International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

IOT Based Smart Controlled Inverter.

[1]Sneha Santosh Shinde, [2]Bhagyashri Santaji Kuchekar ,[3]Prof.Suraj.S.Shinde .

[1,2]B.Tech Students, [3]Asst. Professor Department of Electrical Engineering, Sahakar Maharshi Shankarrao Mohite-Patil Institute of Technology & Research Akluj-413118 Maharashtra, India.

ABSTRACT:

The high energy demand and the constant depletion of fossil fuels lead us to shift our focus to renewable energy sources which are not only the future unlimited source of energy it is also eco friendly and viable for the environment . Solar energy is the oldest form of renewable energy. This paper focuses on design of solar inverter which is required to run an AC loads which is mostly used as consumable purpose .The power output of the designed inverter is 100w, input voltage is 12v, output is 220v, and 50Hz square wave output.

Key words: Charge controller,DC load,Inverter, IOT,Node MCU,PV,Wi-Fi.

1.INTRODUCTION-:

Pollution due to conventional energy sources are increasing day by day and it's time we utilize renewable energy sources to reduce pressure on power grids. It is extremely important to focus on the concept of energy generation using renewable sources and energy storage in an efficient manner. Solar energy is one of the clean renewable sources of energy that can be utilized to reduce the usage conventional sources for power. Solar powered inverter is an answer for clean energy and a solution to power outages. In this paper an IOT enabled solar smart inverter is designed in which the battery is charged by the solar panel. This help in reducing the load on the grid and due to its two way communication with the user it helps in saving energy.

In this paper we are using a solar panel to charge the battery and also contain a solar tracking circuit which increases the efficiency of the solar panel. It also uses wi-fi technology to engage a two way communication with the user and enables the user to control the load by switching it on and off. Home automation is done by using NodeMCU and relay module.So whenever an unwanted load is on or working the user can switch it off wherever he/she is with the help of internet.

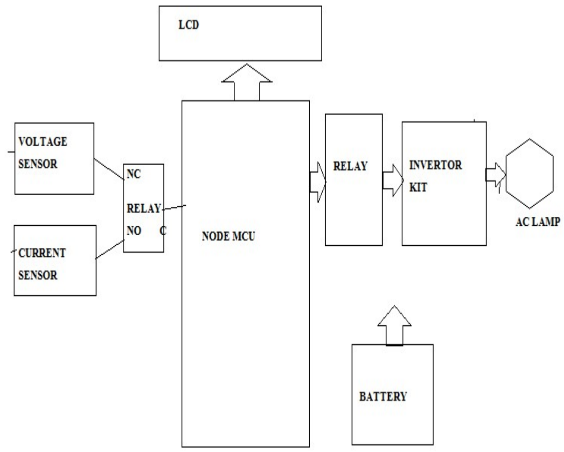
Solar smart inverters are generally defined as inverters that are fed with solar electric energy and can be monitored and controlled by the user. Power has become very much crucial in the proper functioning of a modern economy the engines of a civilization such as enterprises, Homes and even government entities find it hard to operate without access to uninterrupted energy supplies. The exponential rise in population since the 21st century has created an imbalance in energy supply and demand. Pollution from primitive and conventional energy resources has skyrocketed since the dawn of this century. Hence, it's crucial that we initiate switching over to renewable energy sources to reduce the dependence on conventionally polluting energy sources and so it has become inevitable to put more onus on renewable energy generation and efficient energy storage techniques to dampen the existent pressure on conventional power grids.

Energy storage devices offer great convenience during power supply interruption scenarios such as energy failures, floods and storms. The population surge has also had a detrimental effect in power shortages and resultant power cuts. With technical and technological evolution

in IT, more electrical and electronic appliances such as even an inverter are bound to besmarter. This smartness allows information to Be shared between user and machine. Here the focus is on monitoring the inverter's DC source and remote control of loads. Inverters used for basic applications in industries or homes commonly runs on non-renewable energy

Resources and are very much elementary in how they are designed and used. Conventional consumers are often caught off-guard when the battery feeding the inverter fails due to numerous reasons as conventional inverters are handicapped when it comes to sharing its operational information. However, a smart inverter besides using renewable energy to feed itself, also facilitates information sharing in real-time with the consumer. Hence it opens a pool of opportunities in retrofitting conventional inverters to let them be more user-friendly by relaying information on battery charge and battery health, which ultimately promotes the judicious use of obtainable energy by the user.

