

Simulation Model For Evaluation And Monitoring Of Solar Panel

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ABSTRACT:- The primary aim of this project is to improve the solar panel performance. By Evaluation and monitoring of faults occur on solar panels. we explore all types of faults occurring on the photovoltaic panel on the DC side of the solar electrical power generation system. This prototype has two levels of operation where one part continuously collecting data, regarding photovoltaic panels and environmental conditions. Other parts monitoring the data and display the performance of the panel concerning atmospheric conditions at centrally located control stations. Further, it reporting the events of specified faults by alarm and display on the screen. This system is used to analyze the performances of the panel power generation system.

I. INTRODUCTION:-

In the last few decades, electrical power generation plays an important role in day to day? Now its demand getting an increase from domestic purpose to industrial use, hence we needed the proper generation and minimized the loss in the power generation system. Electrical power generation by using solar energy is the most effective and efficient method, because in this there direct conversion of solar energy into electricity. The solar radiation forms sun with specific frequency and heat incident on the arrays of solar panels which develops the free electrons in between the PN junction of photovoltaic cells. The electricity generated from solar panels is non-uniform and varies from time to time according to the atmospheric parameter. So that the efficiency of solar panels is always maintained at its maximum by reducing the loss in panels.

The continuous and proper operation of solar panels there is continuously monitoring and fault detection system is installed near to field of solar arrays. In this technique, we analyze the data form panels and monitoring on the central control

station where real-time data get stored. Further is warning the event of faults and classified it from suitable categories. The data acquisition system is installed on panels that sense the parameters form panels and on-field environmental physical quantity. The data get to manipulate and combine transmitted to the central control station where its display on a monitoring screen with real-time updates. The data gets compared with standard parametric quantities and displays its performances on the screen where its degradation rate can monitor and (bypass circuit) diagnoses the errors in the generation of electrical power and hence other photovoltaic panels on the field continuously in work and generated electricity.

In this paper, we are monitoring the solar panel data at specific interval of time from any location of operator which help to analysis the degradation rate of solar panel .

This paper presents [2] a fault detection and isolation method based on identification applied to a PV system.

No need of extra storage for storing large number of data and also no need to continuous monitoring of solar panel.

Also get easily monitoring and control the panel performance in lowest cost and easily mount on back side of solar panel.

[3] the overall performance of solar cells varies with varying atmospheric condition .that temperature of the solar panel is high ,when sunrays falls on panel is concetrately falls on centre of PV arryas to give maximum efficiency .

[4] For that, a simplified model of the photovoltaic panel in a MATLAB environment is used. Investigation and classification of each type of fault are down and the effects of the faults are illustrated in this paper.The current-Voltage curves signature is interpreted and investigated in a simulation environment.

[5]. Monitoring and detecting faults on a set of solar panels, using a various type of sensor is connected to solar panel to detects faults occurs on panel with respect to normal condition and atmospheric condition which help to save the time as well as manpower also .

The main purpose of this paper [6] is to improve the solar panel performance and increases its working condition throughout its life Span by reducing or diagnosis the panel fault at correct intend of time.

FAULTS ANALYSIS ON SOLAR PANEL :-

All type of sensor such as voltage sensor ,current sensor ,temperature sensor ,humidity sensor ,light sensor are conneted to back side of solar panel. This sensor detect the causes in continous operation of solar panel ,by evaluating and monitoring there parametric value.current sensor depend on hall effect when circuit develop very high current then short circuit fault appear on solar panel.this sensor is transducer that varies its output voltage in response to magnetic feild .this sensor is also used inspeed detection and current sensing application.

When one of the current-carrying paths in series with the load is unintentionally broken or opened, an open circuit fault can be created. This fault have much higher probability of occurring due

to the large number of connections in PV systems. In this case current become zero i.e $I = 0$. And voltage reaches to maximum value i.e open circuit fault occure.

