Design, Analysis And Fabrication Of A Transmission Fault Detector, A New Approach

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***Abstract*-Transmission line multiple faults detection and indication to Electricity Board (EB) deals with the problem of detecting the fault in the transmission lines and the automatic intimation to EB. This paper deals with the design and fabrication of power supply, microcontroller, RF Transmitter, RF Receiver, sensors and GSM modem. This paper proposes greatly reduces the manpower, saves time and operates efficiently without human interference. With the advent in technology, the existing systems are developed to have in built intelligence. In the transmission line feeding any number of loads, an indication is provided to the microcontroller. When the voltage through the line falls below a programmed voltage, an immediate indication is provided by the microcontroller through the RF transmitter. The RF receiver of GMS modem will receive the signal and send the message to the electricity board. The total system has been designed and fabricated in a prototype and also tested with consumer end side voltage**

***Index Terms*—Electricity Board, RF, GSM Modem**

I. INTRODUCTION

The transmission lines and distribution system plays important role in current distribution to the consumers without interruption. The survey indicates that 80% of the consumer's service interruptions are due to failures in distribution networks. To improve the reliability of distribution, the sensory data collection in transmission line is essential. The present distribution automated system includes substation automation, feeder automation, automatic meter reading and automated build-up of geographic information system and so on. But the idea introduces the concept called automatic transmission line monitoring from power house. The feature of this concept is that the power house staff or line patrol staff can retrieve the parameters like amount of current flowing or voltage level in any load acting point. Hence the theft current in load lines can be recognized. The distance from power house to consumers is subdivided into clusters. Here a load acting point can act as either node or cluster head based on the energy consumption. Transmission lines are among the power system components with the highest fault incidence rate, since they are exposed to the environment. Line faults due to lightning, storms, vegetable falls, fog and salt spray on dirty insulators are beyond the control of man. The balanced faults in transmission line are three phase shunt and three phase to ground circuits [1]. Single line-to-ground, line-to-line and double line-to-line faults are unbalanced in nature. On a transmission system the protective relaying the protective system is incorporated to detect the abnormal signals indicating faults isolate the faulted part from the rest of the system with minimal disturbance and equipment damage. Power transmission and distribution lines are the vital links that achieve the essential continuity of service of electrical power to the end users. Transmission lines connect the generating stations and load centers. As the generating stations are far away from the load centers they run over hundreds of kilometers [2]. However, the chances of fault occurring in transmission lines are very high. Since faults can destabilize the power system they must be isolated immediately. Fault analysis is very important issue in power system engineering in order to clear faults quickly and restore power supply as soon as possible with minimum interruption. This system immediately transmits any fault information to electricity board [3]. It monitors the parameters like voltage and current simultaneously and transmits data through wireless medium. By developing and implementing the distribution line management in various transmission line sectors

using sensory data collection in mobile sinks and power stations by wireless communication. The goal of the concept is to provide uninterrupted load from power house to consumer; to achieve significant and immediate improvement in reliability and hence improved service to the electricity consumers. It indicates the fault occurred area to the power house and line patrol staffs. The fault location can be found out effectively and efficiently after a fault had occurred and prevent the theft of current in load lines. This concept can be used in isolated urban and rural areas to recognize the faults in load lines by formation of clusters, cluster head and rendezvous nodes in wireless sensor networks. The Zigbee and GSM technology were used in this sensor network for communication purpose. Fault indicator sensor is used for analyzing the faults in load lines and retrieving the associated parameters.

II MODELING OF THE SYSTEM AND ANALYSIS

The system has been modeled as per the block diagram given in Fig.1. All blocks of the Fig.1 have been designed and fabricated for testing of the faults occurred in the system [4].

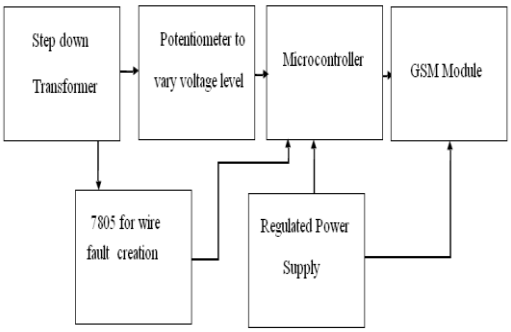

Fig.1: Block diagram of the total system

(a)DC power supply:

The DC power supply is required for the operation of the different circuits like logic circuit stage, gate drive stage (after isolation) etc. This power can be obtained from a single phase bridge rectifier circuit as shown in Fig.2. Single phase AC supply is stepped down to required value of voltage and then uncontrolled rectifier circuit is used [5]. This circuit produces the output voltage of +17.5V with 800mV ripple peak to peak (as shown in Fig.3). The Switched-Mode Power supply (SMPS) circuit is designed and fabricated on printed circuit board (PCB). The circuit configuration is given in Fig.4 with all components. The regulated output is +15V with 300mV ripple peak to peak and 1A maximum (Fig.5).

