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Internet of Things (IOT) Application for Smart Grid

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Abstract

By considering the peak load demand faced by the power plants which causes lots of nonrenewable energy resource utilization , the distributed generation (dispersed generation) comes into existence. This minimizes the non-renewable energy utilization to keep it reserve for our future generations (sustainable development) which helps to reduce the cost of electricity generation to a great extent. Thus reducing the environmental pollution. For achieving this all electrical parameters need to be controlled in a smarter way through GSM [1] (internet) by microprocessor interfaced with GSM efficiently and effectively. Advanced fast monitoring , controlling and protective devices with inbuilt fast fault clearing capability in a smarter way to develop an overall smart grid can be implemented by suitable integration of electrical engineering concepts with the information technologies ,computer technologies and communication technologies only possible with Internet with high degree of cyber security.Thus, the name IOT means controlling all the day to day important electrical , asset , resources, emergency managements, automation in any public and private sectors by Internet interfaced with smart wireless sensor technologies to build a new kind of advanced civilization which never exist 40 to 50 years before.

Keywords: ADMS, DG, GSM, GUI, IED, IOT, SCADA, SPWM, THD,

1.Introduction

In olden days, sharing of information in large amount is very difficult due to the lack of advanced digital , information technologies. The **security and loss of data are also a major concern** [2]. But , nowadays due to the advancement in computer security and digitization the problems can be solved easily. This can be achieved by passing information containing huge data of machine operation by wireless sensors directly to the Internet which can be accessed from any remote places. Appropriate control can be given via Internet to the microprocessor which is connected to all the loads for their proper functioning as well as maintaining the Indian Standards of electricity. **Information can be shared between machines**[3] related to different electrical parameters as well as different work status so that an overall control can be achieved efficiently and effectively with a high degree of reliability and appropriate standards.This results into saving of both time , energy and overall cost , maximizing the profit by maximizing the output due to high efficiency.For building a smart city different type of features as well as security is needed.

2. IOT implementation

IOT can be implemented by interfacing wireless sensors to the Internet by proper hardware interface which will pass huge data to the operator in a far place.Accordingly by considering all the performance parameters and conditions , a suitable controlled can be given via Internet to the microprocessor to control all the devices according to our desired manner[2].

Application of IOT in smart power - There are different applications of IOT in power , they are

- Smart city

- Smart grid
- Transmission,Distribution Switching Substation
- Asset management
- Integration of renewable with the non renewable energies
- Neighborhood area network (NAN)
- Home area network (HAN)

Applications of IOT in cross domain –

- Smart supply chain
- Live Stocks
- Medical
- Industrial automation
- Smart day to day devices
- Smart shopping , clothing
- Smart cooking
- Smart cars
- Smart aircraft
- Smart warfare
- Smart medicine
- Smart business
- Smart world

3. Home area network (HAN)

For implementing a HAN , certain plan has to be done previously.That is which network is to be followed, **our requirements,our comfort level** etc , whether it will be only grid connected or it will have some renewable energy interfacing, which load schedule program to be used for the proposed system by considering the electrical consumption and tariff with respect to each appliances and gadgets in the total house.

4. Comparison of GSM , Z-wave and ZigBee network for HAN [4]

Table 1. Types of different user friendly networks.

SL. NO.	GSM	Z-wave	ZigBee
1.	Wireless	Wireless	Wireless
2.	1800 MHz	900 MHz	915MHz
3.	35 km	300 feet	30 to 60 foot

5. Comparison of automatic control and manual control for HAN

Table 2. Time dependent and Time independent control.

Sl.No.	Parameters	Automatic control (Time dependent)	Manual control (Time independent)
1.	Reliability	More reliable	Less reliable
2.	Accuracy	More	Less

6. Operation of each block for implementing HAN

6.1. Micro controller – PIC 16F877A micro controller controls the relay which will decide the grid to operate in grid connected (synchronous mode) or island ed mode . The grid can be operated in synchronous mode in case of peak load demand periods and can be operated in Island ed mode in case of grid fault. All the electrical parameters from the grid will be displayed in the LCD screen .From studying the electrical parameters over a given span of time , the settings of the GSM device can be made either in the automatic as well as manual mode depending upon the conditions and behavior of all the electrical parameters over the given span of time.