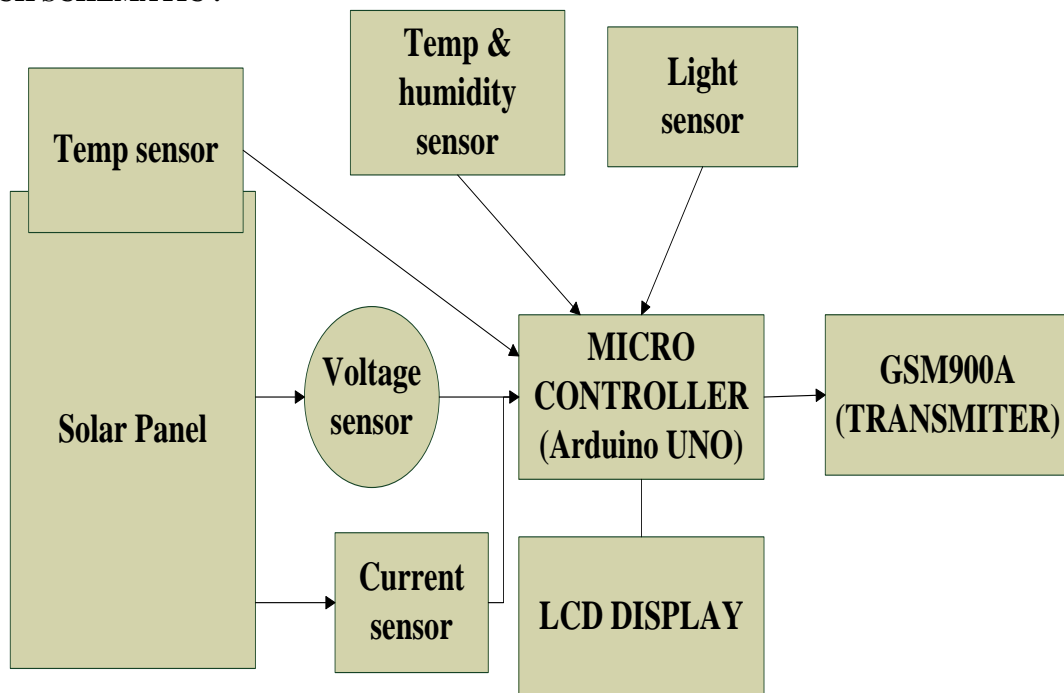
A fault bridging in PV system is happened when low-resistance connection established between two points of different potential in string of module.then bridge fault appear on solar panel. LM35 are the temperature sensor is used ,which function as to output voltage is linearly proportionalto the celcius temperature. Which has an advantage of improving efficiency of panel.

Humidity sensor is used ,which have vital role in diverse areas of measurement and control technology.they improving there durability for the used in in different environment .

Light sensor is used to generate an output signal indicating the intensity of light by measuring the energy calles as light .

Mismatch faults are also analyse in panel it is cause when electrical parameter of one or group of cellare significantly change from other.also shown temporary mismatch like partial shading , dust , dirt because of this solar panel not getting much output ,so whenever such condition occur on panel then sensor senses and gives related signal to the arduino and dtect the fault at correct intend of time.

BLOCK SCHEMATIC :-



All type of sensor such as voltage sensor ,current sensor ,temperature sensor ,humidity sensor ,light sensor are conneted to back side of solar panel .every pins have three terminal that is input terminal output terminal and grounding . they are connected in such away that to getting signal from solar PV cell and transmitt there signal in to Auduino microcontroller which transmi the information regarding fault is on reciever side i.e

GSM module to get information about faults on solar panel.

SYSTEM ANALYSIS:-

Mainly MATLAB software is used for monitoring and evaluation of solar panel. All operation is performed and simulated on MATLAB 2018b software.and there description as follow.

