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Line Fault Detection in Distribution System Using IoT

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ABSTRACT
This paper deals with identifying fault location in a distribution line, which is a complicated and severe problem in existing system. In this work ESP12 Based (ESP8266) advanced micro-controller having in Built WIFI along with GSM model is used. It is used for remote control and monitoring purpose and control of multiple stand-alone with Distribution Transformer. Electrical Power Quality (EPQ) is one of the major issues of electric service providers. It plays an important role in today's community life. The primary goal of this scheme is to carry the electricity from the substaions to the individual customers as per their requirements without any disturbance. It must be giving a reliable, safe and sustainable service when end user needs it.

Keyword-: Distribution, ESP12, Faults, GSM, IoT

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I. INTRODUCTION

The distribution of electric energy must be supplied in such a way that the user receives a continuous service, without interruptions, with a sufficient voltage range,with quality parameters that allows the electrical equipment to operate properly. However, the Distribution System (DS) are not immune to power outages caused by faults. The time of interruption depends on the line fault detection by the protection device assembly, its opening and clearing, the location of the fault and the repair necessary to restore the service. The location process depends on factors like the topology, i.e. length of the feeder, number and length of the divisions, the geographic characteristics of the area where it is located etc. These factors can make the fault location difficult [1, 2].

This is to improve the social and economical life of Power Holding capacity of distribution line. As in distribution system there is a probability of 70 to 80% faults in distribution lines, this may causes a long interruption in the service. Thus we have to take care of the line to reduce frequently interruption of service. To take care of this the proposed work i.e. Line Fault detection In Distribution System using IOT may be the solution. This concept will reduce the outage time detect the fault and also indicate the fault location in a particular phase. The Serial Monitor is used to monitor the normal and faulty condition of a distribution lines [3, 4]. In case of fault condition it is showing the fault in particular phase this device is installed. In between 10-15 poles also there are mentions the zones for Service Reliability. This system may be installed in between 10-15 poles because, to identify the zones between the poles. This work gives the fault location information through IOT monitoring system and gives indication via SMS to operator's mobile. It consist of a single pole Double through Relay having 12 volt DC which supports 250V AC/ 10Amp and 110V DC/ 15Amp. This is interfaced with ESP12 Based controller for monitoring and controlling. In normal condition system records periodically reports of all performances, where as in case of faults it is immediately informs to operators.

II. FAULTS IN DISTRIBUTION SYSTEM

Day by day electrical powers system is growing in size and complexities due to generation, transmission, distribution and load systems. Hence the frequency of occurrence of the faults increases which reduces the reliability of the power system [2,3].

Electrical fault is simply defined as the deviation of voltages and currents from their normal

values or states. When fault occurs, it causes excessively high currents to flow, under voltage, unbalance of the phases, reversed power and high voltage surges which cause the damage to equipments and devices. So the continuous research is going on to find the protective schemes to avoid the damage to transmission system from faults. Mainly following faults exists in power system:

2.1 Open circuit faults

These are the faults due to the failure of one or more conductors. These are also called as series faults. Except three phase open circuit fault all other faults are unsymmetrical faults.

2.2 Short circuit faults

These are the faults due to the abnormal condition of very low impedance between two points of different potential, whether made intentionally or accidentally. These are also called as shunt faults. These faults are generally due to the insulation failure between phase conductors or between earth and phase conductors or both.

These are common and severe kind of faults, resulting in the flow of high currents through the equipment or transmission lines. If these faults are allowed to persist even for a short period, it leads to the extensive damage to the equipment. The various symmetrical and unsymmetrical faults in power systems are as follows:

A) Symmetrical Faults

This type of fault occurs infrequently, when a line, which has been made safe for maintenance by clamping all the three phases to earth, is accidentally made alive or when a mechanical excavators cuts quickly through whole cable. It is an important type of fault in that results in easy calculation and generally pessimistic answer. These are of two types:

i) **Line to Line to Line (L-L-L) Fault:**

All three phases of the system are short circuited with each other

ii) **Line to Line to Line to Ground (L-L-L-G) Fault:**

All three phases of the system are earthed.The probability of occurrence of such fault is nearly 2-3 percent in the power system network.

