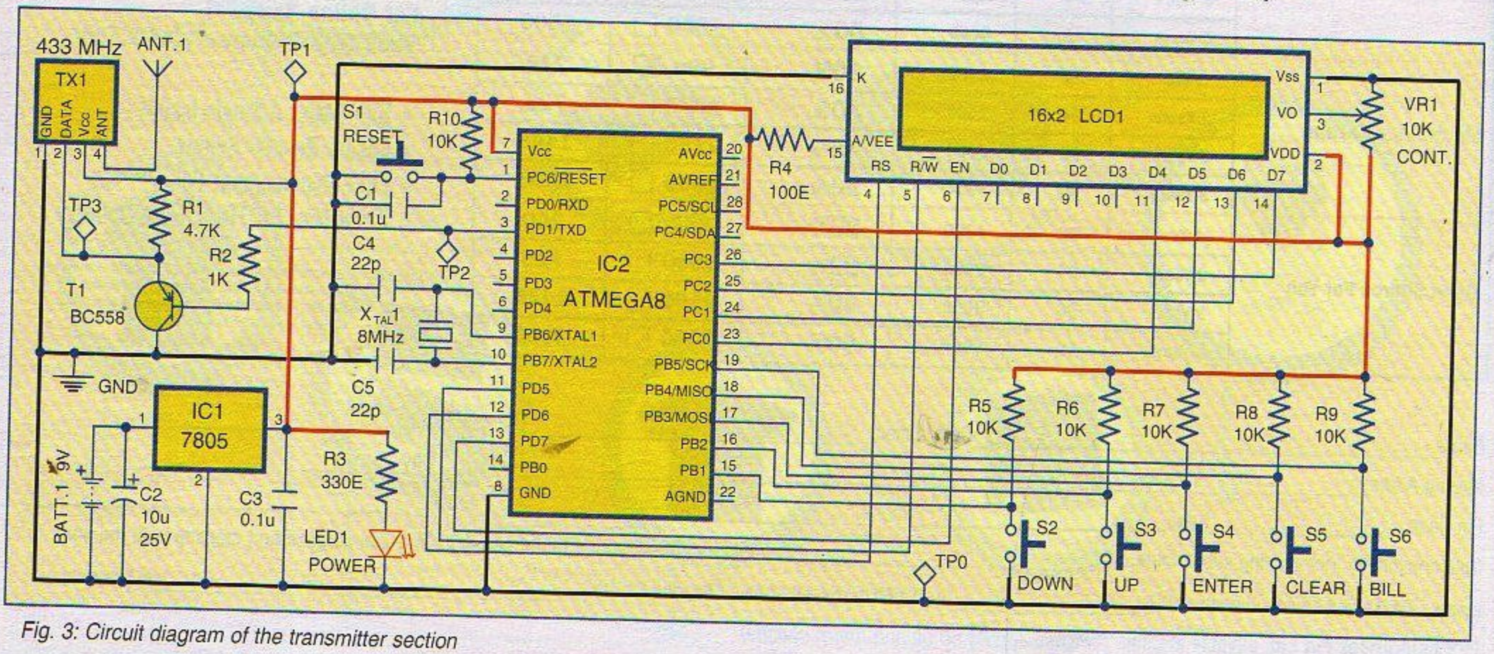

Fig. 3: Circuit diagram of the transmitter section

Laser Based Security Lock

EFY TESTED
NITIN KUMAR

EFY LAB

Presented here is a security system that uses an inexpensive laser torch which is usually available with a key ring. The advantage of this security lock is that you can use any laser torch or pointer that is easily available in toy shops. It employs minimal input keys and yet is very secure. It can be used as a door lock, briefcase lock or any other application related to an electronic locking system.

Circuit and working

The block diagram of a laser-based security lock is shown in Fig. 1 and its schematic diagram in Fig. 2. Switches S1 and S2 work as security input keys and switch S3 is used for opening the lock manually. The lock can be an electric strike installed on the door frame to allow access with an access control system or any electronic remote control system.

Electric strikes are generally available in two configurations—fail-secure and fail-safe. In fail-secure configuration, applying electric current to the strike causes it to open; whereas in fail-safe configuration, applying electric current to the strike causes it to lock. A fail-secure configuration is used in this project.

Opening the lock. The use of switch S2, pressing and releasing of switch S1 and supplying the laser pulses at the right time are the security features of this circuit. Switch S2 should not be released during the entire operation, otherwise the counter will get reset and you will not be able to open on the lock.

