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Fault Detection in Three-Phase Transmission Line by Using IoT

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Abstract: The electrical energy device is cut up into many special sections. One in all is the transmission mechanism, wherein Power is transmitted from producing stations and substations through transmission strains to customers. Both strategies Should numerous kinds of malfunctions are generally stated as a "Fault" Fault is described as a number of unwanted however Unavoidable incidents can temporarily disturb the strong circumstance of the power system that occurs while the insulation of the System fails at any factor. Furthermore, if a carrying out object comes in contact with a bare power conductor, a quick circuit, or Fault. The causes of faults are, lighting stroke, human error, wind damage, timber falling or wines plants throughout transmission Strains, aircraft crash on the transmission line, birds shorting traces, or vandalism. At some point in this study, the causes and consequences of faults Within the overhead transmission strains have been the maximum target of the research. A variety of the numerous reasons for faults and some Detection strategies are going to be mentioned. Those faults cause good-sized damage to the power system equipment. In India It's ordinary, the faults might be LG (Line to ground), LL (Line to Line), or 3L (3 lines) inside the availability structures and those faults in 3 phase delivery can affect the strength plant.

Keywords: Three-phase Fault, Node MCU, Transmission line, Line to Lind fault, Line to Ground Fault, IoT based.

I. INTRODUCTION

A fault in an energy device is any screw-ups that interface with the everyday float of the modern-day. The motive of electrical electricity gadget Faults is insulation breakdown. This breakdown maybe because of a diffusion of various factors such as

- 1) Lightning stroke
- 2) Spray on Insulators
- 3) Trees coming in touch with wires
- 4) System Failure
- 5) Human errors

As to the studies, 70% to 90% of faults are passed off in overhead transmission lines that are brief. There are numerous Transient faults, which include damage to insulation, swinging wires, and little time contact with other objects. Those faults are cleared by Running the circuit breakers or can be cleared by using de-energizing the road for a brief period for clearing the fault. The other 30% to 10% of faults came about in overhead line that is everlasting or long length faults. Permanent or lengthy Length fault took place with the aid of damaged wire which ends up one segment to floor fault or joining the two-phase collectively which is Passed off in overhead line in addition to inside the underground cable. Those faults are cleared by means of finding them in line and restored.

II. TYPES OF TRANSMISSION LINE FAULTS

Electrical faults in three-phase power systems are mainly classified into two types, namely open and short circuit faults. These faults can be symmetrical and unsymmetrical faults. Let's discuss these faults.

A. Symmetrical Fault

A symmetrical fault is a fault where all phases are affected so that the system remains balanced. A three-phase fault is a symmetrical fault. In this fault, all phases are short circuits to each other and often to earth. Such fault is balanced in the sense that the system remains symmetrical.

B. Unsymmetrical Faults

Unsymmetrical faults involve only one or two phases. In unsymmetrical faults the three-phase line becomes unbalanced. Such type of faults occurs between the line to ground or between lines. An unsymmetrical series of faults is between phases or between phase to ground. Whereas unsymmetrical shunt fault is unbalanced in the line impedance.

Sr. No.	Type of Fault	Short Form	Symmetrical Or Unsymmetrical	Probability of Occurrence
1	Three-phase line to ground fault	3LG	Symmetrical	2-3 %
2	Three-phase line to line fault	3LL	Symmetrical	< 1 %
3	Single line to ground fault	1LG	Unsymmetrical	70-80 %
4	Line to line fault	1LL	Unsymmetrical	15-20 %
5	Double line to ground fault	2LG	Unsymmetrical	< 10 %

III. COMPONENTS USED

A. Power Transformer

That is a device that is used to convert power from one alternating contemporary (AC) voltage to another alternating current (AC) voltage with less lack of electricity. There are two types of transformers: - Step-up transformers that increase voltage. - Step-down transformers that decrease voltage.

B. Voltage Regulator (LM7805)

It provides several fixed output voltages The LM7805 is an output +5 volts. It is a 3-pin IC; input pin for accepting incoming DC voltage, ground pin for establishing the ground for the regulator, and output pin that supplies the positive 5 volts

C. Relays

A relay is an operated switch that helps to protect the system from damage by detecting and isolating faults on transmission and distribution lines by opening and shutting the breaker.

D. LCD (Liquid Crystal Display)

An Interface IC is used for the hectic task to handle with Assist of MCU. The IC is to get a function of the data from the MCU and process to display meaningful information onto the LCD screen. The liquid crystal display is normally utilized in different embedded projects because of its low cost, quick access, and adaptability to get programmed. There's a kind of liquid display that has sixteen columns and two rows so it's called 16 x 2 LCD modules.

E. (IoT) Internet Of Things

The Internet of things (IoT) provides an easy and secure connection for sending and retrieving data in real-time. This platform supports interactive, real-time data visualization that permits developers to increase the platform for personal customization when desired. It exists to empower the data from the device.

