The Intelligent Remote Control of Switchgear System using 4G Modem

S. Saravanan[1], M. Kamalesh[2], V. Nithishabhinav[3], K. Saran[4], Y. Thamaraiselvan[5]

[1]Assistant Professor, [2,3,4,5]UG Students – Final Year, Department of Electrical and Electronics Engineering, Perundurai 638 052, Tamilnadu, India

Abstract - **All the electrical equipment's need to be protected from hazards. The goal of Intelligent Circuit breaker controller is to protect and control the power distribution line by both remotely and manually during interruption or faults. The intelligent circuit breaker is mainly used in electrical equipment's against over load, Single phase grounding fault and short circuit. It will be installed in the distribution stations and operated with password both for remote and manual access. Fault location is identified by calculating the line impedance. It will also detect the open circuit fault. The intelligent circuit breaker is designed and tested. PIC16F877A microcontroller is used for implementing the proposed intelligent circuit breaker.**

Keywords - **Microcontroller Pic16F877A, GSM Modem, PS2 Keyboard, LCD, CT & PT.**

I. INTRODUCTION

An intelligent circuit swell or switching device system comprises three separate microprocessor- rested units, including a condition monitoring unit, a swell control unit, and a coterminous control unit. It's substantially used in power distribution network to allocate electric power and cover the line and force outfit against weight, under voltage, short Circuit, and single phase grounding fault. The condition monitoring unit provides detailed individual information by covering vital amounts associated with circuit swell or switching device responsibility. On- line analysis performed by the CMU provides information easing the performance of conservation as demanded and the identification of brewing failures.

The voguish control unit is a programmable system having tone-existent and remote dispatches. The BCU replaces the conventional electromechanical control circuits generally employed to control a circuit swell or switching device. The coterminous control unit provides coterminous switching control for both ending and opening the circuit interrupters. The control processes carried out by the SCU reduce system switching transients and interrupter wear and tear and gash and incision and gash and incision. The ultramodern power system deals with huge power network and huge figures of associated electrical outfit during short circuit fault or any other types of electrical fault this outfit as well as the power network suffer a high stress of denounce current in them which may damage the outfit and networks permanently.

For saving these outfit and the power networks the fault current should be cleared, the system must come to its normal working condition as soon as possible for supplying dependable quality power to the entering ends. In addition to that for proper controlling of power system, different switching operations are demanded to be performed so for timely decoupling and reconnecting different corridor of power system network for protection and control, there must be some special type of switching bias which can be operated safely under huge current carrying condition.

During interruption of huge current there would be large arcing in between switching connections, so watch should be taken to quench these bends in circuit swell in safe manner. The circuit swell is the special device which does all the demanded switching operations during current carrying condition. The magnitude of flash depends upon the moment on the voltage waveform where opening or ending of swell connections do. In an unbridled situation, sooner or latterly switching is bound to do at the worst possible points on- swell. Conventional styles used to limit the magnitude of these switching transients like Pre-insertion resistors, Damping Reactors, Arrestors or upgrading the sequestration are incapacitated, unreliable or precious and don't address the root problem Sooner or latterly, uncontrolled switching is bound to do at the worst possible points on swell.

II. LITERATURE SURVEY

An electrical power system can be divided into three main sections videlicet generation, transmission and distribution. For this all section circuit swell used as switching device to cover the outfit in the power system. Exodus distribution systems are subject two types of electrical faults, videlicet, flash faults and endless faults. Depending on the nature of the system involved, roughly 75 - 90 of the total number of faults are temporary in nature. Generally flash faults do when phase drivers electrically communicate other phase drivers or ground shortly due to trees, snorts or other brutes, high winds, lightning, flashovers, and so on. Flash faults are cleared by a service interruption of sufficient length of time to extinguish the power arc. The fault duration is minimized and gratuitous fuse blowing is prevented by using immediate or high - speed tripping and automatic reclosing of a relay - controlled power circuit swell or the automatic tripping and reclosing of a circuit reclose. Also,

219

the

number of guests affected by a fault is minimized by properly concluding and locating the protective outfit on the confluent main, at the incline point of each branch, and at critical locales on branch circuits.

