

Three Phase Fault Analysis with Auto-Reset

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Abstract: Conductor protection is a vital issue in a grid technology. Transmission and distribution lines have sensible contribution to the generating unit and customers to get the continuity of electrical offer. As 85-87% of grid faults area unit occurring in transmission lines, it's a demand to observe and find the faults within the grid as early as doable. This paper describes automatic tripping mechanism for the three-phase offer system. Within the event of temporary fault, the project output resets mechanically when a short interruption, whereas it stays in a very controlled condition just in case of permanent fault. The faults that area unit LG, LL and 3L could be result in harm to the ability system instrumentality and should be had an effect on the ability system. This project is meant to grasp regarding the essential operation of the relay, and what area unit all the advanced techniques that area unit been employed by the individuals to create the security operation of the electrical appliance and protection.

Keywords: Transmission line, Tripping Mechanism, LG, LL and 3L.

I. INTRODUCTION

A fault in a very grid may be brought up any abnormality within the current flowing in it. As an example, if this is interrupted by some failure within the circuit, the ensuing fault is associate electric circuit fault. If this within the circuit bypasses the traditional load, it leads to a brief circuit fault. In a very three-phase system, the fault could occur between one or a lot of sections and ground or solely between phases of the system. Generally, protecting device's area unit utilized in transmission systems to observe fault conditions and end in operation of circuit breakers or isolators that facilitate in limiting the harm because of the failure. In three-phase or poly-phase systems, a fault could have an effect on some phases (causing asymmetrical faults). If all the phases are affected equally, it leads to a symmetrical fault. Symmetrical faults area unit easier to research than asymmetrical faults.

Classification of faults:

A. Transient faults

In a very system, if a fault diminishes once influence is disconnected for a brief amount, so restored the fault is referred as a transient fault. A transient fault may additionally be associate insulation fault that quickly affects a device's insulator properties. Transient faults could also be caused because of fleeting tree contact, animal contact, lightning strike, etc.

B. Persistent faults

That don't diminish once influence is disconnected and restored area unit referred to as persistent faults. Such faults typically occur because of mechanical harm to the cable or alternative instrumentality of the system.

C. Radial faults

In a very three-phase system, if a fault affects all 3 phases equally, it's referred to as a radial or a balanced fault. Radial faults represent regarding five-hitter of the entire faults.

D. Uneven fault

Associate unbalanced fault or uneven fault leads to unequal result of fault on every of the 3 phases. Uneven faults area unit additional classified as LL or Line to Line fault, LG or Line to Ground fault and LLG or Double Line to Ground fault.

II. COMPONENTS

A. Transformer

Area unit a static theme that carries power from one path to a different path consistent with the principle of mutual induction. Electrical device converts AC current from one voltage to a difference with a small loss of power. Change of magnitude transformers rise voltage, diminution transformers decrease voltage. Most powering provides use a transformer to decrease the dangerously high voltage to a harmless low voltage.

B. 555 TIMER

The standard 555 bundles incorporate over twenty transistors, two diodes associated fifteen resistors on a chip introduced in an 8-stick smaller than usual double in-line bundle incorporates over twenty transistors, two diodes associated fifteen resistors on a chip introduced in an 8-stick smaller than usual double in-line bundle. Ultra-low power variants of the 555 areas unit to boot accessible.

the coil of the relays built a flux that attracts a lever and changes the switch. this in a very coil is on or off therefore relays have 2 switch positions and most have double throw (changeover) switch contacts as shown in figure. Relays allow one circuit to change a second circuit which may be wholly cut loose the primary. The coil of a relay passes a comparatively massive current, usually 30mA for a 12V relay but, it is the maximum amount as 100mA for relays designed to figure from lower voltages. Most ICS (chips) cannot provide this current and a semiconductor is usually accustomed amplify the tiny IC current to the larger worth needed for the relay coil. The most output current for 555 timer IC is 200mA therefore these devices will provide relay coils directly while not amplification. Most relays area unit designed for PCB mounting nevertheless, you'll patch wires foursquare to the pins providing you are taking care to avoid melting the plastic case of the relay.

F. DIODES

Diodes living AC into DC these area unit utilised as half-wave rectifier or full wave rectifier. 3 points should he remembered whereas utilizing any variety of diode.

1. Maximum forward current limit
2. Maximum spin voltage limit
3. Maximum forward voltage limit

Variety the amount the quantity and voltage limit of a little of the necessary diodes accessible within the market area unit as per the following:

- Diodes of number IN4001, IN4002, IN4003, IN4004, IN4005, IN4006 and IN4007 have a most extreme reverse bias voltage limit of 50V and most forward current limit of one Amp.
- Diode of same capacities is utilised as a district of place of every different. Aside from this diode of additional is utilised as a district of place of diode of low capability, but diode of low capability cannot be utilised as a district of place of diode of high capability. for instance, in situ of IN4002; IN4001 or IN4007 is utilised however IN4001 or IN4002 cannot be utilised as a district of place of IN4007. The diode BY125 made by organization BEL is identical of diode from IN4001 to IN4003. BY 126 is a twin of diodes IN4004 to 4006 and BY 127 is a twin of diode IN4007.

