OP17

Solar DC Energy meter- Novel Concept for Measurement of off grid solar energy

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Abstract: -Net meter are available in the market which can be installed where the grid connectivity are available. But due to non-availability of grid it is not possible to feed the solar PV energy in grid.To fulfill the mission of power to all government of India is also promoting DC micro grid so that local energy requirement can be fulfilled. To measure the DC solar energy, present energy meter cannot be used. Hence for such applications solar DC energy meter is required. This IOT compatible solar energy meter will measure solar energy generated in solar panel along with DC voltage, current and power along with temp and humidity of the solar panel installed. Due to advancement in digital electronics and high resolution ADC it is possible to measure DC solar energy with high sampling frequency. Developed IOT compatible solar energy meter is design to meet the requirement of solar energy metering. In this paper the effort was made to develop DC solar energy meter using DSP and importance of critical parameter for solar energy meter will be discussed along with design of the DC solar energy meter for accountability of energy produced and billing to consumer.

1. INTRODUCTION

1.1 GeneralInformation

Renewable energy is sustainable as it is obtained from sources that are inexhaustible (unlike fossil fuels). Renewable energy sources include wind, solar, biomass, geothermal and hydro, all of which occur naturally.
Solar energy [4] is simple, energy provided by sun. This energy is in the form of solar radiation, which makes the production of solar electricity possible.
In the solar power plant, weather station provides weather parameter data like temperature, humidity, solar irradiance, wind speed etc. to main controller using communication protocol.
In this paper, we will discuss the development of prototype module of solar dc energy meter. For the development of solar dc energy meter, we used DSP as a main controller. Four nos. of 250 watt solar modules are connected in parallel. Each solar panel gives 12 volt output. Using voltage divider network, we converted 12 volt dc output in to 3.3 V dc for interfacing of ADC. To measure DC energy, current & voltage [5]-[6] sampling should be done simultaneously. Hence, we select the DSP [1]-[2] based on above requirement to meet high accuracy. This main controller have following features:

- 12 bit ADC , 16 channel with 80 ns conversion rate
- 256K x 16 Flash
- Boot software modes: Through SCI, SPI, CAN, I2C, McBSP, XINTF, and Parallel I/O
- Peripheral Interrupt Expansion (PIE) Block
- Up to 88 GPIO pin capability
- Enhancement control peripheral capability
- J-tag boundary scan support

Weather station gives weather parameter data to the main controller using Xbee wireless module.Xbee transmitter was connected with UART connection of weather station. On the other end of main Controller, Xbee receiver was connected with UART of main controller, which takes the weather parameter data through the UART and store the data in memory.

For established a link between Xbee transmitter and receiver, XCTU software used and done the communication through AT+Command. We have stored the dc voltage, dc current data and controller calculate the power data. This power data is stored inside the controller with date, time and weather parameter data. Our main controller display following parameter on LCD 20 x 4:

- Solar panel dc output voltage
- Solar panel dc current
- Solar power
- Solar energy with integrated period of 5 minutes
- Date & time
- Solar ir-radiance in watt/meter2

General Block diagram of solar DC energy meter is shown in Fig.1

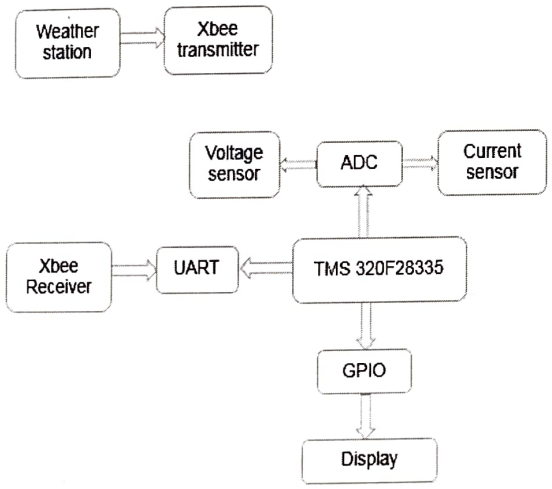

Fig.1Block diagram of solar DC energymeasurement system

More detail on interfacing of voltage, current, RTC, Xbee communication, IoT will be presented in the paper.

4.0 REFERENCES

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