Low Voltage Switchgear or LV Switchgear

Generally electrical switchgear rated up to 1KV is termed as **low voltage switchgear**. The term **LV Switchgear** includes low voltage circuit breakers, switches, off load electrical isolators, HRC fuses, earth leakage circuit breaker, miniature circuit breakers (MCB) and molded case circuit breakers (MCCB) etc i.e. all the accessories required to protect the LV system. The most common use of **LV switchgear** is in LV distribution board. This system has the following parts

Incomer

The incomer feeds incoming electrical power to the incomer bus. The switchgear used in the incomer should have a main switching device. The switchgear devices attached with incomer should be capable of withstanding abnormal current for a short specific duration in order to allow downstream devices to operate. But it should be capable of interrupting maximum value of the fault current generated in the system. It must have an interlocking arrangement with downstream devices. Generally air circuit breakers are preferably used as interrupting device. Low voltage air circuit breaker is preferable for this purpose because of the following features.

- Simplicity
- Efficient performance
- High normal current rating up to 600 A
- High fault withstanding capacity up to 63 kA

Although air circuit breakers have long tripping time, big size, high cost but still they are most suitable for **low voltage switchgear** for the above-mentioned features.

Sub – Incomer

Next downstream part of the **LV Distribution board** is sub – incomer. These sub-incomers draw power from main incomer bus and feed this power to feeder bus. The devices installed as parts of a sub – incomer should have the following features

- Ability to achieve economy without sacrificing protection and safety
- Need for relatively less number of interlocking since it cover limited area of network.

ACBs (Air Circuit Breakers) and switch fuse units are generally used as sub – incomers along with molted case circuit breakers (MCCB).

Feeders

Different feeders are connected to the feeder bus to feeds different loads like, motor loads, lighting loads, industrial machinery loads, air conditioner loads, transformer cooling system loads etc. All feeders are primarily protected by switch fuse unit and in addition to that, depending upon the types of load connected to the feeders, the different switchgear devices are chosen for different feeders. Let us discuss in details

- Motor Feeder
- Motor feeder should be protected against over load, short circuit, over current up to locked rotor condition and single phasing.
- Industrial Machinery Load Feeder
- Feeder connected industrial machinery load like oven, electroplating bath etc are commonly protected by MCCB and switch fuse disconnector units
- Lighting Load Feeder
- This is protected similar to industrial machinery load but additional earth leakage current protection is provided in this case to reduce any damage to life and property that could be caused by harmful leakages of current and fire.

In **LV switchgear system**, electrical appliances are protected against short circuit and overload conditions by electrical fuses or electrical circuit breaker. However, the human operator is not adequately protected against the faults occurs inside the appliances. The problem can be overcome by using an earth leakage circuit breaker. This operates on low leakage current. The earth leakage circuit breaker can detect leakage current as low as 100 mA and is capable of disconnecting the appliance in less than 100 msec.