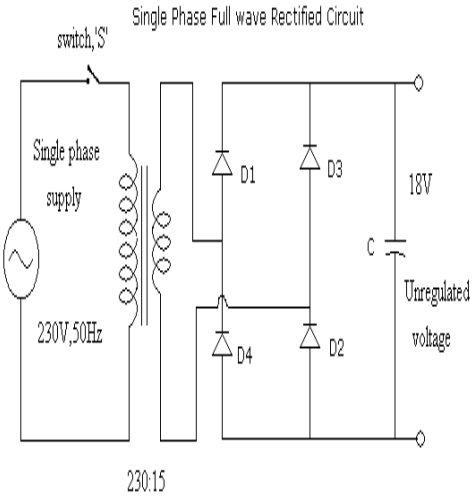

Fig.2: Single phase full bridge rectifier circuit

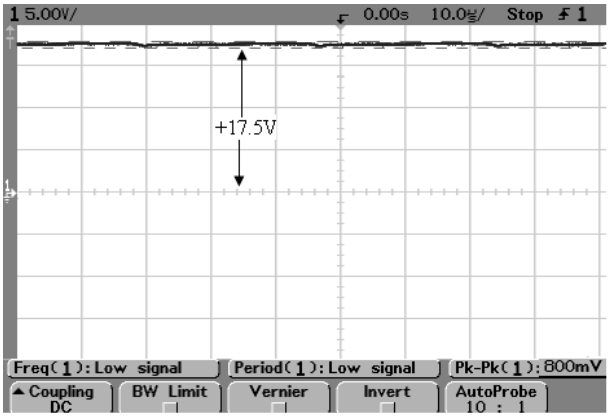

Fig.3: Oscilloscope waveform of unregulated input to SMPS

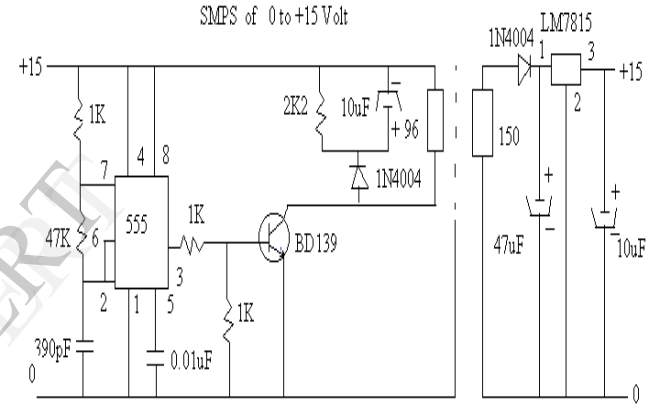

Fig.4: SMPS configuration

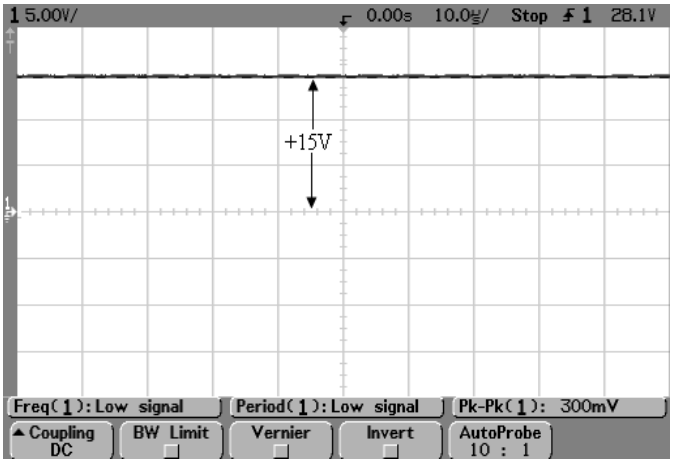

Fig.5: Oscilloscope regulated wave

(b) Microcontroller:

