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Detecting Micro-Grid Synchronization Failure on Sensing Frequency or Voltage Beyond Acceptable Range using ZigBee

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Abstract: ***In this project, we reflect the development of system to have the synchronization failure of any external supply source to the mains on sensing the abnormalities in frequency and voltage beyond acceptable range. Grid synchronization is an important part. There are some power generating units connected to micro grid such as solar, wind or inverter to supply power to the load. This unit need supply power according to the rules of grid. This rules involve maintaining voltage within specified limit and frequency too. In this project, we are planning to implement microcontroller based system to detect the failure and monitor wirelessly with the help of wireless communication devices such as ZigBee.***
Keywords: PIC Microcontroller, Grid Voltage Variation, Frequency Variation, relay, PT, ZCD, ZigBee.

I. NTRODUCTION

This project is implemented for synchronizing solar panels or inverter with main supply in commercial building. The three main reasons through which grid synchronization fails are voltage variation, frequency variation, phase angle variation or phase difference. We are intended in this project to construct such a system that includes voltage, frequency and phase differences which gives a breakpoint based on under and over voltage along with the frequency and maintain a strategic distance from any harm to the micro grid. The main objective of this project is to detect the variations in voltage and frequency and sends signal and output to the person who is at long distance monitoring it. This is a demonstration devised to provide such kind of a system that could detect the failure in synchronization working of the micro grid. In case of any external supply source that is supplying to the mains is encountering any kind of abnormalities.

This system could be used in offices, colleges, or any other commercial building where the consumer has different energy sources such as solar inverter. By using this system, the consumer can sync both the sources. in commercial buildings Energy provides the power to progress. Availability of sufficient energy and its proper use in the country can result in its people rising from subsistence level to highest standard of living.

Energy exists in different forms in nature but the most important form is the electrical energy. The modern society is so much dependent upon the use of electrical energy that it has become a part and parcel of our life. Several new trends have already employed in the electricity infrastructure. It includes the expansion of the existing grid with micro grids and mega grids, extensive sensors, data processing, visualization tools, etc.

Increasing electrical energy demand, modern lifestyles and energy usage patterns have made the world fully dependent on power systems thus the need of a reliable and stable power system grid. However, the power system is a highly nonlinear system, which changes its operations continuously. This project uses the microcontroller PIC family for fast detection and implementation so that the consumer's equipment's and machines should remain safe.

II. BLOCK DIAGRAM

The following block diagram showing us how the project and processing are going to work. The mains supply will be given to the microcontroller through step down transformer and voltage regulator ic 7805 and bridge rectifier. Then the another energy such used in this project is inverter which is also connected to the microcontroller and rectifier circuit. There is relay connected between relay driver and load. the load is connected to the main supply through same relay to which alternate source is connected.

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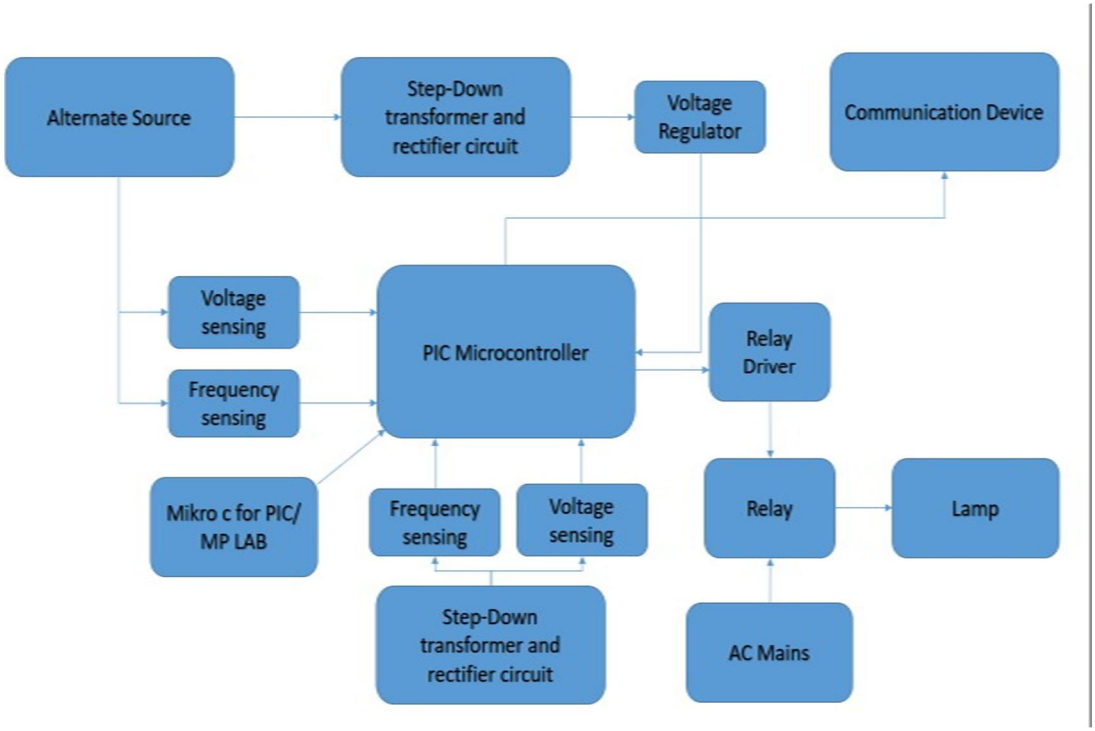

For voltage sensing, the microcontroller takes reference voltage from mains and compare it with the alternate source voltage and if the voltages are same in magnitude then the microcontroller sends high pulse to the relay driver it will get sync with the main supply and shows all the data and message i.e. system has been synchronized in the monitor which is away from it through wireless communication. For creating failure condition there is IC named SG2535 in inverter circuit which is used for varying voltage and frequency using two potentiometers. As the potentiometer position is changed it will vary voltage and island the external source with the main system to avoid the blackout and failure of the system.

