Carrier current protection

For long overhead lines the power line itself may be used as the interconnecting channel between the terminal equipments. Carrier-current protection is the most widely used scheme for the protection of Extra High Voltage (EHV) and Ultra High Voltage (UHV) power lines.

The carrier signal is directly coupled to the power line itself which is to be protected. Carrier-current protection is faster and superior to distance protection schemes and is more reliable when used for long transmission lines, although the terminal equipments are more expensive and complicated.

In addition to protection the carrier signals can also be used for communication, supervisory control and telemetering.

In carrier-current protection or any other unit protection, the circuit breakers at both the ends of the line trip simultaneously when a fault occurs at one of the ends of the protected line sections.

This helps in improving the stability. The carrier signals can be used either to initiate or to prevent the tripping of a protective relay according to which they are classified. When a carrier signal is used to initiate tripping of relay, the scheme is known as carrier inter-tripping, or transfer tripping or permissive tripping scheme.

The scheme is known as carrier-blocking scheme when the carrier signals are used to prevent the operation of a relay.

Different operating techniques used in carrier-current protection:

The two operating techniques mainly used in carrier-current protection are:

1. Phase comparison technique, and
2. Directional comparison technique

In phase comparison technique, the phase angle of the current entering at one end is compared with the phase angle of the current leaving the other end of the protected section. During normal operating conditions or in case of an external fault, the currents at both the ends of the protected line are in phase. In case of an internal fault i.e. fault in the protected section, the currents at the two ends will be 180^{o} out of phase.

The direction of power flow at the two ends of the protected sections is compared in the directional comparison technique. During normal conditions or external faults, the power flows into the protected section at one end and leaves at the other end. During internal faults, the direction of power flow is inwards at both the ends.