

# **Design and Development of a Microcontroller Based Dedicated Counting Device for Mosquito Larvae and Pupae**

**Nusrat Jahan, M. G. S. Islam, M.M.Rashid, M. Aliuzzaman and F. Ahmed**

*Institute of Nuclear Science and Technology (INST), Atomic Energy Research Establishment (AERE)  
Ganakbari, Savar, Bangladesh.  
E-mail: palash.eng07@gmail.com*

## **Abstract**

A Custom designed Microcontroller based dedicated electronic counting device for mosquito larvae and pupae has been designed and developed for the Institute of Food and Radiation Biology (IFRB), BAEC. A dedicated mosquito detector comprised with a glass tube, LEDs and LDRs, has been designed and developed indigenously. When mosquito larvae/pupae are passed through the glass tube, by a pumping device, electrical pulses are generated from the detector. The electrical pulses are then amplified to the TTL level before the counting process. PIC 16F84 has been programmed intending to control overall counting procedure and to display the counting up to 999 mosquitoes through a 7 segment display unit. The device will be used to collect and count the desired numbers of mosquito pupae or larvae from larval colony for insect biotechnology research work. The microcontroller controlled counting device will replace manual time consuming process with better accuracy.

Keywords: Microcontroller, mosquito, larvae, pupae, LDR, display.

## **1. INTRODUCTION**

A Microcontroller based dedicated electronic counting device for mosquito larvae and pupae has been designed and developed in support of insect biotechnology research work to be used in the Institute of Food and Radiation Biology (IFRB), BAEC. The insect biotechnology research lab of Institute of Food and Radiation Biology sterilize mosquito pupae or larvae for their research purpose. During the research procedure they need to pick and count the desire number of mosquito larva from the larval colony manually, which is very tedious job and time consuming. A mosquito sensor unit comprised of a glass tube, a couple of LED and LDR have been designed and developed indigenously to detect the presence of any mosquito inside the glass tube. The microcontroller PIC 16F84 has been programmed intending to control overall counting procedure and to display the counting up to 999 mosquitoes through a 7 segment display unit.

## **2. DESIGN PRINCIPLE**

The microcontroller based dedicated electronic device used for automatic counting as well as displaying of mosquito larvae and pupae comprised of three individual units as follow:

1. Sensor unit
2. Control unit
3. Display unit.

The block diagram of this device is shown in fig: 1

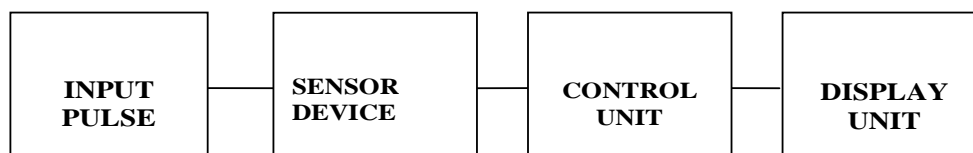


Fig. 1: Block Diagram of Electronic Counting Device of Mosquito Larvae and Pupae.

### 3. SENSOR DEVICE

The sensor unit combined with three individual parts. Those are: Detector, Amplifier and Monostable multivibrator.

When mosquito larvae/pupae are passed through the glass tube, with the help of a pumping device, electrical pulses are generated from the detector. The detector is nothing but a simple arrangement of one LED and three LDR and has been mounted round the glass tube as shown Fig:2 and Fig:3. When mosquito passes through the glass tube, it blocks the light emitted from LED and create the variation of resistance and voltage drop eventually. This change of voltage drop in turn causes the change in biasing condition of transistor Q1 (C828) in such a level necessary to put the transistor Q2 (C828) into saturation. In fact Q2 transistor acts as an amplifier to generate the electrical pulses of TTL level. The 555 timer IC has been designed as one shot pulse generator (multivibrator). A single fixed width pulse is produced when the 555 timer receives a signal as trigger input from Q3, which functions as an inverter. The width of 555 IC output pulse can be adjusted by the values of R and C. The detail sensor diagram is presented in figure 4.

