Real Time Data Monitoring of PV Solar cell using LabVIEW

PROJECT REPORT

SUBMITTED FOR THE COURSE:

VIRTUAL INSTRUMENTATION

(EEE4035)

AAMIR KOLHAR	17BEI0013
LAKSHYA PORWAL	17BEI0034

GUIDIED BY:

PROF. ABHISHEK G

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OBJECTIVE

Nowadays, the growing demands of energy, insecure energy resources and emission of hazardous gases have attracted the attention of the whole world towards the renewable energy. Thus, at this time, the entire world is concentrated on the renewable energy sources. Also, the evolution in software technology, we are able to monitor the data of any system in real-time manner. Monitoring solar panel output is the best way to track the working of the solar power system continuously. Solar monitoring software allows not just viewing how much electricity the solar panels are generating, but also it gives real-time updates. Our project is designed with the help of LabVIEW and sensors. The solar panel is connected to the battery and then with sensors. We have connected four sensors with LabVIEW to acquire data. LabVIEW has shown a high performance in communicating with several devices simultaneously and high capability of displaying several variables behavior at a time. Therefore, the proposed system develops a very simple, low cost, high reliable, photovoltaic data monitoring system using Lab-view software. The monitored data can be stored for further analysis. This project will be useful power for continually monitoring of solar energy at solar plant.

Introduction:

India is the seventh largest nation with an area of 3.287 million km2. Also, it is a relatively rich and rapidly developing country where it receives more than 7 hours of direct sunlight each day throughout the year; for this reason demand for solar energy is growing on significantly annually. The capability of solar cell is that it can convert into electrical energy from the plentiful and free solar energy. Also, any adverse forms of pollution are not generated which may affect our atmosphere. So, India now tends to move to solar energy. Earlier, measuring data continuously was not an easy due to deficiency in advancement of software technology. But, LabVIEW is a national instruments product that we can used to monitor the data for real time applications. Laboratory Virtual instrumentation for Engineering Workbench is an abbreviation for LabVIEW.

Solar cell

A solar cell is an electrical apparatus that translates the light energy into electrical energy by the photovoltaic effect. When light falls on the solar cell, electrons are liberated in the p type region and holes are produced in the n-type region. This reduces the potential energy barrier at the junction, then current flows and set up an external potential difference.

LabVIEW software

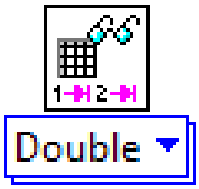
A LabVIEW model is whereby the system equipments are simulated as virtual instruments interacted with functional blocks. In LabVIEW, there are mainly two windows: Front panel and Block diagram. The functional block is constructed in the block diagram, while the output is seen in the front panel. LabVIEW requires graphical block to make program instead of scripted words of line which does not require any coding knowledge. It also executes block in terms data flow programming, which is very convenient.

VI Components:

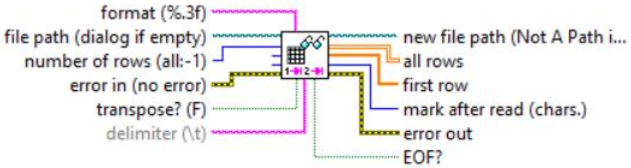
file path (dialog if empty)

file path (dialog if empty)

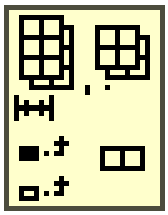
file path is the path name of the file. If **file path** is empty (default) or is <Not A Path>, the VI displays a dialog box from which you can select a file. Error 43 occurs if you cancel the dialog box.



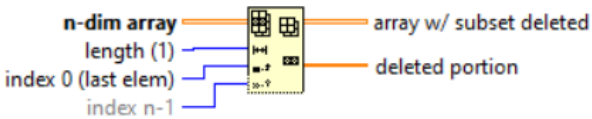
Read Delimited Spreadsheet.vi



Reads a specified number of lines or rows from a numeric text file beginning at a specified character offset and converts the data to a 2D, double-precision array of numbers, strings, or integers. You must manually select the polymorphic instance you want to use.