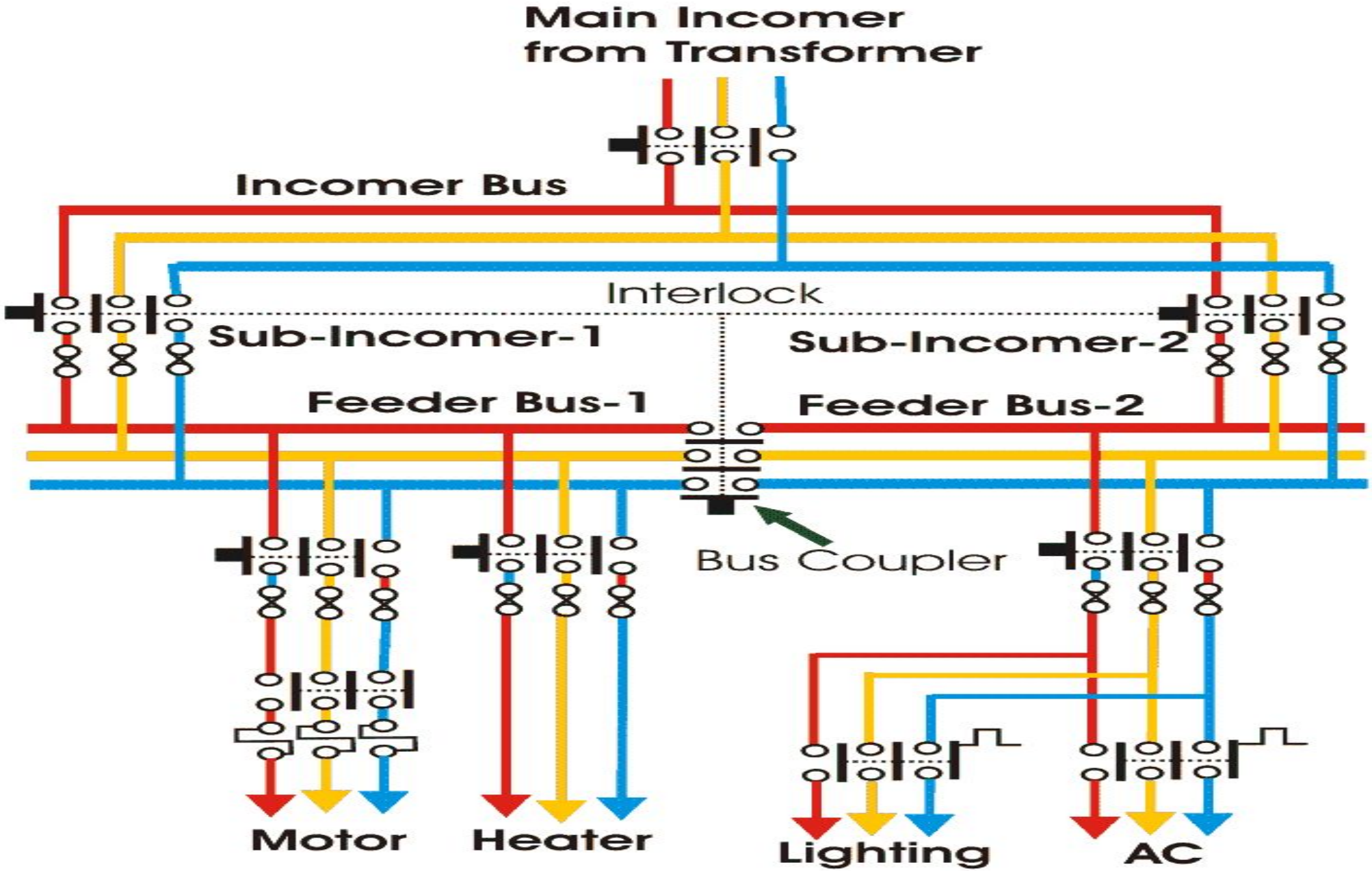

Diagram showing without Neutral Bus

A typical diagram of low voltage switchgear is shown above. Here the main incomer comes from LV side of an electrical transformer. This incomer through an electrical isolator as well as an MCCB (not shown in the figure) feeds the incomer bus. Two sub-incomers are connected to the incomer bus and these sub-incomers are protected by means of either switch fuse unit or air circuit breaker. These switches are so interlocked along with bus section switch or bus coupler that only one incomer switch can be put on if bus section switch is in on position and both sub incomer switches can be put on only if bus section switch is at off position. This arrangement is fruitful for preventing any mismatch of phase sequence between the sub – incomers. The different load feeders are connected to any of both sections of the feeder bus. Here motor feeder is protected by thermal overload device along with conventional switch fuse unit. Heater feeder is protected only by conventional switch fuse unit. The domestic lighting and AC loads are separately protected by a miniature circuit breaker along with common conventional switch fuse unit. This is most basic and simple scheme for **low voltage switchgear** or LV distribution board.