Endless faults are cleared by fuse cut- outs installed at sub main and side incline points. In general, the only part of the distribution circuit not defended by fuses is the main confluent and confluent tie line. The substation is defended from faults on confluent and tie lines by circuit breakers and/ or recloses located inside the substation. A wide variety of outfit is used to cover distribution networks. The particular type of protection used depends on the system element being defended and the system voltage position, and, indeed still there are no specific morals for the overall protection of distribution networks, some general suggestion of how these systems work can be made.

III. EXISTING METHODOLOGY

In Automatic Substation, the switch gears are turned off when the fault occurs on the power station. Then the lineman are need to check and clear the faults. After the clearing the faults, lineman or foreman will turn on the switchgear after getting the permission from AE.

Sometimes the lineman will clear the faults without telling to AE. It will create some problems in Substation. It will damage the equipment. Sometimes the lineman won't clear the faults and they didn't inform about it faults to AE. That's why we invented this system. With this system, the AE can identify the faults and location of the faults.

IV. PROPOSED METHODOLOGY

In proposed methodology, whenever the faults occurs on the power station, the switchgear will sent fault details and time to the AE. If AE receiving this message, He\She will set the password for the switchgear setup through his mobile by bidirectional intelligence system. After set the password, the switchgear setup will be locked. If lineman or foreman clear the faults, they need to turn on the switchgear manually after getting the password from AE.
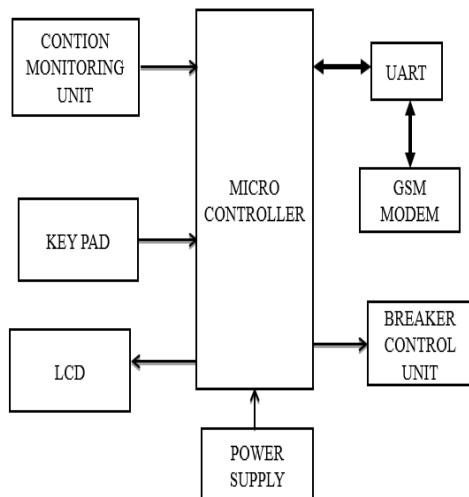
Block Diagram
V. CIRCUIT DIAGRAM
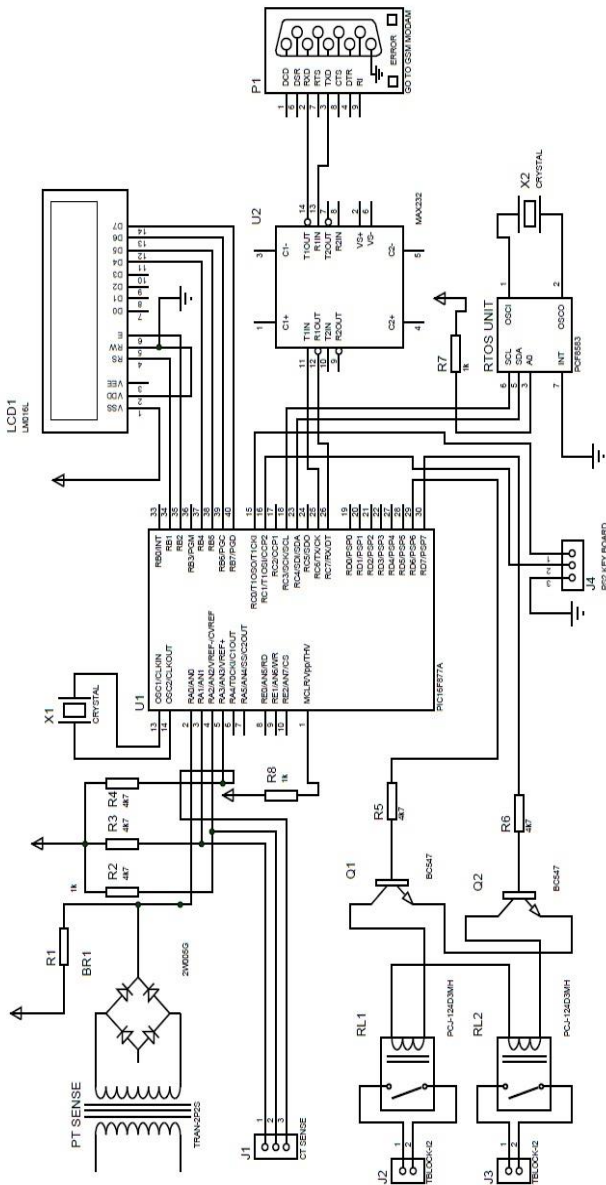
Circuit Diagram