Microcontrollers are "special purpose computers". Any device that measures, stores, controls, calculates, or displays information is a candidate for putting a

microcontroller inside. The microcontroller includes a CPU, RAM, ROM, I/O ports, and timers like a standard computer [6]. Microcontrollers have become common in many areas, and can be found in home appliances, computer equipment, and instrumentation. These are often used in automobiles, and have many industrial uses as well, and have become a central part of industrial robotics. Because they are usually used to control a single process and execute simple instructions, microcontrollers do not require significant processing power [7]. Microcontrollers are hidden inside a surprising number of products these days. If the microwave oven has an LED or LCD screen and a keypad, it contains a microcontroller. All modern automobiles contain at least one microcontroller. The engine is controlled by a microcontroller, as are the anti-lock brakes, the cruise control and so on [8]. The microcontroller chip of Atmega16 (given in Fig.6) is used here and its pin configuration is also shown in Fig.7. It has features of high-performance, low-power AVR, 8-bit microcontroller, advanced **R**educed **I**nstruction **S**et **C**omputer (RISC) and **C**omplex **I**nstruction **S**et **C**omputer CISC) architectures, 131 powerful Instructions, 32 x 8 General Purpose Working Registers, JTAG (IEEE std. 1149.1 Compliant) Interface, Real Time Counter, four PWM Channels, 8-channel, 10-bit ADC, 8 Single-ended Channels and 7 Differential Channels in TQFP Package. RISC and CISC architectures are becoming more and more alike [9]. The block diagram of software AVR used in this microcontroller unit (MCU) is given in Fig.8.

Fig.6: It shows the picture of Atmega16 chip

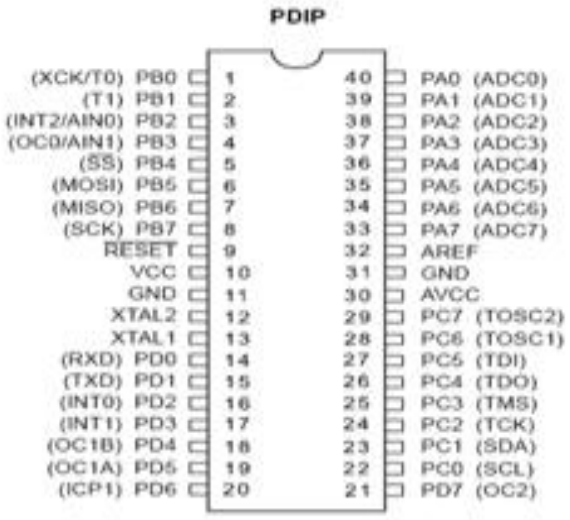

Fig 7: Pin diagram of Atmega16 chip

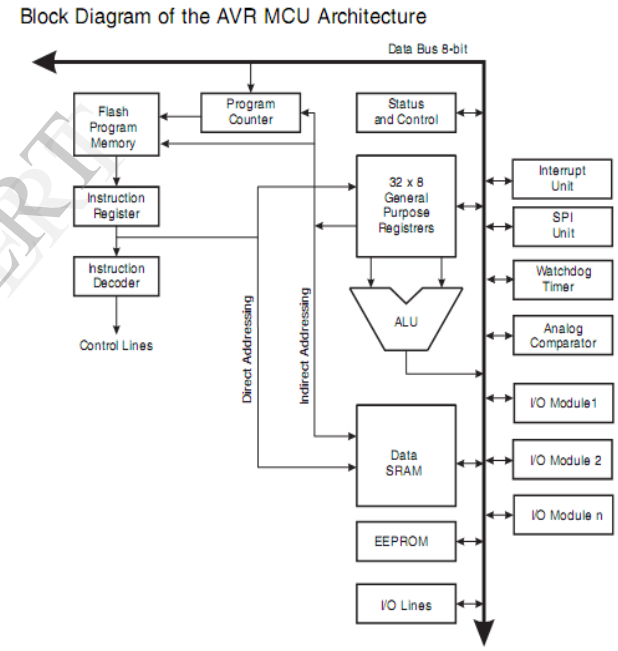

Fig.8: Block diagram of AVR and MCU

(c)GSM modem:

Designed for global market, SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz and SIM300 provides GPRS multi-slot class 10 capabilities and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space requirement in your application, such as Smart phone, PDA phone and other mobile device. The physical interface between SIM300 and the mobile application is through a 60 pins board-to-board connector, which

provides all hardware interfaces from module to customers' boards except the RF antenna interface [10]. The keypad and SPI LCD interface will give you the flexibility to develop customized applications. Two serial ports can help you easily develop your applications. Two audio channels include two microphones inputs and two speaker outputs. These audio interfaces can be easily configured by AT command. □One ADC input □Two GPIO ports and SIM card are detection port [11].

III EXPERIMENTAL TEST BENCH

A real time test bench is required for the experimental validation of the proposed strategy. The development of such test bench is presented in this paper. The test platform is built around a microcontroller and GSM modem. The developed real-time platform includes all the necessary features for the validation/and testing of fault detector in transmission line. The fabricated PCB is shown in Fig.9. It includes entire hardware for testing the proposed topology. The SIM card model is given in Fig.10.

