Factors Affecting L90 Operating Time

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The following factors affect the operating time of the L90 Line Differential Relay:

1. **Fault incidence**: The L90 transmits and receives 2 data packages per power cycle, (about 8.3 ms at 60 Hz gap between packages). The operating time depends on the fault inception instance with regards to the time when packet is being transmitted.

2. **Signal distortion**: The L90 has an adaptive restraint feature that increases the restraint depending on the severity of the distortion in the measured current. This feature is designed to provide increased security over traditional schemes.

3. **Fault resistance and load**: Because of L90 adaptive restraint and charging current compensation, the pickup setting can be chosen very low. It allows relay to detect high resistive faults, which other systems are not able to sense. However, lower fault current are causing longer tripping time.

4. **Communications path delay and damaged packages**: The L90 will not trip unless a valid data package from the remote end is received to be compared with local values. Switching channels on SONET systems causes delays in operation. The L90 tolerates a 4 power cycles (66 ms at 60 Hz) channel delay without degrading the 87L function. If data packages are not received for more than 66 ms, the channel is declared as failed and the 87L function blocked. If channel is restored within 5 seconds on 2-terminal system, the 87L function is started in 60 to 70 ms. The complete synchronization process is initiated after 5 seconds. On 3-terminal system, the system remains operable on the failure of one channel; one relay becomes a "Master" and other two become "Slaves". The master relay, having both channels live, makes a trip decision and send a DTT command to the slaves.