6.2. Power supply – The DC power supply is given to the PIC 16F877A micro controller for it's proper function and operation. The power supply has to be checked over a specific interval of time to maintain it's continuity and maintenance performances. As, the work load on the microprocessor is varied the supply power from the DC power supply will also vary. Supply protection is already implemented in the microprocessor.

6.3. LCD- It will help to display all the electrical parameters at all different conditions at every instant of time. Nowadays the intelligent electronic devices (IED) fixed to the control panel contains inbuilt microprocessor with displaying LCD which can control all the electrical conditions in an intelligent manner.

6.4. IED (Intelligent electronic device)- It helps to control all the electrical parameters either automatically or manually by intelligent means which already implemented in the IED. It can able to locate the fault by calculating the impedance and matching it with the natural impedance , detecting the type of fault by calculating the sequence currents, by minimizing or clearing the fault by disconnecting the faulty phases. In case of any manual fault , it has inbuilt sensing intelligence and can automatically takes decision against all odds in the electrical systems and understands the correct control for that particular conditions automatically.

6.5. Sensors – All types of sensors voltage sensor , current sensor , power factor sensor , frequency sensor , synchroscope , sequence impedance measuring sensors are needed for effective and efficient control. Wireless sensors can work very effectively in this particular areas since most measurements have to be done from remote areas which will save conductor cost to a great extent. In fact without wireless sensors it is impossible to carry the information to control rooms in case of remote and tricky areas. By proper bandwidth the wireless sensors can carry long distance information without loss and less power consumption will take place for sending the information.
Conductor resistivity affects the transmission in case of normal sensors as resistivity increases with temperature and continuous use over years but in case of wireless sensors since the transmission is wireless mechanism so resistivity problems can be overcome d.

6.6. IR receiver – This receiver takes the electrical parameters from all the devices by wireless methods and give them to the microprocessor for control purposes.All types of electrical parameters are sensed by wireless sensors (IR receivers) and parameters fed to the LCD then all parameters can be controlled by microprocessor either manually or automatically depending u[on the setting of the GSM.

6.7. Relay – There are various types of relays which are needed for the development of the overall control of the grid. Voltage relay, current relay , synchronous relay , phase relay , sequence impedance relay all help to for proper control over all the electrical conditions and the amount of active power and reactive power demand for the load is fully satisfied at every instant of time.Relays must have high sensitivity , fast fault clearing capability and should always maintain both the transient state and steady state stability so that no electrical parameters should go beyond any stability limit as per the Indian Standards of different electrical parameters . Nowadays , IED has inbuilt relays which

can operate in all different electrical conditions with the best performances , reliability, sustainability , control, protection by intelligent mechanism already inbuilt inside IED.

6.8. Inverter – DC to AC 3 phase sinusoidal pulse width modulation inverter (SPWM) can be normally used for a particular purpose for the selective harmonic elimination. A sine wave is compared with a DC wave to generate different pulses which will be according to the procedures for selective harmonic elimination. The inverter plays a very important role as the Harmonic content (THD) will be reduced that is order of harmonics will be reduced by selective harmonic elimination. Lesser the order of harmonics more will be the magnitude of the fundamental component of all the electrical parameters. The lifespan of the total equipment present in the power system will be increased. The chances of faults will decrease, the ohmic loss will decrease , skin effect will reduce , so the overall cost of the generation , transmission , distribution and utilization will decrease to a great extent which will help to reduce the tariff and electrical energy can be given to the extreme places that is far remote places. The environmental pollution will decrease due to the less emissions of carbon dioxide during peak load demand which are faced by the nonrenewable energy power plants .Sustainable development will come into existence which is the utilization of proper and exact quantity of energy to satisfy completely all our demands and keeping reserve for our future generations and to increase the reserve capacity of the power plants. Hence , inverter design directly or indirectly helps in the overall development of the power system.

