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Islanding Scheme for Microcontroller Based Load Frequency Controller

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Abstract: *This paper is for detecting power sync errors. The actual power grid consists of power sources that are synchronously connected to power the system. These power supplies must be powered according to grid rules. These rules include voltage and frequency fluctuations within certain limits. Deviations from these limits require that this data source be immediately disconnected from the network and affected. This is known as solo operation. It is used to avoid large voltage drops or power outages from the grid. Our system is designed to warn the network of a power failure, so the network can use other backup data sources as needed to avoid a complete power failure. Our system demonstrates this with the ATmega328P microcontroller. MC is used to detect voltage and frequency from a set of comparators. Since the frequency cannot be changed, use the frequency generator (555 timer). Standard variacs are also used to vary the input voltage of the system. Normal loads are used to indicate the expected power outage or power outage if the voltage / frequency deviation exceeds the limit.*

Keywords: Synchronization, Islanding, Voltage and Frequency etc.

I. INTRODUCTION

Synchronization means reducing the difference in voltage, frequency, and phase angle between the corresponding phases of the generator outlet and the grid supply. The current alternating generator must be synchronized with the grid before connecting. It cannot deliver power unless it uses the same frequency as the network. Synchronization should take place before connecting the generator to the grid. Sync can be achieved manually or automatically. The purpose of synchronization is to monitor, access, enable, and automatically take control measures to prevent power outages and frequency. There are some cases where generators and other local loads are disconnected from large distribution lines. Due to this decrease in supply quality, it may also prevent automatic device reconnection. This is called islanding. For this reason, the settlement of the island should be seen immediately and the production capacity should be stopped immediately. The discovery of the islanding can be done in practical and efficient ways. The modes look for temporary events in the grid and the active modes will scan the grid by sending signals from the grid distribution area. The project is built on the microcontroller ATmega328P. By using comparators the microcontroller monitors low and high voltage power. This project uses a flexible frequency generator (555-timer) to change the frequency, while a potentiometer is used to change the input voltage to evaluate project performance. A light load (indicating unpredictable shutdown, brownout) is applied to the controller. In the case of power or output frequency at an acceptable level. If the voltage and frequency exceed the limits it will affect the grid and cause grid failure. This feed unit is completely separated from the island-created grid to maintain the required alignment between the grid and the feed unit.

II. BLOCK DIAGRAM

230V power is supplied to transformer. The power of the transformer is 12V. We can use a circuit that includes a filter, and power controller can use a rectifier that includes 3 rectifier, filter, and power controller. The rectifier converts the alternating to dc a current, and the filter blocks the ripple to provide a pure current signal. The DC voltage is redirected and the microcontroller receives this DC voltage from the regulator. The output of the microcontroller is connected to a 16x2 LCD display. The voltage can be adjusted by changing the voltage potentiometer. Flexible frequency is taken from 555 timers to evaluate project performance. If you want to do load tests to properly align, connect a 10W heavy lamp to a small LED load. The pot is connected to the microcontroller input. When you change the potentiometer, the voltage changes, and

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after reaching the allowable voltage, the voltage is displayed on the LCD. The relay circuit opens and the grid is secure. Frequency fluctuations are shown before activation. The light shines before it goes out.

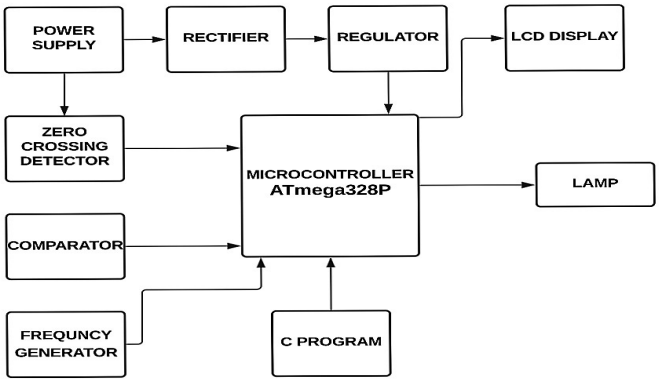

Figure 1: Block Diagram

III. IMPLEMENTATION

Alternate power supply synchronization error recognized by this system will be done. The error can be either under/ overvoltage or under/ over frequency. The system uses the ATmega328P microcontroller to execute this operation. This process is generally known as Islanding.

