Ring Main Unit Demonstration Model for Distribution Networks

Final-Year Project Abstract · Electrical Engineering · Hardware

01 · Title

Ring Main Unit Demonstration Model for Distribution Networks — a three-bay switchgear model for ring-feeder isolation, back-feeding and protection.

02 · Introduction / Background

Distribution networks are built as rings so a single cable fault need not black out a transformer — supply can arrive from either direction. The ring main unit (RMU) is the compact switchgear at each transformer: typically two ring-feeder bays with load-break switches and a tee-off bay with a fused switch or breaker protecting the transformer. This project builds a three-bay RMU as a bench model with rotary-handle switch models, cartridge fuses and a breaker model, a mimic single-line diagram with LEDs, mechanical interlocks enforcing safe sequences, a represented earth switch, and a fault toggle for isolation and back-feeding exercises.

03 · Problem Statement

Ring-network operation — isolate the faulted section, back-feed from the healthy side, earth before maintenance — is a core distribution skill taught from single-line diagrams. Students never operate the switching sequence or feel what an interlock prevents. Real RMUs are 11/33 kV sealed switchgear. A hands-on low-voltage model that enforces real operating discipline is needed.

04 · Objectives

- Build a three-bay RMU cubicle: two ring bays, one tee-off bay.
- Provide load-break switch models, fuse models and a breaker model with rotary handles.
- Show every switching state on a mimic SLD with LEDs.
- Enforce isolation-before-earth sequencing with mechanical interlocks.

05 · Proposed Methodology

The unit starts in the normal state: ring continuous, tee-off closed, transformer fed. The fault toggle trips the tee-off breaker model; the student opens the tee-off switch to isolate the fault, opens the ring switch on the faulted side, and verifies the healthy ring path on the mimic — the back-feeding exercise. The maintenance exercise follows: with the bay isolated, the represented earth switch is closed (only possible after isolation, per the interlock), completing the safe-isolation sequence, which is then reversed for restoration. Each step is recorded.

06 · System Architecture / Working

Three fabricated bays → rotary-handle switch models → tee-off fuses/breaker model → mimic SLD with LEDs (state display) → mechanical interlocks (sequence authority) → represented earth switch. The operator layer performs real switching; the interlock layer permits only safe orders; the mimic layer reports the network state.

07 · Hardware / Software Requirements

Component	Specification
Cubicle	Sheet metal, 3 bays, approx. 600×400×300 mm
Ring switches	Rotary isolator models, 230 V / 10 A class
Tee-off	Cartridge fuse models + breaker model
Mimic	Labeled SLD with 12 V LEDs
Interlocks	Mechanical, isolation-before-earth
Earth switch	Represented
Software	None

08 · Expected Outcomes

- Performed fault-isolation and back-feeding switching sequences.
- Demonstrated safe isolation with interlocked earthing.
- Understanding of ring vs radial reliability.
- Recorded switching-step sheets for the report.

09 · Applications

- Distribution systems laboratory demonstrations.
- Utility switching-operation training.
- Classroom aid for switchgear courses.
- Safety-induction demonstrations of isolation discipline.

10 · Future Scope

- Motorized switch operation with remote control.
- Fault-passage indicator models on the ring bays.
- SCADA-style mimic with event logging.
- Extended lineup with metering bay.