# ARDUINO BASED ON-LOAD MONITORING CIRCUIT BREAKER

**Pankaj Hembrom[1], Swapnil Pachalkar[2], Dhirendra Sinha[3] ,**

**Prof. Rakesh K. Jha[4]**

*Department of Electrical Engineering*
*Sandip Institute of Engineering and Management, Nashik*

------------------------------------------------------------------***------------------------------------------------------------------

**Abstract** – The project is based on Arduino for On-load monitoring of circuit breaker, this module can sense the voltage and current recorded by the device. The Arduino based On-load monitoring circuit breaker by automatic test rig will demonstrate here to be used for reduction of faults on power system by connecting or disconnecting circuit through the power system. The Arduino is used here to the breaker control circuit, thus the working methodology changes about operating speed of circuit breaker. It will help to track circuit breaker switching sense. Ensuring operation of circuit breaker is to be reliable by on-load monitoring the circuit breaker. There might be face difficult to maintain the reliable operation by regular maintenance and inspection. Speculating on quick time switching of circuit breaker and release output about their performance. Information will be documented in the manner that substation be used for record purpose and better optimization.

*Key Words*: Arduino UNO, relay, ACS712, circuit breaker, LCD

## 1. INTRODUCTION

In power system, the circuit breaker plays a major role in protective system. Also these electromechanical devices used to make or break the circuit. Usually circuit breakers have a lifecycle of over mediocre age and they are capable of breaking, carrying, making current under normal condition as well as specified abnormal condition. Most of the time the breaker used to be closed and work as electrical conductor, while detecting fault on the power system and distinguishing the suitable circuit breaker required to be open in order to prevent spreading the faults and ensure the rest of the system to function normally as usual.

Various protections are employed here such as fuses, circuit breakers, relays, etc. They play a very crucial role in power system. Circuit breaker generally can't sense the fault by itself, they need relay in the circuit for detection of fault and transmit data to the circuit breaker which helps to trips the circuit. Circuit breakers are usually of mediocre lifecycle.

Traditional circuit breakers are not meant to have interfacing with older monitoring system. Therefore, microcontrollers such as Arduino UNO are employed to have where hundreds of circuit breakers are to be interconnected to on-load monitoring system. These Arduino based monitoring system helps to provide better increases in reliability and accuracy of the system by collecting and providing information real-time.

## 2. SYSTEM DESCRIPTION

The block diagram represents consist of Arduino UNO, LCD display, relay module ACS712, ambient temperature sensor used
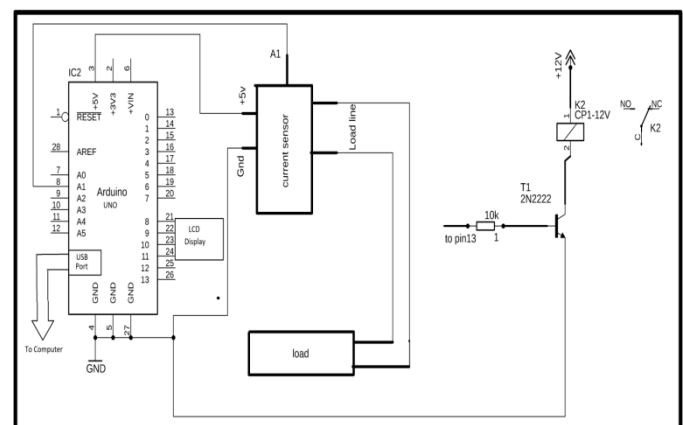


**Fig -1**: Block diagram of On-load Monitoring System of Circuit Breaker

## 3. METHODOLOGY

The rig for the system is connected to 12 volt of DC supply. The main component used for monitoring system is Arduino based microcontroller which will measure the parameters happening in the circuit. Arduino UNO operates on low voltage dc supply therefore separate additional 5volt dc supply is given to it. This supply is obtain from USB which is interfaced with computer. It generally has the adequate voltage level of the supply..Regulator is also been used for the supply constant 5volt dc supply to the ACS712 module. The current flow in circuit breaker, voltage, temperature of circuit breaker and fault sensing of the circuit breaker are sensed by the unit.

Whenever the over current flow through the circuit, then the ACS712 which acts as circuit breaker and relay interrupts the circuit and the display recorded by the computer stops. After being normal condition the unit can be restarted by just pressing reset key on arduino board and the whole rig is restored in service with LCD display functions.

The program used for this rig is based on C++ programming with the help of Arduino IDE which is available in cross-platform for BSD, Windows, Linux and MacOS operating system.

These IDE functions as to be written in C and C++ after that these programs are gone for verify and compile, in the end it got flashed to the Arduino motherboards for performing their programmed tasks.

Most IDE's comes under the GNU General Public License, they had to follow unified set of rules and code to compatible with various libraries which are associated with C and C++. The alternative of traditional IDE is nowadays is replacing by new contender IDE's such as Microsoft VScode and eclipse framework. Many vendors provide a variety of Arduino boards but still a custom variants is sometimes needed for some specialized tasks.

For the interfacing of the monitoring system rig, Linux is the most preferable choice for interfacing between both peripheral. Although Windows and MacOS can also do the same task. But the hurdle with these OS come in terms of driver installation and robust stability which linux can be quite convenient to use with it. The current setup coupled with Linux machine is based on Arch linux with the kernel version 5.17.9. Other than Arch linux, it is supported with other popular linux distributions such as Debian, Fedora Linux, and Ubuntu, which is bit different distributions and modifications, Including various software and package manager. Commercial distributions such as RHEL and SUSE Linux Enterprise. Desktop Linux distributions and windowing system based on X11 or Wayland, with desktop environment such as GNOME or KDE Plasma. Distributions are being used for servers may avoid graphics, or include a solution which is stacked up for such as LAMP. Due to nature of Linux is freely redistributable, so that anyone can build a distribution from scratch for any kind of purpose.

## 4. CONCLUSION

For the betterment of reliable power system on-load monitoring circuit breaker should satisfy to enable better off-grid infrastructure, cost effective and efficient arduino based breaker monitoring function. Hardware should be modular so that it could be easy to enable it's effective upgrade, easy and obsolete part exchange in future. The purpose of these circuit breaker monitoring is employed in lower voltage field and it can be designed in a such way that it can also support upto medium and higher voltage level application. It should also able to achieve a product of having low cost and efficient effective monitoring to provide the data that would help to improve power system function.

## REFERENCES

[1]. CIGRE Working Group A3.12, "Failure survey on circuit breaker control systems: Summary report," Electra, vol. N-216, Oct. 2004.

[2]. Power Circuit Breaker theory and design by C. H. Flurscheim.

[3]. Switchgear and protection by M. V. Bakshi and U. A. Bakshi.

[4]. HVDC Circuit breaker by Saquib Siddiqui.

[5]. M. Kezunovic and G. Latisko, "Automated circuit breaker monitoring functions for improved power system operation and control," presented at the IEEE PES Summer Meeting, San Francisco, USA, June 2005.

[6]. C. Nail, "Automated control circuit breaker analysis," Master's thesis, Texas A&M University, College Station, Texas, Aug 2002.

[7]. Switchgear and Protection by J. B. Gupta.