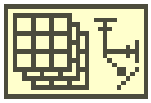
Delete From Array



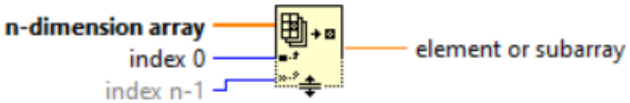
Deletes an element or subarray from **n-dim array** of **length** elements starting at **index**. Returns the edited array in **array w/ subset deleted** and the deleted element or subarray in **deleted portion**.

Array Size

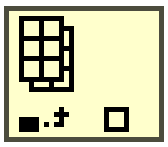
Returns the number of elements in each dimension of **array**.



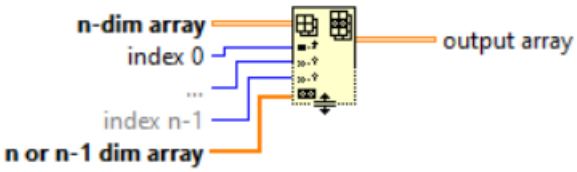
Index Array



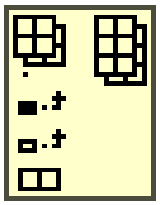
Returns the **element or subarray** of **n-dimension array** at **index**.

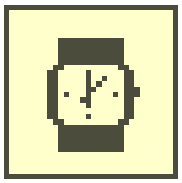


Insert Into Array

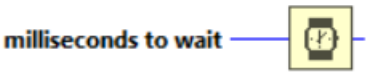


Inserts an element or subarray into **n-dim array** at the point you specify in **index**.

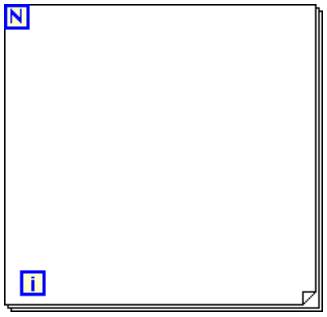




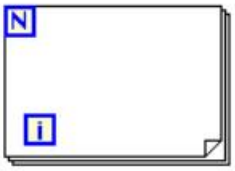
Wait (ms)



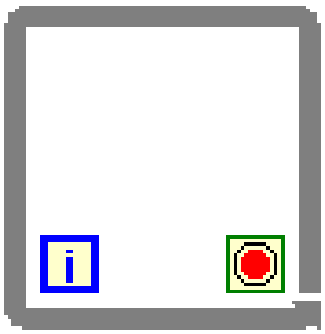
Waits the specified number of milliseconds and returns the value of the millisecond timer.



For Loop

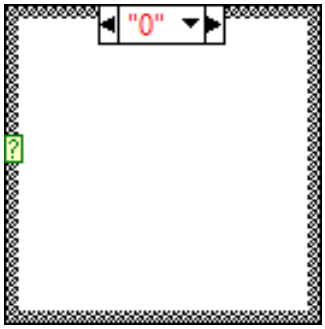


Executes its subdiagram n times, where n is the value wired to the count (**N**) terminal. The iteration (**i**) terminal provides the current loop iteration count, which ranges from 0 to n-1.

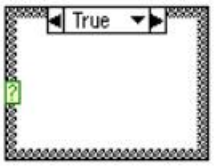


While Loop

Repeats the code within its subdiagram until a specific condition occurs. A While Loop always executes at least one time.

