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LIGHTING PROTECTION SYSTEM FOR HIGH VOLTAGE TRANSMISSION LINE IN AREA WITH HIGH GROUNDING RESISTANCE

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Abstract: **In this paper a laboratory setup has been developed that mainly focuses on implementing the multi-functional numerical relay for the purpose of single phase online fault detection to protect the electrical equipment's against overvoltage, over-current and under-voltage faults. The developed system is highly responsive, and user friendly. The fault parameters values were made adjustable by the use of dedicated on-board tactile switches. The system keeps on comparing the values of over/under-voltage and over-current with that of the reference current/voltage values and takes the decision of isolation in real-time by shutting down the relay circuit immediately if any of the reference limits would cross. Hardware prototype with LPC812 as core controller is built to validate the operation.**

Keywords: **electrical equipment's, Lighting Protection System, High Voltage Transmission Line.**

1. INTRODUCTION

The protection of HVTL against atmospheric changes and the improvement of their lightning performance are the major technical issues of great importance. Lightning can cause the increase in the current level of the high voltage transmission line. This damages the transmission line.

Most disturbance on High Voltage Transmission Line (HVTL) caused by direct lightning strikes that can hit transmission tower or earth wire and produce back flashover (BFO) on insulators at the tower. Direct lightning strike to the phase wire produce travelling wave that will damage also the insulators and it's called Shielding Failures (SF). These disturbances take place more often in the tropical area and have high tower grounding resistance. Appropriate lightning protection systems and grounding can minimize the damage caused by the strike.

2. LITERATURE SURVEY

REF.NO	CLASSIFIERS	FEATURES
1	Study and design of lightning protection for H.V Lines	Zinc oxide arresters with reduced insulation
2	Lightning protection of H.V overhead transmission	Data of surge strength of relief gaps, line insulators and cables
3	Reynalado Zoro lightning protection model	Extended mast terminal
4	simulation for the Hellenic transmission	Surge arresters

Tabulation 2.1:

Based on the above information, in this paper we propose a statistical approach for detection of high voltages and for the protection of transmission lines. Which gives high accuracy when compared to other classifiers.

Lightning / ground fault:

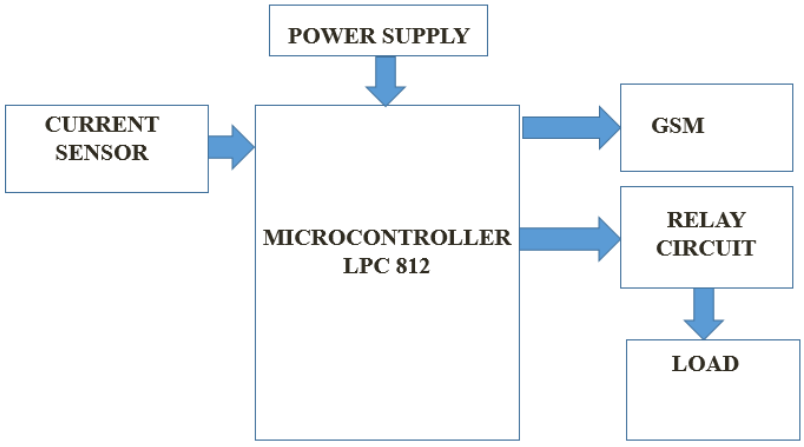
Lightning: It is an atmospheric discharge of electrical energy through the objects to ground with ten to thousands of high voltage current and transfers to the parallel current passing devices and causes the damage.

Ground Fault: It is a condition when a very high voltage, ungrounded current carrying conductor. Transmission line voltage can go up to 500 KV. When the current touches the Earth Ground due to a fault in the system. Thus, large amounts of current can also be injected into the Earth Ground when, for example, high voltage lines from sub-stations develop fault to Earth. These fault currents will also create conditions similar to a lightning strike. As the value of the discharge current is in thousands of Amperes, even very low impedances in the direct discharge current paths along the soil or other conductors can produce a very HV that can damage electrical equipment's connected to these conductive paths. Most of the damages can be caused to the electrical systems by the strike, and high voltage transients will lasts for a few microseconds that are developed in conductive parts that which can be exposed to the intense magnetic fields produced by the flow of hundreds to thousands of Amp of current in the direct discharge paths. Around a high current of around 19K Amperes can flow in a conductor, the lightning conductor, in a very short period of 20 μs at an extremely high rate of change of current around 2000 A per μs . This change in current will produces a very high momentary magnetic field around this conductor and will produce dangerously high induced transient voltages that will damage the associated electrical and electronic components.

Flow of Work:

Current sensor will be used for monitoring the current level of high voltage transmission line. When the current level of the main line is increased, automatically the system will be saved by switching the relay. Current level of the main line would be displayed on the 16x2 LCD.

