SMART INVERTER

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ABSTRACT

In this current era of smart operation of electronic devices has indeed created a phenomenal improvement in our lives. The technology also helps us to improve manifold. The current smart UPS system has many places for improvement. In this time and age, there is a shortage of natural resources and hence a shortage in the power supplied through these power grids. In this paper, we explain about a Smart inverter system that extends the basic life of a battery which is extremely useful during long and unprecedented power outages. The domestic life of the user goes unperturbed and helps him interact with Inverter in a smart and easy way.

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1. INTRODUCTION

The project "Smart Inverter", is an inverter system with uninterrupted power supply which basically controls the load that is drawn from the backup battery that is used in the inverter system. There are different modes of operation which controls the current drawn from the battery.

We explain the different components required, the problems faced and the solutions given during the construction of this project. We also explain the day to day usage of power and its redundancy in today's world. The explanation and solution to many different problem faced by mankind are given in elaborate. We try to analyze the forthcomings and misgivings of the power grid. The shortcomings of smart grids and its usage in India is also mentioned.

The smart inverter gives us an idea of the future and the solution to all the above problems. We try to make amends to the lack of usage of smart grids in many parts of the world and help the user to get a real time experience of how the inverter works and controls the household system.

2. METHODOLOGY

The basic methodology of the smart inverter system is based upon the microcontroller system. We use a set of microcontrollers which decide the operation an working of the smart inverter system. We have explained the operation in detail below.

3. PROCESS DESCRIPTION

The inverter is a microcontroller controlled system which uses 8 bit microcontrollers such as PIC16f886 or higher. There are mainly three modes of application in the system which are

1. Fully automatic – The inverter is operated using an infrared detectors which sense the presence of any human in a given room. If the sensor gives us a negative output, i.e., there is no human presence in that particular room, the inverter automatically switches the supply of the room off, thus limiting the current drawn from the battery.

2. Semi-automatic – In this mode of operation, the inverter is pre-programmed by the user to only switch on a specific set of rooms where there needs to be an uninterrupted supply. This can be changed/modified by the user using an RF (Radio Frequency) controlled remote.
3. Manual – In this mode of operation, the inverter is not controlled by any control system in order to reduce the load current. This basically means that all the rooms in the users habitat is switched on without any monitoring system.

3.1 Main control module

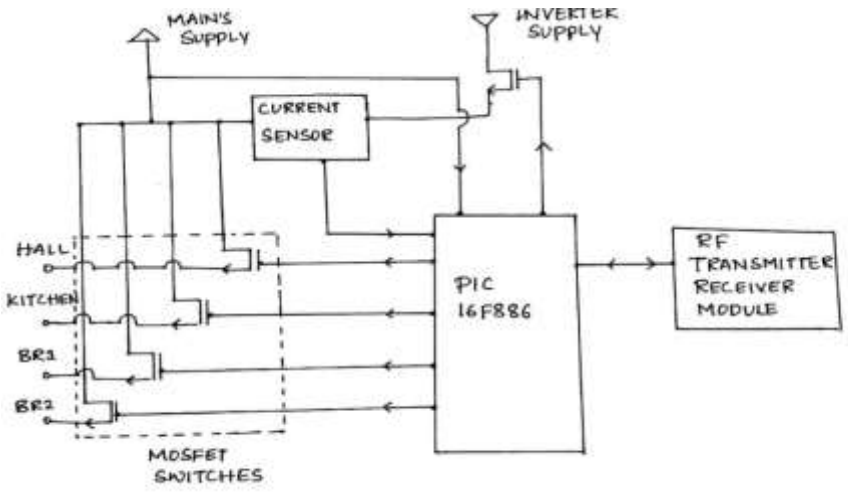


Fig-1.1:Main control module

The main control module does all the work in the Smart Inverter. It generates a pure sine wave output and also controls the slave control modules in the system.

The programming of the microcontrollers will be done using the MpLabX IDE, which is an Integrated Development Entity that converts high level language (ex: C, C++) to a lower level language or machine code. The IDE also has an independent simulator that helps us with the simulation of the program using the microcontroller.