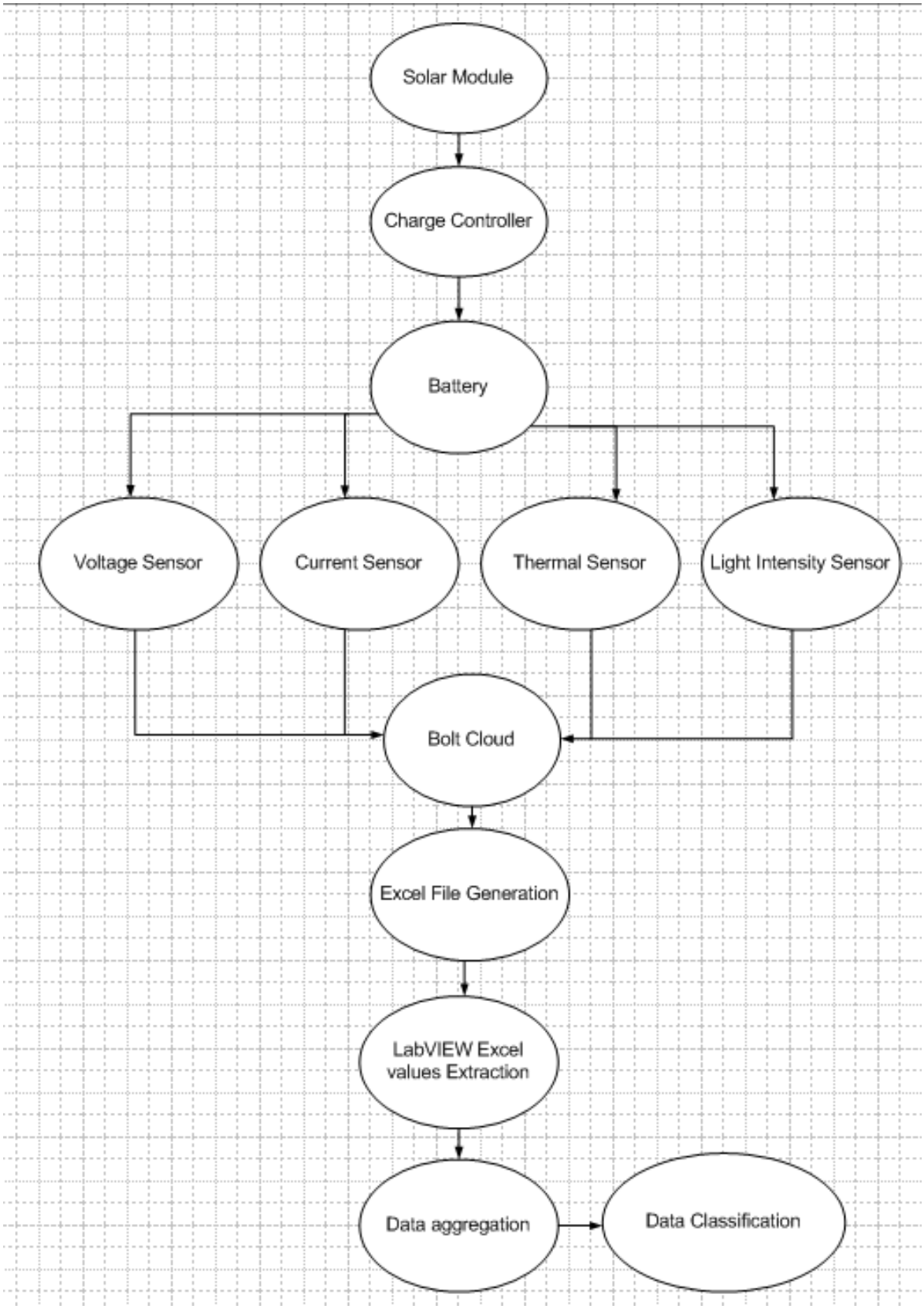


Case Structure



Contains one or more subdiagrams, or cases, exactly one of which executes when the structure executes. The value wired to the case selector determines which case to execute.

Block diagram:

