International Journal of Scientific Research and Management Studies (IJSRMS)
ISSN: 2349-3771 **Volume 2 Issue 9, pg: 383-390**

RADIO FREQUENCY BASED WATER LEVEL MONITOR AND CONTROLLER

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ABSTRACT

Water is a nectar for our life. Without water, we cannot expect about life. Now a days the carelessness of the people arise the problem of water scarcity. Earth is the only planet where the life exists. Earth is covered with 70% of water. The system consists of two parts: transmitter and receiver/pump end. The transmitter end consists of a microcontroller, encoder and an RF transmitter. The receiver/pump end consists of a microcontroller, a water pump, decoder, seven segment display and an RF receiver. The pump will draw water from the pump end to the transmitter end when the storage container is not full. The transmitter will communicate the state of the container wirelessly to the receiver.

KEYWORDS— *Radio Frequency, Level controller, Sensor, Indicator, Pump*

I. INTRODUCTION

In this project we show that how we monitor and control the overhead tank using RF module technology. In this project we fit one module on the overhead water tank and one module at the bottom near the motor.

With the help of wireless radio frequency signal we continuous monitor the overhead tank position. If the tank water is very low down then circuit provide a signal and connected motor is on. In the base circuit we use one seven segment display to display the water level in numbers. Four LED to display the water level. One manual switch to on/off the motor any time.

In this, we show the water level indicator, top level alarm, and auto motor off with the help of the micro controller. With the help of this project we will not only display the level by led but at the same time display the seven segment number also. If the water touches to the top level then alarm is on for a time and motor is off automatically.

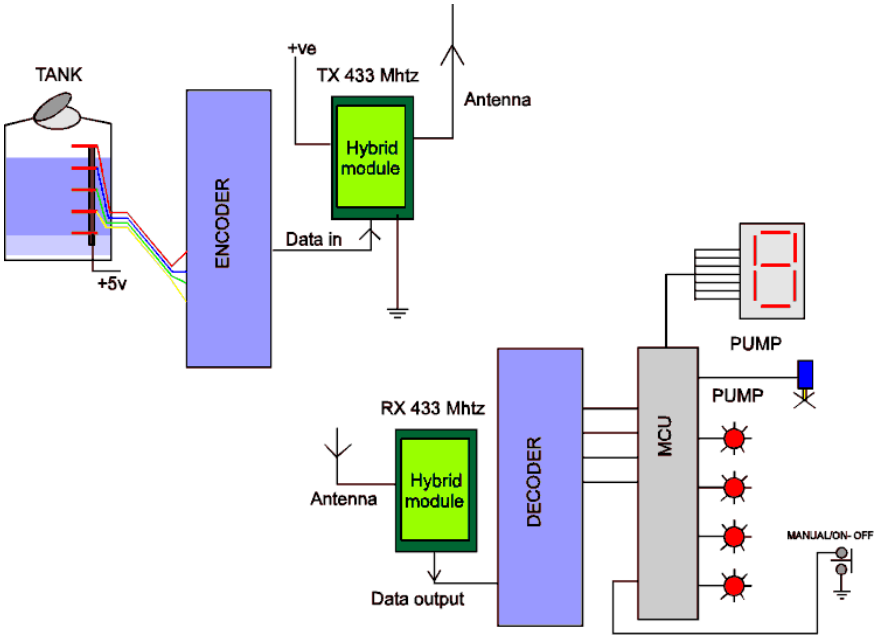

Fig.1: Block Diagram of Water Level Controller

II. BACKGROUND KNOWLEDGE

2.1 IC AT89C51

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the industry standard MCS-51™ instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. The AT89C51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a full duplex serial port, and on-chip oscillator and clock circuitry.

In addition, the AT89C51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The Power down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset. Pin structure of AT89C51 is shown in figure 2.