2. Block Diagram:



2.1 INVERTER:-

Since the normal DC current cannot be used in most applications, therefore, it is necessary to convert the DC current to AC in some way, so an inverter is used, which converts DC to AC within a suitable range for use in household appliances. In this project, DC power from a sealed 6V battery is fed to an inverter, whichthen converts it to AC 140V - 220V, enabling charging of a regular cell phone charger. An inverter is an electrical device that converts direct current (DC) into alternating current (AC), wherein the converted alternating current can be any desired voltage and frequency with appropriate transformers, switches and control circuits. Solid-state inverters have no moving parts and are used in a

wide variety of applications, from small switching power supplies in computers to large electrical installations for high-voltage DC applications that transport mass energy. Inverters are usually used to provide AC power from a DC source such as solar panels or batteries. The inverter performs the opposite function of the rectifier

2.2 RELAY:-

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used tointerface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.A relay switch can be divided into two parts: input and output.

The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC.

When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like SPST, SPDT, DPDT etc, which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off.

2.3 CURRENT SENSOR:-

ACS712

Fully Integrated, Hall Effect-Based Linear Current Sensor ICwith 2.1 kv RMS Isolation and a Low-Resistance Current Conductor

▪ Low-noise analog signal path
▪ Device bandwidth is set via the new FILTER pin
▪ 5 μs output rise time in response to step input current
▪ 80 kHz bandwidth
▪ Total output error 1.5% at TA = 25°C
▪ Small footprint, low-profile SOIC8 package
▪ 1.2 mΩ internal conductor resistance
▪ 2.1 kVRMS minimum isolation voltage from pins 1-4 to pins 5-8
▪ 5.0 V, single supply operation
▪ 66 to 185 mV/A output sensitivity
▪ Output voltage proportional to AC or DC currents
▪ Factory-trimmed for accuracy
▪ Extremely stable output offset voltage
▪ Nearly zero magnetic hysteresis
▪ Ratiometric output from supply voltage

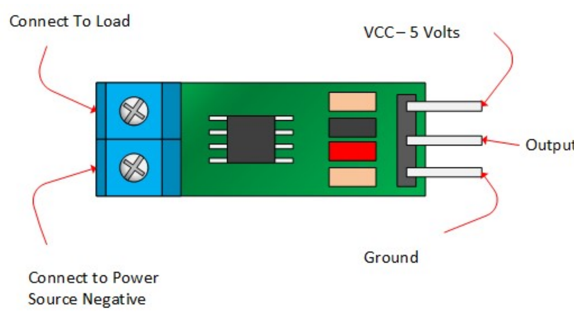
Description

The Allegro™ ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package Allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switchmode power supplies, and overcurrent fault protection. The device is not intended for automotive applications.

The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

The output of the device has a positive slope (>VIOUT(Q)) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sampling. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power loss. The thickness of the copper conductor allows survival of the device at up to 5× overcurrent conditions. The terminals of the

Conductive path are electrically isolated from the signal leads (pins 5 through 8). This allows the ACS712 to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques. The ACS712 is provided in a small, surface mount SOIC8 package. The leadframe is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory



ACS712 Module Pin Outs and ConnectionsThe picture below identifies the pin outs for the ACS172 Modules.
Pay attention to the polarity at the load end of the device. If you are connected as illustrated below, the output will raise. If you connect it opposite of this picture, the output will decrease from the 2.5 volt offset.

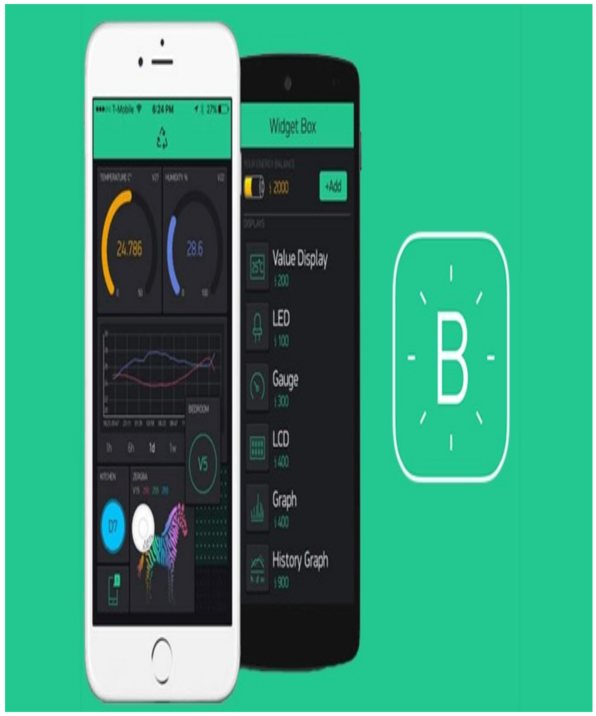
Liquid Crystal Displays (LCD):-

An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller(the black blob on the back of the board). This controller is standard across many displays (HD 44780).