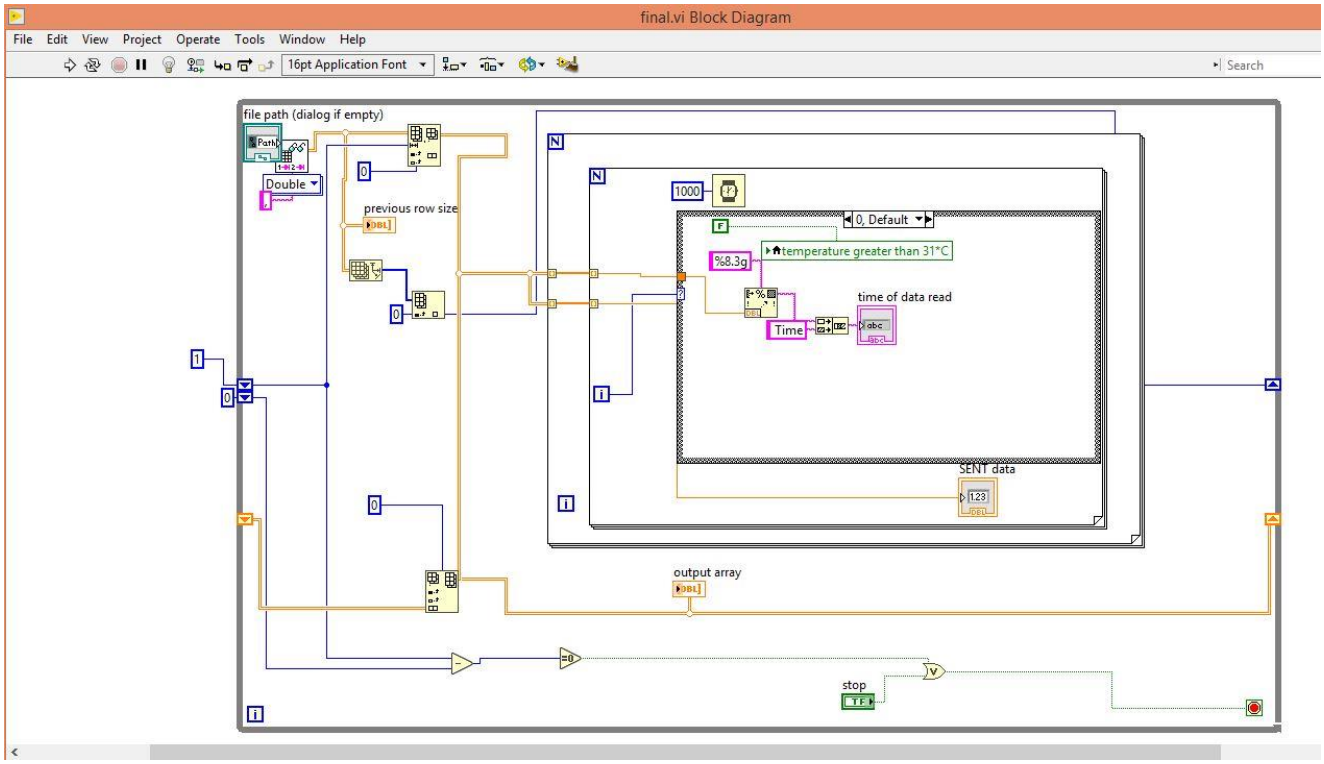


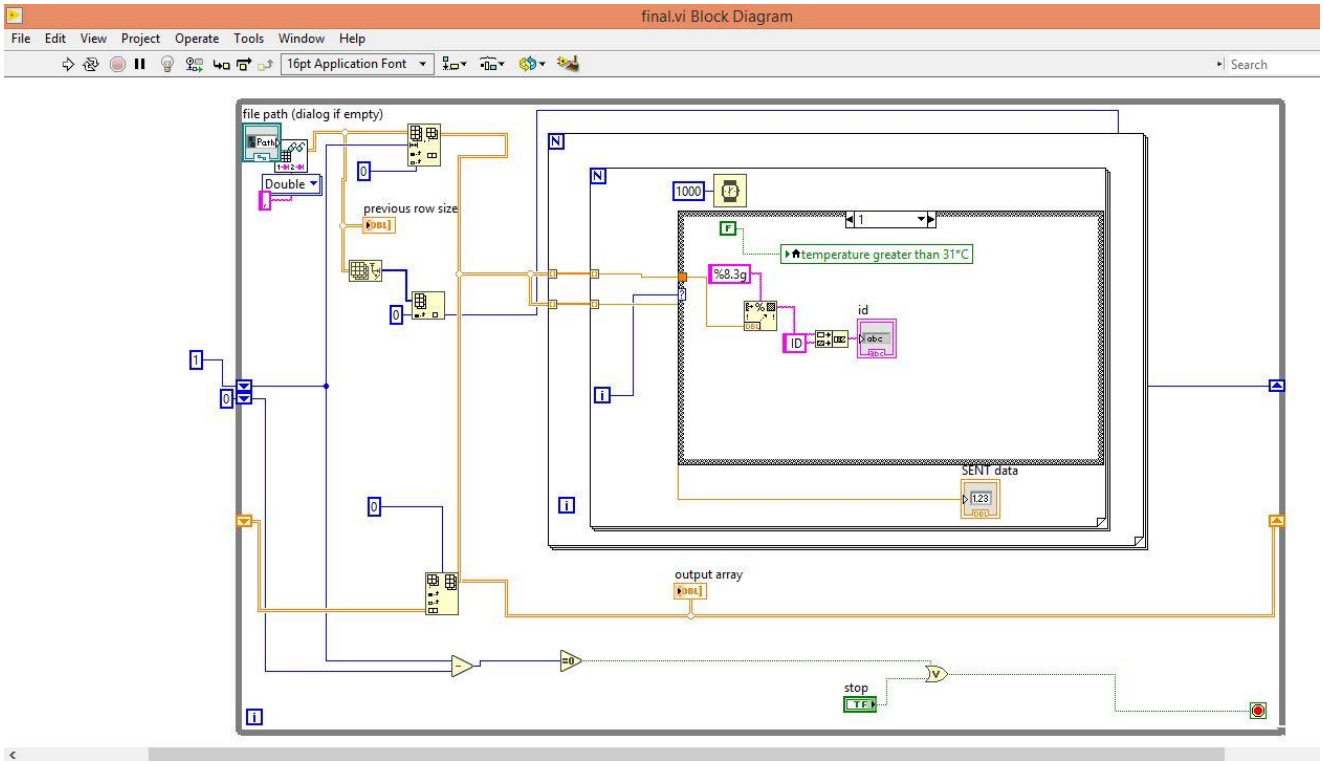
Methodology:

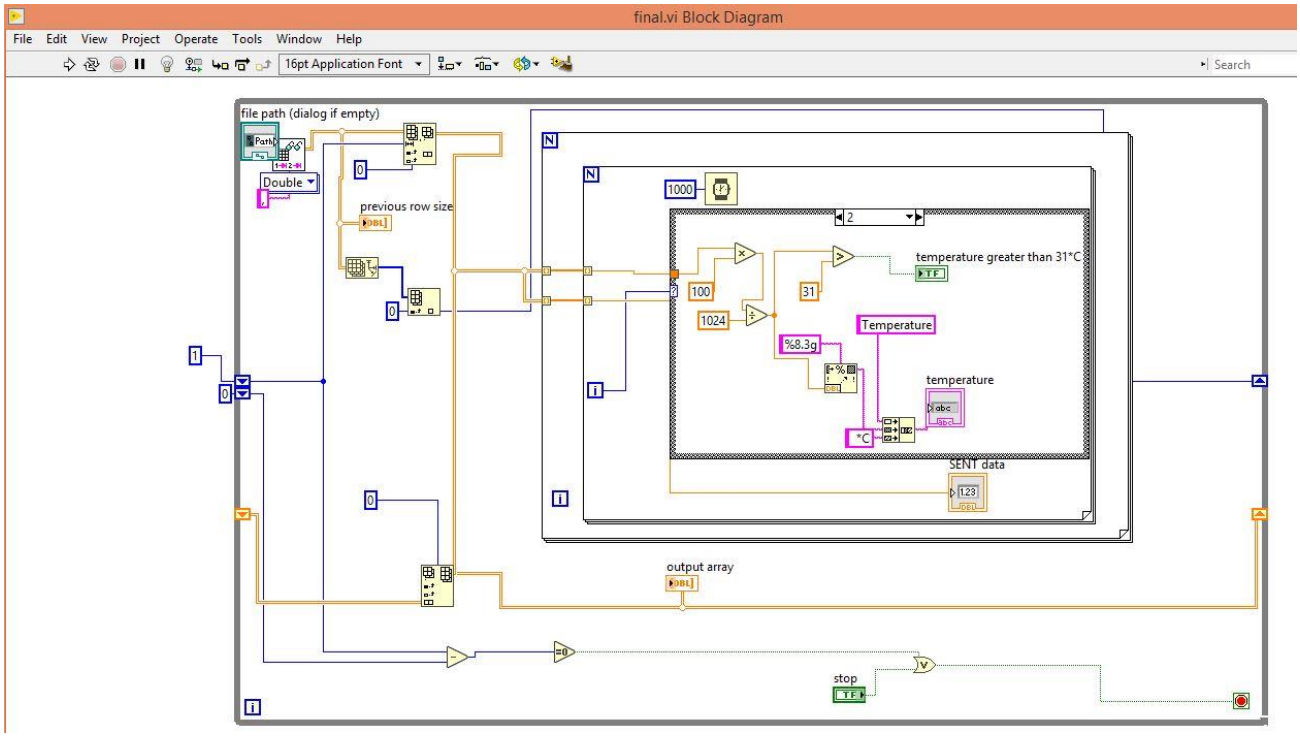
- First of all, the solar module is placed in the open ground for initial charging.
- After that, the charge is applied to the various sensors through battery and charge controller.
- Here, four sensors, voltage sensor, current sensor, temperature sensor and light intensity sensor are being used.
- Then, the output of these sensors is sent to the bolt cloud server, which converts the analog quantity into digital.
- Then the server generates an excel file of the values captured by the sensor.
- Next, the data is interfaced with LabVIEW.
- Temperature and light intensity is firstly obtained as voltage form, but after that from the equations, it is converted into their respective value.
- Here, there is also an indicator, if there is an excessive value from the set reference amount.
- The data is aggregated and classified in the last step and is displayed on the front panel of LabVIEW.