III. OPERATION AND CIRCUIT

The project utilizes half dozen numbers step down transformers for of the total circuit below low voltage conditions of 12v simply to check the three section faults examination. The first aspect of three transformers is related to a 3 stage provide in star arrangement, whereas the secondary of an equivalent is additionally associated in star arrangement. The opposite arrangement of three transformers with its primary associated in star to three phases has their secondary's associated in delta configuration. The output of all half dozen transformers is corrected and filtered separately, and is given to six relay coils. half dozen push switches, one every connected across the relay coil is supposed to form a fault condition either at star. The Tar Heel State contacts of all the relay area unit created parallel whereas all the common points area unit grounded. The parallel connected purpose of Tar Heel State is given to pin2 through a resistance R5 to a 555 timer i.e., wired in monostable mode. The output of an identical timer is connected to the reset pin four of another 555 timer in astable mode. LEDs area unit connected at their output to indicate their standing either on or off. The output of the U3 555 timer from pin3 is given to associate operational electronic equipment LM358 through wire eleven and d12 to the non-altering input of pin3, whereas the inverting input is unbroken at a settled potential by a possible divider RV2. The potential at pin2 coming back from the resistance is command to the purpose that it's on top of the pin3 of the operational electronic equipment used as a comparator, in order that pin1 develops zero logic that fails to figure the relay through the driving force semiconductor unit Q1. This relay Q1 is "3CO" relay i.e., is supposed for disconnecting the load to point fault conditions.

Whereas push catch over the relay is ironed it disconnects that relay and within the method in common contacts moves to the Old North State position to grant a logic low at trigger pin of 555 timer to make up an output that brings the U3 555 timer, that is employed as a vicinity of astable mode for its reset pin to high such the astable operation takes place at its output and that is shows seems by flashing D11 LED. Within the fault is off temporary in nature i.e., if the electric switch ironed is free instantly the U1 monostable disables U3 the output of which works to zero just in case of any electric switch unbroken ironed. For an extended length the monostable output offers an extended length active scenario for U3 the astable timer the output of that charge capacitance C13 through R11 such the output of the comparator goes to high that drives the relay to show off three-phase load. The output of Op-amp stays high indefinitely through a regeneration given for its pin1 to pin3 through a forward biased diode and an electrical device nonparallel. These outcomes within the relay for good switched to disengage the load connected at its Old North State contacts for good off. carry on or keep up flow of DC provide the star connected set DC'S area unit paralleled through D8, D9 and D10 for continuous provide to the circuit DC voltage of 12v and DC voltage of 5v derived out of transformer IC 7805.

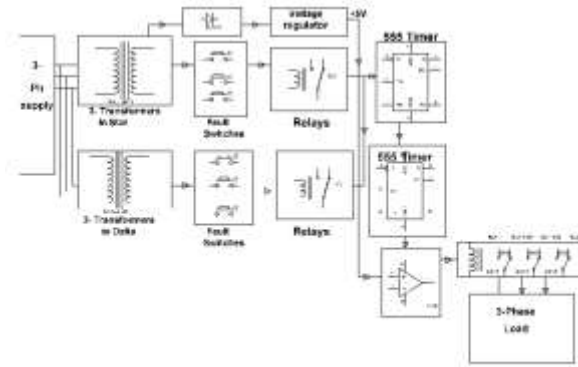


Fig-3: Block Diagram of Circuit

IV. HARDWARE TESTING

A. CONTINUITY TESTS

Checks are going to be performed simply once the hardware fastening and configuration are completed. We tend to use a multi-meter to perform this check. This check aims at finding any electrical open methods within the circuit once the fastening.

B. POWER ON TESTS

This check is performed to research whether or not the voltage at varied terminals is as per the requirement or not. This check is going to be performed while not ICS. In this, we will assure that the voltage in the least the terminals is consistent with the necessity.

C. APPLICATIONS

Business places, Industries, Power lines, applied in transmission and distribution system, employed in station, clearing temporary fault in industries and business sectors.

V. RESULTS

To this last, elements assembled and connected all the circuit connected connections of the various transformers, PCB circuit and therefore the load to apprise the faults to be occurred by tripping through the push buttons. Testing was performed on the circuits and is with success dead for the various continuity check and therefore the power-on test.

The transformers area unit connected to the PCB circuit whose input is 12v. Push buttons, LEDs glows and is dead by pressing electric switch. once with success implementing the association of transformers and cargo with PCB circuit, we tend to give three-phase provide to electrical device. we tend to created fault by pressing electric switch and fault created with success. The fault was cleared like a shot inside seconds notifying the incidence of temporary fault.

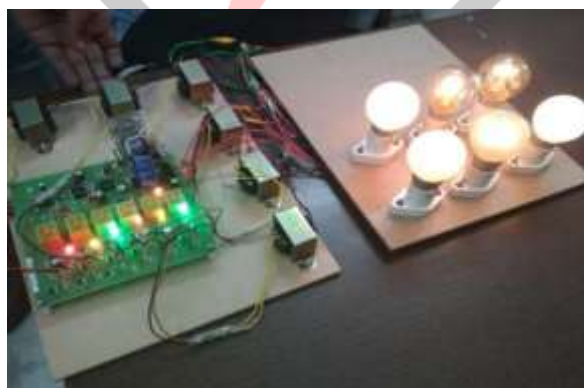


Fig-4: Final Execution of circuit

VI. CONCLUSION

This paper mentioned project style within the sort of hardware for 6 single part electrical device to 230v to 12v of output for to develop automatic tripping mechanism for the three-phase provide system whereas temporary fault and permanent fault happens in system. Throughout temporary fault, it returns the provision to the load like a shot, otherwise it leads to permanent trip. The construct within the future will be extended to develop a mechanism to send message to the authorities via SMS by employing a GSM electronic equipment.

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