VI. CIRCUIT DIAGRAM EXPLANATION

The Intelligent Remote Control of Switch Gear System Using 4G Modem is contain power supply block, communication block, input of ps2 keyboard interface block, controller block, and current and voltage sensing device block, relay driver block

This project have five features
1. Over load and open jumper cut off
2. Auto reclosing in preset time
3. Forced switch off manual through password
4. Password controlled sequence operation and remote   status message sending and receiving through GSM

In the project have dual power supply. One for controller device operation another one is GSM Modem. In that power supply of controlled device have dual output one is 5V and another for 12V-5v output should supply the power to microcontroller and 12V supply is given to relay drive. The power supply having full wave rectifier circuit and 7812, 7805 pre regulator.

In the project used that GSM modem as Norway manufacturer in that modem functional controlled by the AT command. It is interfaced through UART network to microcontroller. In this project Ps2 key board is connected for data entry input device. It is used to help the operation command like password entry and functional operation.

221

Here PIC 16F877A microcontroller is used as control device and that manipulated the logical operation. It is received that the message from input device and manipulated the logical operation as per our sequential program and give to control the output relay. The output relay drive circuit is connected to port D of microcontroller. The output relay are12V device.

It will controlled through transistor buffer for 5V to 12V control. The microcontroller drive the 547 transistor and the transistor drive the relay. The relay is controlled the lamp load in this project. Here this project received the overload and voltage status of the output through current transformer and Potential Transformer. The current transformer CT1 find the open jumper status.CT2 find the over load status voltage transformer sense the voltage of the output.

VII. COMPONENT EXPLANATION

A. MICROCONTROLLER PIC 16F877A

A micro regulator is a true computer on a chip. The design incorporates all the features set up in a microprocessor similar as CPU, ALU, PC, SP and registers. It also has some added features demanded to make a complete computer ROM, RAM, parallel I/ O, journal I/ O, counters and timekeeper circuit. The high use of a micro regulator is to control the operation of a machine using a fixed program that's stored in ROM and that doesn't change over the life time of the system. The armature and instruction set of the micro regulator are optimized to handled data in bit and byte size. The areas if operations of micro regulators include control process, manufacturing process, drug, instrumentation etc.

Architecture of PIC 16F877A

B. GSM MODEM –NEOWAY M590

A genuine computer on a chip is a micro controller. The design comprises all of the microprocessor's components, including the CPU, ALU, PC, SP, and registers.
Additionally, it has several extra features like ROM, RAM, parallel and serial I/O, counters, and a clock circuit that are required to form a complete computer.

A micro controller's main function is to control a machine's operation using a fixed programmer that is stored in ROM and remains constant throughout the system's lifetime. The microcontroller's design and instruction set are optimized to handle data in bit and byte sizes. Microcontrollers are used in a variety of industries, such as manufacturing, instrumentation, medical, and control processes.

C. PS2 KEYBOARD

222

The PIC16f/18F Advanced Development Board was created with the express purpose of assisting students in developing the necessary expertise in the field of embedded systems. The kit is made to make it simple for the students to use all of the microcontroller's potential features. System programming (ISP), which is done over a USB interface, is supported by

the kit. The PIC (PIC16F877A), PIC16F/18F Advanced Development Kit from Microchip is designed to make it easier to build and debug a variety of designs that include High Speed 8-Bit Microcontrollers.

D. BJT TRANSISTOR- BC547

With three terminals—base, emitter, and collector—the BJT Transistor BC 547 functions as an amplifier transistor. It amplifies the signals going to the microcontroller in this project. This is required for the operation of the zero crossing detector circuit.

E. LIQUID CRYSTAL DISPLAY-LMO16L

A liquid crystal display (LCD) is a small, flat electronic visual display that makes advantage of the liquid crystals' (LCs') ability to modulate light. LCs don't directly produce light. They can be found in many different applications, such as television, instrument panels, cockpit displays for aero planes, signage, and computer monitors. Consumer electronics including video players, gaming consoles, clocks, watches, calculators, and telephones frequently use them.