LabVIEW Program:

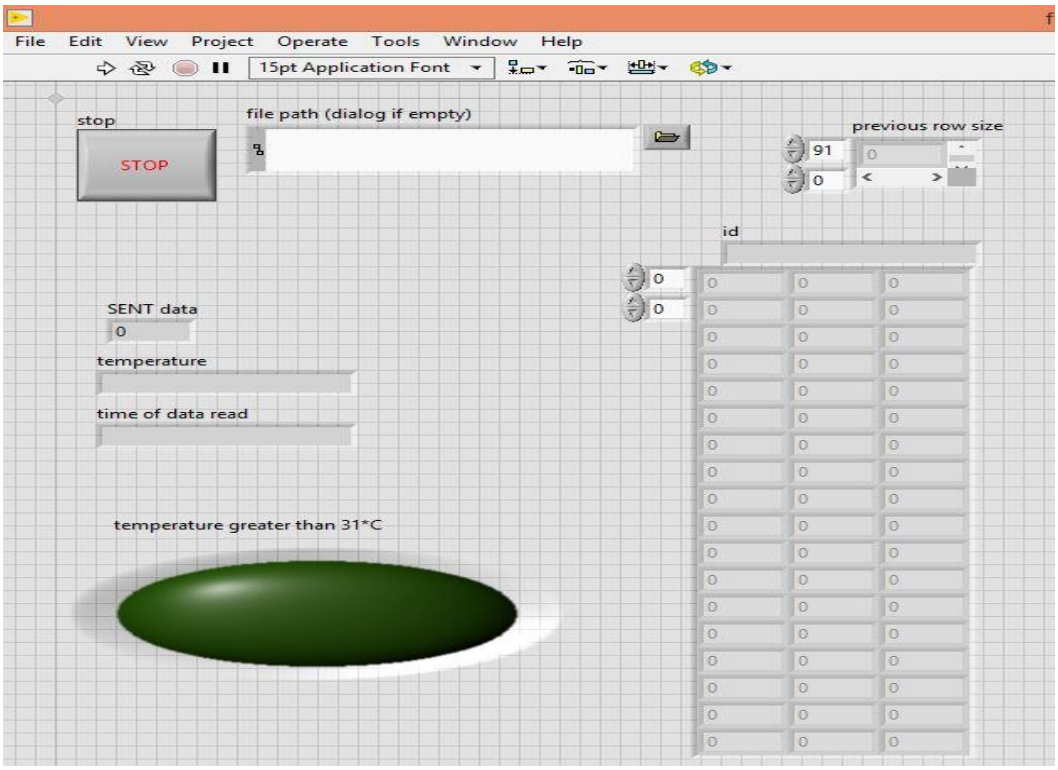
- **Block diagram**






final.vi Block Diagram
File Edit View Project Operate Tools Window Help
16pt Application Font
Search
file path (dialog if empty)
Path
Double
previous row size
1000
2
100
1024
31
temperature greater than 31*C
Temperature
%8.3g
temperature
°C
SENT data
output array
stop
TF