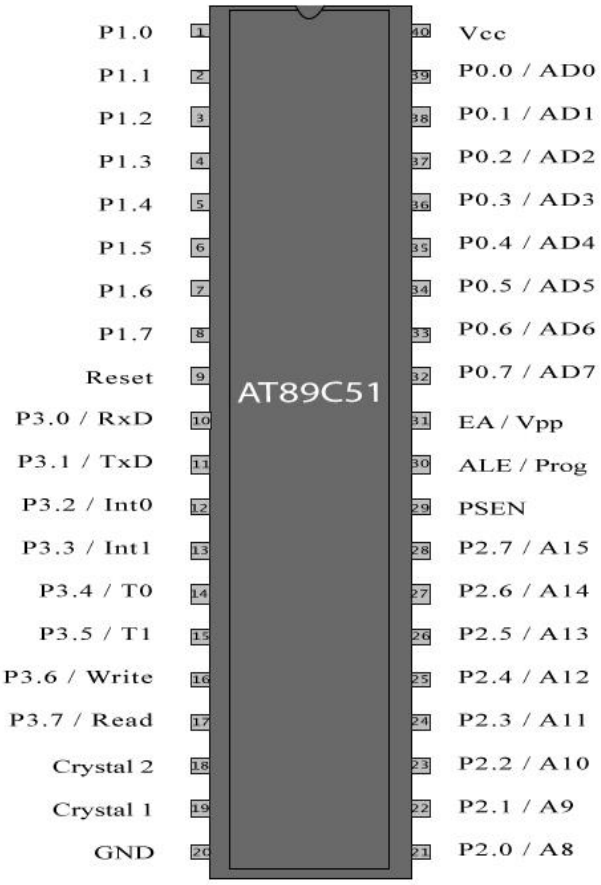

Fig.2: Pin structure of AT89C51

2.2 Level Sensor

For water level scan, we insert the one pipe in the tank. The bottom point of the pipe is connected to the positive line. As the water is rises in the tank other points on the pipe is in contact with the water and the positive voltage is also travel. We connect all the output from sensor to the IC 4049 directly. Output from the IC 4049 is inverted. IC 4049 is inverter cum buffer IC. Output from the IC 4049 is connected to the port P1 directly. Processor gets a data from the port p1 and display on the seven segment display. At the same time this data is display on the LED.
Motor is start by manually any time with the help of switch but off automatically. We provide this solution because to switch on the motor manually is suitable for every condition. It is our choice to switch on the motor or not. Once you switch one the motor then motor is still on until tank is not filled. As the water is filled in the tank motor is off automatically.

2.3 Light Emitting Diode (LED)

LED is special type of diode that can emit light energy when the energy out as heat. The LEDs are available in different colours like red, yellow and infrared (invisible) by using elements such as gallium, arsenic and phosphorus.

III. MAJOR COMPONENT DESCRIPTIONS

The major circuit components of this system are as follows:- AT89C51 Microcontroller, RF Module, HT12E Encoder, and HT12D Decoder. Figures 1 show all the sections of this project.

3.1 Transmitter Module

In the transmitter circuit we insert one plastic probe in the overhead tank. On this plastic probe we connect few connecting wires. We connect five wires. Out of these five wires, four wires are connected with the overhead tank and one wire with the common positive voltage. As the water is to be raise in the tank. Positive voltage on the bottom is also to be transfer from lower point to higher point. Now positive voltage from the bottom is to be connected to other point of the probe. Voltage from the probe is connected to the IC 4049 hex inverter IC. Hex inverter IC gets the data from probe and connected to the encoder chip directly. Here we use HT 12 E encoder IC to convert the parallel data in serial. Output of the HT 12 E is connected to RF transmitter. Here we use 433 MHz transmitter to transmit the data in air.