3.2 Slave control module

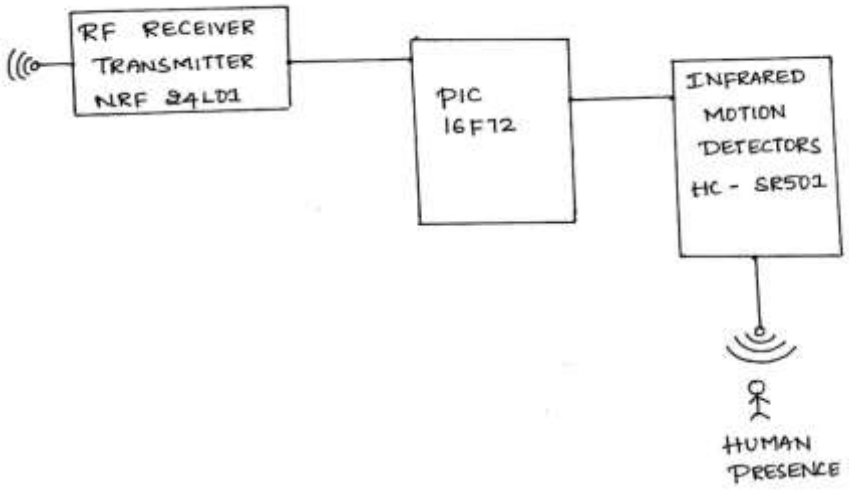


Fig-1.2: Slave Control Module

The inverter system has several independent control systems that will be controlled by a central main control system that will be present in the inverter module. The different control modules will be handled using master-slave combination.

The Smart Inverter uses a Hall Effect current sensing amplifier that has a range of 0-5V which will scale down the RMS voltage of -220-0-220V in the given scale. The scaled down voltage is given to the microcontroller.

3.3 Sine wave generator

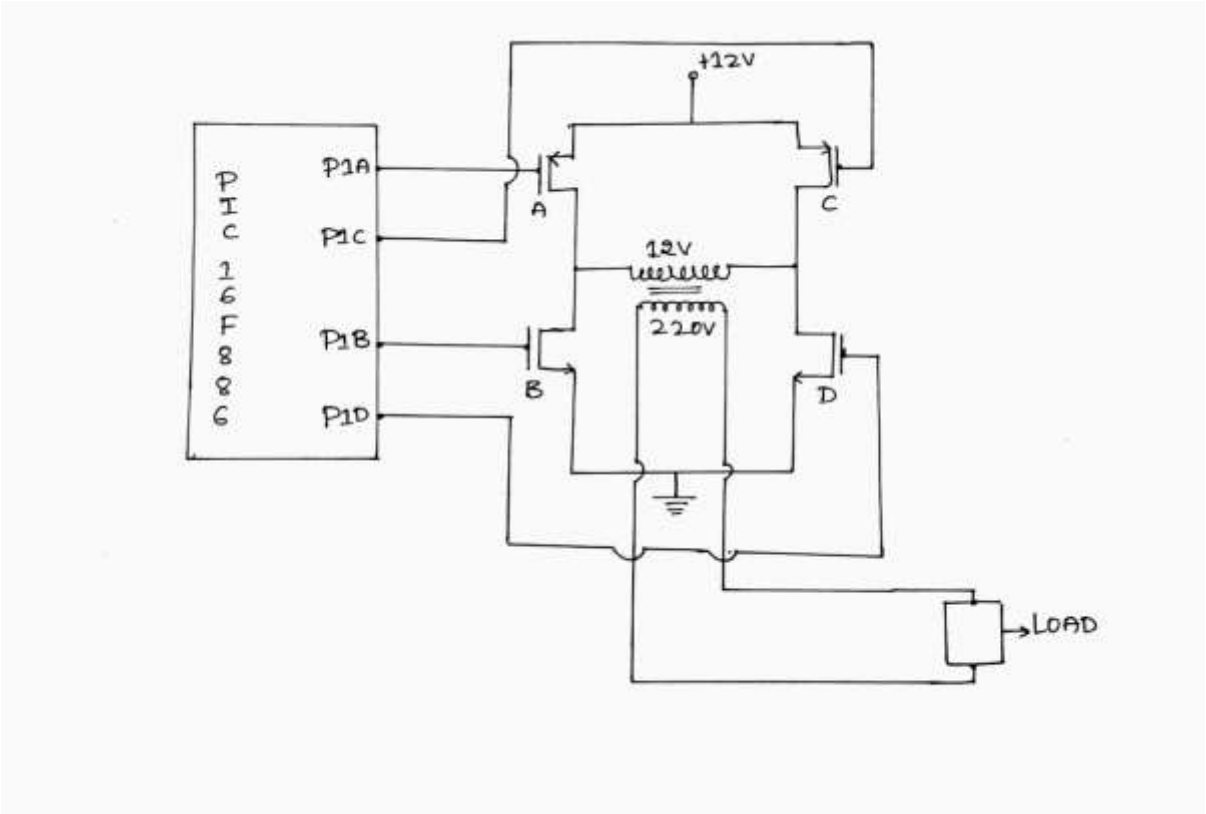


Fig-1.3:Inverter sinve wave genereator

The inverter will be a microcontroller controlled output which controls the basic 12V dc to a 220V ac sine wave output with the use of high frequency transformers. We also use a set of MOSFETs to make sure that we get an uninterrupted power supply.

