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DC Grid Synchronization

Abstract

Grid synchronization is the combination of two or more grids to fulfill the load demand. When main grid does not satisfy the load demand then it is synchronized with another grid to meet the load requirement. In this arrangement we are considering main grid as conventional grid and another one as non-conventional grid.

Keywords: *synchronization, grid, conventional and non-conventional grid.*

1. INTRODUCTION

In day to day life electrical energy becomes one of the most important needs of human being. To generate the electricity conventional energy sources are used such as coal, diesel, petrol,

etc. Many times there is not enough coal to generate the full load demand. In this case we can use non-conventional energy sources such as solar, wind, biogas, etc. to compensate the power generated by conventional energy sources. Grid synchronization is the combination of two or more grids to fulfill the load demand. When main grid does not satisfy the load demand then it is synchronized with another grid to meet the load requirement. In this arrangement we are considering main grid as conventional grid and another one as non-conventional grid.

2. WHAT IS GRID SYNCHRONIZATION

In order to maintain continuous supply to the consumer's different grids are synchronized with each other by means of various equipments such as transformer, rectifier and inverter circuit etc.

DC Grid synchronization is the process in which two or more grids are synchronized to each other on the basis of voltage. In DC synchronization the main condition for synchronizing the grids is that the voltage of both grids must be equal. As compared to ac synchronization dc synchronization is very easy and less complicated because in dc synchronization there is no need of matching the phase angle of voltage and current, frequency, phase sequence?

