

Identify and Measuring Parameter of PV Module Test Bench with the Ammeter and Voltmeter

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Abstract: In recent years, solar power is utilized more in domestic, commercial, and industrial applications. Solar energy is renewable energy which is produced from sun heat. In 2020 India solar installed capacity was 34,627 MW. In this paper developed an experimental setup for solar panel power measurement. In this current, voltage and light intensity has been measured. Declination angle of sun to earth is $+23.5^\circ$ degrees, -23.5° degrees. The model of sun is represented by an incandescent bulb light and the angles set up manually. In this explained about solar power output at load side and see the variation between power and load resistance. Solar panel is generated power by light intensity applied by using incandescent light bulb. The light intensity changed by using a voltage regulator. The power is measured by using voltmeter and ammeter readings. Solar energy is to emulate the solar panel output power characteristics. The model of sun was taken as an incandescent bulb light and placed on the circular iron track to change east to the west. By changing the position of the bulb and changing the bulb light intensity with the help of the D.C speeds regulator. Solar panel is placed in such a way that it freely moves to certain angles. By taking voltmeter and ammeter readings calculate the power. The graph is drawn between resistance versus power, the unique source of energy. The main aim of the paper is. Ensure that the maximum power output occurs at load which is taken as a resistor bank. The increasing demand for clean and sustainable energy has positioned solar power as a major contributor to the global energy mix. Among various solar technologies, photovoltaic (PV) systems are widely used due to their ability to directly convert sunlight into electricity with minimal environmental impact. As the adoption of solar panels grows, ensuring the reliability and efficiency of PV modules becomes critically important

Keywords: Solar energy

I. INTRODUCTION

The increasing demand for clean and sustainable energy has positioned solar power as a major contributor to the global energy mix. Among various solar technologies, photovoltaic (PV) systems are widely used due to their ability to directly convert sunlight into electricity with minimal environmental impact. As the adoption of solar panels grows, ensuring the reliability and efficiency of Modules becomes critically important. To evaluate and optimize the performance of PV modules, it is essential to measure their key electrical parameters—specifically current and voltage. These parameters are directly influenced by environmental conditions such as solar irradiance and temperature [1-100]. Therefore, accurate, real-time monitoring is required to assess the operational behavior and efficiency of PV modules under dynamic conditions. The primary objective of this project is to design and develop a solar test bench that facilitates the precise measurement of current and voltage from PV modules. This system will allow for: Real-time data acquisition, Performance analysis under various conditions, Identification of module degradation or faults, and Support for research and educational purposes in renewable energy studies. Solar power is an alternative source which is available from the sun. Electrical power is generated from solar panel output D.C terminals. Solar energy is renewable energy. Most of the power systems generate power from resources such as coal, water etc. Solar energy produced from sun rays is an inexhaustible source of convenient energy [101-220]. Solar energy is electromagnetic energy. The sun rays falling on the earth's surface create angles [221-288]. The photovoltaic effect principle is used to produce



electricity. Solar energy depends on the sun. There is a need for monitoring and measurement of solar energy. The sun has produced energy for many years. • The sun has produced energy for so many years. Solar energy is the sun's rays that reach to the earth surface. • Solar energy is unique source of energy, and it can be exploited into useful form by different ways such as: 1. By direct conversion into fuel by photosynthesis. 2. By direct conversion into electricity by photovoltaic (PV).

II. SOLAR POWER & ENERGY

Energy is the ability of an object to do some amount of work. Energy available in some forms like kinetic energy, potential energy. Solar means the sun. solar energy is the energy of the sun. Every day the earth receives the energy directly from the sun. using some scientific methods solar energy can be converted in some useful form of energy. For example, we can convert solar energy into electrical energy and then converted in other form like heat energy, kinetic energy, potential energy etc. Solar energy reaches the earth in the form of waves which in sun light. one meter square area of the atmosphere 1.4KW/m² solar energy is produced and it is called as solar constant. Its outer side. The solar energy reduced because of gas particles, water vapors dust particles and reflection in atmosphere. The intensity of solar energy reaching the earth is around 1 KW/m². hence this energy used to heat water and produce the electricity. Solar energy is converted in to electrical energy by using photovoltaic cell which is made by using silicon.

III. PRINCIPLE OF CONVERSION OF SOLAR RADIATION INTO HEAT

The fundamental process now in general used for heat conversion is the greenhouse effect. It is possible to grow exotic plants in cold climates through better utilization of the available sun light. The best way to turn the energy contained in sun light into heat is solar thermal generation. it involves the sun as a source of heat in diffused from it arrives the earth. This heat is captured, concentrated with the help of solar collectors. with the assistance of jumpers. By utilizing transfer mounted on module two Arduino computerized input/output pins, it is feasible to control motors, inductive burdens, and other devices. This two-channel hand-off module is utilized in homegrown tasks and in broader in the space of mechanical technology papers. The module is outfitted with optocouplers on IN1 and IN2 lines so that it ensures the galvanic protection between the transfer load and the control board which drives this module. Associations Pin Capacity IN1 TTL advanced information IN2 TTL computerized input GND Ground +5V Force (+5V) NO1 Regularly open contact COM1 Normal contact NC1 Typically shut contact 1 NO2 Ordinarily open contact COM2 Normal contact NC2 Ordinarily shut contact 2, Pin Capacity Supply voltage +5V.

