

## Displaying Characters using Water

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*Abstract*---Our project “waterfall graphic print” can be described in one word as water speaks. In our project, we are using water as display element and develop a structure using AVR microcontroller, Solenoid valves, Triac-BT316 and MOC-3041. waterfall graphic print can be described in one word as water speaks. Characters which we display are the combination of water droplets and each character size is very large. We cannot display any word file or book using this technology. When water falls in air it creates the characters, so characters are very large and it takes time to read the whole word with proper attention Our project is used at many places like malls, colleges, company to display numbers and logos and different designs in air by using the water and to increase the value of the place. It is also used in chemical industries and dairy industries to mix the liquids in proper percentage by proper controlling of valves. So this project has many applications in general as well as in industries. It can be used at public places for enjoyment and also for publicity of any product. The most important part of this project is programming and we use AVR controller for programming and the software we used is BASCOM. Programming is very easy in this controller, so we spend more time in developing different logics instead of use that time in syntax. In this project, the microcontroller atmega16 is connected to PC or laptop through keyboard interfacing connection. So that the character can be displayed as soon as corresponding button is pressed on the keyboard. Keyboard interfacing will makes this project more user friendly.

**Keywords:** waterfall, AVR microcontroller, solenoid valve, Triac-Bt136, Moc3041, pump

### I. INTRODUCTION

Water is a transparent and colourless element of nature. A dynamic information waterfall with a mesmerizing sensory impact that provides a unique way to display real-time information and delivers a stimulating consumer experience. Water is life giving, refreshing and powerful. Generally in all displays today the basic element that is used to display the images or words is rather a cathode ray tube or new types of displays are the liquid crystal display or LED and LCD TVs. The main difference between this displays and our display is that we use water to display the characters and logos or designs. Though the mechanism used here is simple but its output will leave a long-lasting impact upon viewers. We take one pipe and attach 10 reducers to pipe and from each reducer small pipe join for output, and that all small pipes are join to solenoid valves as input. We attach 10-10 reducers at input and output of valves. Each solenoid valve input and output side connected using the reducers. We use submersible pump for circulation of water in pipe. This project’s main part is programming. Solenoid valves switching is done by triac-bt136 and transistors. And for the

programming we used AVR microcontroller and the software BASCOM is used for the programming.

### II. REQUIREMENTS OF THE PROJECT

- 1) GPB
- 2) Microcontroller ATmega16
- 3) Moc3041
- 4) Triac-Bt136
- 5) Solenoid Valve
- 6) Submersible Pump
- 7) LCD
- 8) 4\*4 matrix keypad
- 9) Reducers
- 10) Pipe
- 11) Transformer

### III. TECHNIQUES FOR OPERATING SYSTEM

#### A. AVR Microcontroller :

AVR microcontroller is used in the project due to its advantages over other microcontrollers like AT89C51. The advantages include maximized power consumption, removal of data transfer bottlenecks, sleepwalking, fast wakeups, advanced arithmetic performance, flash security and peripheral cooperation. AVR microcontroller has high performance and it consume low power, it has inbuilt ADC and also provide six sleep modes. Programming is very easy in this controller. So it is more efficient. Triac-Bt136 is interfaced directly to microcontrollers and used for motor controlling and valve switching. Many languages like c, c++, assembly language, bascom avr can be used to operate this system but among all bascom is simplest to implement. And this software has also very easy syntaxes, so we can learn and do programming in less time. Robokits software is used for loading the program hex file in the microcontroller. After loading the program, it is stored for the long time period. Proteus software is used for designing of circuit. Proteus is software for microcontroller simulation, schematic capture, and printed circuit board (PCB) design. It is developed by Lab centre Electronics. The AVR microcontroller is connected to PC or laptop through keyboard interfacing by using serial cables. And hyper terminal software is used for keyboard interfacing.

#### B. Solenoid Valve :

Solenoid valves switching is done by relay and transistors.

