

Automatic alert and switching control of secondary distribution system

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Abstract- The secondary power distribution is the final stage of power distribution. In this paper, a GSM (Global system for mobile communication) based alert and switching control system is proposed to monitor and control secondary distribution. Automatic alert and switching control of secondary distribution system (AASCSDS) can be installed in a distribution substation. Fault due to tripping of circuit breakers and blowing of fuses are alerted to authorities as GSM messages. The system is authorised with a unique phone number, assumed to be that of the authorised person. The incorporated GSM module acts as a mean for monitoring and controlling through a real time two way interaction between the system and authorised person via SMS (Short Message Service). In this paper a GSM based alert and switching control system is proposed to automate secondary power distribution.

Index Terms- Secondary power distribution, GSM, automation, distribution substation

I. INTRODUCTION

An electrical power distribution system is the final stage which delivers electric energy directly to industrial and residential consumers. The electrical equipment and circuits are connected to the substation must be protected in order to limit the damages due to abnormal currents and over voltages. Protective relays, circuit breakers and fuses are used to detect overloads and to disconnect circuits at the risk of damage. Under certain conditions a network component shutting down can cause current fluctuations in neighbouring segments of the network leading to a cascading failure of a larger section of the network. This may range from a building, to a block, to an entire area. The failure or tripping of protective devices must be alerted as fast as possible to authorities. The proposed system, GSM based automatic alert and switching control of secondary power distribution is a system which alerts the authorities about this failures as GSM messages. At the highest abstraction level the proposed system is the secondary distribution automation using GSM

II. SYSTEM SPECIFICATIONS

Following are the specifications of the proposed system presented in this paper

- 1) The proposed system is powered from secondary distribution itself. There is also a battery provided for backup

- 2) The system is authorised to a unique phone number, which is assumed to be that of the authorised person
- 3) The power failure due to tripping of circuit breakers or failure of fuses in the distribution system can be alerted via SMS
- 4) The authorised person can shut down the distribution system via SMS
- 5) The embedded GSM module provides the mean for this two way interaction between authorised person and the system

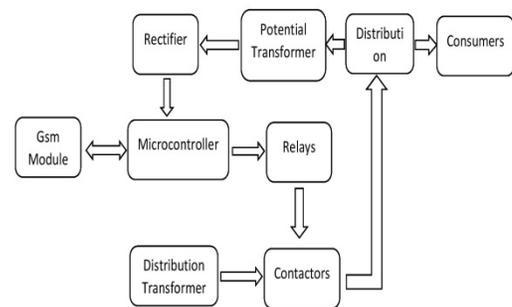


Fig.1: block diagram of AASCSDS

III. REMOTE MONITORING FUNCTION OF THE SYSTEM

The AASCSDS is connected to the secondary side of distribution transformer. Protective devices such as fuses and circuit breakers are connected in each phases. Potential transformers are connected in each phases separately, they are high accuracy class electrical devices used to isolate and transform voltage levels, the primary winding of potential transformer is connected to high voltage distribution system and a rectifier circuit is connected in secondary. The rectified output is given to the microcontroller. In the case of a power failure occurs due to the melting of fuse link, the supply to the rectifier circuit is disconnected and it is sensed by the microcontroller. The micro controller communicates with the GSM module serially and the information is passed as GSM messages to the authorities. The content of the message includes the transformer number, name of faulty phase and the details of the affected region.