611. Power grid- The power grid is actually connected with the renewable energies in case of peak load demand and is disconnected in case of grid faults (Island ed operation). The renewable energy sources are properly synchronized with the electrical parameters of the main grid so that the load can be satisfied with all the rated electrical parameters at all instant of time.Frequency, voltage should be adjusted and synchronized according to the main grid at every instant to reduce the circulating current and failure.

Table 3. Scheduling criteria for non renewable and renewable energies.

SL.NO.	Time duration	Load	Operation
1	Peak load demand period	Load satisfying	Main grid + Renewable energy.(Synchronizing mode)
2	Normal load demand period	Load satisfying	Main grid .
3	Main grid fault	Load satisfying	Renewable energy. (Island ed mode)

6.9. Renewable energies –The wind power generator, solar panel are the two main renewable energies used in India as solar energy is plenty available in India as India is a tropical country. Wind is also available plentifully in India. These two renewable energies are a fast advantage for India for the generation of electrical energy which has the potential to generate in the range of GW's in India.The cost can be very high but researches are going on to minimize the cost and maximize the efficiency for the solar generation and wind generation.

6.10. GSM- Global mobile communication system is the basic mode for the communication of all the electrical parameters at every instant of time. The GSM device is fully equipped with all the control mechanisms either manually or automatically.The settings of all the electrical parameters can be set within the boundary conditions according to the Indian Standards.Nowadays GSM can be interfaced with the IED , for intelligent control mechanisms.The important scenario of power system control by internet is it's security. But , the advancement of computer science ,digital technology, satellite technology,electronics and communication technology helps to build a secure system with proper bandwidth which is resistance to external signals and is distortion free and can be operated from remote areas for achieving control and protection to remote areas at every instant of time which has

inbuilt mechanism of anti-hacking. Minimizing the loss of the signal over very large distances transmission and security for protection is the most vital scenario nowadays.It has to be achieved by the growing knowledge of science and technology.

6.12. Loads- Loads can be linear which will be easy for the control and protection by the relays or the IED's. The loads which are nonlinear they can generate lots of harmonics for overcoming this problem the transformers of the main grid must have one winding star connected even in case of delta delta transformer the tertiary winding must be there which must be star connected so that the neutral of the star point can be grounded to maintain the balance in the total power system in all the 3 phases by grounding of the fault current by the neutral point. Also in case of unsymmetrical faults the zero sequence current gets a path to flow to the ground thus minimizing the fault current in the power system thus maintain stability and secure the power system , increase the lifespan of all the equipment and loads thus maintaining stability.The relays under non linear loads should operate very fastly and can sense very fastly for the nonlinear characteristics with respect to time for any electrical system parameters under any electrical conditions.Nowadays, relays present inside IED has inbuilt intelligent systems which can operate successfully and effectively in all the electrical fault conditions so that the overall power system or any system part of the power system should be within the transient state stability limit and steady state stability limit in case of any kind of faults which helps to generate the concept of smart control, smart protection,smart clearance of faults ,sustainability , reliability , cost reduction, availability of electricity for poor in the remote places with decentralized control to develop an overall smart grid for sustainable development in India for our future generations.

6.13. GMSK modulation-

In GSM, GMSK [6,7] modulation is performed. A Gaussian filter is developed mathematically which takes digital data in sequences and modifies it and then supply the modified signal to the frequency modulator. This type of modulation is helpful for interference free transmission for the entire range of signals which makes the GSM signal safe thus increasing the reliability and sustainability of the GSM signal which directly affects the reliability and sustainability for the smart grid which is directly depends on the GSM control both from the consumer side and the local economic load dispatch centers.

6.14 Methods to Improve P.F

Using static capacitor bank

FIG. 1. Power factor improvement based on capacitor bank method.