3.1 Voltage Sensing Part

Microcontroller is connected to zero voltage detection circuit and confirms that the frequency of the power supply is the normal frequency of 50Hz. VARIAC is used to get variable voltage. VARIAC is set so that the AC input voltage exceeds the normal value. The microcontroller sends a high logic pulse to turn on the relay driver. This will turn on the relay and turn on the light when AC power is received. likewise, if VARIAC is set to be lower than normal at some point in the input AC voltage. When microcontroller receives this break in, it sends a logic high signal to the relay driver to turn on the relay and the lamp begins to light.

3.2 Frequency Sensing Part

VARIAC is set to the normal value of the AC input voltage. The pin of the microcontroller is connected to the output of the timer via an NPN transistor. The timer operates in stable mode produces a signal with a frequency that can be conformed with variable frequency. This output is connected to the microcontroller's internal timer, which calculates the frequency of the pulse consequently and uses a relay driver if the frequency of the pulse is above or below normal frequency. Is actuated, the relay is turned on, and AC power is applied to the light. The lamp will start to light. 4. WORKING: Islanding of grid is principally to manage two parameters. One parameter is voltage and different parameter is frequency. Since we can not change the frequency, we've taken a 555 timer in a free running astable mode, the frequency of which can be varied by R. We know that by the R & C combination, the multivibrator mode of the 555- timer output can be generated at different frequencies. This output is given to the MC leg which has the provision of changing the frequency 48Hz-52Hz by varying R as explained over through selector slide switch So, the MC will get will get the changed frequency. This is the reason why we use a 555 timer for giving precisely 52Hz or 50 Hz or 49 Hz which must be tested by the program. In the program it's so written that if the output from 555 timer which is fed to the MC goes to below 48 Hz or above 52Hz the corresponding outputs of MC will go high, which will affect in switching "ON or OFF" a lamp to indicate that the islanding has taken place. As far as the voltage is concerned, we've taken 2 comparators. Both the comparators are given to i.e., one for inverting input and other for non- inverting input which are given at a particular voltage. They are so set that the output of these two comparators going to MC pin remain high for low voltage and for the high voltage it's held low. So, when the input voltage changes at Rs which is a remedied voltage which is coming from the DC voltage, when the input voltage changes i.e., if goes high. (It given a high command) and if it goes low (it gives a low command) to the microcontroller. That's how the commands are handled by microcontroller.

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IV. Results and Discussion

After the completion of hardware and software observed the following results: After testing system, we have observed lamp indication based on voltage stable and unstable state on voltage ranges:

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Voltage (V)	Lcd Display	Lamp Indication
<230	low voltage	on
230-240	stable voltage	off
>240	high voltage	on

Table 1: Voltage ranges

After testing system, we have observed lamp indication based on frequency ranges:

Frequency (Hz)	Lcd Display	Lamp Indication
<48	display frequency	on
48-52	display frequency	off
>52	display frequency	on

Table 2: Frequency ranges

Fig. 2. High frequency condition

Fig. 3. High voltage condition

Fig. 4. Low frequency condition

V. Conclusion

The paper elaborates the idea of developing a system for detecting the synchronization failure of any external supply source on the power grid when it detects abnormalities in frequencies and electrical power. There are several power supply units connected to the grid such as hydro, thermal, solar, etc. to provide power to the grid. These are need to supply power according to grid rules. These rules include maintaining variability of volage within limits and frequency. If any deviation from the acceptable grid limit is mandatory that the same server should be automatically disconnected from the grid called islanding. It is best to have a system that can alert the grid well in advance so that other arrangements can be kept in place to avoid grid failures

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