3. CIRCUIT DIAGRAM

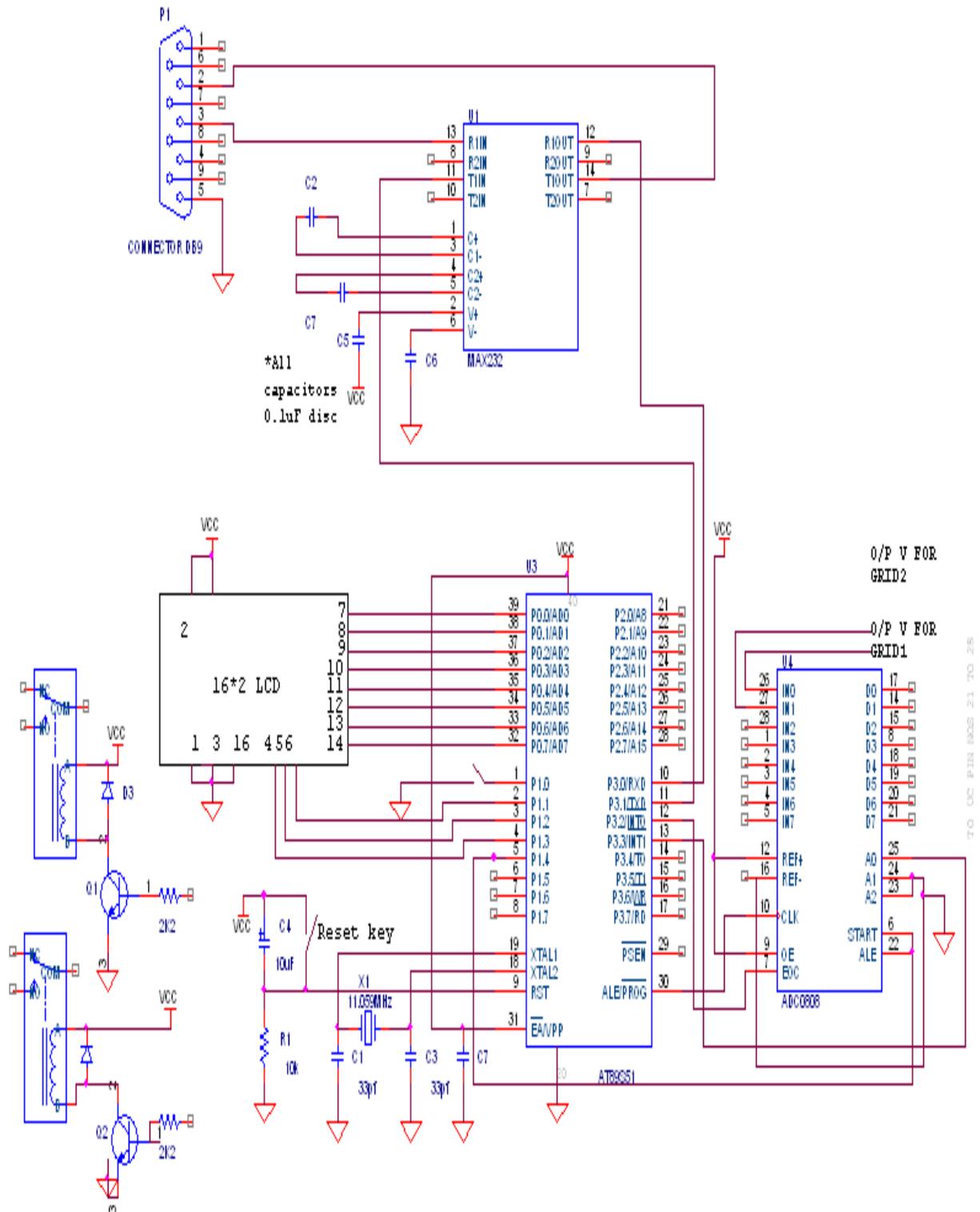


Fig.1 circuit diagram grid synchronization

4. CONSTRUCTION

Figure shows the circuit diagram for DC grid synchronization. In this circuit the main components are

1. Micro-controller (8051)
2. ADC (0808)
3. LCD (16*2)
4. MAX-232
5. DB-9 Connector
6. Relay

8051 micro-controller has four ports, out of that port 0 and port 1 are interfaced with LCD i.e. P0.0 to P0.7 and P1.0 to P1.3. Similarly ADC 0808 is also interfaced to micro-controller with port 2. MAX-232 is connected to pin P3.0 RXD and P3.1 TXD for reception and transmission of serial data respectively. For interfacing of MAX-232 with pc and micro-controller we connect it to pc through DB-9 connector. Relay 1 and Relay 2 are connected to pin P1.5 and P1.6 respectively. These two relays are used for synchronization.

To show the different conditions of our project the voltages of both the grids must be variable. For this purpose, two potentiometers are connected to ADC i.e. pot 1 and pot 2 are connected to pin 26 and 27 respectively.

5. WORKING

For this scheme synchronization is the main condition so that, the voltage ratings of both the grids are continuously read by ADC and it is given to micro-controller. In first condition the voltage of main grid is sufficient to provide the supply to both industrial as well as residential load. When the voltage on main grid is reduces then it can't provide supply to both loads. Hence main grid provides supply to only industrial load and residential load is supplied by solar grid.

When the fault occurs on main grid then it's voltage drops and again sensed by ADC and gives signal to micro-controller. Then supply from main grid to CFL is cuts and it is provided by solar grid. During this condition the supply to residential load is not provided by solar grid. The main role of ADC in this scheme is to measure the voltages of both the grids which is in analog signal then convert it into digital signal and gives to micro-controller. Depending upon the condition of voltages of grid, micro-controller takes decision to switch the grid to required load. During this process of synchronizing and switching whatever is the condition of circuit, is displayed on the screen of LCD which is connected to port 0 of micro-controller. So we can read the message on LCD.

