DESIGN AND IMPLEMENTATION OF ADAPTIVE AUTORECLOSURE FOR EHV TRANSMISSION LINE

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Abstract—- Autoreclouser (A/R) Relay is one of important protection relays installed at the transmission line. It is Necessary changes to a Recently Developed Non-Communication Adoptive Single pole and Multi-shot Schemes based on some methods are proposed. The work intends to design a Real time Implementable simple and Effective Single Pole Adaptive AutoReclouser Schemes for Extra High Voltage (EHV) transmission line. A proposed change provides Necessary immunity against Noise. also, the Concept of Deionization time is introduced to Achieve Successful reclose. The Computational redundancy is Avoided to an extent by reducing monitored output variables, Coupled With the simple Hardware Inclusion. The steps are incorporated Against Possibility of Maloperation During Non faulty Conditions of Power System under Consideration. The Suggested Changes are require to be incorporated for Successful Implementation of the Method.

Index Terms— Transmission line, EHV system, Adaptive single-pole auto reclosing, transient fault, arc extinction.

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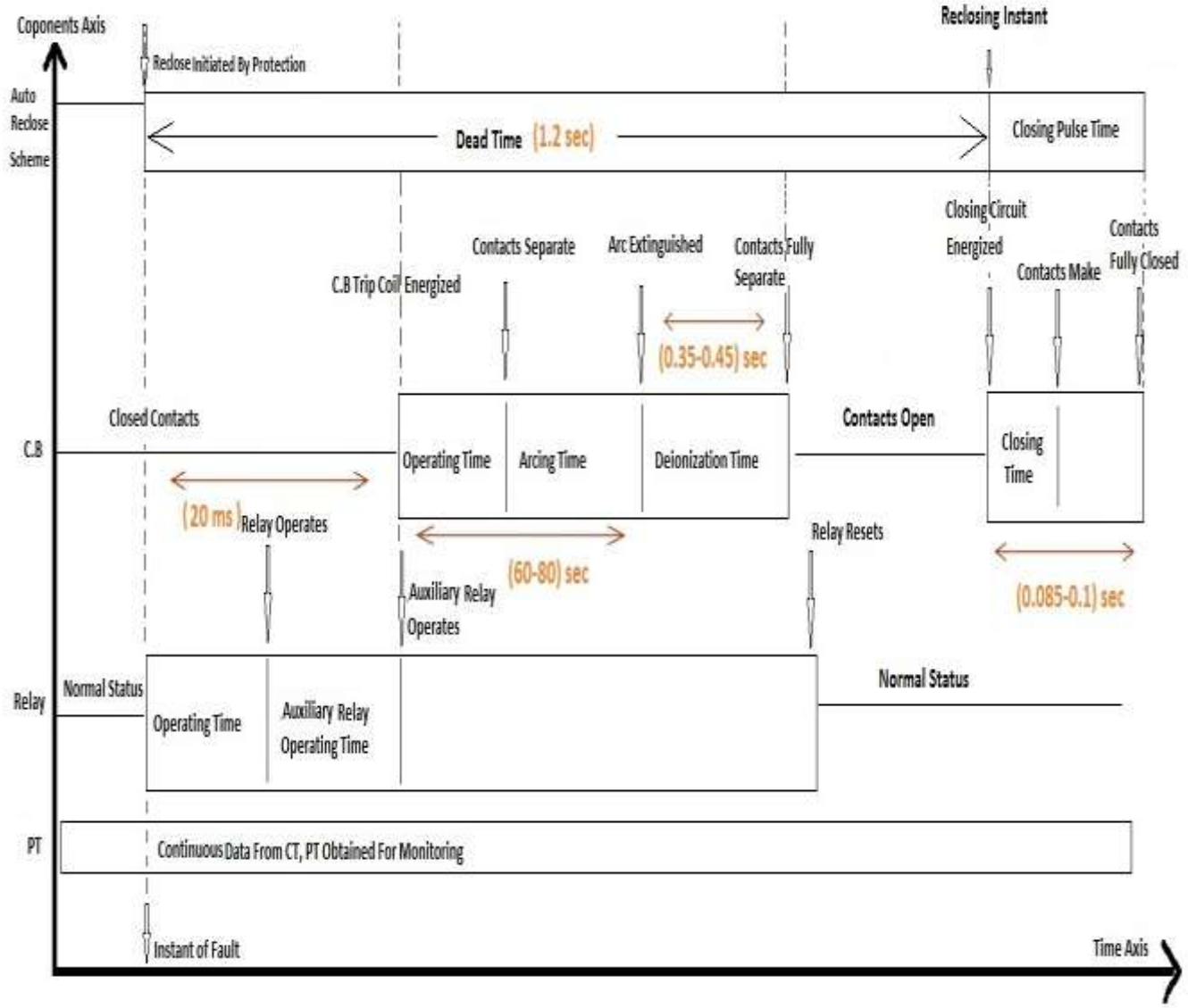
1. INTRODUCTION

