Project Report

Water Level Indicator with 7 Segment led Display

Embedded system

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Year: 2022

Introduction:

What is the water level indicator?

The Water Level Indicator employs a simple mechanism to detect and indicate the water level in an overhead tank or any other water bodies.

Features:

- It's Save the Water.
- Easy installation.
- Low maintenance.
- Compact elegant design.
- Avoid seepage of roofs and walls due to overflowing tanks.
- Consume very little energy, ideal for continuous operation
- Shows clear indication of water levels in the overhead tank or any water bodies.

Need of water level indicator:

- Overflow problem
- To prevent wastage of energy and water.

List of Electric Components used:

on off switch
pcb circuit board
Seven segment display
CD4511 IC with IC base
74HC147 IC with IC base
green connector
470Ω resistor
33kΩ resistor
10kΩ resistor
560kΩ resistor
bc547 transistor
10 core multi-color wire
single wire for connection
9V battery
7805 IC 25V 100uf capacitor

# Description of Electronics Components Used in Water Level Indicator Project:

1. **On/Off Switch:** The on/off switch is a manual control component that allows users to activate and deactivate the water level indicator system as needed.

2. **PCB Circuit Board:** The printed circuit board (PCB) serves as a platform for mounting and connecting electronic components in the water level indicator circuit. It allows for easy assembly, organizing, and electrical connectivity.

3. **Seven Segment Display:** The seven-segment display is a visual component that indicates the water level in the overhead tank. It is made up of seven LED segments organized in a precise arrangement to display numerical digits (0-9), which correlate to the water level.

4. **CD4511 IC with IC Base:** This BCD-to-7-segment decoder driver integrated circuit (IC) is utilized to transform binary-coded decimal (BCD) input signals into output signals that operate the seven-segment display. A socket on the IC base makes it simple to insert and remove the IC from the circuit.

5. **74HC147 IC with IC Base:** This IC is a priority encoder that converts input signals that indicate the water level into an output that is binary-coded. To ascertain the current water level, it ranks the input signals according to importance. Convenient IC installation and replacement are made possible by the IC base.

6. **Green Connector:** The water level indicator circuit can be connected to external wires or components using the green connector, which acts as a terminal block. It offers a dependable and safe connecting interface.

7. **Resistors:** These passive electrical components, which come in 470Ω, 33kΩ, 10kΩ, and 560kΩ varieties, are used to divide voltage in a circuit, set voltage levels, and restrict current flow. In the circuit for the water level indicator, each resistor has a distinct purpose, such as voltage division, current limitation, and signal conditioning.

8. **BC547 Transistor:** Applied in circuits for both switching and amplification, the BC547 transistor is a general-purpose NPN bipolar junction transistor (BJT). It can be used to regulate other circuit functions or to drive the seven-segment display.

9. **10 Core Multi-colour Wire:** This type of wire is made up of several insulated conductors that are wrapped into one sheath. It helps with orderly wiring and signal routing by connecting different parts and signals within the water level indicator circuit.

10. **Single Wire for Connection:** Single wires provide electrical conductivity and communication between various components in a circuit by serving as individual signal connections.

11. **9V Battery:** The water level indicator circuit is powered by a 9V battery, which provides the necessary voltage for it to function. For small-scale electronic applications, this portable and compact power source is ideal.

12. **7805 IC:** This integrated circuit (IC) is a voltage regulator that controls input voltage to produce a steady 5V output value. By providing a steady and dependable power source, it shields the circuit's constituent parts from unstable and erratic voltages.

13. **25V 100μF Capacitor:** The capacitor is a component for energy storage that filters and stabilizes the voltage of the power source. The circuit's 25V 100μF capacitor ensures the electronics components operate smoothly and steadily by assisting in the reduction of power supply noise and ripple.