Cathode ray tube (CRT) displays have been replaced by LCDs in the majority of applications. Typically, they are smaller, lighter, more portable, affordable, more dependable, and easier on the eyes. Compared to CRT and plasma displays, they come in a larger range of screen sizes, and as they don't use phosphors, they won't experience image burn-in LCDs offer improved energy efficiency and offer safer disposal than CRTs.

F. CURRENT TRANSFORMER

A current transformer (CT) is a measurement device created to generate a secondary coil current proportionate to the primary coil current flowing through it. It is used in metering equipment for three-phase 400 ampere electrical supply. In the electrical power business, current transformers are frequently employed in metering and protective relaying where they make it possible to measure huge currents safely, frequently in the presence of high voltages.

The measurement and control circuitry is safely separated from the high voltages that are often present on the circuit being tested by the current transformer.

G. POTENTIAL TRANSFORMER

Another type of instrument transformer, voltage transformers (VT) or potential transformers (PT), are used for metering and protection in high-voltage circuits. In order to accurately step down high voltages so that metering and protective relay equipment can be operated at a lower potential, they are intended to put a minimal burden on the supply being measured. To match the input ratings of protective relays, the secondary of a voltage transformer is often rated for 69 V or 120 V at the rated primary voltage.

H. RELAY-PCJ 124D3MH

An electrically controlled switch is a relay. A magnetic field produced by current passing through the relay's coil draws a lever and modifies the switch contacts. Relays feature two switch positions and are double throw switches since the coil current can be either on or off. Relays enable one circuit to switch another, potentially entirely independent, circuit.

VIII. RESULT AND OUTPUT

The Intelligent Remote Control of Switch Gear System Using 4G Modem is utilized to fix the faults. Utilizing a GSM module in a substation where overvoltage, voltage swag, and voltage swell were to blame. The system for breaking intelligence has been created and built. The system's intended use was successfully accomplished and in accordance with specifications. The system's components are easily accessible, reasonably priced, and extremely dependable. The technology offers a reliable power supply and aids in fault elimination.

ADVANTAGES

1. The intelligence system assists the breaker system in correcting faults in the substation.
2. AE is aware of the location and specifics of the issue thanks to this breaker system.
3. It lessens accidents that occur while linemen are at work.
4. It offers a high-quality power supply.

5.   It

avoids the power quality issues like voltage sag, voltage swell, over current, etc…,

IX. REFERENCES

[1]   B. Singh, G. Bhuvaneswari, and V. Garg, "Multipulse im-proved-power-quality ac-dc convertors for vector-controlled induction-motordrives," Proc. Inst. Elect. Eng. Electric Power Appl., vol. 153–1, pp. 88–96, 2006.

[2]   B. Singh, G. Bhuvaneswari, and V. Garg, "Harmonic mitigation using 12-pulse AC-DC converter in vector-controlled induction motor drives," IEEE Trans. Power Del., vol. 21, no. 3, pp. 1483–1492, Jul. 2006.

[3]   K. Oguchi, G. Maeda, N. Hoshi, and T. Kubata, "Coupling rectifier system with harmonic cancelling reactors," IEEE Ind. Appl. Mag., vol. 7, no. 4, pp. 55–63, Jul./Aug. 2001.

[4]   D. A. Paice, Power Electronic Converter Harmonics: Multipulse Methods for Clean Power. Piscataway, NJ: IEEE Press, 1995.

[5]   E. Matheson and K. Karimi, "Power quality specification for more electric airplane architectures," in Proc. SAE Power Syst. Conf., 2002, 2002-01-3206.

[6]   M. Villablanca et al., "Harmonic reduction in adjustable-speed synchronous motors,," IEEE Trans. Energy Conv., vol. 16, no. 3, pp. 239–245, Sep. 2001.

[7]   M. Villablanca and M. Arias, "High-pulse series converters for HVDC systems," IEEE Trans. Power Del., vol. 16, no. 4, pp. 766–774, Oct. 2001.

[8]   Y. H. Liu, J. Arrillaga, and N. R. Watson, "A new high-pulse voltage sourced converter for HVDC transmission," IEEE Trans. Power Del., vol. 18, no. 4, pp. 1388–1393, Oct. 2003.

[9]   Y. H. Liu, J. Arrillaga, and N. R. Watson, "Multi-level voltage sourced conversion by voltage reinjection at six times the fundamental frequency," Proc. Inst. Elect. Eng. Electric Power Appl., vol. 149, no. 3, pp. 201–207, 2002.