B) **Unsymmetrical Faults**

The term unsymmetrical fault is used to mean an unbalanced condition. It is a connection or situtaion which causes an unbalance among the three phases. An unsymmetrical shunt fault is an unbalance between phases or between phase and ground. A series fault is an unbalance in the line impedances. It does not involve any connection between lines or between line and ground at fault point [5]. These are of following types:

i) **Line to Ground (L-G) fault:** is most common fault and 65-70 percent of faults are of this type. It causes the conductor to make contact with earth or ground.

ii) **Double Line to Ground (L-L-G) fault:** 15 to 20 percent of faults are double line to ground and causes the two conductors to make contact with ground.

iii) **Line to Line (L-L) fault:** Line to line faults occur when two conductors make contact with each other mainly while swinging of lines due to winds and 5- 10 percent of the faults are of this type.

III. DISTRIBUTION SYSTEM FOR STUDY

In this ring main feeder 11 kV source is used to supply the complete feeder. The feeder is closed on itself. This arrangement is shown in Fig. 1 where ABCDEFA forms a complete ring. The distributors are connected at A, B, C, D, E and F as shown in Fig. 1. There are two parallel paths of the feeders one is A-B-C and other D-E-F. The two paths are totally different. The advantage of such arrangements is that it offers a greater reliability of supply in the event of fault in any section of the feeder; say at X, the supply to all consumers can continue to be available by isolating faulty section between B and C.