Oc=I2cos phi 2 = I1 cos phi 1
I2=I1 (cos phi 1/ cos phi 2)
Hence , line current taken from the supply is less in this case
And P2 = P1
VI1 cos phi 1 = VI2 cos phi 2
That is same power is taken from the supply.

VIC = VI1 sin phi 1 – VI2 sin phi 2
Q C = Q1 – Q2
Q C = P (tan phi 1 – tan phi 2)
since P = V ID cos phi
Calculation of value of C
Q C = V . IC
IC = VwC

Now, from the phasor diagram, **Q C = square V . w . C**

ab = ac – bc

IC = I1 sin phi 1 – I2 sin phi 2 **C = Q / (w . square of V).**

Power factor in case of 3 phase system , in case of star connected will be three times as that of delta connected. Hence, delta connected capacitors is used for power factor improvement whose turning on and turning off will be determined by the GSM control either by manually or by automatically depending upon the settings of the GSM which is an interfaced between loads , source and the microcontroller.

7. Block Diagram for HAN

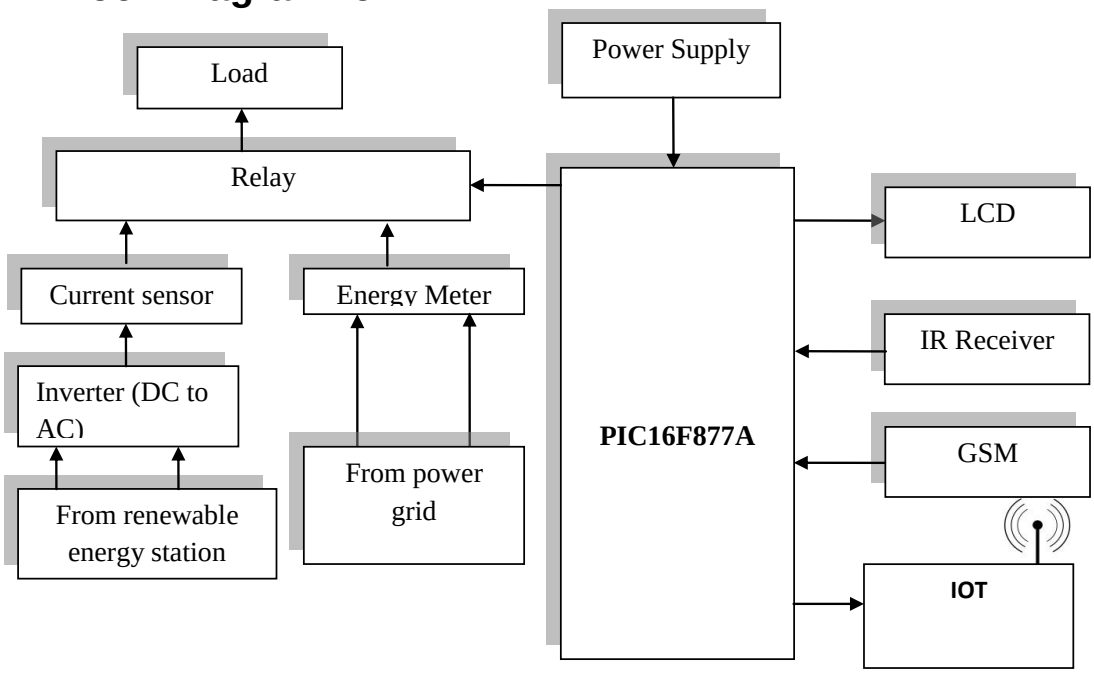

FIG. 2. TOTAL BLOCK DIAGRAM OF IOT APPLICATION ON SMART GRID WITH GRID AND RENEWABLE ENERGIES (DG).