FEATURES

• 5 x 8 dots with cursor
• Built-in controller (KS 0066 or Equivalent)
• + 5V power supply (Also available for + 3V)
• 1/16 duty cycle
• B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED)
• N.V. optional for + 3V power supply

BLYNK LEGACY (APP):-



With Blynk, you can create smartphone applications that allow you to easily interact with microcontrollers or even full computers such as the Raspberry Pi.

Read this article to learn about the components that make up the Blynk platform.

With Blynk, you can create smartphone applications that allow you to easily interact with microcontrollers or even full computerssuch as the Raspberry Pi.

The main focus of the Blynk platform is to make it super-easy to develop the mobile phone application. As you will see in this course, developing a mobile app that can talk to your Arduino is as easy as dragging a widget and configuring a pin.

Battery:-

Fig.H.battery

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between.

Solar Panel:

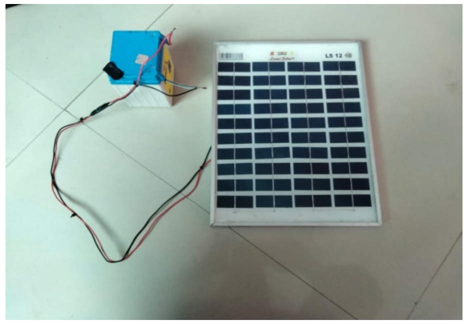


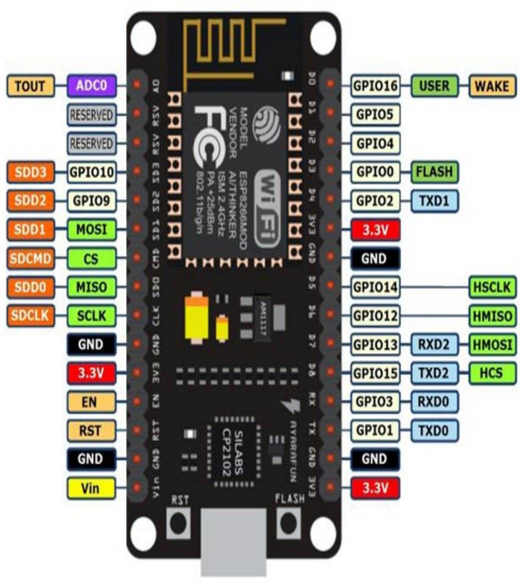
Fig. Solar Power Generation.

The PV system is a renewable and sustainable renewable energy generation source. The PV array is made upparallelandseries arranged solar cells which convertSunlightintothe formElectricalenergy.Atypical PV system utilizes solar panels each comprising a number of solar cells. Which generateelectricalpower?Theinitialstepisthe

photoelectriceffectfollowedbyan electrochemicalprocedurewhere Crystalized atoms,ionizedina cell

A single photovoltaic cell cannot produce require amount of electricity. Therefore, a no. of photovoltaic cells is connected on farm and they are electrically connected to each other to form a solar panel or PV module. Windturbines is an another renewable energy source used in micro-grid to use as energy source.Thelargemassesofairmovingovertheearthsurfaceareintheformofkineticenergywhichisconvertedtoelectrical Energy with the help of wind turbine. Wind turbine receives this kinetic energy which is further converted into useful mechanical energy and again transformed into electrical energy.

