"Internet of Thing (I.O.T) Base Controlling & Monitoring of Circuit Breaker"

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Abstract: *This paper discusses "internet of thing (I.O.T) base controlling & monitoring of circuit breaker". Circuit breakers have a very important role in generation and transmission of electricity and represent a vital of the power system. Reliable operation and monitoring the high voltage circuit breakers represent an important challenge when this activity must be acquired online. This paper presents the architecture of an online monitoring and diagnosis System of electrical equipment which has the role to acquire, to transfer and to process information about the monitored equipment. An interface is designed on top of which different local and system applications can be recorded by the system. The Microcontroller near the circuit breaker section will continuously transmit all the parameters of the circuit breaker to control room and it will be displayed on screen of computer. as well as after C.B trip it gives signal also to GSM module so that due to GSM the texting message can received with fault description only in registered number. After receiving text message the operator or any authorized person give command for set or resetting the breaker. So that we minimize the fault clearing time and Improve maintenance method in circuit breaker increases life time and reliability of the circuit breaker.*

Keywords: Monitoring circuit breaker; circuit breaker modeling; generation, transmission and distribution; wireless communication.

1.Introduction

Wireless communication has announced its arrival on big stage and the world is going mobile. We want to control everything and without moving an inch. This remote control of appliances is possible through Embedded Systems. The use of "Embedded System in Communication" has given rise to many interesting applications that ensures comfort and safety to human life. It is very important to closely monitor the circuit breaker in-service behavior to avoid costly outages and loss of production. It is well known that to maintain the system reliability it is necessary to protect the with circuit breaker from different abnormality condition i.e. faults. Distribution Circuit breakers have a long service life if they are operated under rated conditions. However, their life is significantly reduced if they are overloaded, resulting in unexpected failures and loss of supply to a large number of equipments thus effecting system reliability.

Online monitoring and controlling of key operational parameters of distribution circuit breakers can provide useful information about the health of circuit breakers which will help the utilities to optimally use their circuit breakers and keep the asset in operation for a longer period. This will also help identify problems before any catastrophic failure which can result in a significant cost savings and greater reliability. Circuit breakers are a vital part of the transmission and distribution system. Monitoring circuit breaker condition online can prevent faults that are costly to repair and result in a loss of service. In this project we designed a system in such a way that it will monitor and control the load of the substation continuously and that information is transferred to the control room using Wi-Fi. You can use this system for online monitoring of circuit breakers. You can then use information to avoid dangerous and costly failures, while optimizing maintenance schedules and extending the life of your circuit breakers. In our system a microcontroller will continuously keep on monitoring the various parameters (Output current, Output voltage and Temperature) of the circuit breaker and this information will be continuously be updated on your PC using a VB based software. A keypad is used to change the set points for the parameters. By using monitor or mobile phone to displays the parameters. We have even provided a protection relay so if there is any problem with the circuit breaker the power to it can be remotely disconnected. And it can give the text message to register mobile number by using the GSM module.

1.1 Motivation

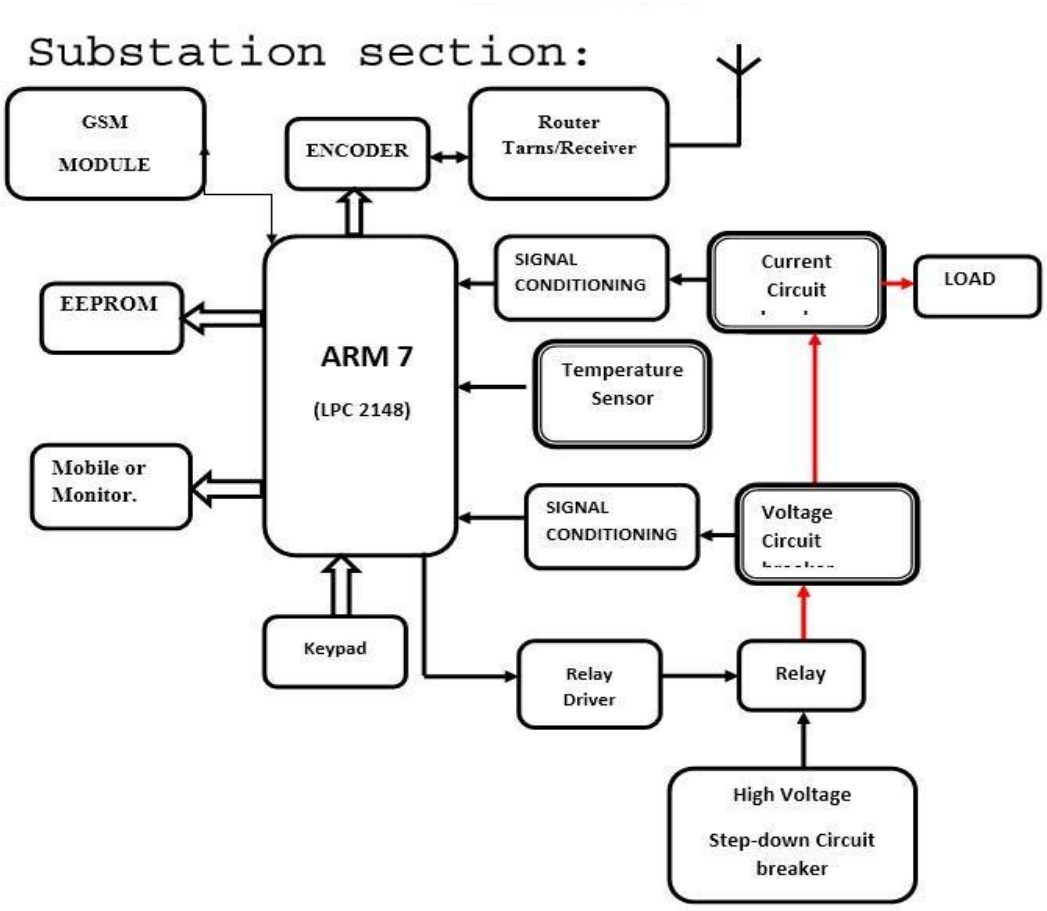
1. Distribution circuit breakers are currently monitored manually where a person periodically visits a circuit breaker site for maintenance and records parameter of importance. This type of monitoring cannot provide information about occasional