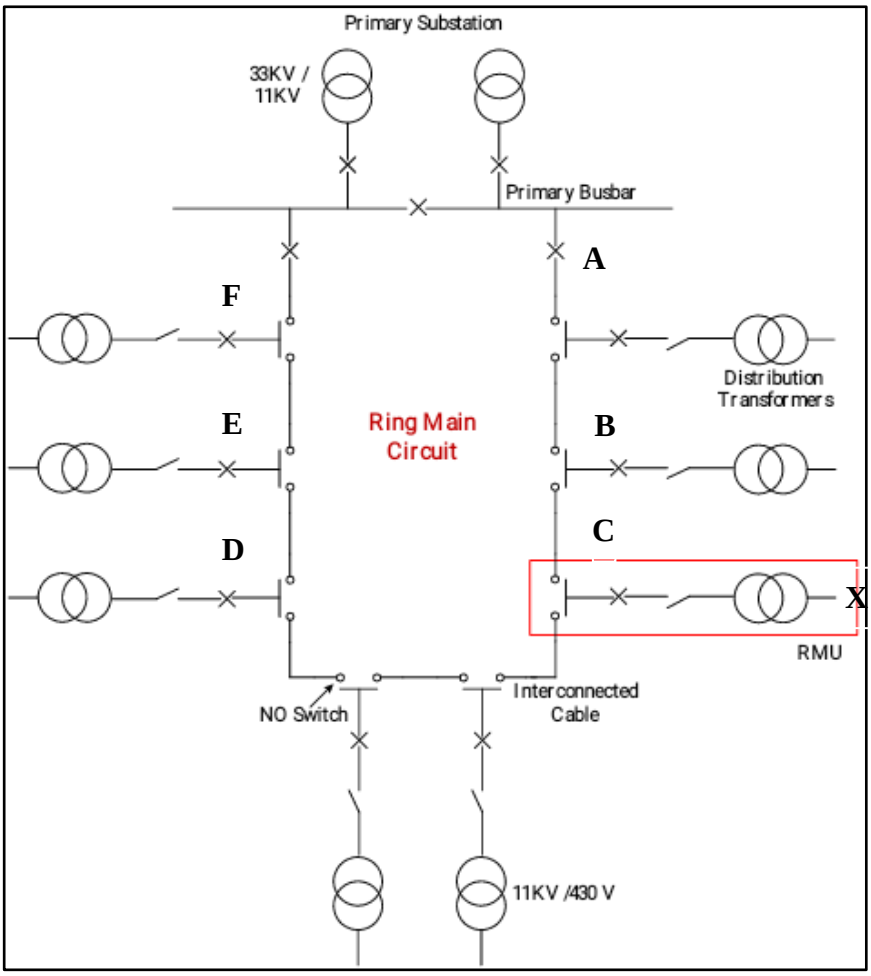

Fig.1 Single Line Diagram of Ring main System

IV. PROPOSED METHODOLOGY

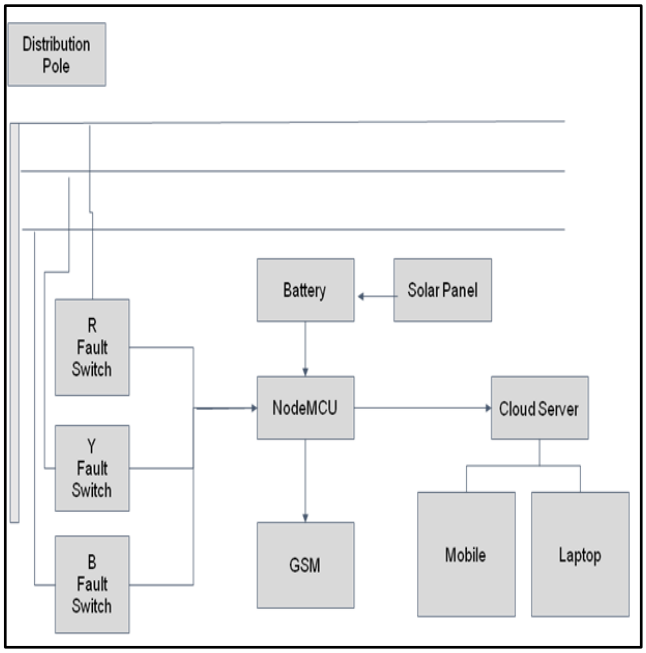

Fig.2 Block Diagram

This work deals with the detection of fault and location on distribution line. The system monitors the individual phase by using the relays. Relays are powered by the 7805ic is connected to each phase. The signal from relay COM goes to Nodemcu and Nodemcu detects the 0 or 1 as per the phase ON and OFF. When the Nodemcu pin is 1 then phase is on when command goes 0 then phase is off. As soon as relay 0 signal goes to nodemcu it sends sms alert. Similarly for all phases the signal is from relays. Nodemcu is a WIFI Controller when it power on the IP Address is assigned by hotspot to see the status on web browser. The equipments in this scheme operate sequentially as per the block diagram shown in Fig. 2.