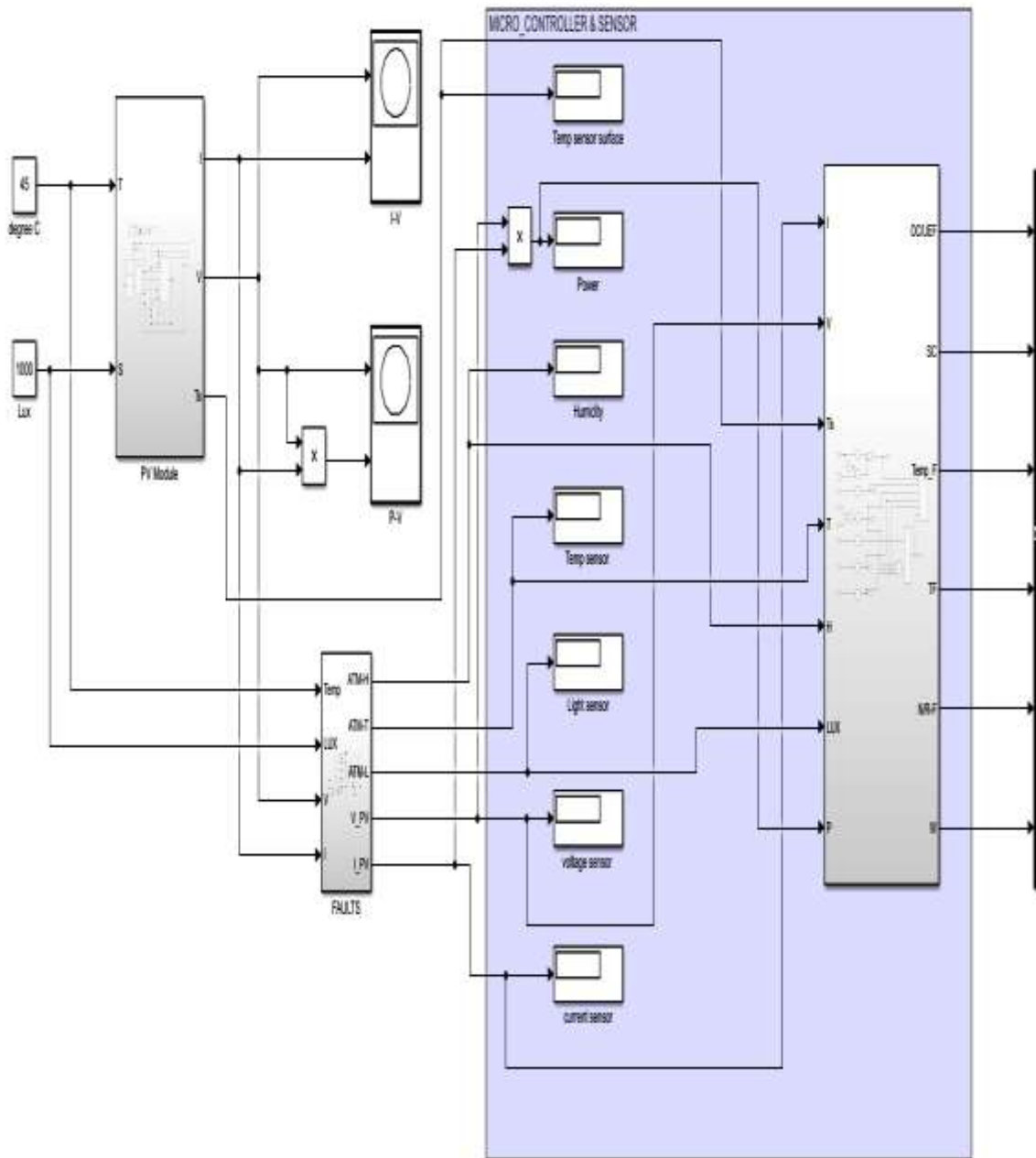


Fig – Simulation model for evaluation and monitoring of solar panel .