When switch S1 is pressed, the first in-built timer of IC2 is triggered. Its output pin 5 goes high for four seconds. LED1 glows and transistor T3 conducts. During this time, the collector of T3 becomes low, which in turn pulls the clock enable pin (pin 13) of IC1 to low state. This enables the counter (IC1) to count. During this time, five laser pulses are applied (by you) at photo sensor T1. These signal pulses go to clock pin 14. LED4 glows and T2 conducts at the fifth pulse. This triggers the in-built second

Test Points

Test point	Details
TP0	0V
TP1	5V
TP2	High when S3 is pressed

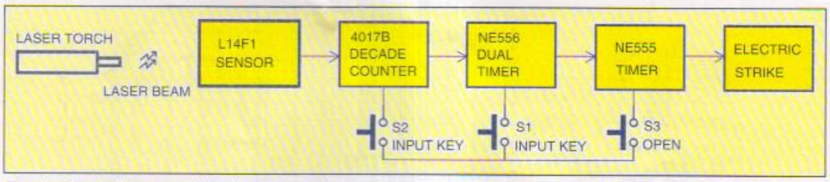

Fig. 1: Block diagram of the laser based security lock

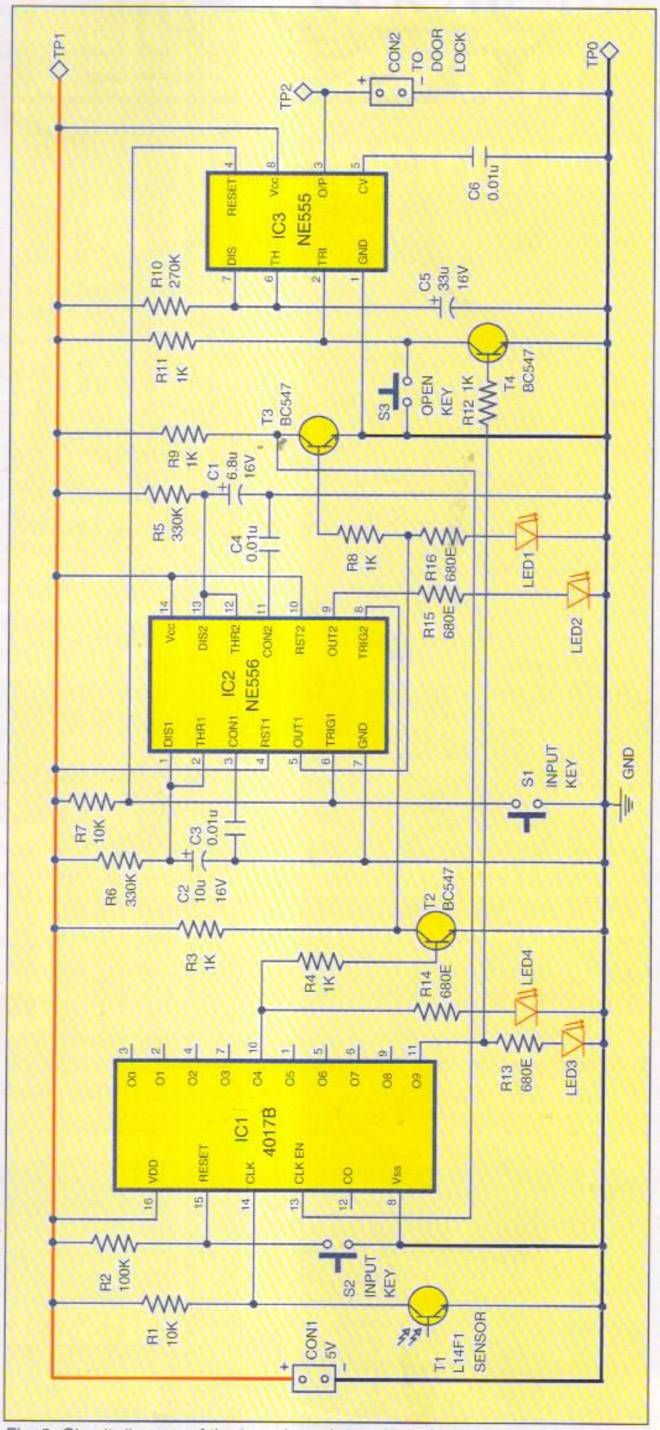

Fig. 2: Circuit diagram of the laser based security lock

Simple Adjustable Staircase Waveform Generator

PETRE TZV PETROV

Staircase signals find many applications in the field of electronics, such as in television systems, telemetry, and analogue and digital communications. Here is a circuit illustrating the basic principles of staircase waveform generator. Advantages of this circuit are: simple, low-cost, no complex programming, easy-to-assemble on a breadboard and adjustable staircase waveform outputs of variable step sizes and durations.

Circuit and working

The circuit diagram of a simple adjustable staircase waveform generator is shown in Fig. 1.