8. Description of each block for HAN

8.1 Microcontroller – PIC 16F877A microcontroller does all the sensing mechanisms from all the sensors connected to different loads. The sensors gives the information's to port A of the microcontroller by setting the TRISA bit of the microcontroller to high value to make port A as the input port. Hence, suitable ports B and C are also present in the microcontroller where these ports can be set high to make them as inputs or set low to make them as output control signals to the loads. All the ports are therefore bidirectional. Schmitt trigger will compare the electrical parameters with the threshold value so that each of the electrical parameter lies within the transient state stability limit and steady state stability limit. If, any of the electrical parameter goes out of the threshold value then automatically the output port will become low to send a signal to that particular relay to disconnect the particular parameter from the system. Port D,E of the microcontroller is connected with the Schmitt trigger .Port B,C and D are eight bit bidirectional but port A is six bit bidirectional. USART communication the hardware configuration of PIC 16F877A microcontroller. It deals with synchronous mechanism and also can deal with asynchronous mechanism. Both in the transmitter

side and also in the receiver side these two mechanisms can be carried out. C programme can be used to operate all the ports of the microcontroller and to give control to the microcontroller by interfacing with the GSM device by proper modification of the C programmer of the microcontroller for proper control of all the electrical parameters according to the desired criterias following the Indian Electricity Standards and fulfilling the load demands.Interrupts are used to stop the normal operation for a special cause given by the software intrerrupts and it can also be given by the hardware interrupts.In case of software interrupts the programme counter can switch from the next memory address to the new memory address where a new programme starts to make it execution which is compulsory to execute in the middle of the programme, and after executing ,the programme counter again goes to that particular memory address which it has left before. Interrupt enable if it is used then it is a case of hardware interrupt which will block all the software interrupts. Hardware interrupt can be enabled in case of some special cases where the microcontroller has to be operated in case of some emergency situations.For transmission of datas TXSTA register is used and for receiving of datas RCSTA register is used.TXREG bits are used to store eight bits according to LSB and MSB standards and TX9D bit is used to store the 9^{th} bit.Similarly, for the datas receiving purposes , RSR bits are used to store the eight bits according to LSB and MSB standards and RX9D bit is used to store the 9^{th} bit.Priority based renewable energy switching in case of many renewable energies present can also be achieved by suitable programming which will enable that particular port first which is connected with the highest priority renewable energy source which should be at first switched on in case of peak load demand and then after some delays the other renewable energy sources get switched on one after the another if the peak load demand permits and cross a particular range for a particular requirement of a particular renewable energy.The microcontroller used is an interface of software and hardware which creating the environment for IOT applications.Hence, the compatibility of the software and the hardware is used to reduce the overall cost which is a type of future work and research areas nowadays.Thus,microcontroller helps to integrate non renewable energies with the renewable energies which is the main criteria for smart grid.

8.2Power supply- The power supply given to the IC of the microcontroller is a very complex process as the microcontroller is very much voltage sensitive so, a minor transient change in the voltage may damage the microcontroller IC. For protecting the microcontroller IC different stages of voltage manipulation has to be done.At first a transformer is needed which will step down the voltage suitable for the microcontroller IC then, the voltage is fed to a rectifier for the conversion to d.c. then the voltage signal is fed to the input filter which has capacitors to filter the input ripples to a great extent , the voltage signal is fed to the d.c. voltage regulator which will keep the d.c. voltage constant irrespective of the change in the voltage level due to the disturbance faced by the microcontroller due to the rapid change of load during transient operation in case of emergency.The regulator has capacitors on both input and output sides which will try to maintain the voltage level always constant irrespective of the electrical condition / parameter change.The voltage signal then goes to the output filter which has capacitors of less value as compared to the input filter for filtering out the small ripples present in the voltage signal so that a completely pure d.c. waveform is formed all the time which will be finally fed to the microcontroller for proper operation of the microcontroller all the time.Thus, all the arrangement is done for the proper voltage waveform given to the microcontroller IC by considering it's sensitivity to minute rate of change of voltage for preventing it from damage increasing stability, reliability and sensitivity for the good performance throughout it's lifetime.