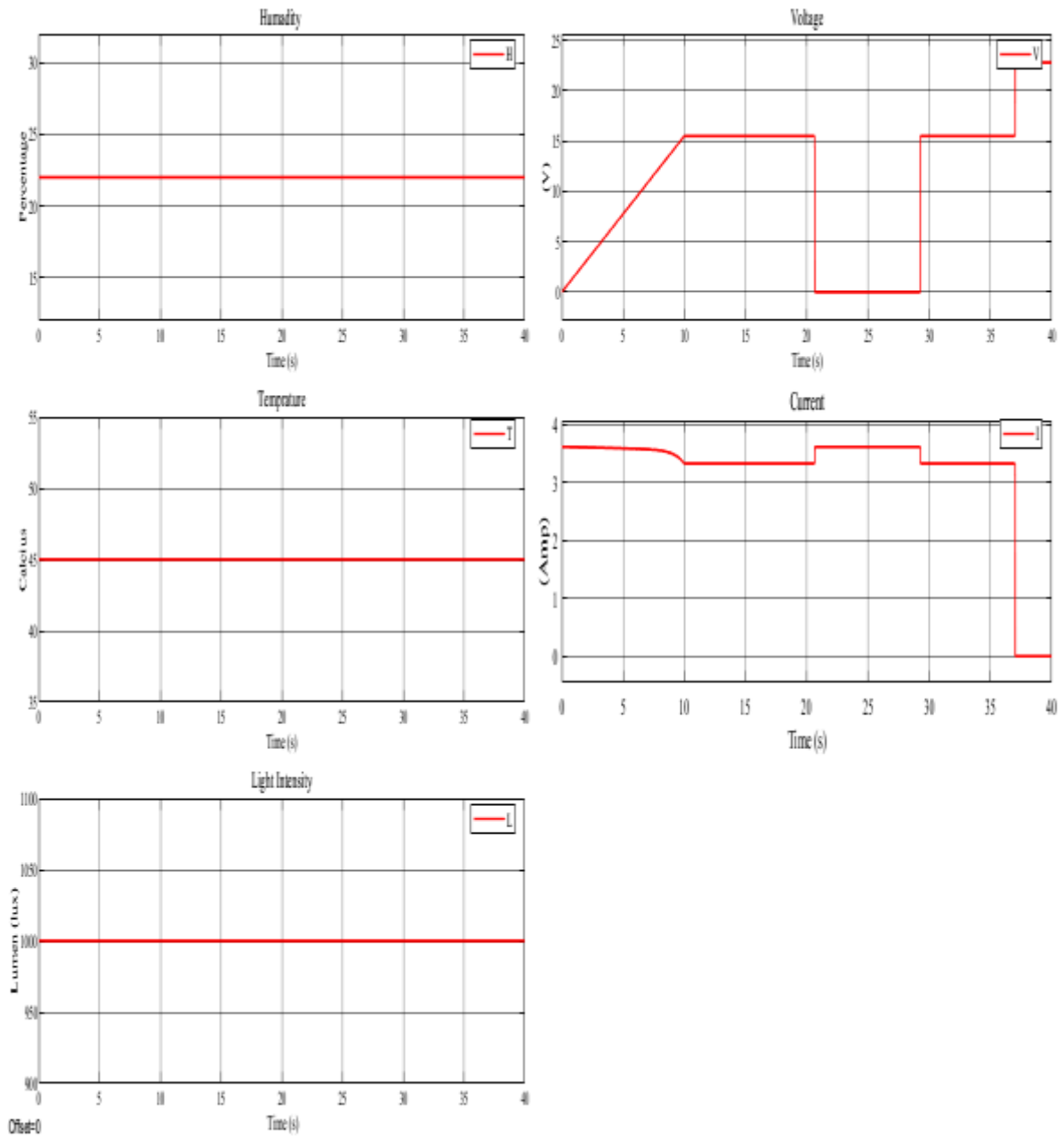


Figure 1.1: Above waveform represents the (open circuit) bridge fault and short circuit fault.