overloads and overheating of circuit breaker. All these factors can significantly reduce circuit breaker life. A number of techniques are currently being used for offline as well as online monitoring of power circuit breakers.
2. Most power companies use Supervisory Control and Data Acquisition (SCADA) system for online monitoring of 3. Hence, In our system a microcontroller will continuously keep on monitoring the various parameters (Output current, Output voltage and Temperature) of the
circuit breaker output and this information will be continuously be updated on your PC using a VB based software. A keypad is used to change the set points for the parameters. power circuit breakers output but extending the SCADA system for online monitoring of distribution circuit breakers is an expensive proposition.
We have even provided a protection relay so if there is any problem with the circuit breaker the power to it can be remotely disconnected. and given message through GSM module.

1.2 Objectives:

1. The main objective of this project is to use the WI-FI technology to continuously monitor and control the distribution circuit breaker output or
2. Normally most of the equipments are burning because of over load, short circuit or single phasing and decreased efficiency due to unbalance of voltage hence by incorporating monitoring and control circuits, correspondingly increasing the life time of the circuit breaker as well equipments.

2. BLOCK DIAGRAM:



2.1 Block Diagram Explanation:

In this project we designed a system in such a way that it will monitor and control the load of the substation continuously and that information is transferred to the control room using Wi-Fi Technology. In the main station these parameters are displayed on the Screen of computer. In the display unit we can view the continuous information of circuit breaker i.e. due to what reason the circuit breaker has been break, when the power is resumed etc. With the help of this kind of system, the maintenance staff of the department can have a continuous vigilance over the circuit breaker.

In this project work, for the demonstration purpose a circuit breaker of 440v, 5 amps rating. In output of C.B is connected to a load. In this project we are using CT circuit breaker for measuring load current, voltage sensor and temperature sensor. All these parameters are converted into digital value by using ADC. If the parameters of the circuit breaker regain the limited range values then Circuit breaker will automatically get trip condition. Microcontroller near the circuit breaker section will continuously transmit all the parameters of the circuit breaker to control room and it will be displayed on screen of computer. as well as after C.B trip it gives signal also to GSM module so that due to GSM the texting message can received with fault description only in registered number.

After receiving text message the operator or any authorized person give command for set or resetting the breaker. So that we minimize the fault clearing time and process interruption clearing also get within less time

2.3 Block Diagram Description:

The block diagram mainly consists of the following blocks:

1. Microcontroller ARM 7
2. LCD Display
3. RF Trans/Receiver
4. Keypad
5. Signal Conditioning
6. Temperature Sensor
7. Voltage Transformer
8. Current Transformer
9. Computer

2.3.1 Microcontroller ARM (LPC2148):

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, that combines the microcontroller With 32 kb, 64 kb and 512 kb of embedded high speed Flash memory.

2.3.2 LCD Display:

LCDs have become a cheap and easy way to get text display for embedded system Common displays are set up as 16 to 20 characters by 1 to 4 lines. Thus we have used the 16*2 LCD that means it can display the two lines containing 16 characters each.

2.3.3 RF Trans/Receiver:

RF Transmitter STT-433/315

The STT-433 is ideal for remote control applications where low cost and longer range is required. The transmitter operates from a 1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance.

RF receiver STR- 433/315

The STR-433 is ideal for short-range remote control applications where cost is a primary concern. The receiver module requires no external RF components except for the antenna.

2.3.4 Keypad:

Keypad is used to change the set of points for the parameters i.e temperature, voltage & current range.

2.3.5 Signal Conditioning:

The process of performing operation on signals to convert in suitable form for interfacing with other circuits is called signal conditioning.

