

Programmable Timer-Based Switching System Using DS3231 RTC & Arduino



Working principle:

The system operates by using the DS3231 Real-Time Clock module to maintain accurate time. The Arduino continuously reads the real-time data and compares it with preset ON/OFF timings. When the current time matches the programmed schedule, the Arduino triggers the relay module to switch the connected electrical device ON or OFF. An LCD display shows the current time, preset values, and device status. This automated cycle runs continuously, providing reliable and hands-free operation.

Hardware Components

- **DS3231 RTC Module:** Offers precise timekeeping.
- **Arduino Board:** Serves as the control unit.
- **Relay Module:** Handles switching of the connected load.
- **16×2 LCD Display:** Shows time and system status.
- **Push Buttons:** Used to set the ON/OFF timings.
- **Hi-Link 5V 1A AC-DC Converter:** Provides isolated and stable power.
- **Terminal Blocks, Wires & Accessories:** Ensure safe connections and overall system integrity.

Each component has been selected for efficiency, reliability, and ease of integration.

Applications

This automated switching system is suitable for a wide range of real-world applications, including:

- Home lighting automation
- Garden and landscape lighting
- Shop signboards and display lighting
- Street and security lights
- Water pump and motor control
- Industrial timed operations
- Agricultural equipment control

Anywhere time-based switching is required, this system provides a dependable solution.

Advantages

- Eliminates manual effort
 - Improves energy efficiency
 - Ensures consistent operational timing
 - Simple to program and modify
 - Built using low-cost, easily available components
 - Easily scalable for advanced automation and IoT integration
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Conclusion

The Automated Timer-Based Switching System demonstrates an effective and practical use of the DS3231 RTC and Arduino platform for scheduled device control. It delivers accuracy, convenience, and long-term reliability, making it a valuable addition to home, commercial, and industrial environments. With future enhancements—such as IoT connectivity, remote control, and sensor integration—the system can evolve into a comprehensive smart automation solution.

Project Team

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