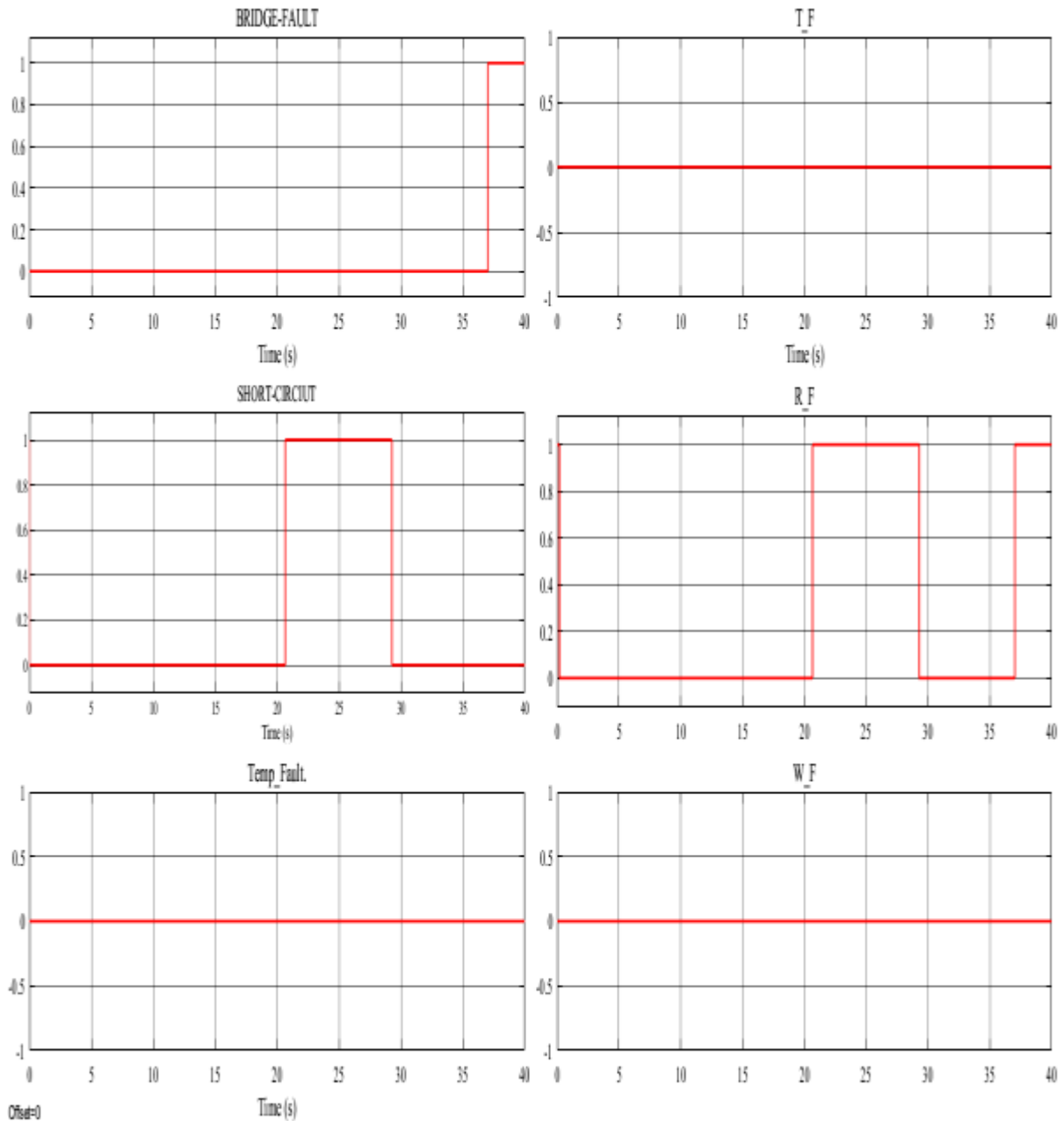


Figure 1.2: waveform shows the digital (1 or 0) transmitted signal by Microcontroller.

The above waveform shows the different faults in PV cells; mainly it is system faults on solar PV cells under normal operation. Figure 1.1 is seen that when a short circuit happens between interval $t = 20s$ to $30s$, the voltage of the solar PV panel goes to zero, and the current reaches its maximum short circuit value that is $3.56A$. At the same time microcontroller detects the condition and sends the signal in binary coded information (figure

1.2) and at the receiver side, it shows the short circuit fault.

The same thing happens when an open circuit/bridge fault has occurred on the PV panel shown in figure 1.1 after time interval $t = 35s$. In this condition, the current value reaches zero and the panel output voltage shows its open circuit value that is $22.8V$.