2.3.6 Temperature Sensor:

The temperature sensor used is LM35. The sensor has three pins, Vi is the input voltage pin which acts as at 5V, Vo is the output voltage gives the display provide to it. GND pin is the ground pin. The output voltage is directly proportional to the varying resistance. If the temperature rises the above the desired level, cooling fan automatically switch ON. This reduces the raised the temperature of the C.B. The output of temperature sensor is displayed in LCD display showing the detected temperature value.

2.3.7 Voltage Transformer:

A Voltage Transformer theory or Potential Transformer theory is just like theory of general purpose step down transformer. Primary of this transformer is connected across the phases or and ground depending upon the requirement. Just like the transformer, used for stepping down purpose, potential transformer i.e. PT has lowers turns winding at its secondary. The system voltage is applied across the terminals of primary winding of that transformer, and then proportionate secondary voltage appears across the secondary terminals of the PT.

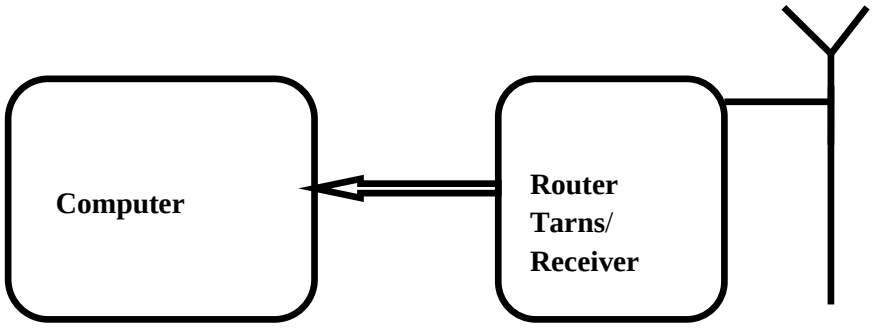
2.3.8 Current Transformer:

A CT functions with the same basic working principle of electrical power transformer, as we discussed earlier, but here is some difference. If a electrical power transformer or other general purpose transformer, primary current varies with load or secondary current. In case of CT, primary current is the system current and this primary current or system current transforms to the CT secondary, hence secondary current or burden current depends upon primary current of the current transformer.

2.3.9 Computer:

In the main station parameters such as temperature, voltage ,current displayed on the screen of computer. In the display unit we can view the continuous information of transformer i.e due to what reason the transformer has been failed, when the power

3.CONTROL SECTION:



1. Advantages:

1. Devices can be operated from anywhere in the world.
2. Efficient and low cost design.
3. Low power consumption.
4. Real time monitoring.
5. Improve circuit breaker reliability and minimize downtime
6. Maximize circuit breaker life with maintenance activity to address abnormal operation
7. Provides true dynamic loading capability
8. Minimize condition monitoring costs through unified monitoring of various parameters for the entire circuit breaker
9. Integrate with your facility's computerized maintenance management software (CMMS)
10. Measure and record loading of your circuit breakers and prevent overloading.

2. Disadvantages:

1. Depends on the network signal strength.
2. Sometimes it may happen that due to weak signal data cannot be send at quick instant. But this problem is not for so much time period.

3. Applications:

1. This system can be implemented in industries.
2. This system can be used to monitoring and controlling the home appliances.
3. This system can be implemented to monitoring and controlling Distribution Circuit breakers located at remote areas.

4.Conclusion:

In modern control centers, system operators get alarm messages from many devices in real time. From alarms, it is still very hard to find out location and type of the potential equipment problem. One needs an automatic way of processing the events to identify whether sequences of equipment operation were as expected. Instead of many alarm messages, only one report should be sent to the operators with concise information about success or failure of a switching sequence. In the case of a breaker, report will offer more detailed message whether the breaker failure logic worked out properly and finally disconnected faulted section. This kind of analysis enables tracking of every CB operation allowing reconstruction of an entire sequence of operations. In our project we studied designed to attain real time control &monitoring of Circuit Breaker. Measure and record loading of your output of C.B and prevent overloading & increasing whole system life.

5.References:

http://www.datasheetarchive.com/RF%20transmitter%20and%20receiver%20433.9-datasheet.html

http://www.redlion.net/Products/Groups/CurrentCircuit breakers/CT/Docs/12035.pdf

http://static.schneiderelectric.us/docs/ElectricalDistribution/LowVoltageCircuit breakers/7400CT9601.pdf

M. Kezunovic, M. Knezev, Automated Circuit Breaker Monitoring – Software Requirements Specification Version 2.5, DOE - CERTS, June 2006.

Final Report of IEEE Power System Relaying Committee Working Group H8, 2001, “File Naming Convention for Time Sequence Data”, Fault Disturbance Analysis Conference, Atlanta, Georgia

[3] IEEE Std. C37.111-1991 "IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems", IEEE Inc.,1991

[4] IEEE Inc., 1999 "IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems", IEEE Std. C37.111-1999

[5] M. Kezunovic, Z. Djekic, Automated Circuit Breaker Monitoring – Hardware Implementation, Final report for FY 06, DOE - CERTS, August 2006.

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