- Solenoid valve has main 3 parts:
  - 1) Coil
  - 2) Water input/output
  - 3) Relay connection

When the supply is given to the coil it energized and attracts the magnet at upper-side. By proper on/off controlling of valve alphabets or patterns are created by

valves. The various components of the solenoid valve is shown I figure 1.

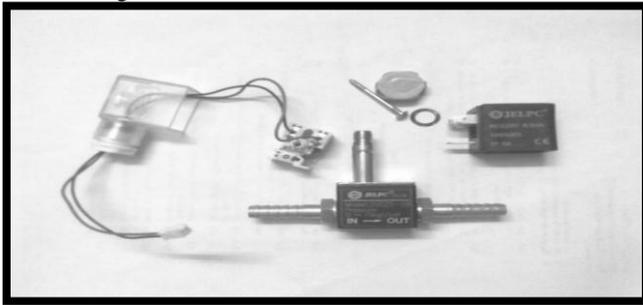


Fig. 1: Solenoid Valve

C. TRIAC BT136 :

It is a planar passivated sensitive gate four quadrant and plastic package intended for use in general purpose. It has idirectional switching and phase control properties. This sensitive gate "series E" triac is intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits. Direct triggering from low power drivers and logic ICs High blocking voltage capability. It uses low holding current for low current loads and lowest EMI at commutation.

Triggering in all four quadrants Figure 2 shows TRIAC BT136.

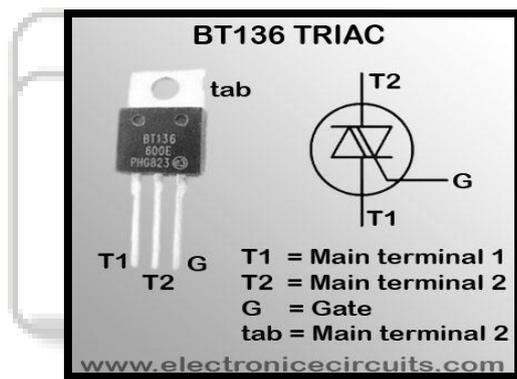


Fig. 2: TRIAC BT136.

D. MOC3041 :

The MOC3041, MOC3042 and MOC3043 devices consist of gallium arsenide infrared emitting diodes optically coupled to a monolithic silicon detector performing the function of a Zero Voltage Crossing bilateral triac driver. They are designed for use with a Triac in the interface of logic systems to equipment powered from 115 Vac lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

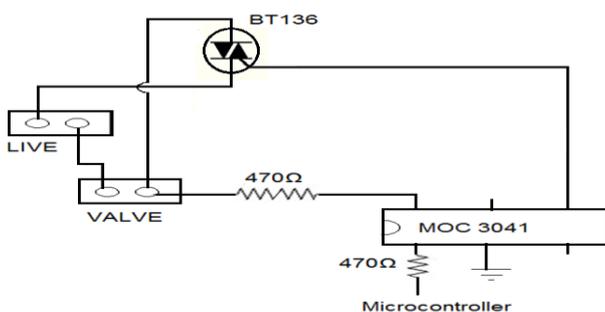


Fig. 3: Interfacing of MOC 3041

IV. METHODS

The proposed method is built in three stages and it is applied to the display screen.

- 1) Design the structure and mount the hardware components and circuits.
- 2) Load the fixed time delay in to micro controller and develop the logic program to operate the valves.
- 3) Press the key on keyboard and same alphabet or number displays by waterfall with the help of solenoid valves.