3.4 Inverter Module

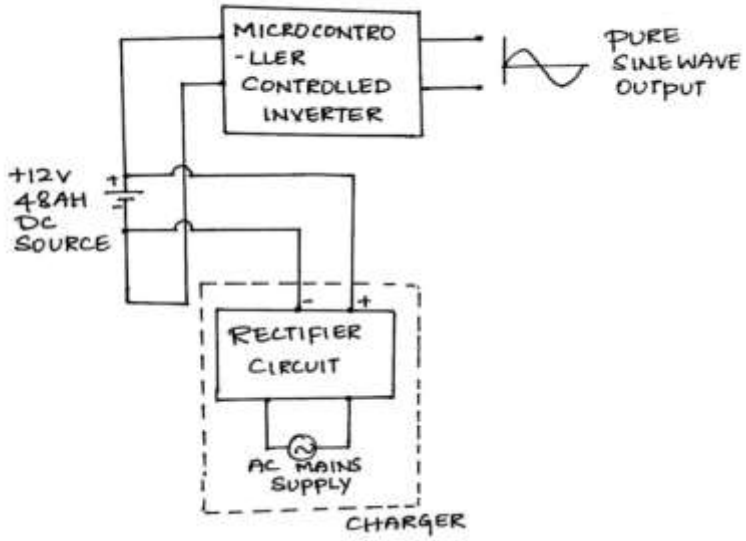


Fig-1.4: Inverter Module

The inverter also contains a battery charger that will be used to charge the battery through the mains supply after every time the battery is drained out. The charger is made up of a rectifier circuit that steps down the 220V ac voltage into a dc voltage that will appropriately charge the battery. The rectifier circuit will be made up of diodes or SCRs (Silicon-Controlled Rectifiers) that will be arranged in a bridge circuit. We also make use of step down transformers in the rectifier circuit.

The IR sensors are wirelessly controlled modules which, again makes use of RF to transmit and receive data. There will be about four IR sensors namely – hall, kitchen, bedroom 1 and bedroom 2. Each of these individual sensors communicate with the main central module that will be present in the inverter module.

