



Automatic Water Level Sensor and Work Wireless, Contactless

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Abstract: A Water Level Indicator is used to detect and indicate the water level in an overhead tank or any other water container. In this paper, we investigated the design of a water level sensor device using IC 328, that can detect the level of water in a water storage system. The Automatic Wireless Contactless Water Level Sensor System is a modern and efficient solution designed to monitor water levels in various applications without direct physical contact. This system employs ultrasonic technology for accurate and reliable water level measurements, ensuring ease of use and maintenance. The wireless communication feature enables real-time data transmission to a centralized monitoring system, providing timely information for effective decision-making.

Keywords: Contactless Water Level Monitoring, Wireless Water Level Control, Automatic Water level control, Industrial Water Management.

I. INTRODUCTION

Automatic water level controllers are a product that was created to automatically control a motor, which helps to ensure a constant reserve of water in a storage tank. These automatic water level controllers are used to automatically fill the over-head tank when it starts or has become empty as well as monitor the water level in it. Automatic water level controllers switch the motor on whenever the water level drops below a certain level and shuts the motor off when the water rises well above a fixed level. The motor will also switch off when the sump water is exhausted before it fills the over-head tank, or if the pump is running dry as well as maintains voltage fluctuations.

These are state of the art advanced, digital technology micro-controller based products. This system is quite versatile. There are also custom made variations such as control of tanks. An automatic water level sensor is a crucial component in modern water management systems, designed to monitor and control water levels in various applications. This sensor technology eliminates the need for manual intervention, offering an efficient and automated solution for maintaining optimal water levels.

The primary purpose of automatic water level sensors is to prevent overflow or depletion in water reservoirs, tanks, or other containers by providing real-time data on the water level and triggering appropriate actions based on pre-defined thresholds. Automatic water level sensors find widespread applications in diverse sectors, including agriculture, industrial processes, smart homes, and environmental monitoring.

In agriculture, they assist in efficient irrigation by automating the control of water supply based on the crop's water requirements. In industrial settings, these sensors contribute to the optimal utilization of water resources, preventing wastage and ensuring a sustainable water supply. Additionally, in smart home systems, they enhance convenience and energy efficiency by automating water-related processes.



Schematic Diagram:

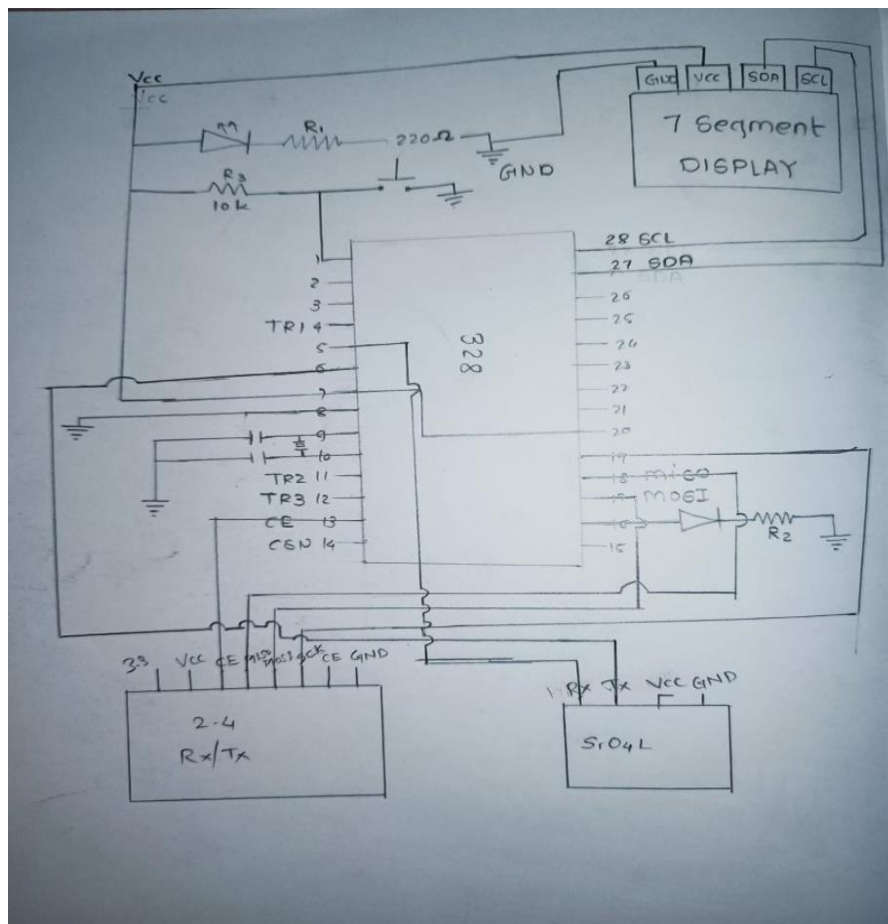


Fig. Schematic Diagram of Automatic water level sensor

II. PROCEDURE

1. Two circuits have been designed named as pcb1 and pcb2.
2. Wi-fi module is installed in both, its range is 2 km.
3. First circuit pcb1 will be near the water tank and other circuit pcb2 will be near the starter of the motor and transmitting/receiving process will be done in both the circuits.
4. A water level sensor is used in the pcb1 which is near the tank. So the microcontroller which is placed down of the tank knows how much water is in the tank.
5. If the water is less than 20% in the tank, the upper microcontroller (pcb1) will commend the lower microcontroller(pcb2) and then pcb2 near the motor will turn on immediately.
6. When the tank is 95% full, it will turn off automatically and the process will repeat itself.

III. WORKING

The working of an Automatic Wireless Contactless Water Level Sensor System typically involves the integration of ultrasonic sensors, wireless communication modules, and a microcontroller. Here's a simplified explanation of how such a system might work:

1. Ultrasonic Measurement:

An ultrasonic sensor is employed to measure the distance between the sensor and the water surface without direct contact. The sensor emits ultrasonic pulses, and the time taken for the pulses to travel to the water surface and back is measured.



2. Microcontroller Processing:

A microcontroller (such as Arduino, Raspberry Pi, or a specialized microcontroller) processes the time measurements from the ultrasonic sensor.

Using the speed of sound in air, the microcontroller calculates the distance from the sensor to the water surface.

3. Wireless Communication:

The microcontroller is connected to a wireless communication module (Wi-Fi, Bluetooth, LoRa, etc.).

The measured water level data is transmitted wirelessly to a centralized monitoring system or a receiving unit.

4. Data Logging and Analysis:

The receiving unit logs and analyzes the data received from multiple sensors.

Historical data may be stored for trend analysis and future reference.

5. User Interface and Alerts:

A user interface allows users to monitor real-time water levels, set alert thresholds, and configure system parameters.

An alert system can notify users in case of abnormal water levels, enabling timely responses to prevent issues such as flooding.

6. Power Management:

The system may incorporate power management features to optimize energy consumption.

This could include sleep modes or the use of renewable energy sources (solar panels) for sustainable operation.