8.3 LCD- Nowadays , LCD is used everywhere for the measurement with high degree of accuracy and precision by digital means. A material which is polarized is made into two symmetrical pieces and then liquid solution is kept between the two pieces of the polarized material , the liquid is a crystal solution . LCD can be controlled by the presence of current flowing through the liquid and thus the crystal gets aligned for the LCD to operate. Due to the advancement in power electronics and drives the lcd's are much more advanced nowadays due to the good performance , good display,less cost to buy ,higher reliability and sustainability due to the high response in both the transient as well as steady state conditions with a good resolution,precision and accuracy.Nowadays, LCD can display two lines at a time,20 charecters can be displayed per line which includes both numbers and chatecters of all the vital electrical parameters with respect to time. Nowadays, LCD can be

interfaced with computers for storing datas and it can also be interfacesd with Intelligent Electronic Devices (IED).

Pin description of LCD

Table 4. LCD IC different pin functions.

PIN	PERFORMANCE
Vcc,Vss	Power supply of +5v to Vcc and Vss will act as ground.
Vee	LCD contact can be adjusted.
RS=0	User to LCD interface, user can give instruction(or) command to LCD like clear display etc.
RS=1	User to LCD interface, user can give information like any data to display.
Read write register	R/W=1[read] read information from LCD by user R/W=0[write] write information from LCD by user.
Enables register	Enables the data operation of the LCD.
D0 –D7	Data files for 8 bit data to read and write.

FLAG DESCRIPTION OF LCD:

Busy flag is D7. If this flag value is one then LCD will be busy to do it's internal functions and information receiving and transmitting will net happen. The normal function will resume when busy flag is zero.

8.4 INTELLIGENT ELECTRONIC DEVICE :(IED) - Due to recent development in the fields of artificial intelligence in different fields of engineering such as advancements in neural network, genetic algorithm, bio algorithm. The advancement also came to the electrical engineering in the form of intelligent electronic device control and mechanism of implementation. For implementing IED ,the different parameters of normal operation of the power system is calculated and all the parameters are adjusted in the IED by considering the transient state and steady state stability limit of the power system and then the IED can locate any kind of faults including manual fault also by intelligent mechanisms and it also has ability to aware us before any serious blackouts and any serious faults and any minor faults in the power system by intelligent means IEDs work as relays in a very intelligent manner with a very good reliability, sustainability and a good transient state as steady state performances.

8.5 SENSORS Wind sensor is a special type of sensor which is used for measuring the wind speed. A particular type of conducting material is placed in the direction of usual flow of wind; the materials get heated to certain temperature. Each temperature happens in case of each particular wind speed. Now electric current required to heat the material at different temperature is different. Hence, the arrangement is done in such a way that the electric current is directly proportional to the square of the speed of the wind. The material of the wind sensor is very sensitive with a very small amount of air force. Eighteen to twenty four inch distance air can be measured very accurately by the speed of the air by the highly sensitive sensor.

SPECIFICATIONS OF THE SENSOR:

PARAMETERS	DIMENSIONS
Voltage of supply to the wind sensors	10 volts[rated]
Current of supply to the wind sensors	40mA{rated}[depending on the speed of the wind]
Output of the wind sensor	0 to collector voltage of the wind sensor device
Dimensions of the wind sensor	Length .68", breadth 1.590"and height .25".

Table 5. Ratings of the wind sensor.

For about 10 seconds the sensor has to be placed near wind then it should be operated so that results obtained in the measurement should have good accuracy and precision.

CALIBRATION PROCEDURE:

Output 0.5 volt- zero wind speed with 6 volt supply voltage.

If we calibrate to 0.2 volt output for zero wind speed with 6 volt supply voltage then the performance will not be very good.

Here, the principle of the speed of the wind changes to the temperature of the contact of the wind and the sensor change is the basic principle of the sensor which is done by calibration with the current wind sensor is interfaced with the GSM by the IR receiver.

CURRENT SENSOR:

For measuring current, current sensor is used which needs a current transformer. The sensor is interfaced with the GSM by the IR receiver.