3.5 Remote Controller

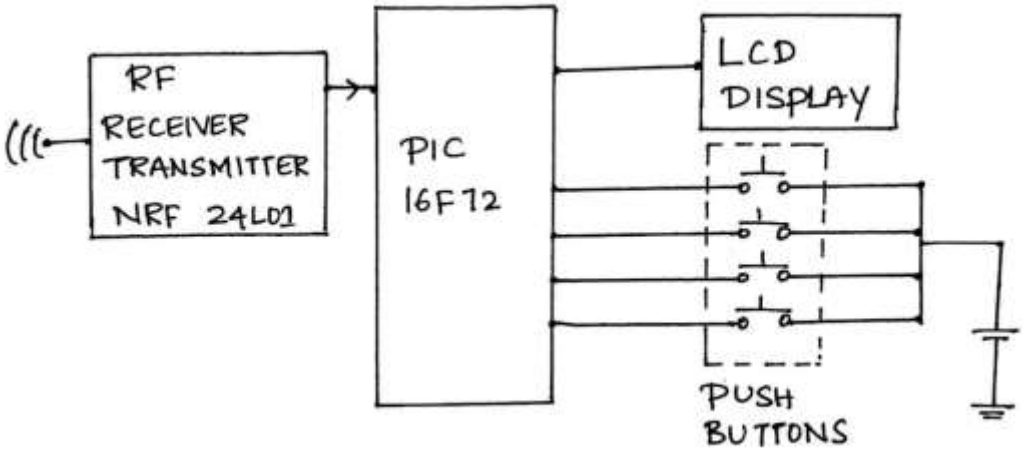
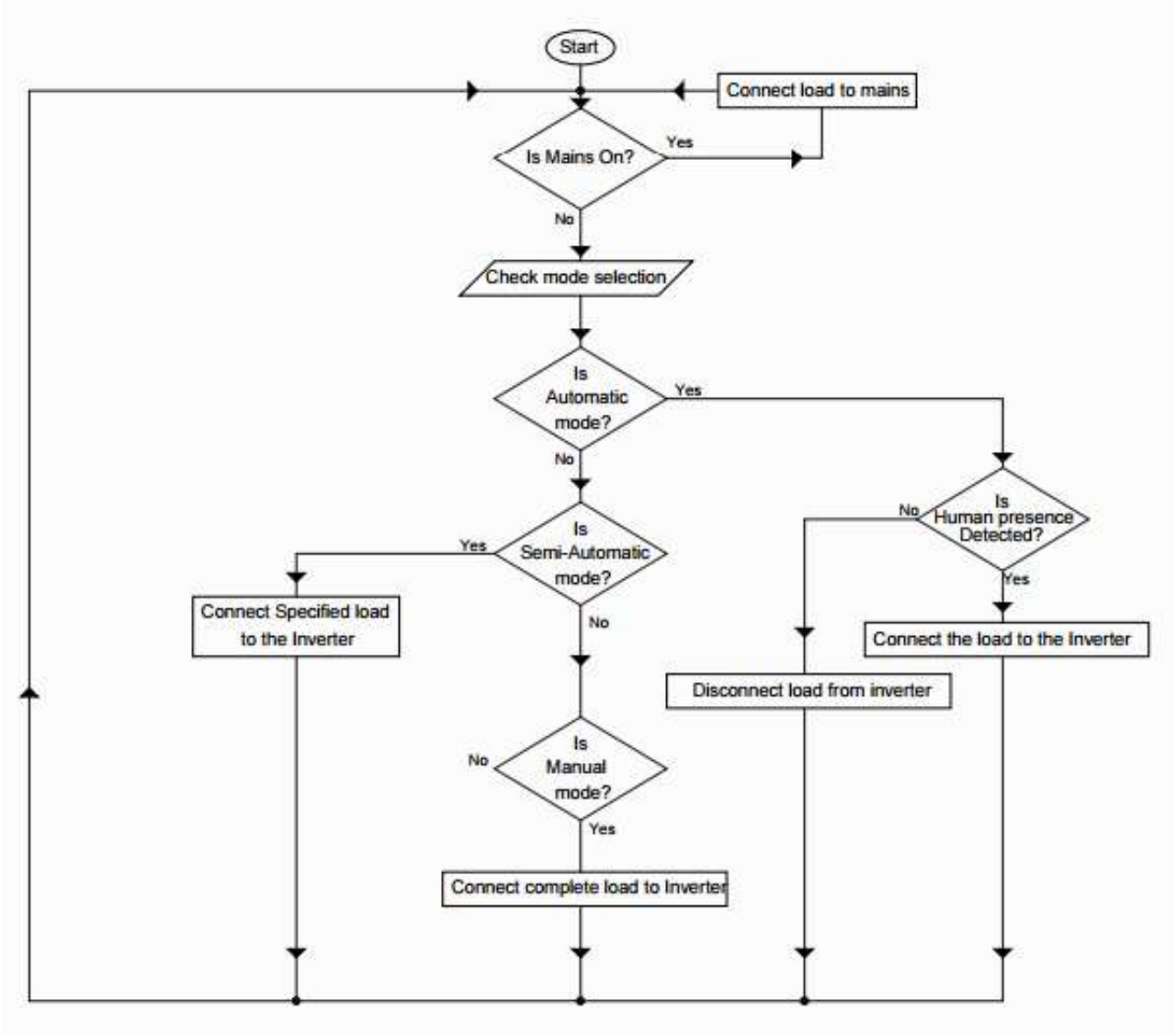


Fig-1.4: Remote Controller

The remote will also contain an LCD display that will show the user in which mode the inverter is being operated. It will also help the user to switch to different modes of operation.

4. FLOW CHART

The below flowchart explains the basic operation of the Smart Inverter. The different modes of operation are clearly mentioned. The interaction between the user and the Inverter system is also made easy.



4. CONCLUSION

The Smart Inverter system reduces the basic human effort in monitoring the load shared by the inverter. We may expect the Smart Inverter to efficiently reduce the load placed on the Inverter, thus extending the battery life. It also ensures that the battery does not fall on full load, which creates a stress on the battery in the long run. Thus, we may conclude that the Smart Inverter to help the daily life of the user efficiently and without any hiccups.

5. REFRENCES

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