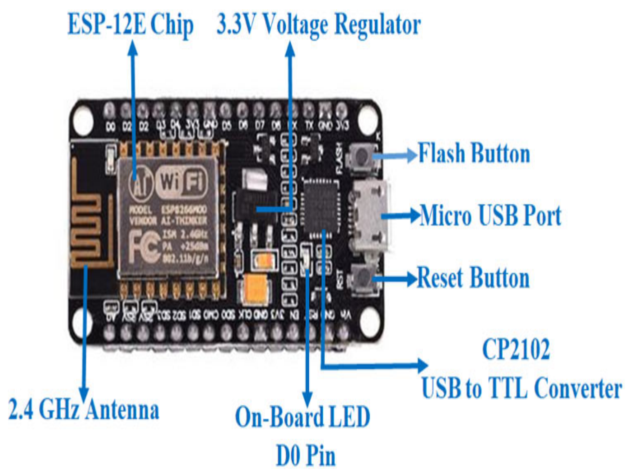
HARDWARE DISCRIPATION:-



The **NodeMCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

IOT MODEM:-



is s as shown in fig.2 and 3 respectively[4]. The converter is designed to give fast, accurate, and repeatable con-versions over a wide range of temperatures. The converter is par-titioned into 3 major sections: the 256R ladder network, the suc-cessive approximation register, and the comparator. The converter's digital outputs are According to this system, accuracy and automatic system for the transmission.While the Processing layer refines the data, the Application layer analyses the data, the Business layer delivers intelligence solutions, and the Security layer makes sure to protectthedata at any cost. For a small business, it can be quite challenging to work with IoT layers of systems.

Analog to Digital Converter:-

The heart of this single chip data acquisition system is its 8-bit analog-to-digital converter. The pin diagram and block diagram of ADC 0808 is s as shown in fig.2 and 3 respectively[4]. The converter is designed to give fast, accurate, and repeatable con-versions over a wide range of temperatures. The converter is par-titioned into 3 major sections: the 256R ladder network, the suc-cessive approximation register, and the comparator. The convert-er's digital outputs are positive true.The ADC0808, ADC0809 offers high speed, high accuracy, min-imal temperature dependence, excellentlong-term accuracy and repeatability, and consumes minimal power[6].

Micro Controller:-

In this project a low power, high performance8 bit microcontroller (AT 89S51) is used. The pin diagram of AT89S51 is as shown in fig.3. The AT89S51 [5] is a low-power, high-performance CMOS 8-bit µC with 4K bytes of In System Programmable Flash memory. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. It has following features:

- Compatible with MCS®-51 Products
- K Bytes of In-System Programmable (ISP) Flash Memory
- 4.0V to 5.5V Operating Range
- 128 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Dual Data Pointer

CIRCUIT DIAGRAM-

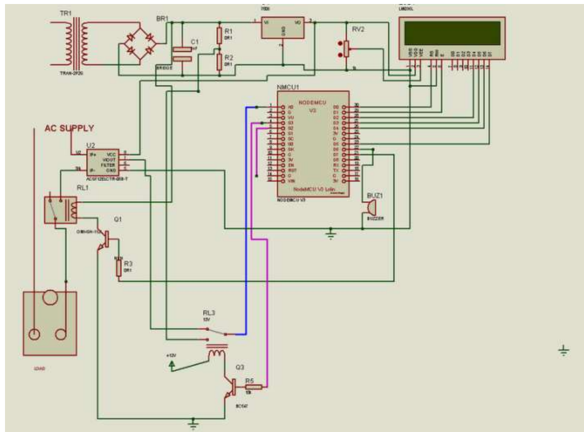


Fig. ckt diagram of IOT based smart controller inverter

MODEL:-

Fig.Model of IOT based smart controlled inverter.

As shown in the fig microcontroller 8951 is the main control-ling element to which PT on input side, LM35 and float sensor are connected. These four sensors are used to monitoring substation parameters (voltage, current, temperature & oil level) Initially input from mains lines to load is monitored by voltage substation. The output of the Substation is fed to the ADC0808 for converting analog voltage to digital voltage. ADC0808 does conversion of analog signal into digital by successive approximation method and with the help of Clock pulses, which is generated by NOT gate IC, this NOT gate produces 50kHz clock and give it to ADC. The output of the ADC is 8 bit which is fed to the microprocessor for further processing of the data. When power supply is switched on, microcontroller starts program execution from zero memory location. The microcontroller has four input parts, which are contains 8 lines for input or output. In our project 4 lines of microcontroller are used for giving address selection input and ALE signal to

ADC for selecting sensor line, after this microcontroller receives 8 bit output from ADC. This output is digital equivalent of power consumption. This all information is displayed on LCD. The functions of microcontroller are continuously check power consumption of customer by means of CT, ADC and get digital I/p. This I/p is compare with maximum limit setting. Display both those data on LCD.