IC1 (74HC14) is a hex inverter Schmitt trigger that generates oscillatory pulse (square wave) and gives an output clock at pin 14 of IC2 (74HC93), which is a 4-bit binary ripple counter. Pins 8, 9 and 12 of IC2 are connected to select pins of IC3 (74HC4051), which is an 8-channel analogue multiplexer/demultiplexer with three digital selected pins 9, 10 and 11. Input pins of IC3 are connected to eight potentiometers of 10-kilo-ohm each.

Variable step sizes are obtained

PARTS LIST

Semiconductors:	
IC1	- 74HC14 hex inverter Schmitt trigger
IC2	- 74HC93 4-bit binary counter
IC3	- 74HC4051 8-channel analogue multiplexer/demultiplexer
IC4	- LM358 low-power dual-operational amplifier
Resistors (all 1/4-watt, ±5% carbon):	
R1, R3, R4	- 100-ohm
R2	- 10-kilo-ohm
VR1-VR8, VR10	- 10-kilo-ohm potentiometer
VR9	- 100-kilo-ohm potentiometer
Capacitors:	
C1	- 10µF, 16V electrolytic
C2	- 1µF, 16V electrolytic
C3	- 100nF ceramic disk
C4	- 10nF ceramic disk
C5-C7	- 0.33µF ceramic disk
C8	- 100µF, 16V electrolytic
Miscellaneous:	
S1	- Rotary switch
S2	- On/off toggle switch
CON1-CON6	- 2-pin terminal connector

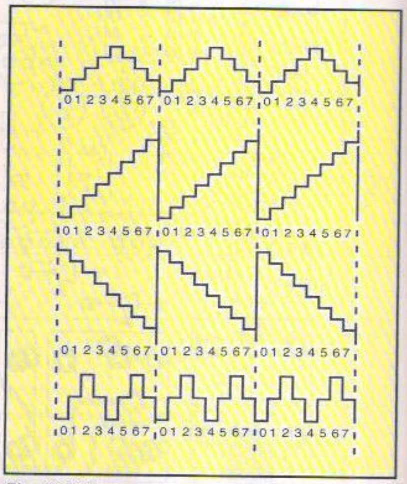

Fig. 2: Staircase output waveforms

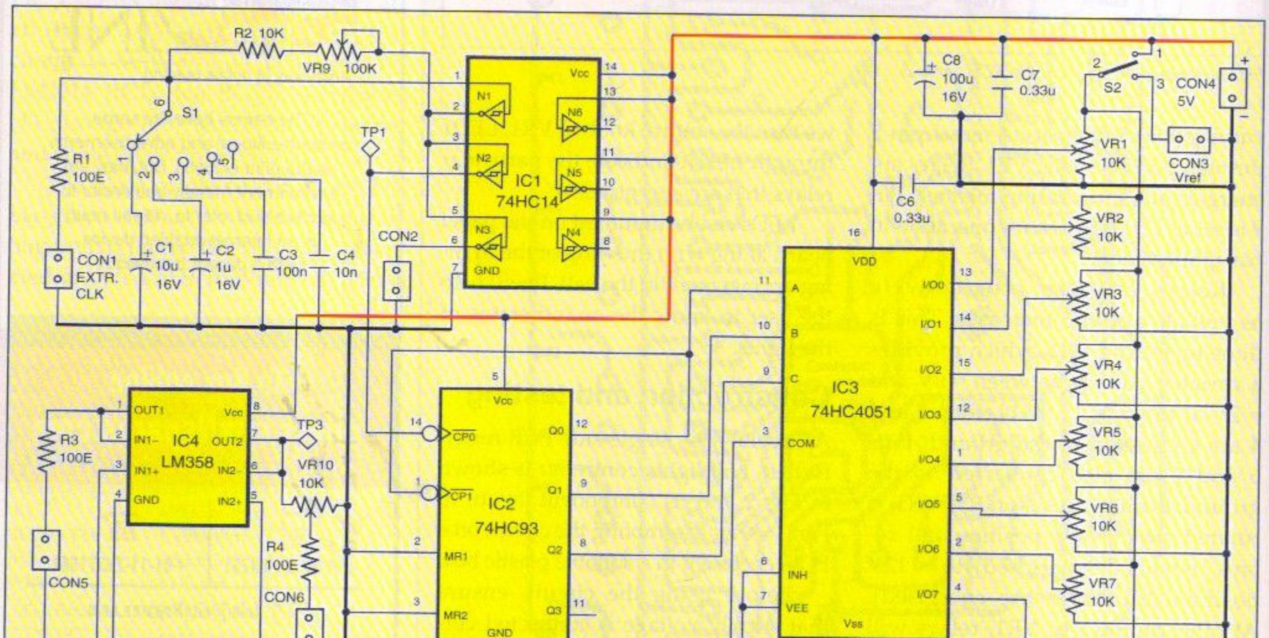

Fig. 1: Circuit diagram of simple adjustable staircase waveform generator