V. LOGIC USED IN PAPER

Table: 1 According to ground

R	Y	B	N	FAULT
1	0	0	1	R-N
0	1	0	1	Y-N
0	0	1	1	B-N
0	0	0	0	Normal

Table: 2 Fault between two phases

R	Y	B	N	FAULT
1	1	0	0	R-Y
1	0	1	0	R-B
0	1	1	0	Y-B
0	0	0	0	Normal

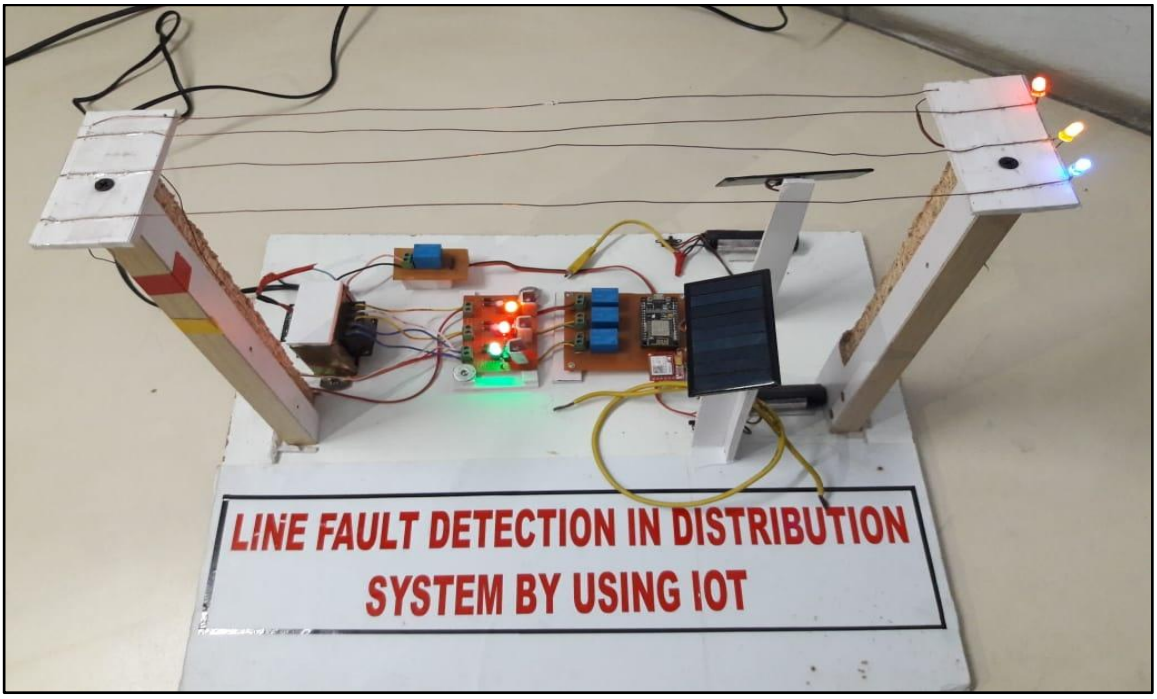

Fig. 3 Photograph of Proposed Scheme

VI. RESULTS

It is observed that the results obtained are exactly co-related with the logic used. The complete hardware is as shown in Fig. 3. As per the proposed logic the hardware results obtained are as shown below in Fig.4:

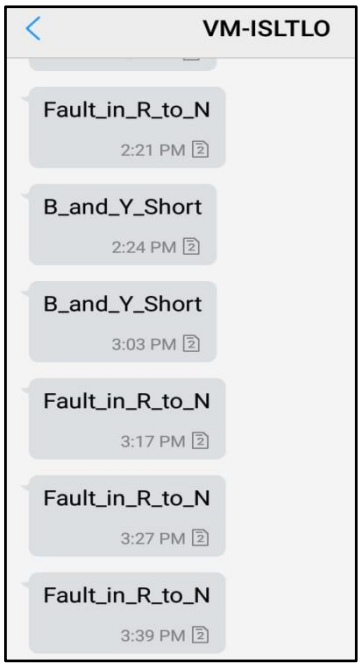

Fig. 4 Results as per proposed logic

VII. CONCLUSION

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the GSM technology used for the fault detection of three phase line send the messages to the In-charges and operator's mobile phone of that particular location. Using this system it is possible to identify the exact faulty phase under abnormal condition. It is effective in providing safety to the working staff. It is economical and time saving. It can be easily installed. Online monitoring can be easily possible using IoT.

REFERENCES

[1]. M. Kezunovic, Smart fault location for smart grids, *IEEE Transactions on Smart Grid* ***2****(1) (2011), 11-22.*

[2]. R. Perez and C. Vasquez, Fault Location in Distribution Systems with Distributed Generation Using Support Vector Machine and Smart Meters, *IEEE Ecuador Technical Chapters Meeting (ETCM), 2016, pp. 1-6.*

[3]. Velladurai S, Sarathkumar G, Praveenraj Gility, Senthamizhselvan R, Ms Venkateswari.M, Detection of Fault Location in Transmission Line Using Internet of Things (IOT), *Journal for Research Volume 02 Issue 01 March 2016.*

[4]. Allan, Ron and Billinton, Roy, Probabilistic Assessment of Power Systems, *Proceedings of the IEEE, vol. 88, No. 2*

[5]. Ashfaq Husain, *Electrical Power System*(CBS Publishers and Distributors Pvt. Ltd.)