- **Front Panel**


File Edit View Project Operate Tools Window Help
15pt Application Font
stop
STOP
file path (dialog if empty)
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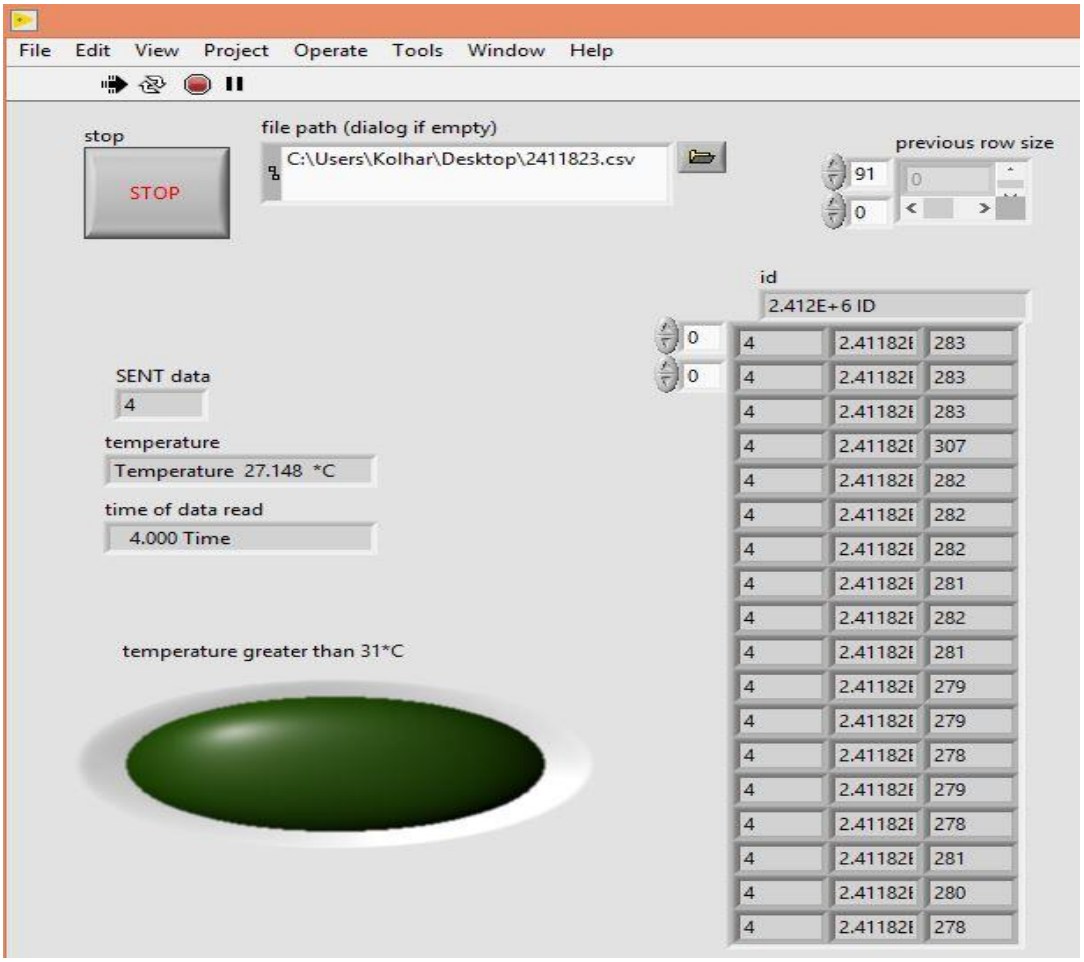
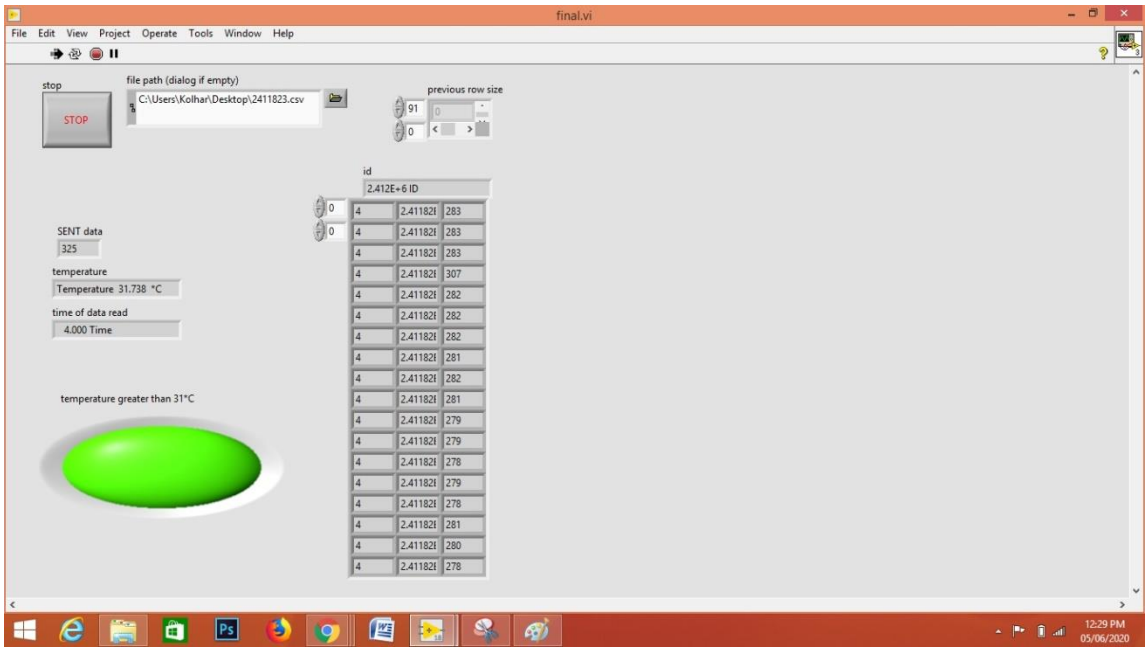
id
SENT data
0
temperature
time of data read
temperature greater than 31*C


