

SINGLE PHASE TRANSMISSION LINE PROTECTION SIMULATION PANEL

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Abstract - A single phase transmission line protection panel, it is basically a kind of simulation panel used as demonstration kit for study purpose. As we know the need of transmission line protection is to detect faults or abnormal operating conditions and to initiate corrective actions. We learnt the protection scheme, also analyzed and studied the different faults that are Earth leakage fault, Overcurrent fault and Line break fault occurring in transmission line. Procedure of the tests was followed based on which readings were noted. We also discussed about the future use to the society, applications of the panel.

Key Words: Transmission, Fault, Simulation, Abnormal, Protection.

1. INTRODUCTION

The power system is a huge and complex network which consists generation, distribution, transmission and utilization system. It is basically an electrical power system which consists of generators, transformers, transmission and distribution lines, etc. Faults and other abnormal working conditions often occur in a power system. System cannot be allowed to work in a faulty condition. Fault causes serious dangers for both electrical system and the people. If a fault arises in an element of a power system, an automatic protective device is needed to isolate the faulty element as quickly as possible to keep the healthy section of the system in normal operation. For which the protection scheme is needed at every stage of powers system the fault must be cleared within a fraction of a second.

1.1 OBJECTIVES

Prepare the demonstration simulation panel of single phase transmission line in order understand the following-

- ◆ Study the different electrical transmission line protection scheme.
- ◆ Analyse and study the different faults occurs on transmission line.
- ◆ We observed the faults namely over current fault, earth leakage fault and line break i.e open circuit fault.

There are several protective schemes for transmission lines and may be grouped into two groups viz., Non-unit type and Unit type. The non-unit type of protection includes time-graded over current protection, current-graded over current protection, and distance protection, while the unit type protection includes pilot-wire differential protection, carrier-current protection based on phase comparison method etc.

2. CIRCUIT DIAGRAM

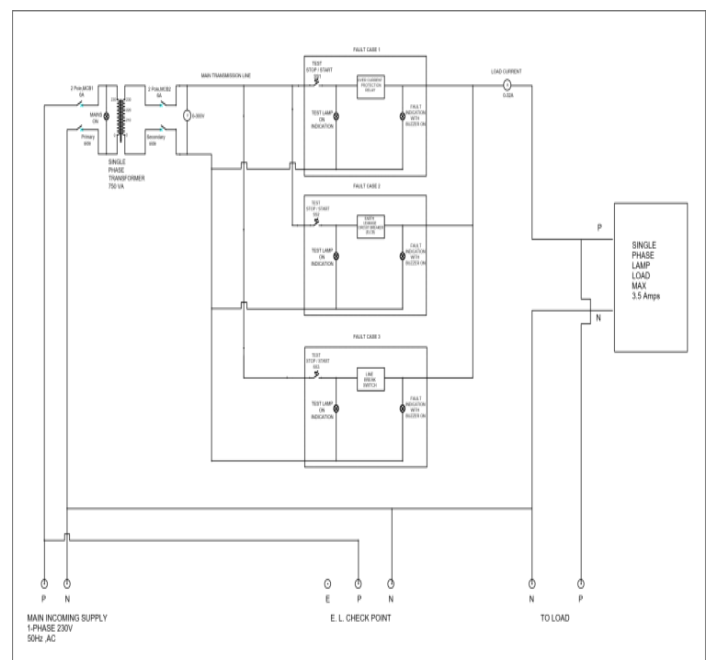


Fig. 1 Circuit diagram

Analyzed and study the different faults occurs on transmission line with the help of over current relay and earth leakage circuit breaker connected. We observed the faults namely over current fault, earth leakage fault and line break i.e open circuit fault with the help of buzzer connected.

S r . N o .	Name of the Fault	Normal Condition		Faulty Condition (Test Condition)	
		Load Current (IL) in Amps	Voltage (V) in volts	Load Current (IL) in Amps	Voltage (V) in volts
1	Over Current Fault (O.C. Fault)	2.32 A	201 V	3.01 A	192 V
2	Earth Leakage Fault (E.L. Fault)	2.55 A	219 V	00	230 V
3	Line Break Fault (Open Circuit Fault)	2.52 A	200 V	00	229.5 V

Table 1 : Current and voltage at different faults

3. PROCEDURE FOR TESTING:

At start make sure that:-

- Single phase input supply (1 phase, 230V) should be connecting to testing kit and also connect the single phase lamp load to kit. (Make sure wire contact should not be loose connected.)
- Now switch "ON" the main 2 pole MCB and make sure that blue lamp is "ON" which indicates the supply is properly connected to the kit.(observe on the voltmeter i.e. 230V)
- And make sure all test selector switch must be initially at "STOP" position

1.For Over Current Fault:- Follow the following steps

Important Note: -

connect the Lamp Load to [To Load] i.e. P (phase) and N (Neutral) point)

Step 1: After making the proper connection to input supply and load, over current fault test selector switch must be "START" position and also make sure that test lamp (red lamp) should be "ON".