Fig.9: Fabricated circuit of power supply, MCU and GSM

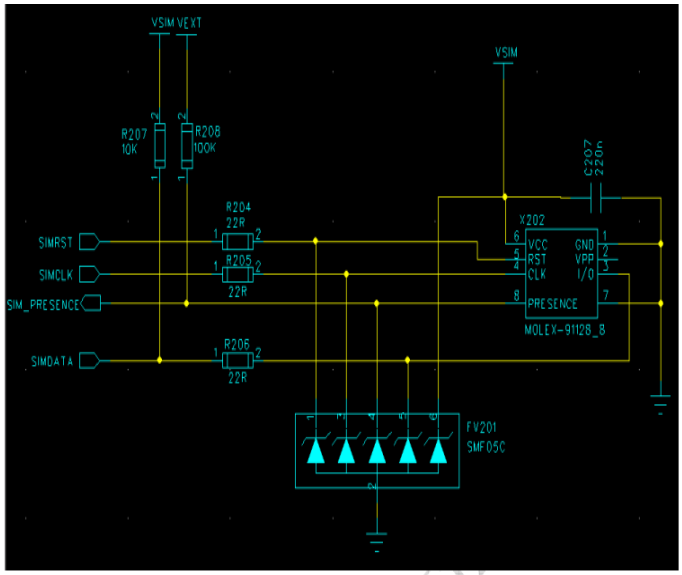

Fig.10: SIM card model circuit

IV EXPERIMENTAL RESULT

The result of practical test conducted on the experimental set-up is presented here. The test includes those to verify proper working of the laboratory developed module of transmission detector. The waveform upholds the success of the entire set-up as also its parts. The entire set up is shown in Fig.11.

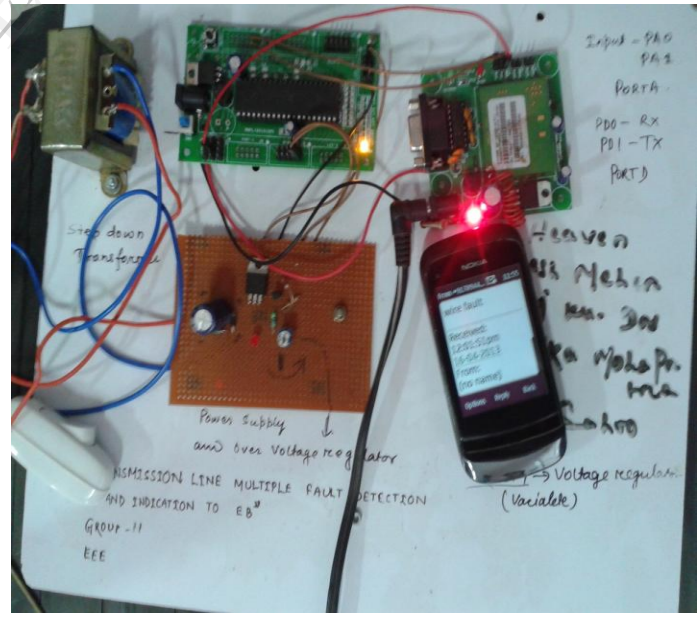

Fig.11: Experimental fabricated card

The main aim is to find transmission line faults in power network. Mainly in this paper we are looking for the fault like "wire fault" & "voltage fault". When a wire fault created by switching on & off a message of "wire fault" will be detected in mobile cell phone. On the

same way by making a voltage fault by varying the voltage regulator we'll get a message like"voltage fault" in that cell phone. In the GSM module a sim has been installed. The message will go to that mobile or sim that is mensioned in the program. So that we can clear the fault as quick possible in the power network.

V CONCLUSION

By developing and implementing the distribution line management in various transmission line sectors using sensory data collection in mobile sinks and power stations by wireless communication. The goal of the concept is to provide uninterrupted load from power house to consumer; to achieve significant and immediate improvement in reliability and hence improved service to the electricity consumers. It indicates the fault occurred area to the power house and line patrol staffs. The fault location can be found out effectively and efficiently after a fault had occurred and prevent the theft of current in load lines. Fault indicator sensor is used for analyzing the faults in load lines and retrieving the associated parameters. In this paper a new approach to fault detection is presented and its effectiveness is demonstrated. The suggested approach is based on the use of microcontroller and GSM technology. The paper presents a positive approach to improve the performance of transmission line. The proposed program is extensively tested by independent test fault patterns and promising results are obtained. Effects of different system parameters and conditions are studied. Extensive studies indicate that the network is able to classify different faults correctly and rapidly.

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