V. EXPERIMENTAL SET-UP

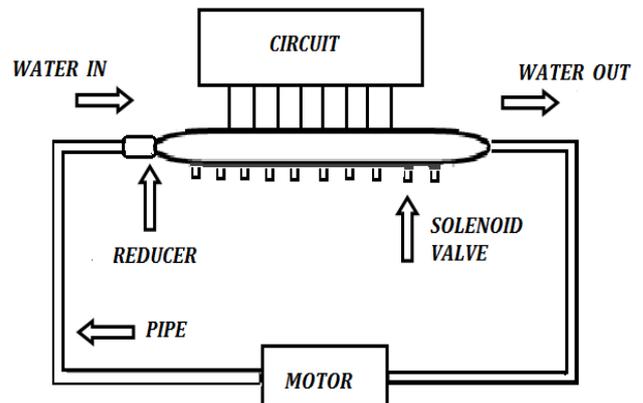


Fig. 4: Arrangement

The arrangement of our project is shown in figure 4. The main water pipe's both ends are cover by reducers and it forms a complete close loop of water circulation. The hardware consist a pipe, reducers, motor and solenoid valves. All valves are connected in pipe and one circuit is design to operate that all valves. In above structural design, main pipe consists of 10 fitted reducers and at each reducer output; a pipe is connected for output. That output is given to valve as input. At both end of pipe different diameter reducers are used for creating water pressure inside the main pipe. Water circulation is done by the submersible pump. This circuit can operate the whole project with the help of computer or Laptop. The program is already stored in the controller by using Bascom. So when the power supply is given to the circuit, and as we press the key on keyboard, same alphabet or number displays by water with the help of solenoid valve switching with fixed delay time which is already loaded in the AVR microcontroller. A proprietary computer system and software synchronizes hundreds of valves expelling single water drops on demand which result in a freely definable bit-map muster. The core Aqua script module is 1 meter long and can easily be extended by adding modules up to 60+ meters. The block diagram of the project is shown in figure 5.

As shown in the diagram, microcontroller is connected to the Triac-Bt136 and valve assembly. Also the microcontroller is connected to LCD through keyboard interfacing.

By programming the microcontroller we give input to switching circuit (MOC 3041 and Triac-Bt136) and it operates the valves. Triac-Bt136 and MOC3041 is used for the switching the valves and for controlling the motor. The circuit diagram is shown in figure 6.

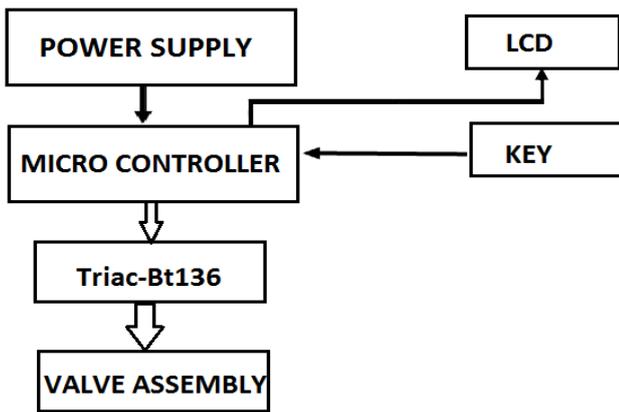


Fig. 5: Block diagram

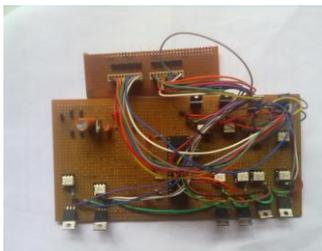


Fig. 6: Circuit diagram

This circuit is connected to PC or laptop. When we press any key on keyboard, same character or number displays in the form of water droplets. The keyboard interfacing connection to laptop is shown in figure 7