ACTUAL CIRCUIT

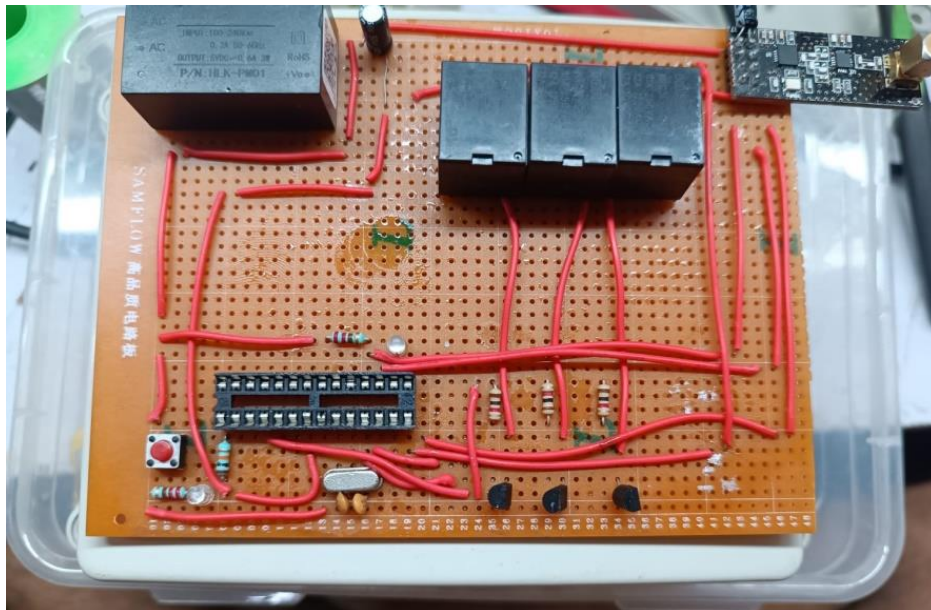


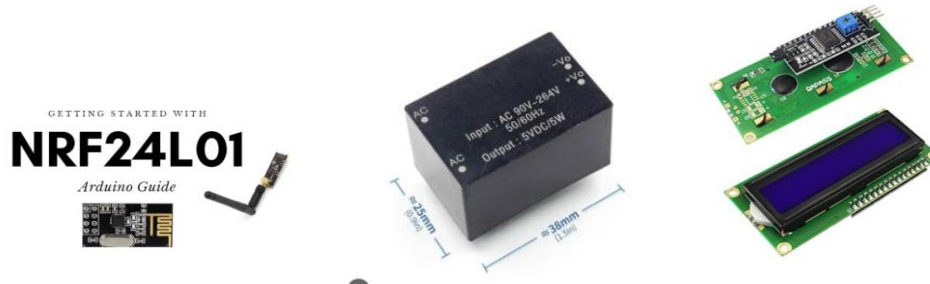
Fig. Actual circuit of Automatic water level sensor

Objectives:

- **Saving Money:** A water level controller helps save money by limiting the waste of water and electricity. These devices accurately regulate how much energy is used to protect against any unnecessary water/electricity usage. Over time, the money saved is quite substantial.
- **Preventing Overflow or Shortages:** One of the key objectives of an automatic water level sensor is to prevent both overflow and shortages. By continuously monitoring water levels, the system can send alerts or trigger actions when levels reach critical points. This proactive approach helps avoid overflow situations, which can lead to wastage and potential damage. Simultaneously, it aids in preventing shortages by ensuring that there is always an adequate supply of water available. This objective is crucial for maintaining the stability and reliability of water supply systems.



➤ Components Specifications:



The nRF24L01 is a wireless transceiver module that operates in the 2.4GHz ISM frequency band. It's designed for ultra-low power wireless applications and uses GFSK modulation for data transmission.

DC from 120V AC - 220V AC.

Voltage input: AC: 90 ~ 264V

High efficiency, high power density

Low power consumption, environmental protection, no-load loss <0.1W

Operation Temperature: -20 — +60°C

Rated input voltage: 100-220VAc

Maximum input current: <0.2A

Input current surge: <10A

Input Low Voltage Efficiency: $V_{in}=110V_{Ac}$, Output full-load: 69%

Input High Voltage Efficiency: $V_{in}=220V_{Ac}$, output full-load: 70%

Load rated output voltage: $+5\pm 0.1$

Shell maximum surface temperature does not exceed 60°C

➤ Description:

The Automatic Wireless Contactless Water Level Sensor System is an innovative solution designed for accurately monitoring water levels in various applications without the need for physical contact with the liquid. The system utilizes advanced sensor technology, wireless communication, and automation to provide real-time water level data for effective management and decision-making.

The intelligent non-contact liquid level sensor uses the inductive capacitance of water to detect whether there is liquid. When there is no liquid close to the sensor, the sensor has a certain static capacitance to the ground due to the distributed capacitance on the sensor

➤ Applications for Problem Solving:

PROBLEMS :

Remote water monitoring data collection can save hours in the field, lower costs and reduce risk. But many professionals avoid remote monitoring systems because they're notoriously difficult to set up and manage.

We've changed that with our reliable and easy-to-use cellular telemetry, and our powerful and versatile data services platform, for real-time access to your data from anywhere.