SPECIFICATIONS OF THE CURRENT TRANSFORMER:

Table 6. Ratings of the current sensor.

PARAMETERS	RATINGS
Voltage input	300 volts [rated]
Voltage output	1.5 volts [rated]
Primary resistance	1 kilo ohm
Secondary resistance	20 kilo ohm.

ENERGY METER:

Time integration is done on the product of the instantaneous values of the voltage and current to give the energy reading of the amount of energy used in 1 hour. The meter is interfaced with the GSM by the IR receiver.

OTHER SENSORS:

Voltage sensor, power factor sensor, synchroscope change of measurement with respect to time is always noted in all the sensors interfaced with GSM by the IR receiver.

8.6 RELAY-

Different types of relays are required such as switch over relay for switching either manually (or) automatically depending upon the settings of the GSM. Voltage relays for detecting the over voltage and the under voltage. Frequency relays which determine frequency change and cuts the total supply if frequencies go beyond certain values to maintain transient and steady state stability of the power system , which is already set in the settings of the GSM and can be controlled either manually (or) automatically . Reactive power depends on the voltage and the reactive power depends upon the frequency and in both cases both stability is to be maintained in both the voltage and current for the power system for reliable and sustainable operation.

Electricity is related with the magnetism is the concept of relay. Electric current is passed through the coil, thus creating a magnetic field. This magnetic field needs a magnetic material which is connected with the contact thus separating the contact in case of relay for open ckt. For close ckt the mechanism will be opposite so that the contact closed due to the magnetic field. ULM 2003 is the relay driver for the relay interfaced with the uc. The settings of relay can be done at the time of manufacture by considering the rating of current required open and close the circuit at the time of operation. Different constructional features of the relays are

- Magnetic low reluctance path.
- Efficient movable parts.
- Efficient contacts.

The po-0, po-1, po-2 and po-3 pins of the controller is the data transmit pins of the uc to transmit data to the relay by ULM 2003 relay driver interface.

8.7 INVERTER-

For the A.C load system in case of solar panels the inverter is used which converts D.C source voltage and current into A.C voltage and current with negligible THD for a pure sine wave all the time

which is fed to the loads for reliable and sustainable operation so that the loads have a good performance. Normally sinusoidal pulse width modulation (SPWM) technique is used for the interaction so that the timing pulses should be given to the inverter switched to minimize the higher order harmonies by former transformer.

8.8 POWER GRID-

Normally a 3d wire coming from the distribution side to the different loads such as industries and commercial complexes but in houses single phase lines comes. The power grid always maintains a high stability as if any system is connected to the power grid if any to maintain the device to operate in steady state value.

8.9 RENEWABLE ENERGIES-

In case of grid faults, the system of load should be disconnected for protection and the system of load should be operated in LS landed mode only by the renewable energy sources not by connection on synchronization with the main grid.

8.10 SOLAR CELL-

Conversion of light energy to electrical energy is done by the solar cells. They are incapable of sharing the electrical energy. Semiconductors are used for the manufacture of solar cells. Between p type and n type semiconductors a bonding is made for the flow of electrons. Electron gathers in the n type junction at the terminals and in the holes in the p type junctions at the terminal this emitting a path difference to flow of electric current. There are many features of solar cell which are implemented by proper technologies to the solar cells.

They are

- Long life,
- Operate efficiently in intense sunlight,
- Easy to install.

In this project solar cells can work as both renewable energy source as well as battery chargers. It can work as a backup for light in the substitution and to all the devices which can operate in emergency situation in case of grid failure.

8.11 GSM

Interfacing with the GSM with the uc is done by MAX 232. Here MAX 232 is a driver for the control of the uc. GSM has TX and RX pin which is connected with the MAX 232 for interfacing with the uc transmission and receiver side. In case of digital cellular communication GSM plays a global standard. There are many advantages of GSM module

They are

- Robust,
- Reliable,
- Cheap,
- SMS facility,
- Roaming internationally,
- Each GSM has a particular address for recognition,
- GSM application for mobile,
- Spectral efficiency,
- Anti-hacking,
- Reliability is high and sustainability is high.