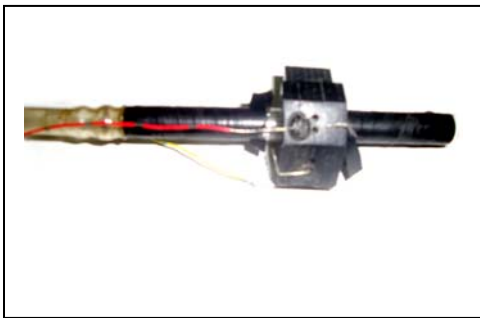


Fig: 2 Detector of Mosquito Counting Device

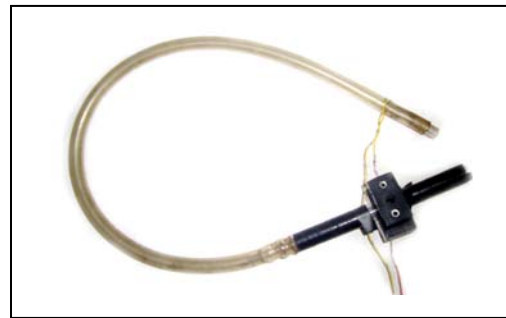


Fig:3 Total view of the detector of mosquito counting device

4.

### CONTROL UNIT

PIC 16F84 has been programmed intending to control overall counting procedure and to display the counting up to 999. A microcontroller (also microcomputer, MCU or  $\mu C$ ) is a small computer on a single integrated circuit consisting internally of a relatively simple CPU, clock, timers, I/O ports, and memory. For the present purpose PIC16F84 has been selected. The main feature of the 16F84 is its 1024 bytes EEPROM memory that is electrically erasable and reprogrammable. It has 35 single word instructions to execute the entire program flow and all of the resetting, clocking, programming and timing is implemented in software. It has one 4-bit port (Port A) and one 8-bit port (Port B) and each line of these ports can be individually set as an input or output.

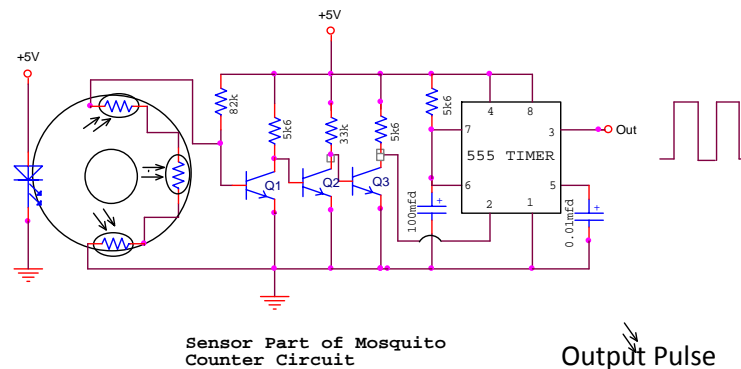


Fig:4 Circuit Diagram of Sensor Part of Mosquito Counter

## 5. DISPLAY UNIT

The display unit has three latches and three 7 segment display units. The latch is an electronic logic circuit that transfer the data from input side to the output side as long as the IC keep selected by a specific chip select pin. The output data of the latch has been passed to 7 segment display finally. The seven segment display is a form of electronic display device for displaying numerical number.

## 6. WORKING PRINCIPLE

The Circuit Diagram of Electronic Counting Device for Mosquito Larvae and Pupae is shown in fig:5. When mosquito larvae/pupae are passed through the glass tube, by a pumping device; light from LED surrounded glass tube has been interrupted. Change of light intensity of LED cause the variation of resistance of LDR and this consequently change the electrical pulses generated from the detector.