Block Diagram



EXPLINATION:

Current sensor will be used for monitoring the current level of high. voltage transmission line. When the current level of the main line is increased, automatically the system will be saved by switching the relay. Current level of the main line would be displayed on the 16x2 LCD.

5v of Power supply is given to the micro controller. LPCXpresso code is written in the microcontroller LPC 812 and according to the code when the current flow is more than the given voltage then the circuit will breakdown with the help of relay circuit.

LPC 812:

Source code is driven into to microcontroller which will helps to trigger the other components that are connected to the hardware component. In our project we are connecting a current sensor(ACS 712),Relay circuit, GSM component.

ACS712 will be connected to the analog pin ports as shown in the module diagram and the relay circuit will be connected to M2 and UARTS which will help to trip the circuit off. GSM will be connected to the I2C pins.

ACS 712:

This is a current sensor that will helps us to measure how much current is passing ahead in the transmission line.ACS712 is built upon a integrated circuit which will works on 5v of current. It is a low noise analog output which will operates at 270kv of current.

In our project we will place the sensor that will measures the current and sends the output to the LPC812 through the analog pins. ACS712 can withstand up to a high range of power, so that we can implement this component at the current passing lines.

Relay circuit:

As we all know that a relay is used for connecting or disconnecting a circuit.It will act as a switch on and off. Generally a relay is an electromagnetic switch,it is used in application to turn on and off a circuit by a low power signal or where several circuits must be controlled by one signal.

There are many components act like a relay for example Thrisistor,transistor.These are the solid state relays these are for semiconductor devices.In our project relay ckt will be connected to the m2 pin of LPC812 and the output will connected to the transmission line.when the current is more than the power supply then immediately LPC will send a signal to the relay circuit to break the circuit.

GSM:

GSM will be connected to the I2c pin. When the circuit goes off immediately gsm will gets activated and the signal will be sent to the certain mobile.

We can connect any type of component to intimate the signal like alaram,gps,gsm etc., .We can connect number of devices to the I2c chip as per our requirement,the number of devices connection will be dependent on the addressing mode of microcontroller.

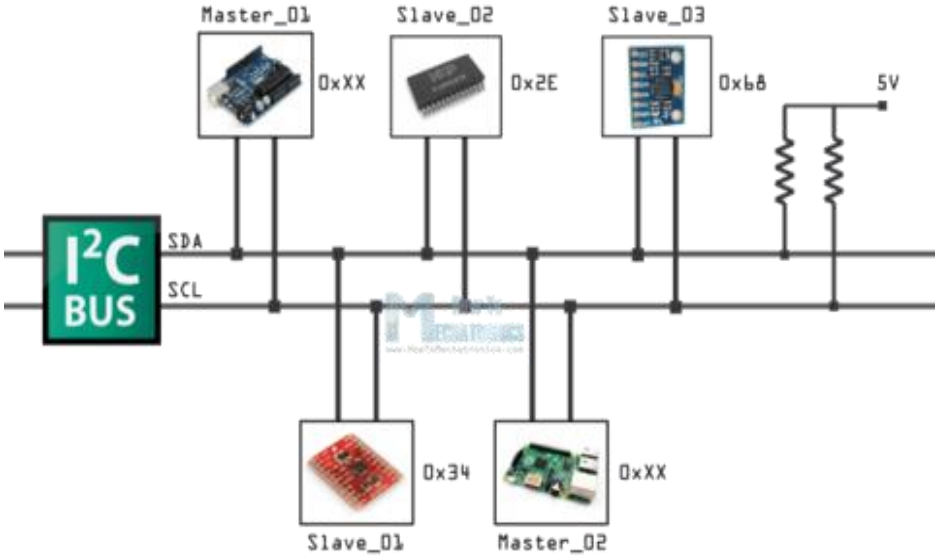
3. CONCLUSION

So far for the prevention for the damages occurring to the transmission lines through lightning which are done the arresters are getting failed, so that we implement a device that will makes the circuit turn off at the transmission lines with the help of LPC812,ACS712,Relay circuits etc., . Current sensor will be used for monitoring the current level of high. Voltage transmission line. When the current level of the main line is increased, automatically the system will be saved by switching the relay. Current level of the main line would be displayed on the 16x2 LCD.

5v of Power supply is given to the micro controller. LPCXpresso code is written in the microcontroller LPC 812 and according to the code when the current flow is more than the given voltage then the circuit will breakdown with the help of relay circuit.

FUTURE ENHANCMENT:

The microcontroller, which we are using in our module, does consists of an I2C pin, that which can provide us the connections to n number of devices according to the addressing mode.



In our project, we had connected a GSM device according to our requirement. Instead of a GSM device, we can replace it with other devices like GPS, alarm system or we can connect both the devices according to the requirement. In future, this project can be improvised to protect the low grounding areas and at the local current transmission lines.

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