For frequency sensing., the microcontroller takes reference frequency from mains supply to which the alternate or external source is to be sync and varies it with the external source frequency if they both are same then the system is synch and data and message is get showed on monitor. For varying frequency, the same procedure has to carry as it is for voltage.

III. CONCLUSION

This project gives brief idea about indicator which senses the abnormalities in voltage as well as in frequency and sends signal and data to receiver so as to detect the synchronization failure of any external supply source to the micro grid. This type of indicators is much needed in most commercial building where number of voltage levels, number of sources and number of load lines are existing. In short it will be beneficial in case of complicated buildings because at present there is not such facility for synchronization in commercial buildings.

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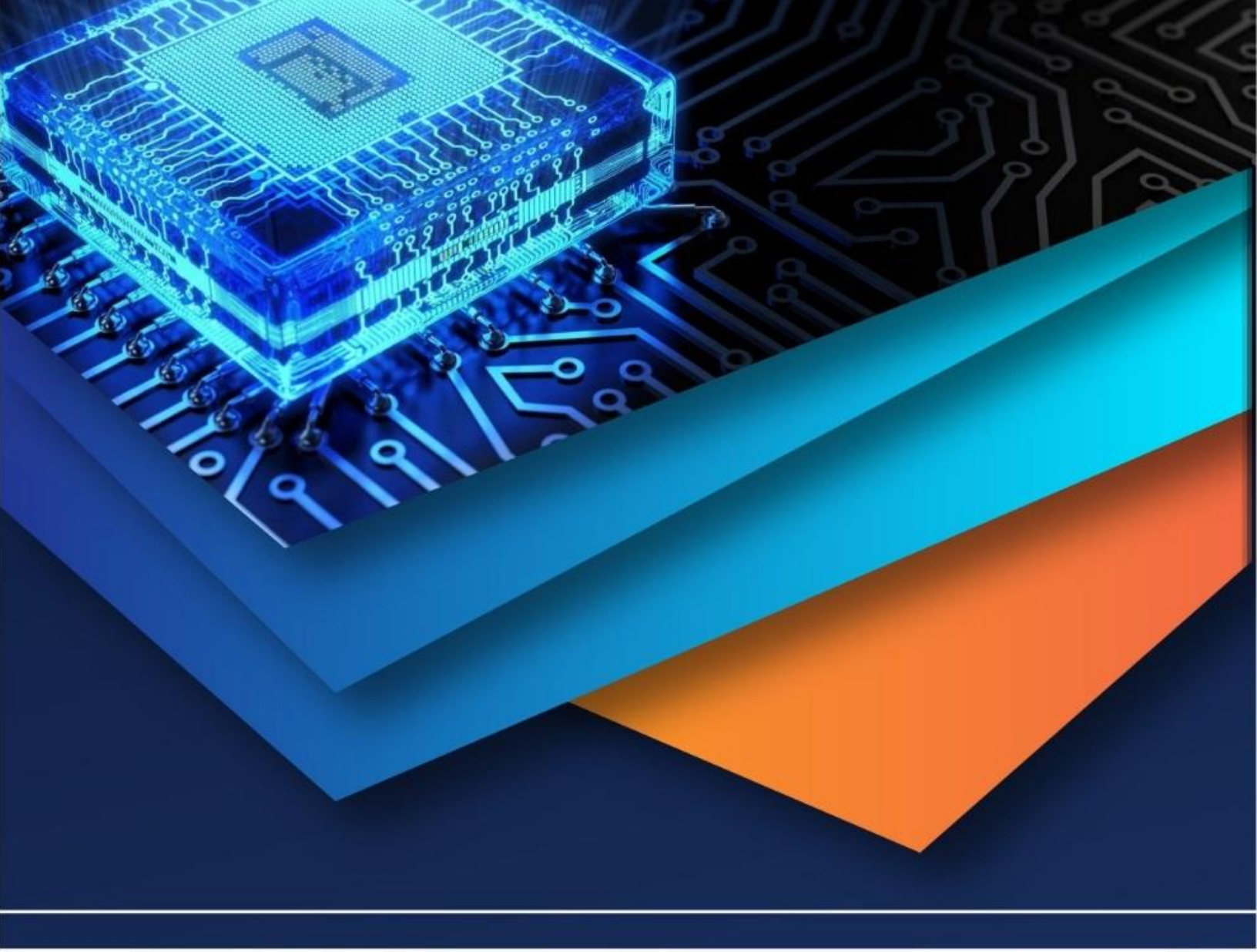

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