In present day power systems 90% of faults on any overhead line network are transient in nature. The remaining 10% of faults are either semi-permanent or permanent. Transient faults are commonly caused by lightning and temporary contact with foreign objects. Auto-reclosing is an important technique for the speedy restoration of faults, improvement of system stability and the prevention of power system disturbances.The Autorecloser shall be designed for pole mounted or substation installation. It avoids reclosing unto permanent faults and recloses unto transient faults only after the secondary arc has extinguished [1]. These faults lead to substantial damage to the power system equipment. In India it is common to observe the failures in supply system due to the faults that occur during the transmission or distribution. Permanent faults, such as broken conductors, and faults on underground cable sections, must be located and repaired before the supply can be restored. Use of an auto-reclose scheme to re-energize the line after a fault trip permits successful re-energization of the line. Power system equipments such as circuit breaker (CB), protective devices, generator and transformer undergo huge amount of electromechanical stresses during these conditions. Hence adaptive autoreclosure schemes are deployed for better operating performance. Many methods have been proposed for the adaptive reclosure, but hardware implementation requires simplicity, reliability and real time implementation capability.

1.1 Adaptive Autoreclosing Philosophy

Protection systems take finite amount of time to detect fault and issue trip signal to the CB. Then, the CB takes couple of cycles to separate its contacts after getting trip command. This is followed by extinguishing of the fault arc. Nominal timings of various post fault events are shown in Fig. 1 [2]. The probable total time of all events in case of a temporary fault ranges from 0.43 - 0.55 sec, for three pole reclosure schemes, considering 220 - 400 kV systems. For single pole schemes, deionization time can be more. Against the total time calculated above, the conventional dead time used for single pole auto reclosure is about 1.2 sec [2]. In case of a transient fault, successful autoreclosure will be achieved after 1.2 sec and for permanent fault autoreclosing will fail. Optimization of such an autoreclosing scheme is required. Using adaptive autoreclosing scheme will serve the purpose and can avoid reclosing against permanent fault. Automatic reclosing is widely adopted in medium voltage networks. Automatic reclosing is easy to implement in a radial distribution network. It becomes problematic when distributed generation is introduced to the network[3].Autorecloser functions on the principle of Coordination of Inverse Time Overcurrent Relays with Fuses. The duty of protection equipment is to allow overload currents that occur during operation, yet to prevent impermissible loading of lines and equipment[4]. To avoid damages in the case of short-circuits the relevant equipment must be tripped in the shortest possible time [5]. On the other hand only few feeders or loads as possible should be disconnected from supply.The protection relays available in the power system must recognize the fault, perform tripping themselves or give trip commands for the relevant switching device.



1. Post fault event

2. Recloser control circuit

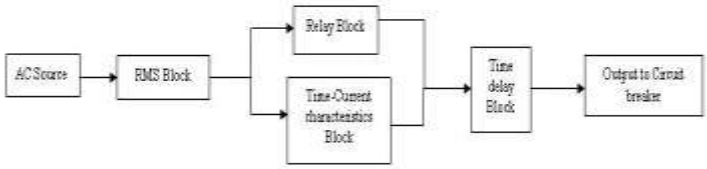


Fig. 2. Block diagram of Autoreclosers

Fig.2 shown in the control circuit of autorecloser which is located inside the subsystem.

Sine wave: The sine wave block is the representation of AC source that is considered as supply source. For recloser AC (230V) or DC (110V) source can be considered as supply source.

RMS (Root Mean Square): The RMS block is used to measure the root mean square value of the instantaneous current passing through the recloser.

Gain: The gain block is used to obtain peak value of the instantaneous current passing through the recloser.

Time-Current Characteristics: The peak value will pass to two blocks; the first is a Function Block. which contains the fast curve of the recloser.

Relay: The next block is a Relay Block which allows its output to switch between two specified values (0, 1). If the current is less than a specific value (reclosers setting) the relay output will stay at zero value, if the current value is greater than that specific value and more the output of the relay will be stick with 1.

Variable time delay: Variable Time Delay block receives the output of the previous two blocks as an input. The output of that block will be either 0 or 1 after a delayed time. If a fault current is passed through the relay; its output signal is 0, and this signal will be delayed (by the

variable time delay block) for a short time inversely proportional to the fault current value. The output of the last block is a signal that opens the breaker switch. If the fault is a temporary one, the relay output will be 1, so that the breaker switch closes.