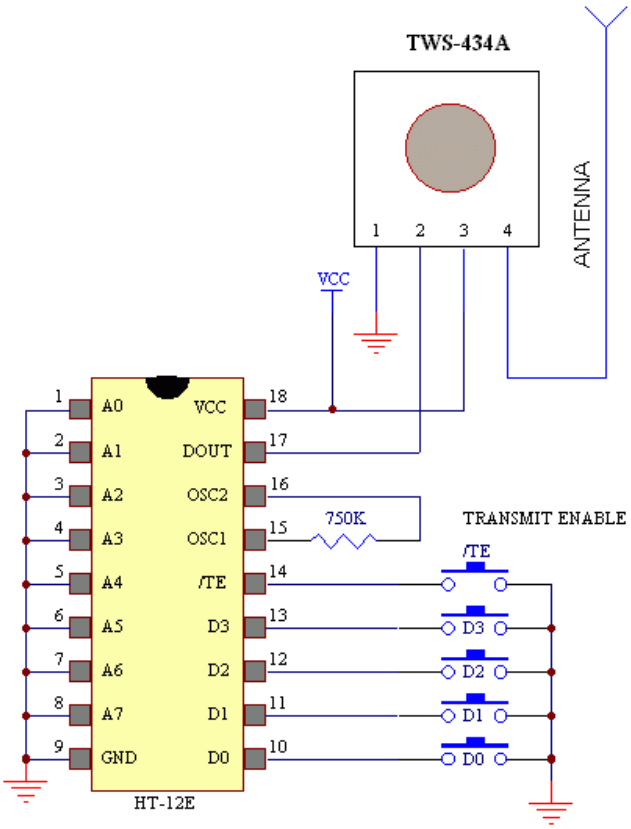

Fig.3: Encoder/RF transmitter sub-circuit

The TWS-434 and RWS-434 are extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter module is only 1/3 the size of a standard postage stamp, and can easily be placed inside a small plastic enclosure.

3.1.1 TWS-434

The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.

Fig.4: TWS-434A

The TWS-434 transmitter accepts both linear and digital inputs, can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The TWS-434 is approximately the size of a standard postage stamp.

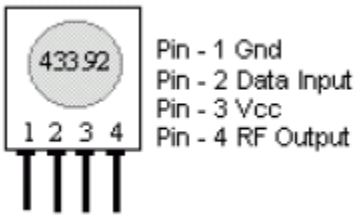

Fig.5: TWS-434 Pin Diagram

3.2 Receiver Module

In the receiver circuit first of all we use one receiver module to receive the data from transmitter. Data from the receive module is serially output. Output from the RF module is connect to the decoder IC. Output of the RF module is connected to the pin no.14 of the IC. Pin no.1 to 8 is address line and connected to the ground pin. We set the same address line of the transmitter and receiver. Pin no.15 and 16 of the IC is connected to the external resistance to provide an oscillation circuit.

Output from the decoder is connected to the pin no.5, 6, 7, 8 of the microcontroller directly. Pin no.18 and 19 is connected to the external crystal oscillator o provide an external clock to the circuit. Pin no. 40 of the controller is connected to the positive 5 volt supply. For this positive 5 volt supply we use one step down transformer to step down the voltage from 220 volt ac to 9 volt ac. This AC is further converted into DC with the help of the full wave rectifier circuit. Output of the rectifier is further converted in smooth dc with the help of the filter capacitor. Output of rectifier is further converted into smooth dc with the help of the 7805 regulator. IC 7805 regulator provide a regulated 5 volt dc to the circuit. This supply is connected to the pin no.18 of the decoder IC and pin no.40 of the controller IC.

Seven segment display is connected to the pin no. 39 to 32 of the controller to display the water level in digit. Water level LED is connected to the pin no.1, 2, 3, 4 of the controller. Positive point of the LED is connected to common positive and cathode point of the LED is connected to the controller via 470 ohm resistor. Start switch is connected to pin no. 13 of the controller. Switch is connected with the ground voltage. As we press the switch motor is to be start. With the help of this switch we on/off the motor when we require. As the water level is very low down then motor is to be start automatically.