GSM has AT commands.AT commands has different functions.

They are

- Central of SMS,
- Signal strength, parameter information,
- Keep a record of previous electrical parameters change over an emergency period,
- Changing the parameter of battery and battery status are also recorded in the AT command.

GSM system in the power system has three different parts.

They are

- BASE STATION SYSTEM:
  It gives control to the GSM modem through internet.
- SWITCHING SYSTEM:
  Here, the switching is done by the switch over relays automatically depending upon the defined parameter setting of the GSM.
- OPERATION AND SUPPORT SYSTEM:
  All the electrical parameter control goes to the load dispatch center which through different algorithms for load of effective with minimum cost of distributor gives command to the base system to operate the GSM settings in an effective manner.

SPECIFICATIONS OF GSM:
Table 7. GSM the best method for long distance data transmission.

PARAMETER	RATE OF VALUES
Frequency bandwidth	1850 to 1900 MHz
Difference between uplink and down link frequency	80 MHz
Modulation	GMSK
Rate of transmission	270 Kbps
Access method	Same carrier where can send many different information at a particular time interval.
Hold circuit	Reduce the bit rate so that cognition will not occur in GSM by holding the information for particular power system so that the previous information gets proper time to transient and receive by the GSM interfaced with uc by MAX 232.

8.12 ADC:

Resolution is directly proportional to the number of sampling steps and is also directly proportional to the retrieving of the shape of the original analog signal from the digital signal. Now, as resolution increases time of conversion also increases. A particular type of algorithm is followed for analog to digital conversion for the control of different pins of the ADC 0808. For representing an analog signal int digital signal numbers of binary bits are used. As the number of bits increases for representing a particular value of analog signal its efficiency and accuracy, precision increases. Here, in ADC 0808, each analog signal particular value at a particular instant of time is represented by 10 bits so that at the receiving end the original value of the analog signal is formed with a good accuracy and precision. The ADC 0808 has four eight bit registers. They are

Table 8. ADC IC different register functions.

REGISTERS	OPERATION
ADCON0	Behavior of A/D to do the conversion with respect to time.
ADCON1	Control the configuration of port A and port E.
ADRESH	Most significant bit storage.
ADRESH	Least significant bit storage.

9. Challenges and future scope of work

The most important challenge faced by the internet control is it's security[5,9]. For this reason the devices are developed which operate digitally in such a frequency range so that it will directly interfaced with the remote microprocessors through satellites which does not have any intervening or in between devices so that interference and hacking can not be possible to take place.
The cost will be high for implementing in this techniques but by considering the advantage which we get from the smart grid implementation by internet the overall cost can be minimized to a great extent.

10. Conclusions & Summary

The main conclusion is the control of grid in a smarter way to develop the concept of smart grid with the help of internet which allow us to control the interfaced microprocessors from remote areas which will increase the reliability , sustainability [5,10] , increasing the lifetime of each and every device , quick monitoring , controlling , protecting and fault clearance , maintaining transient and steady state stability limit for all electrical parameters in all different normal and fault conditions , maintaining proper voltage to satisfy the active power demand,frequency , reactive power demand according to power factor and VA ratings following the device ratings and the Indian Standards , maintain proper overall synchronization and fulfillment of 24 hours everyday load demand ,reduce the harmonic distortion to a great extent , minimizing the probability of fault occurrence and load shedding ,reducing the overall cost of generation , transmission and distribution , maintenance of the whole power system to a great extent , reducing tariff allowing for the electrical utilities for remote areas , increasing the fundamental component of voltage and current by reducing the order of harmonics thus results into reducing the Watt ratings of the devices for proper desirable output .A smart grid is possible to achieve from a simple and easy approach only due to the achievements and development of Internet and our Indian satellites for overall supervisory control and security.

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