6. BLOCK DIAGRAM

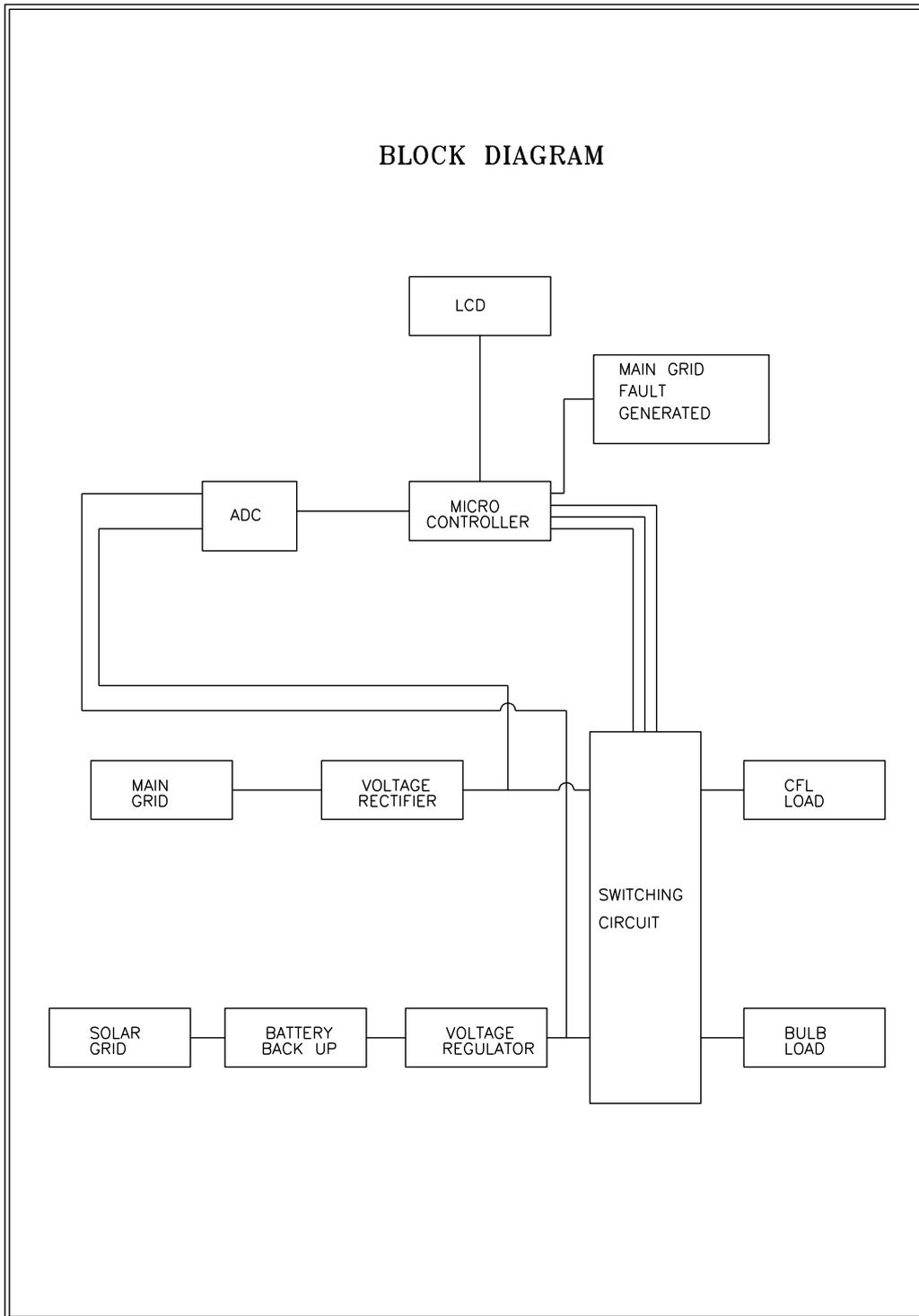


Fig 2. Block diagram for grid synchronization

7. CONSTRUCTION

Fig.2 shows the block dig for DC grid synchronization. In this block dig the main components are

1. Transformer
2. Solar panel
3. Battery
4. Inverter
5. Regulator

In this arrangement we use two grids i.e. solar grid and main grid (thermal grid). Solar panel is connected to battery through diode. Next the regulator is connected at the output of the battery.

The voltage coming from main grid id taken from transformer (230/12 Volt). The output of the transformer is connected to rectifier circuit. 240 Volt CFL lamps are connected at the output of main grid which acts as industrial load. The small bulb is connected at the output of solar grid which acts as residential load, before the load inverter is connected.

8. CONCLUSION

At the end of this project we conclude that by synchronizing two grids, we can maintain the continuity of supply at the utility side. The requirement of fuel for conventional grid is also reduces because we are using solar grid in addition with main grid during the period of fault on main grid. By the use of solar grid we can fulfill the large load requirement. As the solar grid is eco friendly it does not causes any harm to environment or does not pollute the environment

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