Three Phase Fault Detection Through Automatic Tripping Mechanism

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Abstract- *The project is designed to develop an automatic tripping mechanism for the three-phase supply system. The project output resets automatically after a brief interruption in the event temporary fault while it remains in tripped condition in case of permanent fault. The electrical substations which supply the power to the consumers, industries or domestic can have failures due to some faults which can be temporary or permanent. These faults lead to substantial damage to the power system equipment. The faults might be LG (Line to Ground), LL (Line to Line), three L (Three lines) in the supply system and these faults in three phase supply system can affect the power system. This system is built using three single phase transformers which are wired in star input and star output, and three transformers are connected in delta connections, having input 220 volt and output at 12 volts. This concept low voltage testing of fault conditions is followed as it is not advisable to create on mains line. 555 timer are used for handling short duration and long duration fault conditions. a set of switches are used to create the LL, LG and three L fault in low voltage side, for activating the tripping mechanism. Short duration fault return the supply to the load immediately called as temporary trip while long duration shall result in permanent trip.*

Keywords- Comparator, IC555, Relay Driver, Relay.

I. INTRODUCTION

Faults on transmission lines can be caused by lightning strike, flash over on contaminated insulator surface broken conducting line short circuit between conducting lines. Electromagnetic transients in power systems result from a variety of disturbances on transmission lines, such as faults, are extremely important .A fault occur when two or more conductors come in contact with each other or ground in three Phase systems faults are classified as Single line-to ground faults, Line-to-line faults, double line- to-ground faults, and three phase faults. For it is at such times that the power system components are subjected to the greater stress from excessive current. 70 to 90% of the faults are transient in nature such as insulator flash over, lightning, swinging wires and temporary contact with foreign objects. Remaining 10-20% faults are permanent in nature. Example: a small branch falling onto the line, broken wire causing a phase to open or a broken pole causing the phases to short, faults on underground cables, these faults give rise to serious damage to power system equipment. Fault which occurs on transmission lines not only affect the equipment but also the power quality.

II. BLOCK DIAGRAM

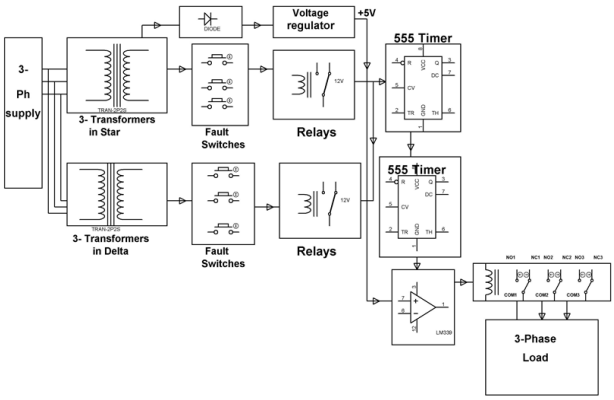


FIG.1.BLOCK DIAGRAM

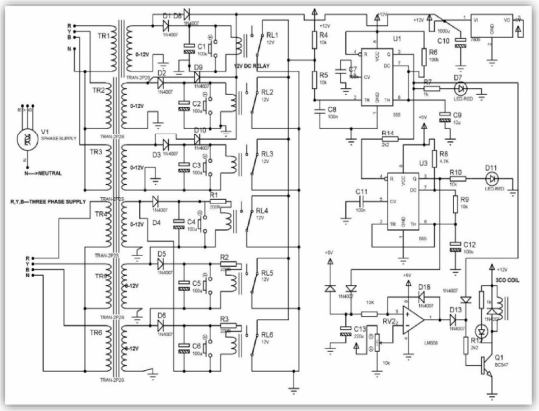


FIG.2 CIRCUIT DIAGRAM

III. WORKING

The project uses six numbers step-down transformers for handling the entire circuit under low voltage conditions of 12V only to test the three phase fault analysis. The primary of three transformers is connected to a three phase supply in star

configuration, while the secondary of the same is also connected in star configuration. The other set of three transformers with its primary connected in star to three phase have their secondary‘s connected in delta configuration. The outputs of all the 6 transformers are rectified and filtered individually and are given to 6 relay coils. Six push buttons, one each connected across the relay coil is meant to create a fault condition either at star i.e. LL Fault or 3L Fault. The NC contacts of all the relays are made parallel while all the common points are grounded. The parallel connected point of NC is given to pin2 through a resistor R5 to a 555 timer i.e. wired in monostable mode. The output of the same timer is connected to the reset pin 4 of another 555-timer wired in astable mode. LED‘S are connected at their output to indicate their status. The output of the U3 555 timer from pin3 is given to an Op-amp LM358 through wire 11 and d12 to the non-inverting input pin3, while the inverting input is kept at a fixed voltage by a potential divider RV2. The voltage at a pin 2 coming from the potential divider is so held that it is higher than the pin 3 of the Op-amp used as a comparator so that pin 1 develops zero logic that fails to operate the relay through the driver transistor Q1. This relay Q1 is 3CO ‘relay i.e. is meant for disconnecting the load to indicate fault conditions.