Scope: The signal in the recloser control circuit is monitored at various levels with the help of scope. Basically, there are 4 scopes used at different level in recloser control circuit [6][7].

3. COMPONENT OF CIRCUIT DIAGRAM

3.1 Microcontroller:

In this project microcontroller find fault condition and give control signal to operate relay as fast as possible. We use Atmega328-Pu**.**

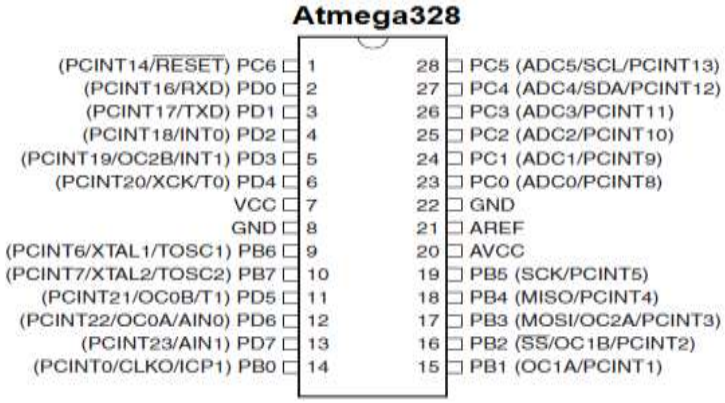


Fig.3 Pin Diagram Atmega328

3.2 Pushbutton:

This switch is in two position and device actuating with button press is on and released when off. This switch is used by an internal spring mechanism when it is off or un-energized position. Other switches will latch sequencly on and off when push button is pressed. Some push button remain in ON position when pressed till it's not get off or pulled back out.

Fig.4 Push button

3.3 Relay

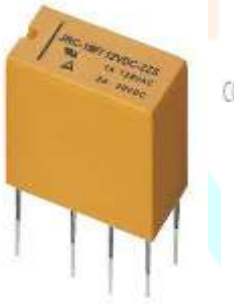


Fig-5: Relay

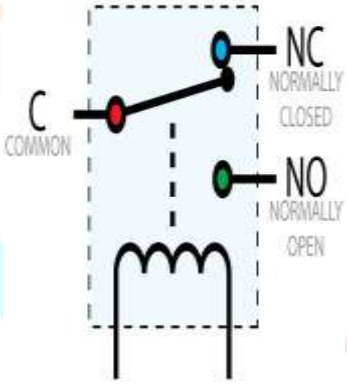


Fig-6: Relay Contact

Here fig.[5] shows the relay and fig .[6] relay contact. There are three terminal of the relay contact one is common for the supply and the other two or normally open and normally close. Relay is connected in circuit as we want as normally open or normally close. When relay coil is energized by the current it results to pull the plunger or push the plunger as it's connection. by the operation of relay one signal is given to the circuit breaker and it's disconnect the circuit.

3.4Capacitor

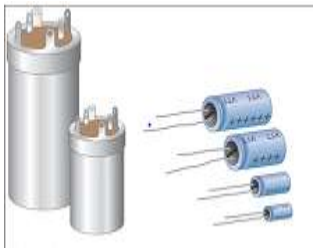


Fig.7 Capacitor

Fig.8 symbol

Capacitors are used electronic components that store, filter and regulate electrical energy and current flow and are one of the essential passive components used in circuit boards.

3.5 Resistor

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law V = IR

Fig.9 Resistor

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment.

3.6 Voltage regulator-7805

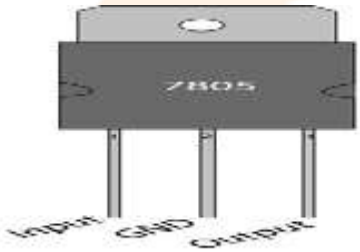


Fig.10 Voltage Regulator

Voltage regulator which is integrated circuit number is 7805.Normally 78xx series used for the fixed linear voltage regulated ICs. it is used because the voltage from the voltage source is not fixed it's fluctuate so for the fixed supply to the circuit voltage regulator is used. It has 3 pin, two is input and output and the other is ground. 7805 voltage regulator gives +5v supply.

3.7 LED

Fig.11 LED

Fig.12 LED symbol

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride. When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.

3.8 Diode

Fig. 13 Diode

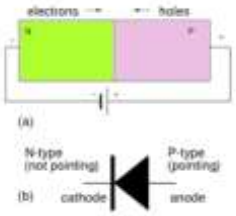


Fig. 14 Diode symbol

Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier.Three points must he kept in mind while using any type of diode.