IV. COMPONENT USES

ARDUINO MEGA:- microcontroller is associate degree open supply, computer onerous product and programming organization, activities, and shopper native space that plans and fabricates single board microcontroller units for building advanced gadgets and intuitive articles that may notice and management objects within the actual world. The comes things sent as ASCII text file instrumentality and programming, which area unit approved below the wildebeest lesser overall population license (LGPL) or the wildebeest overall population license (GPL), permitting the grouping of Arduino sheets and programming dissemination by anybody. Arduino sheets area unit accessible industrially in preassembled structure.

Arduino board plans utilize associate degree assortment of microchips and controllers. The sheets area unit outfitted with sets of advanced and easy information/output(I/O) sticks that may be interfaced to completely different extension boards(shields)and different circuits. The sheets highlight successive interchanges interfaces, including Universal Serial Bus (USB) on sure models that area unit to boot used for stacking programs from PCs. The microcontrollers area unit unremarkably changed utilizing a jargon of highlights from the programming dialects C and C++. In addition to utilizing typical compiler tool chains, the Arduino comes offers associate degree incorporated advancement environment (IDE) in sight of the handling language paper. The Arduino comes began in 2003 as a program for understudies at association configuration foundation in Ivrea, Italy, aiming to provide lowest expense and easy ways that for fledglings and specialists to determine gadgets that interface with their current circumstance utilizing sensors and actuators. traditional instances of such gadgets papered for amateur specialist incorporate basic robots, indoor regulators and movement



identifiers. The name Arduino comes from bar in Ivrea, Italy, wherever some of the originators of the undertakings accustomed meet. The bar was named when Arduino of Ivrea, WHO was the margrave of the walk of Ivrea and lord of European country from 1002 to 1014.

Light dependent resistor (LDR)

It is a basically photoconductivity device. A photo resistor also known as a light dependent resistor LDR, it is a passive component which decrease the resistance with respect to the receiving luminosity on the components sensitive surface. It works on the principle of voltage division. It has three terminals VCC(5volts), Ground and voltage divider point(V).
Fig: light dependent resistor (LDR).

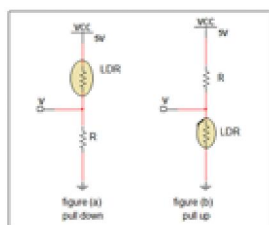


Fig.1 LDR



Fig.2 Solar Panel

SOLAR PANEL

A solar panel is a group of solar cells. A solar battery may be a set of solar cells electrical phenomenon modules electrically connected and mounted on structure. An electrical phenomenon module is prepackaged, connected assembly of solar cells. The solar battery will be used as a bigger electrical phenomenon system to come up with and provide electricity in business and residential applications. solar cell is a specialized semiconductor device diode that converts visible light into direct current. Photovoltaic cells are an integral part of solar electric energy systems, which are becoming an increasingly important as alternative is sources of utility power.

FOUR WHEELS

These wheels are rubber tire which has rough surface to move the upper wooden board with the help of motor rotation. Four wheels, in this two Wheels Run by D.C motor which are supported to rotate another two wheels. Fig. 11: Four wheels

V. HARDWARE SETUP OPERATIONAND MEASURMENT OF POWER

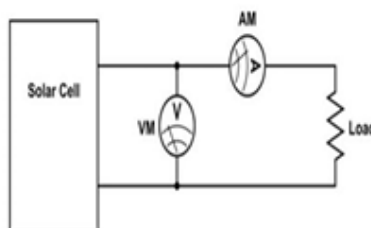


Fig.3 Solar panel connected to resistive load.

VI. PROCEDURE

Connect the power connector to Arduino from CPU for 5V.

- A 5V D.C supply given to relay input.
- A 12V D.C supply taken from D C regulated power supply for motor input.



- A 230V A.C supply given to Incandescent bulb through voltage regulator for varying light intensity.
- Connect required connection from Arduino, 2 Channel Relay, Switches motors and main A.C supply.
- Dump the program into the Arduino.
- Switch ON all power supply.
- Set the solar panel at 0°.
- Place LDR at solar panel for light intensity measurement.
- Move the incandescent bulb at various degrees as 15° to 90°.
- Connect the load across Solar output terminals.
- Measure the voltage and current by placing ammeter in series and voltmeter in parallel to the load and power is calculated from readings.
- Set solar panel at 23.5°, -23.5° and move the

VI. CONCLUSION

The project IoT based Flood monitoring and Alerting System is used for measuring the water level using the sensors and send the alert messages through the Web or internet applications through Blynk we send SMS alert and E-Mail alert. This system can be into two sensing test of sensor test, GSM Test within the microcontroller (Arduino). Here the ultrasonic sensor senses the water level near the river beds and when water reaches the threshold level it sends a0lert or warning messages to the concerned authorities and the residences. Here in this project the ultrasonic sensor is connected to the Arduino and GSM to control the water level in the water nearby rivers.

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