Counting device for Mosquito Larvae and Pupae

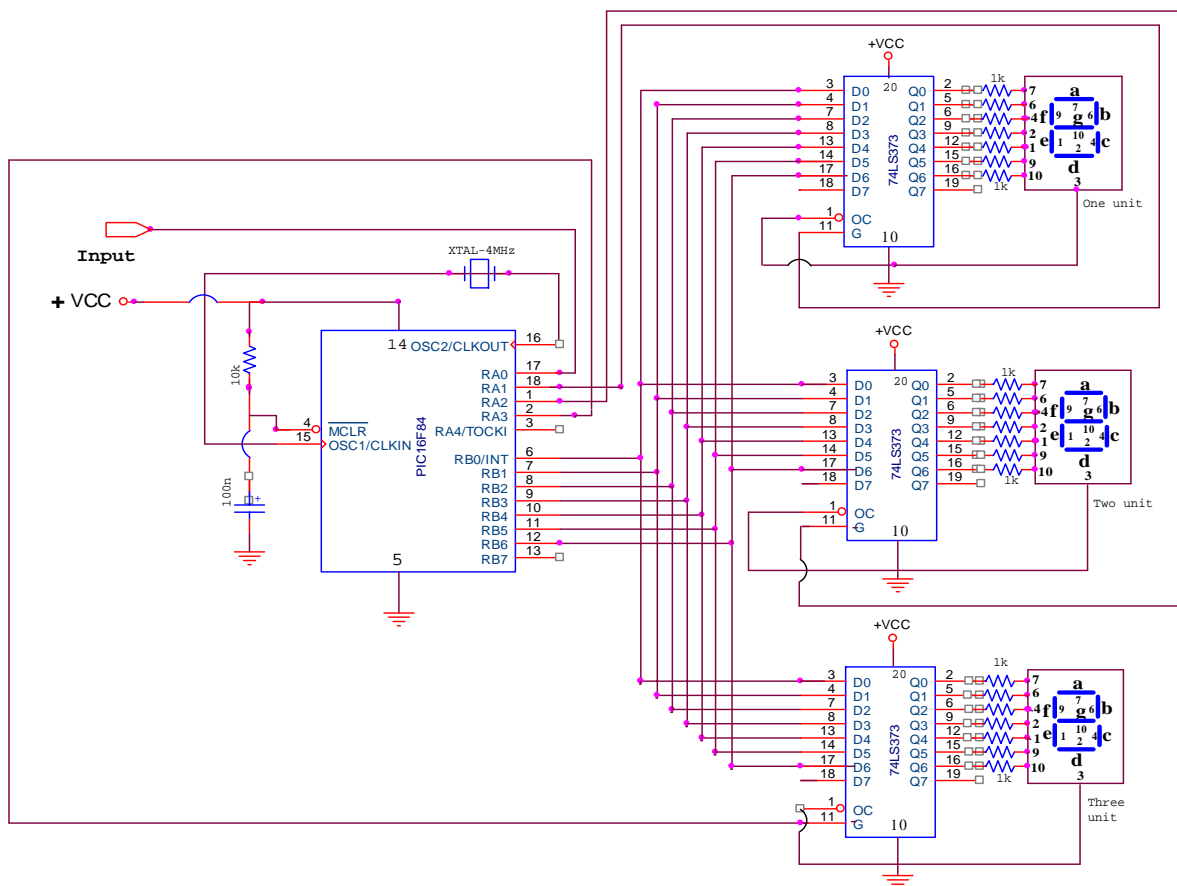


Fig: 5 Circuit Diagram of Electronic Counting Device for Mosquito Larvae and Pupae.

These electrical pulses have been amplified to the TTL level before the counting process. Pulses have been counted and displayed up to 999 through a 7 segment display unit. Microcontroller (PIC 16F84) has been programmed intending to control the overall counting and display procedure.

## 7. CONCLUSION

The Counting Device for Mosquito Larvae and Pupae has been designed and developed. The microcontroller controlled counting device will replace manual time consuming process with

better accuracy The developed device will be used to count mosquito larva automatically up to 999.

## **REFERENCES**

- [1] Millman & Halkias, Electronic Devices and Circuits, Mcgraw-Hill Book Company, 27th Printing 1985.
- [2] R.A. Penfold, An introduction to PIC Microcontrollers, Bernard Babani (Publishing) Ltd, October, 1997.