Step 2: Before giving the lamp load to kit. Make sure that over current relay and ammeter shows "00" indication. Now increase the lamp load till 2.4 Amps as normal. (Over current relay set at 2.9Amps as limit current in the system)

Step 3: Now note down the load current and voltage in the observation table as in normal condition.

Step 4: Now increases the lamp load to maximum (above 3 Amps or 3.4 Amps). Once increase the load, over current relay senses the current and gives the tripping signal to

breaker and buzzer gets "ON". Indicating over current has occurred in the system.

Step 5: Now note down the max load current given to the kit and also note down the voltage in the observation table as in testing condition or Faulty condition

Step 6: Now gradually decrease the load current, when load current decreases means less than the limit current set in the relay the buzzer gets "OFF".

Step 7: After completing the test, make sure that over current fault test selector switch must be "STOP" position and also make sure that test lamp (red lamp) should be "OFF".

2.For Earth Leakage Fault:- Follow the following steps

Step 1: After making the proper connection to input supply and load (E.L. Check Point), Earth Leakage Breaker must be "ON"

Step 2: Then the Earth Leakage test selector switch must be "START" position and also make sure that test lamp (red lamp) should be "ON".

Step 3: Now increase the lamp load till 2.4 Amps as normal.

Step 4: Now note down the load current and voltage in the observation table as in normal condition.

Step 5: Now with the help of wire or patch cord short the Phase (P) and Earth (E) in the E.L. Check Point.

Step 6: Within milliseconds the ELCB will get trip and buzzer gets "ON" and shows that earth leakage fault has occurred in the system.

Step 7: Now note down the load current shown by ammeter on panel and also note down the voltage in the observation table as in testing condition or Faulty condition.

Step 8: After completing the test, make sure that Earth Leakage fault test selector switch must be "STOP" position and also make sure that test lamp (red lamp) should be "OFF".

2.For Line Break Fault (Open Circuit Fault):- Follow the following steps

Step 1: After making the proper connection to input supply and load(E.L Check point) , Earth leakage breaker must be ON.be "START" position and also make sure that test lamp (red lamp) should be "ON".

Step 2: Now increase the lamp load till 2.4 Amps as normal.

Step 3: Now note down the load current and voltage in the observation table as in normal condition.

Step 4: Now manually press the red push button in order to break the line in the system.

Step 5: Once the you press the red push button line gets break (i.e. open from the system) and buzzer gets “ON” indicating the open circuit fault has been occurred in the system.

Step 6: Now note down the load current shown by ammeter on panel and also note down the voltage in the observation table as in testing condition or Faulty condition.

Step 7: Now release the red push button in order to re-join the line to system (come back to its original position).

Step 8: After completing the test, make sure that Line break fault test selector switch must be “STOP” position and also make sure that test lamp (red lamp) should be “OFF”.

Important Note:-

1. Initially all test selector switches must be on “STOP” position.
2. Every time verify the main supply and load connection and then switch the main supply.
3. Only one test can be performed at a time, multiple tests cannot be performed.
4. Before performing the test on the kit please read the procedure carefully and then performs the test on the kit.



Fig. 2 Protection panel

4. CONCLUSIONS

From our project work we can conclude that, our product have large future scope. Successfully prepared the single phase transmission line protection simulation kit and also studied the

different faults occurred on the transmission line. From the observation table we are able to analyze the different fault and protection used to protect the transmission line. Also we are concluding the following things based on the successful protection scheme used in simulation panel-

Over Current Fault: At the time of occurrence of over current, the over current relay senses the current, which is over the limit of system and gives the command to the breaker in order to protect the line. Also, as current increases, the voltage of the system decreases which can be seen the observation table.

Earth Leakage Fault:- This protection scheme used is very important in the system because it protects the human from getting shock. From observation table we saw that when we make phase to earth fault, the breaker gets trip within the milliseconds and protects line as well as linemen from getting shock.

Line Break Fault (Open Circuit Fault):- The most commonly used type of transmission is overhead system. Such faults happen due to any natural things. So such faults are also detected by the relay, which provides the feedback signal to power control room and hence the operator knows such fault has been occurred in the system.

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