This thesis describes development of Matlab/Simulink based program for the analysis on the behavior of Mho Distance Relay during varying faults and system conditions. Power system source impedance, current transformer and voltage transformer at relay location, types of fault with or without arc resistance and location of fault on the protected line are modeled. The modeling of these components within a Matlab/Simulink environment represent new work. An actual transmission network with either one or two equivalent sources is modeled together with a to be protected transmission line. Parameters of the transmission network under some prescribed network fault conditions are used for simulation in the Matlab/Simulink based program. Accurate three phase currents and voltages levels present on the network are fed into simple linear models of current and voltage transformers. The output of the instruments model are fed into a multiphase mho distance relay being modeled by phase angle comparators. Phase angle comparators are classified into 4 types of polarization techniques including: Self-polarised and Cross-polarised either with or with out memory polarization. Network fault conditions include varying fault location and varying types of faults (A-B-C, B-C, A-G and B-C-G) with or without arc resistances are modeled together with varying loading conditions. The developed program can be used to extensively analyse the behavior of mho distance relays for a full range of expected power system contingencies. Results of the analysis are given in terms of the values of the impedances seen by the relay or in graphical presentation of the mho distance characteristics. The results can be used to illustrate how types of faults, fault resistances, fault location under varying system and loading conditions can influence the performance of mho distance relay. A utility may use the result of the analysis to find an optimum setting for a full range of expected power system contingencies.

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