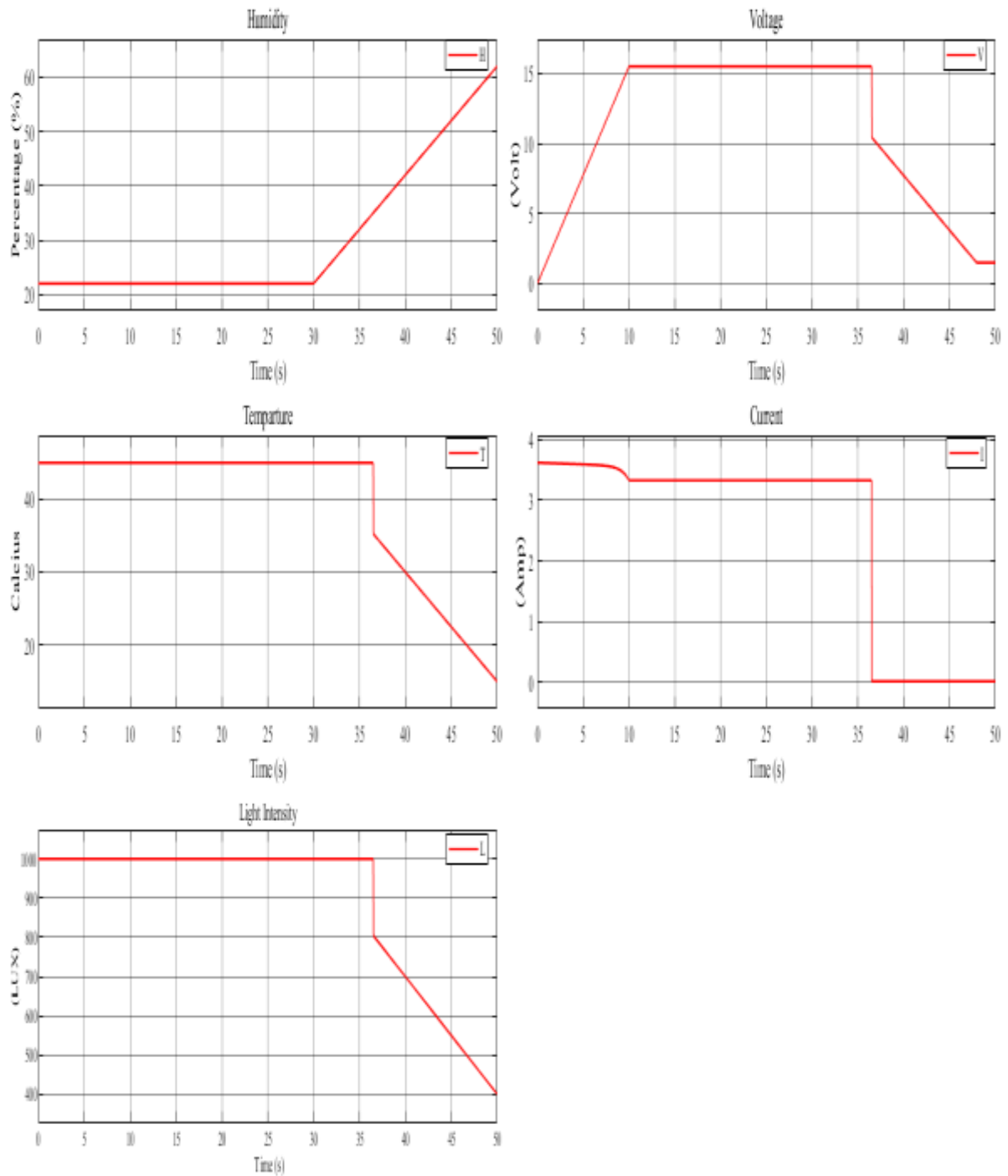


Figure 1.3: waveform of the parameter of PV panel and atmospheric conditions.