4. CIRCUIT DIAGRAM

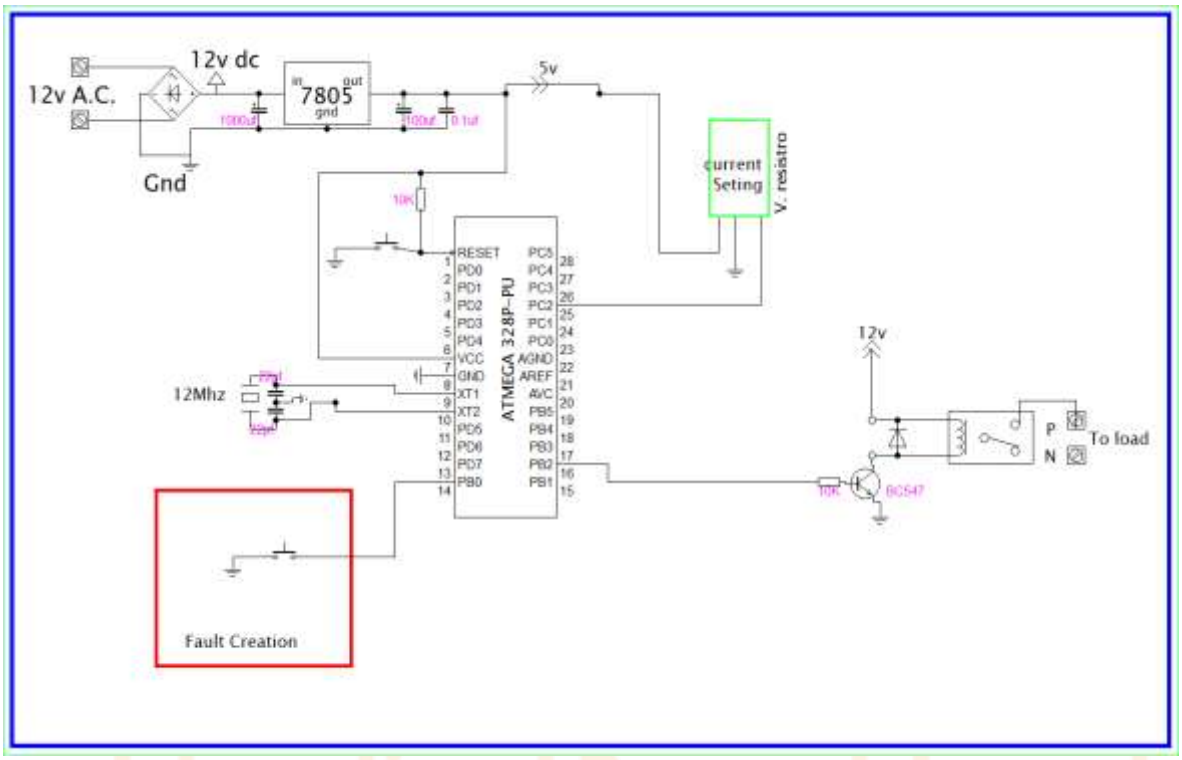


Fig-15 Circuit Diagram

Circuit Discription

-> for power supply 230 Ac to 12 ac transformer is use here, by application of bridge rectifier Ac converted in dc ,1000uf capacitor is use for filtering,7805 use for 5v regulator,then 47uf capcitor for again filtering after ,led with 470 resistor is use for power indication.
-> To start Atmega328 ,Connect it to supply and reset and 16mhz crystal circuit
-> 10k resistor is connected to A5 ADC to Vary fault current
-> Two push button to create fault
-> Lcd show different data

In this Project we study about different types of fault and its nature, here we create symmetrical and unsymetrical fault by pressing key and set different fault current by variable resistor. Here we define different class of fault base on current value and how much time to clear fault.during transient fault current value is low and Fault time is also low so Auto recluser low during permanent Fault shorting time and Current is also high so controller not allow for Auto reclosing.

5. ACKNOWLEDGEMENT

We would like to thank my guide for constant support and necessary guidance and also thanks to our faculties who have helped us.

6. CONCLUSIONS

The benefits of adaptive autoreclosure scheme have been elaborately discussed in this paper. Based on this some important suggestions have been made in the propose work.the use of Autorecloser control methodology, Protection system for distribution network Fast clearing of EHV fault is essential to maintain power quality in an area, because events on the EHV system affect the underlying Transmission and Distribution system. Benefits of successful high speed reclosing on EHV overhead Transmission lines are Improved system stability,reducing the duration of fault arc.Auto-reclose scheme was increase the reliability and stability in power system.

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