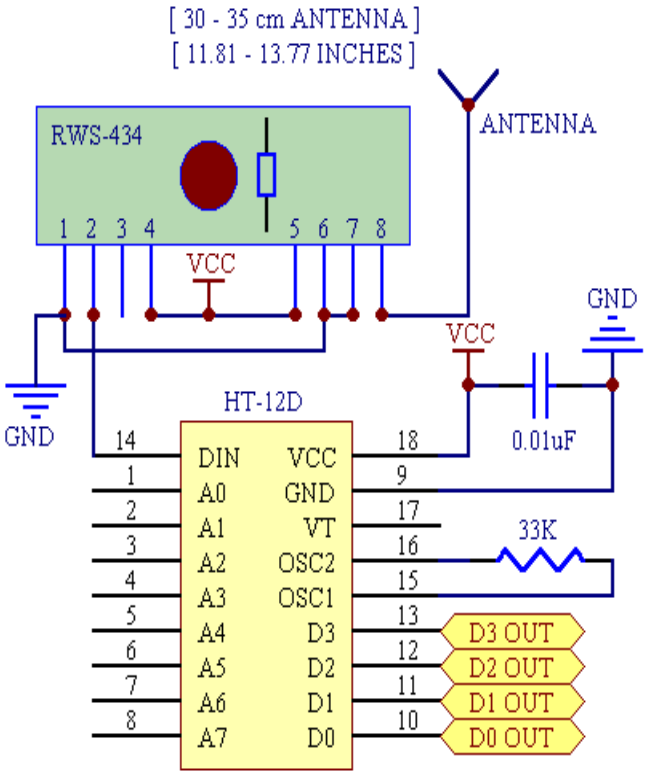

Fig.6: Receiver/decoder sub-circuit

3.2.1 RWS-434

The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The RWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

Fig.7: RWS-434 Receiver

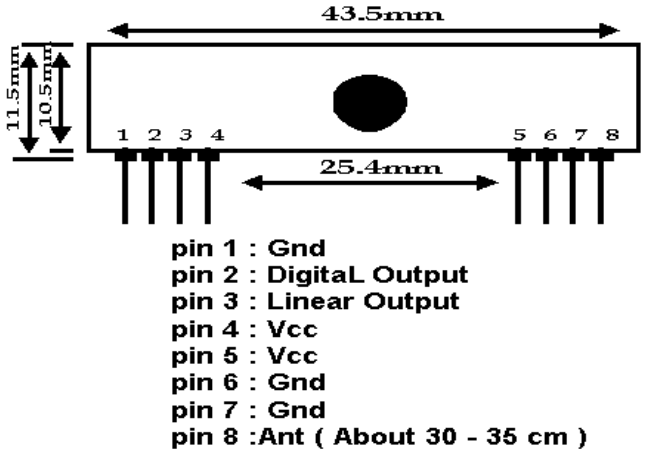

Fig.8: RWS-434 Pin Diagram

IV. CONTROL UNIT

For this work we connect a small dc motor base pump with the microcontroller via two transistor circuit and connected to a relay circuit. The collector of this transistor is connected with the relay circuit and the emitter is grounded. Output of the controller is in active low output. So to get an output from the controller we firstly connect a PNP transistor. Output of the PNP transistor is further connected to the NPN transistor. Output of the NPN transistor is connected to the small dc motor directly. The output of the relay circuit is connected with motor pump's cable as a negative. The other side of motor's cable connected with AC 220V as positive voltage.

V. CONCLUSION

Water is precious for life. As we know that water is used in day to day work like cleaning, bathing, washing etc. It is known that only 2-3% water is applicable for drinking on earth. Water is also useful to make electricity. So we can learn that water is precious for us. In this paper wireless monitoring and controlling of water tank makes the switching of device fully automatically and wirelessly thus we conclude that by using the RF module technology our work of switching becomes very easy. Through this project we understood the basics of microcontroller and the concept of RF transreceiver. It is best applicable for residential application. Our range is covering upto 15m. These systems can be linked to relays which can automatically control the switching of gates by allowing excess water to flow. It has no problem such as breakage of wire arising after installation.

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