DESIGN AND IMPLEMENTATION OF A MICROCONTROLLER-BASED MULTIFUNCTION RELAY

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Why?

Electrical Power System protection is required for protection of both user and the system equipment itself from fault, hence electrical power system is not allowed to operate without any protection devices installed. Power System fault is defined as undesirable condition that occurs in the power system. These undesirable conditions such as short circuit, current leakage, ground short, over current and over voltage.

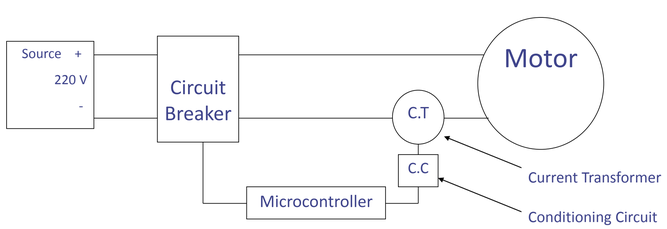
In summary, the needs of power protection ar

- User/Personnel Safety
- Equipment Safety

Protection Relay

Protection relay is a device which by means of measuring power system quantities (currents and voltages) and processing them through its internal logic which has the capacity to control the operation of a circuit breaker. The internal logic allows the relay to initiate a tripping sequence when irregular conditions arise within the power system.

Configuration



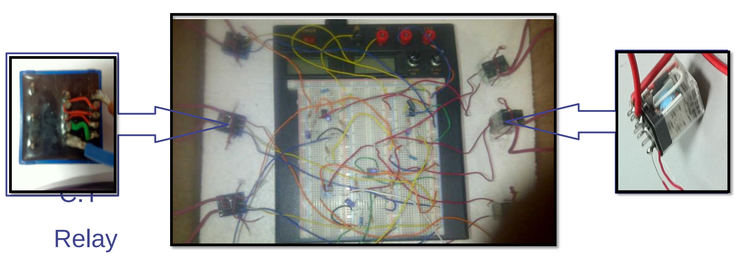
How it works

- First , the current comes form the motor to the current transformer to reduce it with a ratio of 5/1000 so the conditioning circuit can handle it.
- Second, the conditioning circuit takes input signal from a current transformer, then come out with a proper signal for a Microcontroller-Based Multifunction Relay, involves: filtering, shifting and regulating.
- Then, the microcontroller reads the signal coming from the conditioning circuit and convert it to digital to make a decision if there is an overcurrent in the line.
- Finally, if overcurrent is detected, a signal form the microcontroller is set to trigger the circuit breaker and shut down the motor.

LAB Work

- Motor Connection

- Conc



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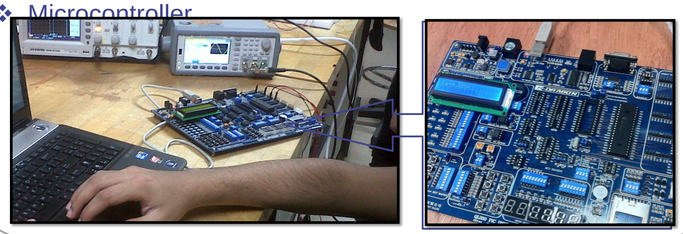
Relay

- Microcontroller



Decision Maker

This is the procedure followed to make a decision if there is an over current in the microcontroller

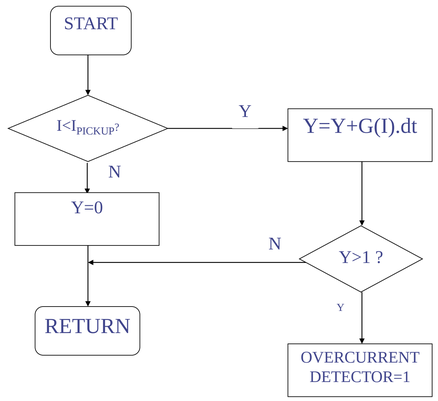
This flow diagram can be understood by assuming the tripping time , T0 to be a function F(I):

$T_0 = F(I)$

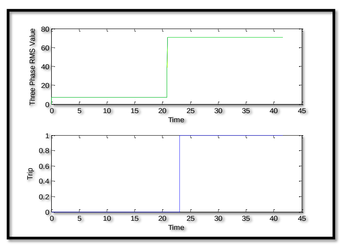
$G(I) = 1/F(I)$

$G(Ij) \cdot T0 = 1$

$T0 = n \cdot dT$



Results



Trip signal in MATLAB simulation

Fault message in microcontroller LCD

Conclusion

During this semester, the project goals have been achieved. Starting by surveys about relays, current transformers and circuit breakers. Also MATLAB has been used to test the algorithm that used to detect the RMS value from the Four-Sample Method. After that, designing the conditioning circuit and the power circuit has started as well programming the microcontroller. In the end, connection of the conditioning circuit, the power circuit and the microcontroller have been done for final testing in the lab and completion of the project.