File Edit View Project Operate Tools Window Help
stop
STOP
file path (dialog if empty)
C:\Users\Kolhar\Desktop\2411823.csv
previous row size
91
0
id
2.412E+6 ID
SENT data
4
temperature
Temperature 27.148 *C
time of data read
4.000 Time
temperature greater than 31*C

Result


final.vi
File Edit View Project Operate Tools Window Help
stop
STOP
file path (dialog if empty)
C:\Users\Kolhar\Desktop\2411823.csv
previous row size
id
2.412E+6 ID
SENT data
325
temperature
Temperature 31.738 *C
time of data read
4.000 Time
temperature greater than 31*C

Application:

- When a number of modules are connected to the grid PV system via an inverter, they transform the DC current generated by the solar PV modules to AC current. The electricity generated can be used for lighting purposes and powering household appliances. The excess electricity can be sold to the grid directly.
- Individual solar PV modules can be used for powering torches, flashlights, wrist watches, etc. in remote and rural locations.

Future Scope:

- We can send the data of any solar panel from one place to remote area by using internet.
- We can also connect a dual-axis stepper motor to move the solar panel as the sunrays changed their direction for getting high efficiency.
- We can connect an inverter across the battery to generate ac electricity.
- To combine PV system with other renewable system to monitor the data continuously make it as a hybrid system.

Conclusion:

Although, charges of renewable energy square measure over the non-renewable resources, these ways square measure perpetually rises because the demand for renewable energy is rising because of heating. Besides, day by day, the number of traditional resources diminishes and it becomes pricey in worth. So, a lot of and a lot of individual's square measure giving birth top star panels. So, it's important to see the output of the PV panels so as to attain the correct operation of the device and scale back the energy losses. Within the developed system, we've no inheritable the information from the star module. So, we will get the information from any star plant and sent it for any analysis. This technique is incredibly correct and reliable for information acquisition and endlessly measure.

References:

http://inpressco.com/real-time-data-monitoring-of-pv-solar-cell-using-labview/

https://www.ni.com/getting-started/labview-basics/online-help

https://en.wikipedia.org/wiki/Solar_cell

https://www.boltiot.com/