

Design and Implementation of an OTP-Based Access Control System for Electrical Distribution Panels

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Abstract: *This research presents a One-Time Password (OTP)-based security system designed to improve the safety of linemen working on electrical distribution panels. During maintenance of live power lines, linemen are exposed to significant risks, often due to communication failures between the control room and field personnel, which may lead to the accidental re-energization of circuits. To address this, the proposed system employs a microcontroller integrated with a GSM module to create a secure, OTP-enabled access mechanism. Before initiating repair work, linemen can safely disable the power supply by entering an OTP through a keypad. Additionally, the system supports remote operation via SMS, enabling linemen to control the panel door from a distance—enhancing both safety and convenience. The use of GSM technology ensures reliable communication without the limitations of Bluetooth range or dependence on manual procedures. Unlike conventional password-based systems that are vulnerable to forgotten credentials or fixed passwords, this solution generates a new OTP for each access, providing secure, single-use control. By preventing unauthorized access and accidental power restoration, the system significantly reduces the chances of electrical hazards. This innovation not only enhances linemen's safety but also streamlines maintenance procedures, contributing to a more secure and efficient electrical distribution network.*

Keywords: OTP-Based Microcontroller, GSM Module, Distribution Panel