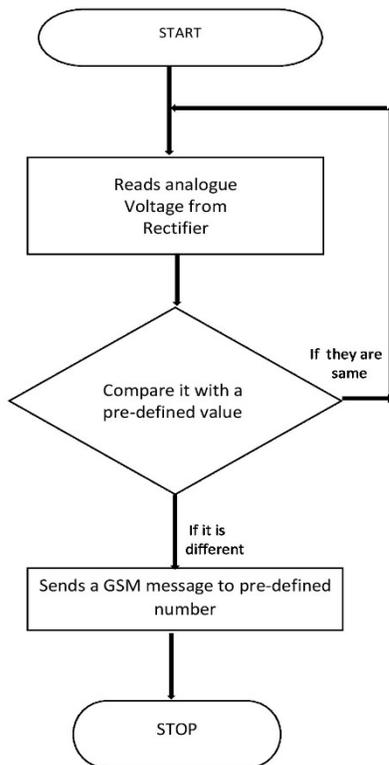


Fig.2 :Flow chart of remote monitoring function of AASCSDS

IV. FAULT ISOLATION AND SWITCHING FUNCTION

Fault isolation and switching function enables the authorities to switch the distribution system from anywhere. GSM message from a pre-defined number which is assumed to be that of the authorised person enables them to shut down the power supply in the case of an emergency. The system decrypts the message received and identifies the sender according to the message content. This job is carried out by the microcontroller. The message which is received by GSM is transmitted to microcontroller through serial communication. This information contains the phone number of the source and message content. The microcontroller compares both the source and message content to pre-defined data and corresponding functions are executed. Contactors are used for switching. Relays connected to the microcontroller controls the contactors according to SMS commands and thus the faulty region can be isolated.

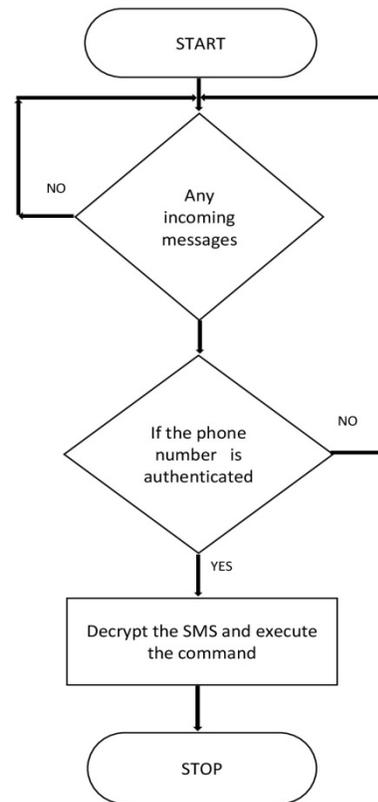


Fig.3: Flow chart of fault isolation and switching function of AASCSDS

V. SMS COMMANDS AND THEIR DECRYPTION

- 1) R : To shut down R phase
- 2) 1 : To reconnect the R phase
- 3) Y : To shut down Y phase
- 4) 2: To reconnect the Y phase
- 5) B : To shut down B phase
- 6) 3 : To reconnect the B phase

VI. WORKING PROTOTYPE

The working prototype of AASCSDS is shown in fig. it consists of three lamps indicating three phases. Three fuses indicates the fuses which are provided for the protection of secondary distribution system. An android application is developed to send and view GSM messages easily. The buttons shown in the interface sends corresponding GSM messages to the system.



Fig.4: Prototype of AASCSDS

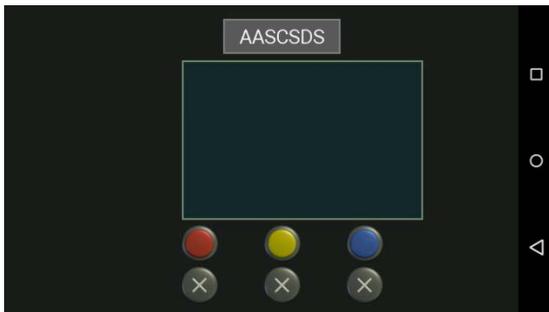


Fig.5: Android interface of AASCSDS to send and receive messages .

VII. CONCLUSION AND FUTURE SCOPE

AASCSDS is an essential aspect in secondary power distribution. In this paper a system is proposed to control and monitor the secondary distribution system at low cost .The proposed GSM based alert and switching system is simple, cost effective and reliable . It also offers many windows for modifications in future .By correlating the last voltage or current measured before an outage from several points along distribution system, an indication of fault as well as its approximate location can be obtained. The fault detection and isolation of ring main system can also be included.

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