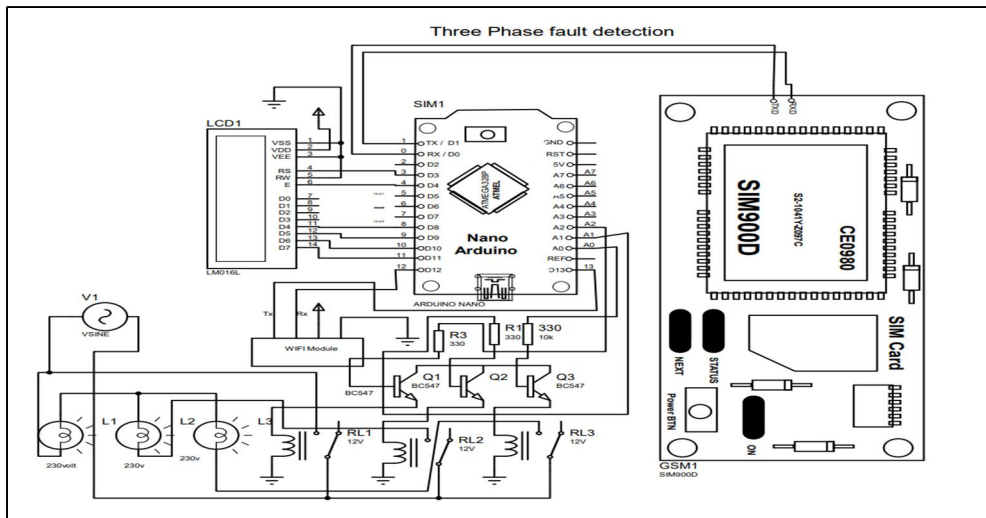
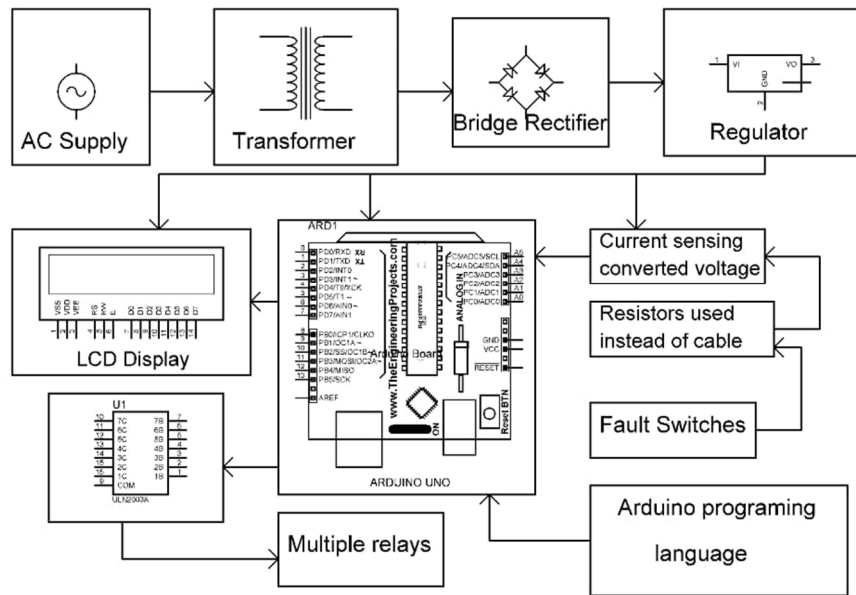
F. ARDUINO UNO

The Arduino UNO is a microcontroller board supported by the At mega 328 (datasheet). It has 14 digital input/output pins (of which 6 are often used as PWM outputs), 6-analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The UNO differs from all preceding boards in this it doesn't use the FTDI USB to serial driver chip. Instead, it features the ATmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to serial converter.

IV. WORKING PRINCIPLE

The undertaking makes use of one step-down transformer for dealing with the whole circuit below low voltage situations of 12V simplest to check. The three-segment fault evaluation. The primaries of 1 transformer Are connected to a 3-segment deliver in a celeb configuration, While the secondary of the equation is also related in a star configuration.

The output of the transformer is rectified and filtered and is given to 3 relay coils. Fault switches, each one is connected across the relay coil, meant to create a fault situation both at big-name i.e. LL. Fault and 31. Fault, LED'S are Related to their output to signify their popularity. The Microcontroller is used which converts the analog value of the voltage to a virtual one which is displayed on a 16x2 liquid crystal display. If the fault is created by means of any fault switches The virtual price shown on the liquid crystal display will differ abnormally given the fault vicinity. If the fault is cleared in the detailed term, then it is going to be a brief fault if it isn't then there may be a permanent journey. This Relay is supposed for disconnecting the burden to indicate fault situations



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