Circuit Diagram:
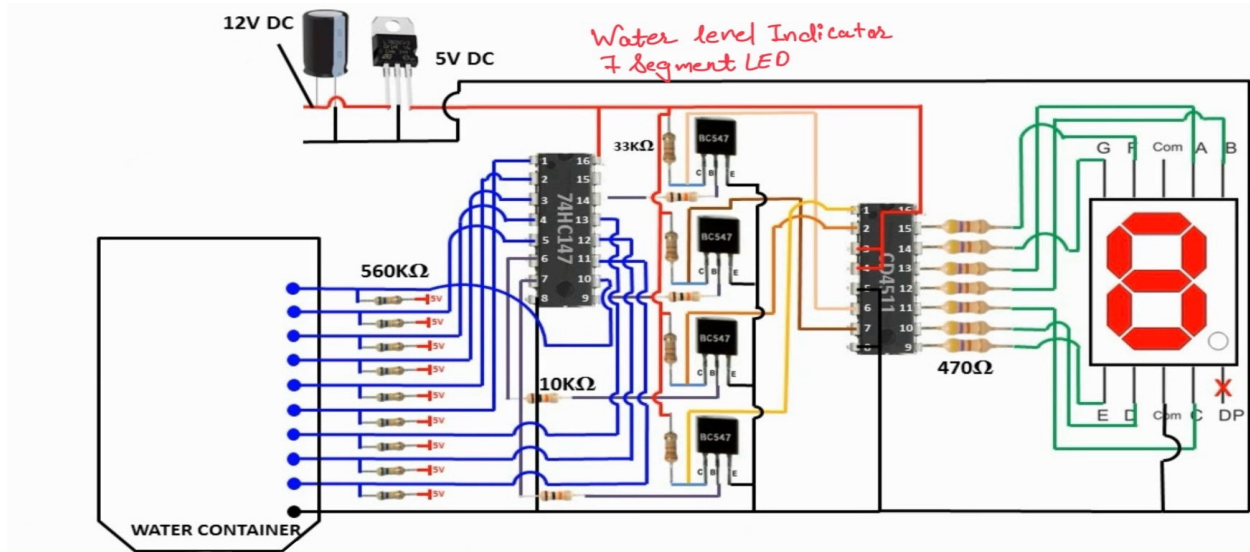
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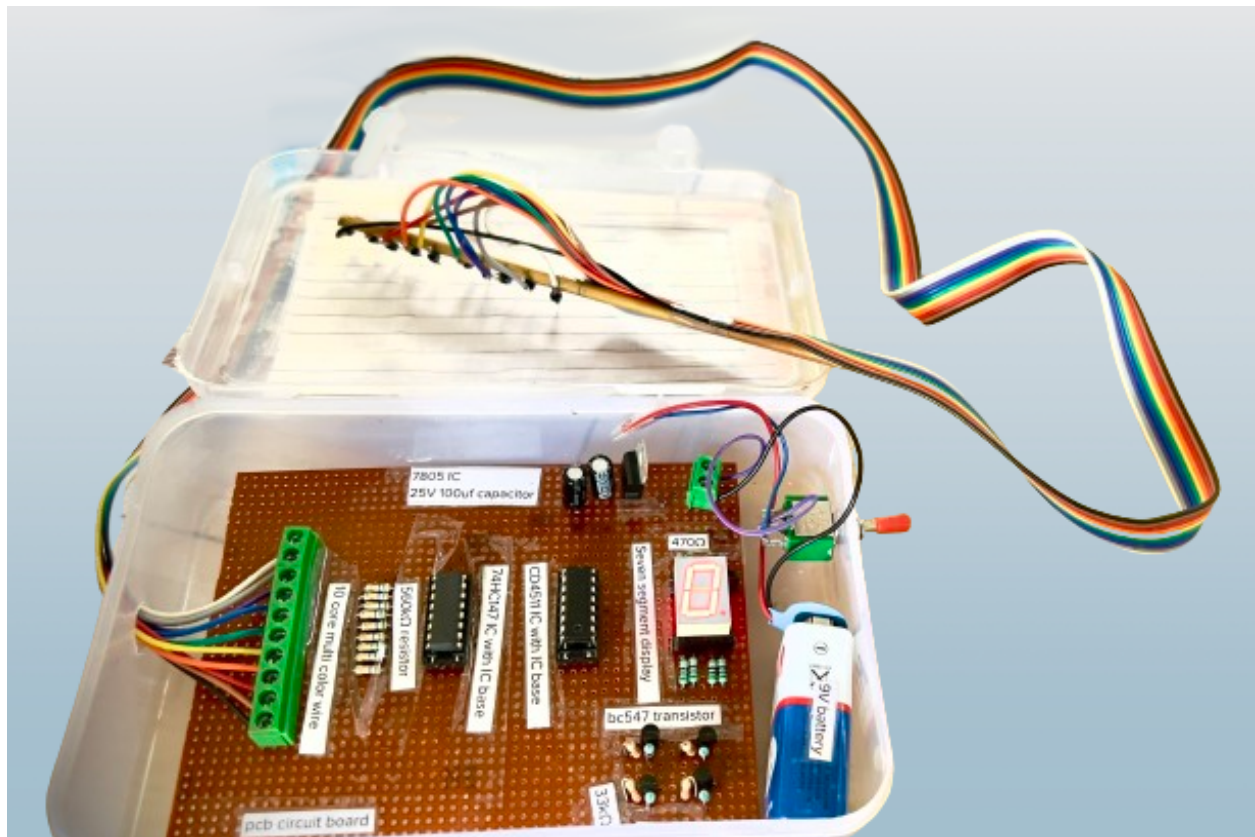
Working:

The 5V regulated power source powers the numerical water indication circuit. The common cathode 7-segment display, BCD-to-7-segment decoder IC CD4511, and priority encoder IC 74HC147 serve as its main structural components.