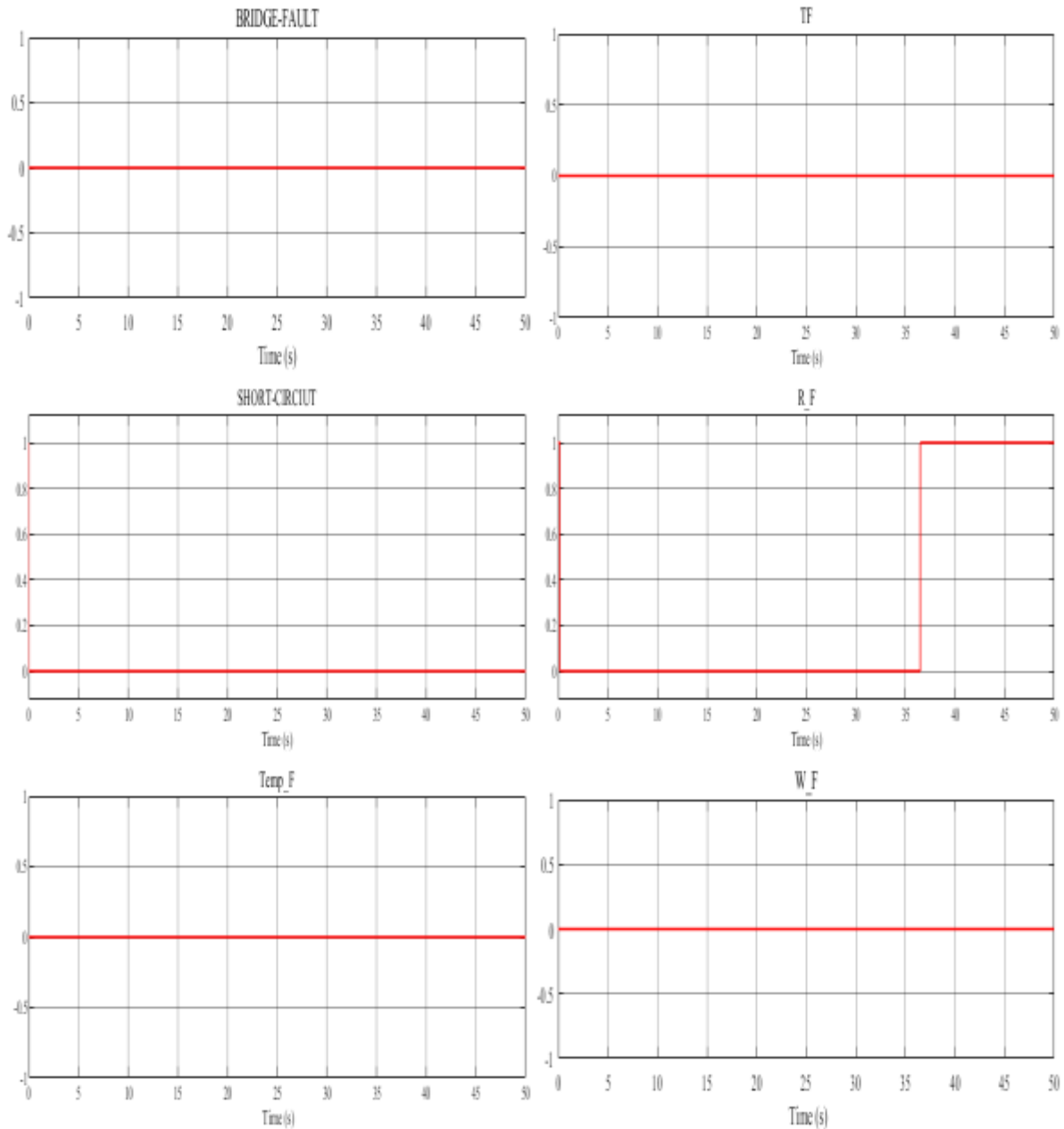


Figure 1.4: waveform shows the digital (1 or 0) transmitted signal by Microcontroller.

In figure 1.3 and figure 1.4, it shows how the atmospheric condition affects the working parameter of the PV panel we simulated the rainy condition. In this condition after $t = 35s$ the atmospheric parameter changes rapidly and it also affects the parameter of PV panel output. And power generated by the PV panel is going on decreased at the same time the microcontroller sends the information at the receiver side.

II. RESULT :-

After upload the program in MATLAB and Arduino MEGA the program successfully show the all parameter on screen i.e voltage, current, humidity, temperature and light intensity on LCD display. If the fault is occurred then Arduino manipulated the data form sensor and show the type of fault on screen such as given below:

- Bridge fault
- Open circuit fault

- Earth fault
- Mismatch fault.

If one of the parameter does not match with the normal working parameter the micro controller automatically manipulated the program and the message on operator mobile through SMS. All above are the main type of faults which occurred frequently.

III. CONCLUSION:-

- The operator can easily get information regarding to fault and parameter with respect to solar panel at any location and it know about which parameter get affect the solar panel performance.
- There is no need of continuous monitoring of solar panel data, it can easily get the information at any time just sending the simple message to GSM model.
- It used any solar electrical power generation system where large number of panel is installed. And it required less cost of running and capital cost.

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