A.7805 Voltage Regulator:

The LM78XX direction of motion of 3-terminal controllers is available with settled yield voltages of 5V, 8V, 12V, and 15V. A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. It may use an electromechanical mechanism, or passive or active electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. There are two types of regulator. They are

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

78xx: ’78’ indicate the positive series and ‘xx’indicates the voltage rating. Suppose 7805 produces the maximum 5V.’05’indicates the regulator output is 5V.

79xx:’79’ indicate the negative series and ‘xx’indicates the voltage rating. Suppose 7905 produces the maximum -5V.’05’indicates the regulator output is -5V.

These regulators consist of the three pins they are

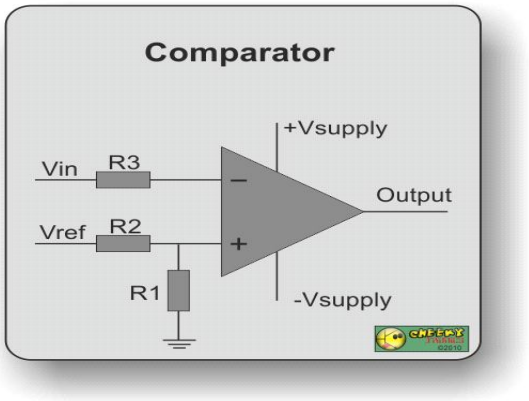
Pin1: It is used for input pin.

Pin2: This is ground pin for regulator

Pin3: It is used for output pin. Through this pin we get the output.

B. OPAMPS (LM358)

View all consequences on OpenDatasheets.com datasheet specifies that it includes two impartial, excessive benefit, internally frequency compensated operational amplifiers which had been designed especially to function from a single energy supply over a huge range of voltages. Operation from break up power resources is also possible and the low energy deliver modern-day drain is independent of the significance of the strength supply voltage. The LM358 and LM2904 are available in a chip sized bundle (8-Bump micro SMD).



Operation from break up power resources is also possible and the low energy deliver modern-day drain is independent of the significance of the strength supply voltage. The LM358 and LM2904 are available in a chip sized bundle (8-Bump micro SMD) the use of Countrywide’s micro SMD bundle generation.

C. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

The single Pole Double Throw SPDT relay is very useful packages due to its inner configuration. It has one not unusual terminal and a pair of contacts in 2 unique configurations: one can be generally closed and the other one is opened or it may be generally open and the other one closed. So basically you may see the SPDT relay as a way of switching among 2 circuits: while there is no voltage carried

out to the coil one circuit "gets" modern-day, the opposite one doesn't and whilst the coil gets energised the alternative is happening.

D. 555 TIMER

This is a transfer driver circuit which can be driven by either AC or DC input voltage. Furthermore, not at all like alternate circuits, a particular voltage, for example, the evaluated voltage values we used to drive the others, doesn't should be utilized. Since this circuit contains a transistor, a great deal less power needs to utilize on the info side to drive it.

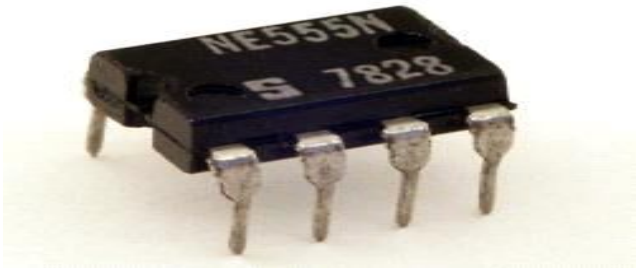


Fig.2 IC 555

IV. CONCLUSION

The mission is designed to develop an automated tripping mechanism for the 3 phase supply system. The undertaking output resets routinely after a brief interruption within the occasion temporary fault at the same time as it stays in tripped circumstance in case of everlasting fault the electrical substation which deliver the energy to the purchasers i.e. industries or domestic could have disasters because of a few faults which may be brief or everlasting. These faults cause enormous damage to the electricity device equipment. In India it's miles commonplace to have a look at the failures in supply machine due to the faults that arise during the transmission or distribution.

The idea in the destiny may be extended to developing a mechanism to send message to the authorities through SMS with the aid of interfacing a GSM modem. Three with three phase Fault detection via automated Fault Tripping Mechanism may be very beneficial to Engineering students.

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