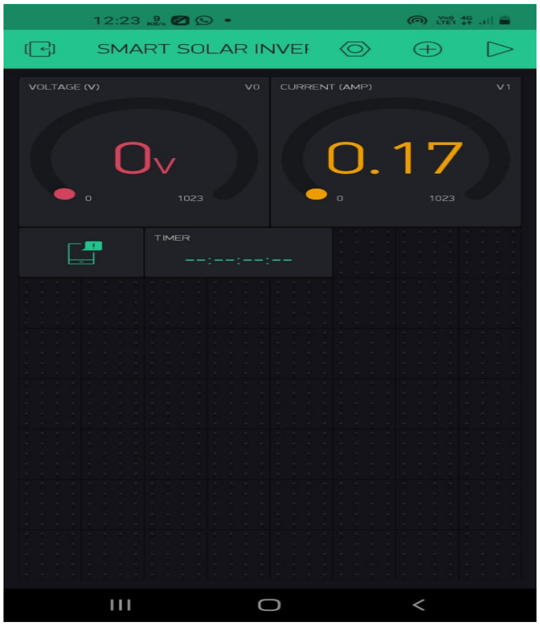
In program kit has provided with following four parameter of substation:

1. 180 >Voltage >260 --Voltage Fault

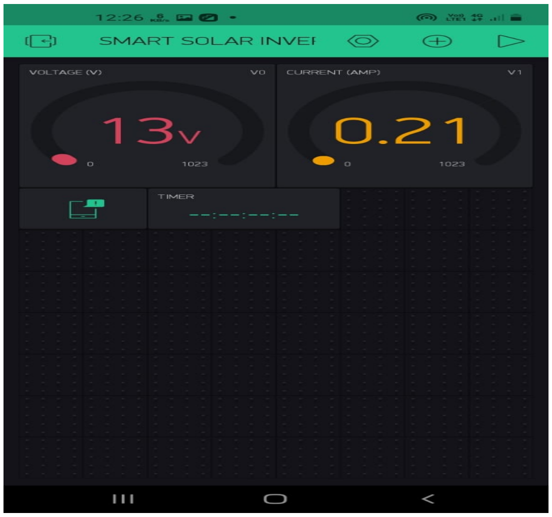
2. Temperature > 40C---Temperature fault

Therefore any change occurred in above rating during running of project model, these changes is shown in LCD and same data obtained via SMS to user.

OUTPUT:-



Fig(a).NO load condition.



Fig(b).Load condition.

5. CONCLUSION:

IoT based Smart controlled inverter is being implemented by adapting an existing inverter with bidirectional communication with the user by power management system. Based on the priorities, anyone can control wirelessly loads at the time of power cut, simultaneously they can monitor the load current of the inverter. This prototype gives us a deep insight into working of a self sufficient and reliable system for monitoring and controlling loads using existing load current. The green energy system requires only initial stage investment in solar panel and the smart controlled inverter system is developed at low cost. A consumer generates enough energy for oneself and uses it accordingly with an environment friendly system. Hence in the work, Eco-friendly IOT based smart controlled inverter is proposed to control the various combination of load in the home or Industry on user choice basis intellectually through Wi-Fi.

REFERENCES:

1. Gopal G Menon, Jidhun Das, Sai Kiran, Dr. Siny Paul, “Solar Smart Inverter”, International Journal of Engineering and Technology (IRJET), vol 07, no. 4, April 2020
2. M. G. Villalva, J. R. Gazoli, E. Ruppert F, "Modelling and circuit-based simulation of photovoltaic arrays", Brazilian Journal of Power Electronics, 2009 vol. 14, no. 1, pp. 35--45, ISSN 1414-8862.
3. Mummadi Veerachary, "Control of TI-SEPIC Converter for Optimal Utilization of PV Power", IICPE, 2010 New Delhi.
4. Jubaer Ahmed, Zainal Salam, “An improved perturb and observe (P&O) maximumpower point tracking (MPPT) algorithm for higher efficiency”, Applied Energy, Vol. 150, pp. 97-108, 2015.[5] HendAbd El-monemSalama, Adel Taha Mohamed Taha, “Practical Implementation of
5. Dual Axis Solar Power Tracking System”, Twentieth International Middle East Power Systems Conference (MEPCON), 2018.[6] Aishwarya Kumar, Anusha Ashok Bijapur, Charitha B, Kirthi R Kulkarni, K Natarajan, “An IOT based smart inverter”, IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2016.
6. Kumar Mandula, RamuParupalli, CH.A.S. Murty, E. Magesh, RutulLunagariya, “Mobile based home automation using Internet of Things (IOT)”, International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), 2015.