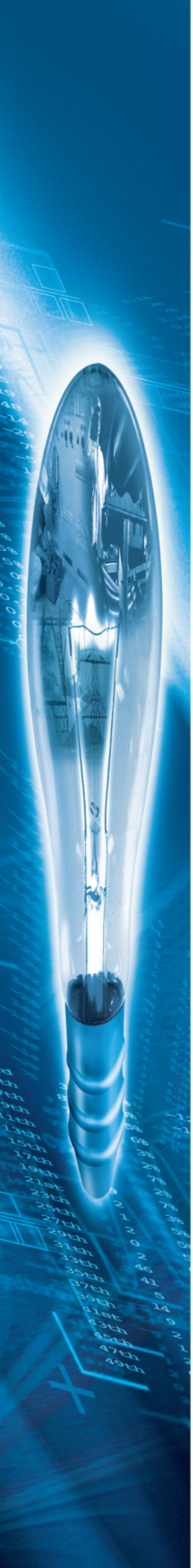
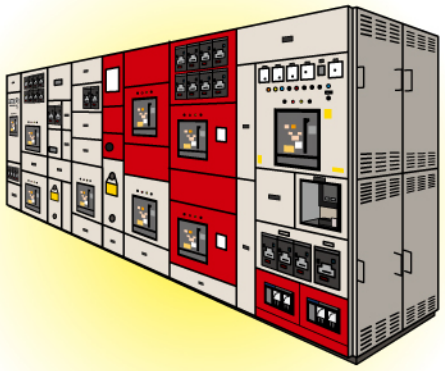


Case Study:

Ideal LV Changeover Scheme Design Prevents Building Supply Interruption

Introduction

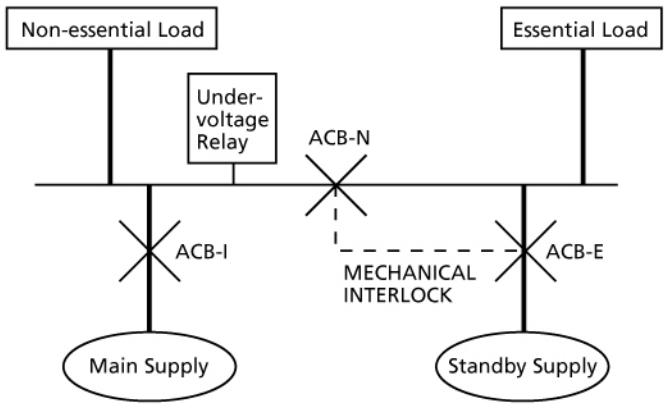
LV changeover scheme (LVCOS) is an essential design for maintaining power supply in buildings. In the event of a supply interruption, the scheme will switch to standby supply in order to maintain essential equipment operation. However, if the scheme is susceptible to voltage dips, it may mal-operate leading to an unnecessary changeover. In a worst-case scenario, the whole building may lose supply.



LV Panels in Switch Room

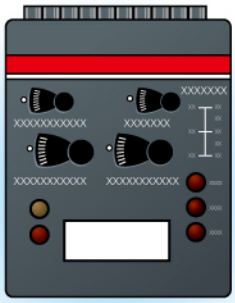
Case Study

In a voltage dip incident reported recently, building A lost its entire building supply. Air circuit breaker ACB-1 tripped while the standby supply was not activated. To restore electricity supply, manual reset of the entire scheme was required. Restoring the building supply took around half an hour.



Typical LV Changeover Scheme Diagram

In investigating the above case, it was found that the tripping command for ACB-1 was initiated by two main control components. Here were the findings:



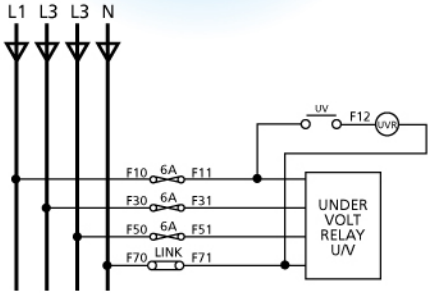
3-ph UR

1. 3-ph Under-voltage Relay (UR) - Set at 80%, 2 sec

- UR was designed to power-up by L1-ph
- It was susceptible to voltage dips
- It would operate when L1-ph voltage dipped to 80% remaining for 0.1 sec

2. Under-voltage Repeat Relay (UVR)

- UVR was supplied by L1-ph
- It was susceptible to voltage dips
- It would drop off when L1-ph voltage dipped to 40% remaining for 0.05 sec

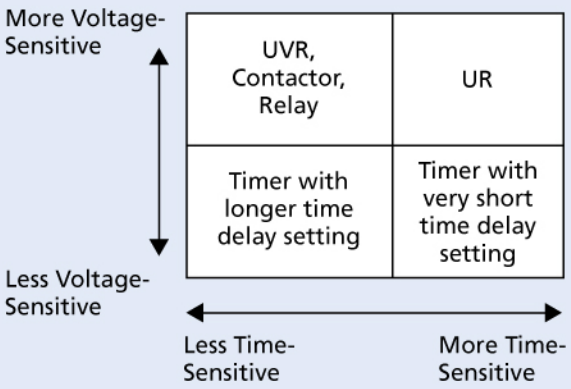


UVR in Wiring Diagram

3. Control Components Voltage Dip Ride-through Capability Comparison

After studying the control components, including UVR, contactors, relays, UR and timers, we have summarized their voltage dip ride-through capabilities as shown in the table on the left.

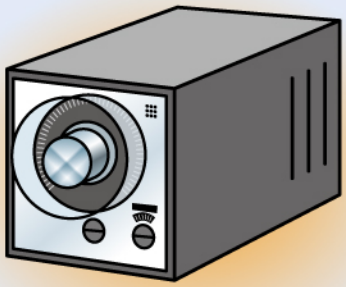
According to the test results, UVR, UR, contactors and relays are more voltage-sensitive, while the timer is more time-sensitive if set with a very short time delay setting.



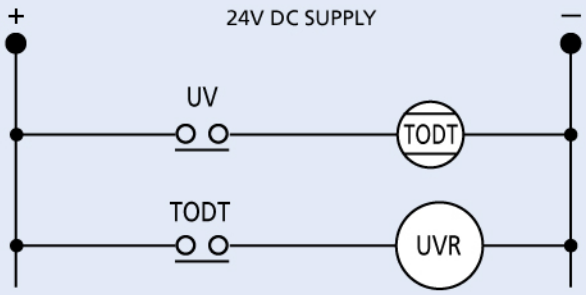
As both UR and UVR were susceptible to voltage dip, such that ACB-1 was falsely tripped. On the other hand, the standby supply would not be activated due to voltage dip. Therefore, the whole building lost its supply and manual reset for the scheme was required.

Recommendations

1. To employ a UR with good voltage dip ride-though capability or to add a true-off delay timer (TODT) to avoid mal-operation of the UR during voltage dips.
2. To replace the UVR with a DC relay and relocate it to the DC control circuit as shown in the wiring diagram below.



True-off Delay Timer(TODT)



DC Control Circuit with TODT and UVR

Tips for an Ideal LVCOS Design

1. Use of DC scheme and equipping with battery and charger.
2. If AC control supply has to be installed, it should be protected by batteryless UPS.
3. To employ UR with good voltage dip ride-through capability.
4. If the UR is sensitive to voltage dip, true-off delay timer should be added.
5. Please contact CLP to obtain the recommended LVCOS for reference.