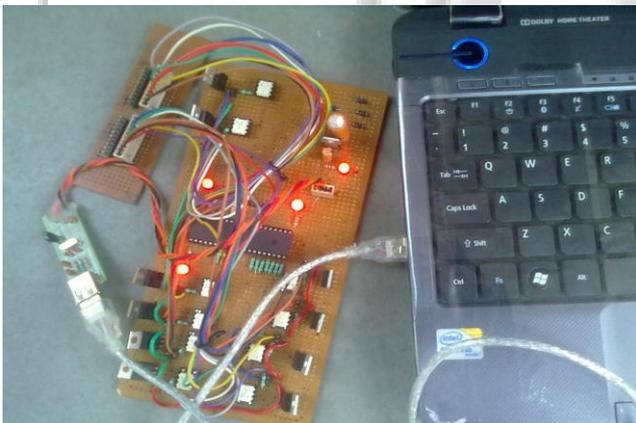


Fig. 7: keyboard interfacing

## VI. SOFTWARE SPECIFICATION

This project's heart is programming and we use AVR controller for programming and the software we used is BASCOM. AVR microcontroller has high performance and it consume low power, it has inbuilt ADC and also provide six sleep modes. Programming is very easy in this controller, so we spend more time in developing different logics instead of use that time in syntax. So it is more efficient. After developing the program of displaying the pattern, ROBOKITS software is used for loading the hex file in the microcontroller by using loader. This software is used for all AVR microcontrollers. The program to turn on and off the valves is as follows:

```

$regfile="m16def.def"
$crystal=8000000

```

```

$framesize=40
$hvstack=32
$svstack=8
Config port D.4=output
Config port D.3=output
Config port D.2=output
Config port D.1=output
Config port D.0=output
Config port A.2=output
Config port A.1=output
Config port A.0=output
Config port D.6=output
Config port D.5=output
Do
Set port D.4
Wait 1
Reset port D.4
Set port D.3
Wait 1
Reset port D.3
Set port D.2
Wait 1
Reset port D.2
Set port D.1
Wait 1
Reset port D.1
Set port D.0
Wait 1
Reset port D.0
Set port A.2
Wait 1
Reset port A.2
Set port A.1
Wait 1
Reset port A.1
Set port A.0
Wait 1
Reset port A.0
Set port D.6
Wait 1
Reset port D.6
Set port D.5
Wait 1
Reset port D.5
Loop
End

```

## VII. APPLICATION

Water display can be used at the entrance of a company or institute thereby adding value to its infrastructure. It can be used in malls and hotels for public attraction. It can increase the popularity of malls and hotels. We see huge advertisement banners on the roads for the publicity of any product. Water display can be used as an alternate. The 'Name of Company' or 'Company logo' or 'Tag-line of the company' can be displayed. People can use water display at birthday parties for wishing happy birthday to the person or at wedding receptions.

Another application of solenoid valve is in the dairy industry. Milk and milk products such as butter milk can be poured into cans. These valves can also be used in chemical industry for mixing various chemicals in the right

proportion. Here the amount of each constituent is fixed and accuracy is required which can be obtained by solenoid valve. Solenoid valves can be used for filling liquid into containers. The quantity of liquid can be programmed. So required amount of liquid can be filled depending on the size of the container.

[6] The 8051 microcontroller and embedded systems

#### VIII. MERITS

The waterfall graphic print project is an Attention Grabbing model. It is plug and play system and can easily mounted indoor as well as outdoor. This project is interactive and is used for many purposes. It is also controlled by remote. Therefore it is flexible and scalable. This system is maintained easily and quickly installed. The AVR microcontroller used in this project is very easy to operate. Programming using Bascom software is easy. Water used in the system can be recycled. It replaces other complex system for filling up the liquid in the desired containers. It is a cost effective decorative piece.

#### IX. DEMERITS

As we know that the water is constantly flowed through the valves may cause rusting of some parts of the valves. Therefore Replacement of solenoid valve is necessary after certain period of time. This may increase the maintenance cost. Also casing is necessary to protect circuit from dust, accidental contact, water, etc...

#### X. FUTURE EXPANSION

Currently this project, 10 valves are used for displaying a character but it can be expanded in many valves for displaying logo of the company; name of company, institute, hotels. Digital time can also displayed by this system.

#### XI. CONCLUSION

By this system we can display characters in a water fall. This system successfully displays all characters and numbers by water fall. Solenoid valves are very well-suited for this application. By using the triac we can get  $\mu$ sec delay. By keyboard interfacing we can operate the whole project with the help of computer or Laptop. As we press any key on keyboard, same character or number displays in the form of water droplets. Also this system is used for air purification and humidification. It creates a calming atmosphere. Hence "waterfall graphic print" system is dazzling accent piece with feel good factors.

#### ACKNOWLEDGMENT

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