➤ ADVANTAGES:

The Automatic Wireless Contactless Water Level Sensor System offers several advantages that make it a preferable choice for water level monitoring in various applications. Here are some key advantages:

1. Contactless Operation:

The system operates without physical contact with the water, reducing the risk of sensor corrosion, fouling, or damage. This ensures a longer lifespan and consistent performance.

2. Accurate and Reliable Measurements:

Utilizes ultrasonic sensor technology to provide precise and reliable water level measurements. This technology is less affected by environmental factors and offers high accuracy in determining water levels.



3. **Wireless Communication:**

Enables remote monitoring and control through wireless communication modules such as Wi-Fi, Bluetooth, or LoRa. This feature allows real-time data transmission to a centralized system, facilitating easy access to information from any location.

4. **Reduced Maintenance Requirements:**

The contactless design minimizes the need for regular maintenance associated with traditional submerged sensors. This results in cost savings and ensures continuous operation.

5. **Energy-Efficient Operation:**

Incorporates energy-efficient components and sleep modes to optimize power consumption. This may include the ability to integrate solar panels or other renewable energy sources, promoting sustainability and reducing reliance on external power.

IV. CONCLUSION

In conclusion, the implementation of an automatic water level sensor with contactless, wireless capabilities represents a significant advancement in monitoring and managing water levels. This technology offers numerous advantages, including convenience, efficiency, and improved accuracy in water level measurements. The contactless feature eliminates the need for physical probes or sensors to come in direct contact with the water, reducing the risk of contamination and minimizing maintenance requirements. The wireless functionality enhances the system's flexibility, allowing for remote monitoring and control. This is particularly beneficial in hard-to-reach or hazardous locations, providing real-time data without the constraints of wired connections. Moreover, the automatic nature of the sensor streamlines the monitoring process, enabling rapid response to fluctuations in water levels.

REFERENCES

1. **Ultrasonic Water Level Sensors:**

Reference: [MaxBotix Inc.](<https://www.maxbotix.com/>)

Description: MaxBotix offers a range of ultrasonic sensors that are suitable for contactless water level measurement. Their sensors are known for their accuracy and durability.

2. **IoT-based Water Level Monitoring System:**

Reference: [Libelium - Water Quality and Levels Monitoring](<https://www.libelium.com/iot-solutions/water-quality/>)

Description: Libelium provides IoT-based solutions for water monitoring, including water level sensors. Their wireless sensor platforms are designed for various environmental applications.

3. **Wireless Water Level Monitoring System:**

Reference: [Banner Engineering - Wireless Solutions](<https://www.bannerengineering.com/us/en/solutions/wireless.html>)

Description: Banner Engineering offers wireless solutions, including sensors suitable for water level monitoring. Their wireless technology allows for easy deployment and remote monitoring.

4. **Contactless Radar Water Level Sensors:**

Reference: [Vega - Radar Sensors for Water Level Measurement](https://www.vega.com/en/home_us/products/product-catalog/radar/vegapuls-69)

Description: Vega provides radar sensors like VegaPuls that are contactless and suitable for accurate water level measurements. Radar sensors can operate in challenging environmental conditions.

5. **Wireless Water Level Monitoring with LoRa:**

Reference: [Dragino - Water Level Detection with LoRa](<https://www.dragino.com/products/lora-lorawan-end-node/item/154-water-detection-sensor-lg.html>)

Description: Dragino offers wireless water detection sensors utilizing LoRa (Long Range) technology. These sensors can be integrated into LoRaWAN networks for efficient data transmission.

6. **Contactless Capacitive Water Level Sensors:**

Reference: [Omega Engineering - LV400 Series](<https://www.omega.com/en-us/sensors-and-sensing-equipment/level/sensor-type/capacitance/p/LV400>)

Description: Omega Engineering's LV400 Series includes contactless capacitive sensors suitable for measuring water levels. Capacitive sensors offer a non-intrusive approach to level sensing.

7. **Wireless Water Level Monitoring with NB-IoT:**

Reference: [Espotel - NB-IoT Water Level Sensor](<https://www.espotel.com/en/iot-solutions/nb-iot-water-level-sensor/>)

Description: Espotel provides NB-IoT (Narrowband Internet of Things) based water level sensors for wireless communication, ensuring efficient and low-power connectivity.