

Distance protection

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Distance relay performance is defined in terms of reach accuracy and operating time. Reach accuracy is a comparison of the actual ohmic reach of the relay under practical conditions with the relay setting value in ohms. Reach accuracy particularly depends on the level of voltage presented to the relay under fault conditions. The impedance measuring techniques employed in particular relay designs also have an impact.

Operating times can vary with fault current, with fault position relative to the relay setting, and with the point on the voltage wave at which the fault occurs. Depending on the measuring techniques employed in a particular relay design, measuring signal transient errors, such as those produced by Capacitor Voltage Transformers or saturating CT's, can also adversely delay relay operation for faults close to the reach point.

Electromechanical/Static Distance Relays

With electromechanical and earlier static relay designs, the magnitude of input quantities particularly influenced both reach accuracy and operating time. It was customary to present information on relay performance by voltage/reach curves, as shown in Figure , and operating time/fault position curves for various values of system impedance ratios (*S.I.R. 's*) as shown in Figure , where:

$$S.I.R. = \frac{Z_S}{Z_L}$$

and

Z_S = *system source impedance behind the relay location*

Z_L = *line impedance equivalent to relay reach setting*

DISTANCE RELAY CHARACTERISTICS

Some numerical relays measure the absolute fault impedance and then determine whether operation is required according to impedance boundaries defined on the R/X diagram. Traditional distance relays and numerical relays that emulate the impedance elements of traditional relays do not measure absolute impedance.

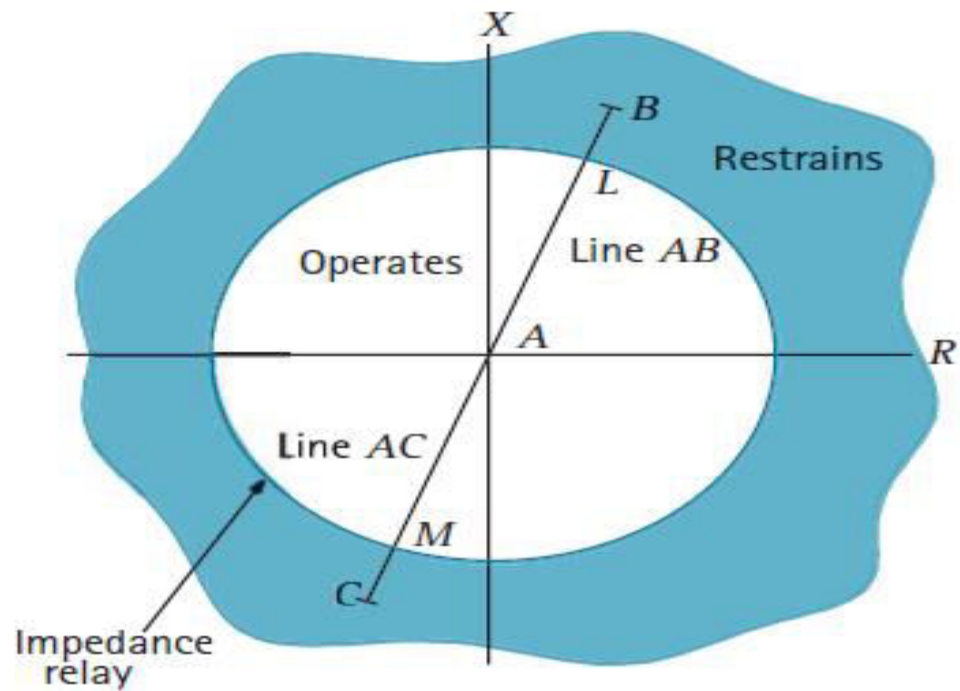
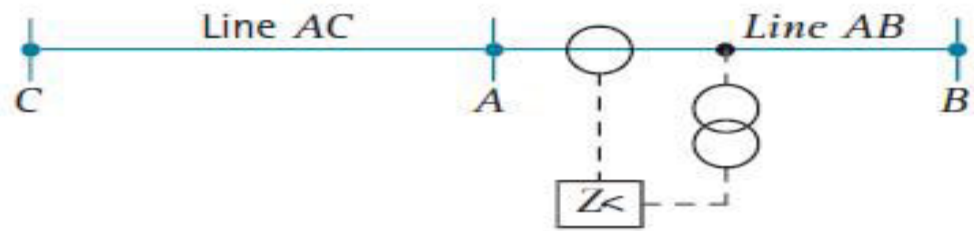


Figure : Plain impedance relay characteristic