

## Experiment # 1

### 555 TIMER IN INDUSTRIAL APPLICATIONS

#### INTRODUCTION:

The 555 Timer is a universally accepted device for the generation of clock waveforms, single pulses, PWM, FM and in a wide range of applications ranging from simple hobbyist games to computer timing control. Our major interest in the present experiment is to investigate the use industrial applications of the 555 timer. In this regard usually two transducers are combined with the 555 timer to provide us with a useful application. Usually a transducer is used to convert a nonelectrical quantity into an electrical quantity is used to control the frequency of operation of the 555 timer. As you know the frequency of oscillation of a 555 timer configured as a square wave generator is a function of the externally connected resistances. Thus by making one of these resistances a function of a nonelectrical quantity it is possible to change the frequency of oscillation according to the variations of this nonelectrical quantity. The output square wave of the 555 timer can be used to give the user a sensible measure of the variations in the nonelectrical quantity. This can be achieved through flashing, ringing or any other measuring system. In all cases the change in the frequency of the square wave output of the 555 timer is used to activate another transducer at the output of the system.

#### EXPERIMENTAL WORK:

In this experiment we will examine the operation of a number of interesting industrial applications of the 555 timer.

(a) Skin Resistance (lie Detector)

Fig 1 shows the circuit of a lie detector. In this application, the body resistance is used to control the frequency of oscillation of the 555 timer. The output is obtained via a loudspeaker. The theory behind this lie detector is very simple. It is well known that when the subject tells the truth he remains relatively relaxed, but he becomes exposed to increased stress when he lies. Stress causes increased perspiration, which in turn results in increased resistance between the two electrodes positioned on the subject's skin.

(b) Electric Fuel Pump Driver

Fig 2 shows the circuit of an adjustable-speed pump driver. In this application the 555 timer and a transistor provide a system for driving a high-speed electric fuel pump. This arrangement allows the pumping rate to be adjusted and can be used with any pump of the solenoid-plunger type. The output of the 555 timer drives the transistor on and off and so operates the solenoid-driven plunger of the pump. Commutating diode D protects the transistor from surges at the turnoff. The speed can be adjusted by changing  $R_2$ . The components shown are selected to drive a pump requiring less than 1 ampere. If a different pump is used that requires a current of more than 1 ampere, a different transistor must be chosen.

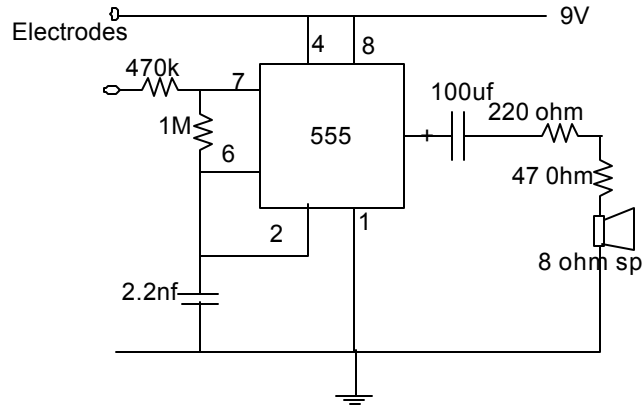
(c) Flasher

Fig. 3 shows the circuit of a flasher. It can be used in a darkroom situation to indicate whether it is safe to enter or not. Other applications are also possible. Explain the circuit operation.

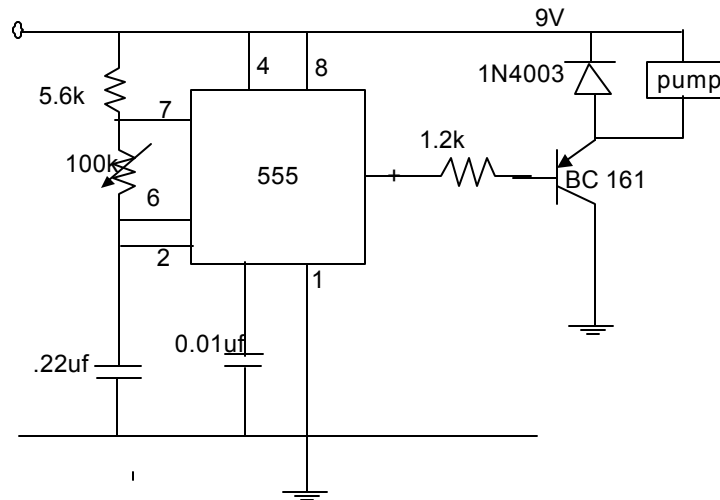
Note that the transistor must supply the necessary current for operating the lamp.

YOU ARE REQUESTED TO CONSTRUCT THESE THREE EXAMPLES. VERIFY THEIR OPERATION. WRITE A REPORT INCLUDING YOUR OBSERVATIONS.

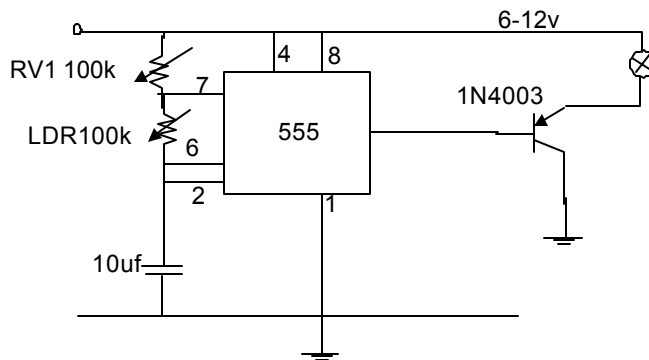
WHY NOT TRY TO MODIFY THESE CIRCUITS TO PRODUCE OTHER USEFUL INDUSTRIAL APPLICATIONS?



**Fig. 1: Lie Detector**



**Fig.2: Adjustable speed Pump Driver**



**Fig.3: Flasher Circuit**