When the water tank is empty, 74HC147's inputs are all still high. As a result, all of CD4511's inputs are low since its output likewise stays high. At this point, the display reads "0," which indicates that the tank is empty. Likewise, the display indicates "1" when the water level reaches the L-1 position and "8" when it reaches the L-8 position. Ultimately, when the tank is full, all of 74HC147's inputs turn low, and its output also turns low, raising all of CD4511's inputs. Now that "9" is displayed, the tank is full.

Application:

1. **Residential Water Tanks:** In residential settings, where overhead water tanks are frequently used, the water level indicator is widely used. By giving users access to real-time water level information, controlling overflow, and minimizing water resource waste, it guarantees effective water management.

2. **Commercial Buildings:** Water level monitors are essential for preserving the water supply in commercial buildings with significant water usage, such as hotels, offices, and apartment buildings. By notifying maintenance personnel to replenish or adjust the water levels in above tanks, they aid in the prevention of water excesses or shortages.

3. **Industrial Facilities:** For a variety of operations, industries frequently need big volumes of water. Industrial facilities need water level indicators to keep an eye on the water levels in the storage tanks. This way, production operations can be guaranteed at all times, and spills or overflows that could cause waste or other problems can be avoided.

4. **Agricultural Applications:** Water storage tanks are frequently used for irrigation in farms and agricultural fields. By assisting farmers in keeping an eye on the water levels in these tanks, water level indicators help them manage water resources more effectively for crop irrigation and livestock watering, both of which support sustainable agricultural practices.

5. **Public Water Distribution Systems:** To keep an eye on the water level in storage tanks and reservoirs, municipalities and water authorities might incorporate water level indicators into their water distribution systems. This allows them to maintain the community's water supply without interruption by optimizing water distribution, preventing shortages, and acting quickly in the event of system anomalies or leaks.

6. **Remote Monitoring:** Thanks to technological developments, water level indicators can now be fitted with remote monitoring features. Through web interfaces or mobile applications, people can now access real-time water level data from any location. These kinds of systems are helpful in isolated areas since they guarantee prompt action in the event of emergencies or irregularities in the water level.

7. **Rainwater collecting Systems:** By keeping an eye on the water levels in storage tanks, water level indicators are essential to rainwater collecting systems. They support water conservation and sustainability by effectively using collected rainwater for a variety of uses, including landscaping, gardening, and non-potable domestic applications.

8. **Educational Institutions:** Water level indicators can be used as teaching aids by educational institutions to illustrate electronics, sensing, and water management concepts. In addition to learning about sensors, circuits, and data interpretation, students can also gain an appreciation of the value of water conservation and efficient use.

Future Upgradation:

1. **Wireless Connectivity:** Integrate wireless communication modules such as Wi-Fi, Bluetooth, or LoRaWAN into the water level indicator system. This would enable remote monitoring and control of water levels via smartphones, tablets, or computers, providing users with real-time data and alerts regardless of their location.

2. **IoT Integration:** Transform the water level indicator into an Internet of Things (IoT) device by incorporating IoT platforms and protocols. This would allow for seamless integration with smart home or building automation systems, enabling automated responses based on water level thresholds, scheduling water refills, and optimizing water usage.

3. **Data Logging and Analytics:** Implement data logging capabilities to record historical water level data over time. Coupled with advanced analytics algorithms, this data can provide valuable insights into water consumption patterns, identify potential leaks or inefficiencies, and facilitate predictive maintenance of the water supply system.

4. **Smart Alarms and Notifications:** Enhance the alarm system to provide customizable alerts and notifications based on user-defined thresholds and preferences. This could include SMS alerts, email notifications, or push notifications through mobile applications, ensuring timely responses to critical water level events.

5. **Integration with Smart Meters:** Integrate the water level indicator system with smart water meters to enable automatic billing, monitoring of water usage trends, and detection of abnormal consumption patterns. This synergy between water level monitoring and metering technology enhances overall water management and billing accuracy.

6. **Solar Power Integration:** Explore the feasibility of integrating solar power technology to supplement or replace the existing battery power source. Solar panels coupled with energy-efficient components could enable self-sustaining operation of the water level indicator system, reducing dependency on grid electricity and minimizing environmental impact.

7. **Multi-level Sensor Array:** Enhance the sensing mechanism by incorporating a multi-level sensor array or ultrasonic sensors to provide more granular and accurate measurement of water levels. This would enable precise monitoring of water levels at different points within the tank, improving overall system reliability and performance.

8. **User-Friendly Interface:** Redesign the user interface to be more intuitive and user-friendly, with features such as touchscreen displays, graphical representations of water levels, and interactive settings menus. Simplifying the user experience enhances usability and accessibility for a wider range of users.

Reference : https://www.youtube.com/watch?v=VlpJ8TR4g1A&t=76s