REMOTE CONTROL SOLAR PLOUGHING MACHINE

PROJECT REPORT

Submitted to

The Director/M.S (PCS&T)

REF No.10761/PCS&T/FA/PROJ/JSA-II/2014/648

GOVERNMENT OF PUDUCHERRY

DEPARTMENT OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

PUDUCHERRU COUNCIL FOR SCIENCE AND TECHNOLOGY

III FLOOR,PHB BUILDING,ANNA NAGAR,PUDUCHERRY-5

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UTILISATION CERTIFICATE

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2. Name of the Department: Electronics and Communication Engineering

3. Title of the project: Remote Control Solar Ploughing Machine

4. REF No.10761/PCS&T/FA/PROJ/JSA-II/2014/648

It is certified that a sum of Rupees One lakhs Sanctioned by the council for carrying out above mentioned student project has been utilized for the purpose for which it was sanctioned and sum of Rs .Zero remaining unutilized is refunded.

Signature of the HOD/ECE **Signature of the Dean with Seal**

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ABSTRACT

India had a profound great impact on agriculture and increasing in farming system. In which all types of agricultural equipment like - ploughing, cleaning, tractor, combine, etc has been mechanized due to the demand of farmer labourer women and men. A Green Revolution and the liberal era of modern agricultural system using new techniques, have its profound impact on poorer farmer and their general socio - economic situation. From this point of view, we have designed a remote control based solar ploughing machine for our farmers. This automatic plow machine is operated by the remote with wireless RF communication. The D.C motor speed can be controlled by PIC microcontroller module and it get power from the rechargeable battery. Solar panel used to recharge the battery for ploughing D.C motor is used to it. To the best of our knowledge solar based ploughing machine including the remote control activation has not been reported. So we are assured this is the first time.

CHAPTER-1

INTRODUCTION

1.1 DESCRIPTION

We are doing our project **REMOTE CONTROL BASED SOLAR PLOUGHING MACHINE**. It is used to avoid the environmental pollution and utilize the man power.

Our aim is manufacture the plow machine and everyone to operate it especially the youth to take part in the agriculture.

In future we proposed all the tillage tolls are placed in our remote control machine.

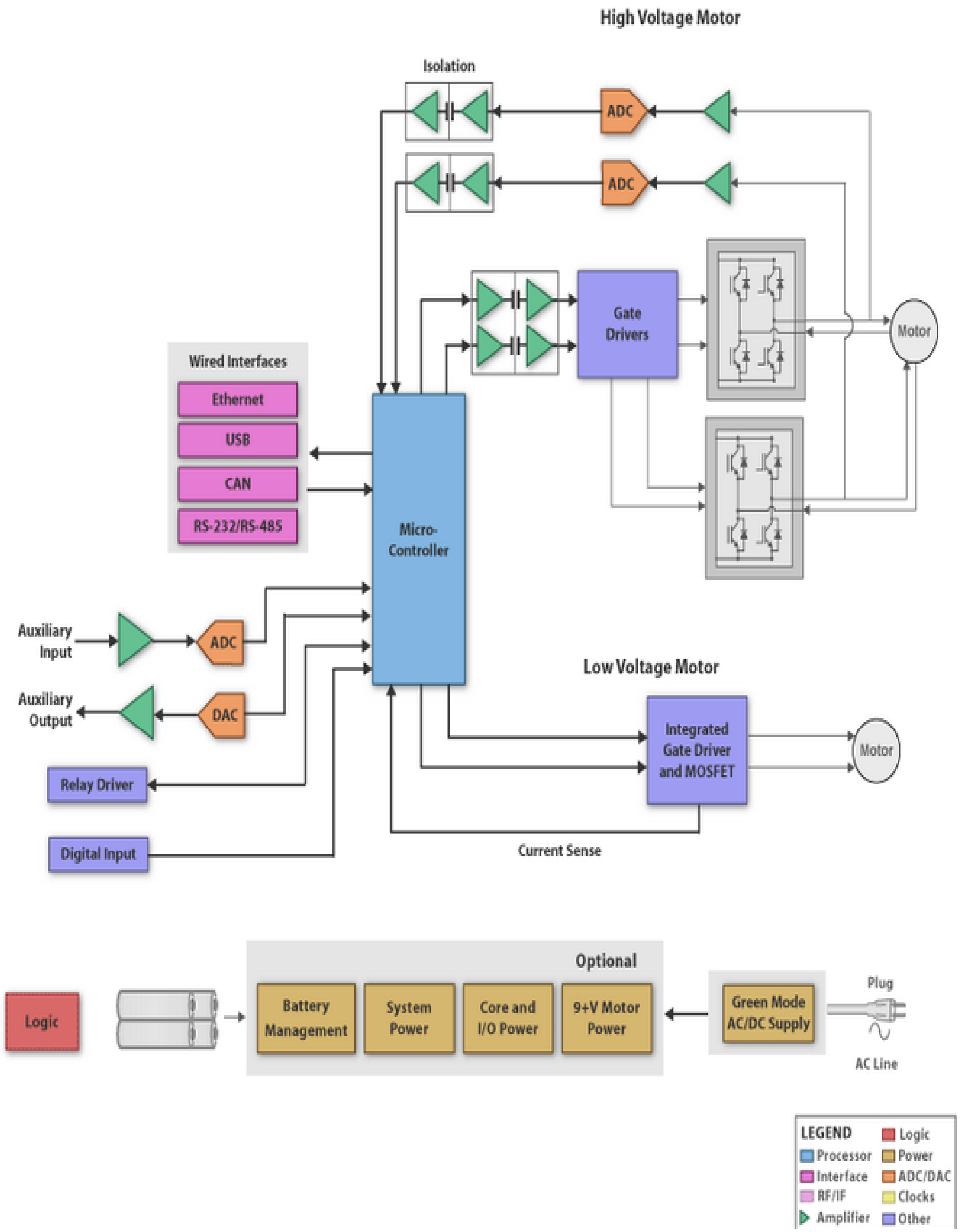
One of the major economic issues faced by the country is agriculture as this is the sector which is source of livelihood for about 54% of Indians till date. Still today this sector is not well developed and faces lots of problems resulting into low productivity of crops.

Indian agriculture includes a mix of traditional to modern farming techniques. In some parts of India, traditional use of cattle to plough farms remains in use. Traditional farms have some of the lowest per capita productivities and farmer incomes.

Since 2002, India has become the world's largest manufacturer of tractorswith 29% of world's output in 2013; it is also the world's largest tractor market. Above a tractor in use in north India.

The main advantage of the project is avoid the environmental pollution from an exhaust gas and utilizes the renewable source. And it’s easy to handle

1.1 BLOCKDIAGRAM



1.2 EXISTING MODEL

Since 1921 Tractor was invented but there is no invention on land ploughing.In existing systemis fully manual operation and also it having lot of difficulties. There are many types of ploughing we are using for example Tractors and Cows etc.

1.3PROPOSED SYSTEM

2 **REMOTE CONTROL:**

3 This mechanism can be operated automatically from the distance of 15 meter by a remote using Radio frequency control unit.

4 **COMPACT IN SIZE:**

In order to plow one hectare of land it costs rupees three thousand for tractor rent diesel and wages for the labors. This machine will cut down all such cause with only a very nominal amount for annual maintenance. The students are eager to manufacture the real time machine if the government could assist them financially.

4.3 CIRCUIT DIAGRAM

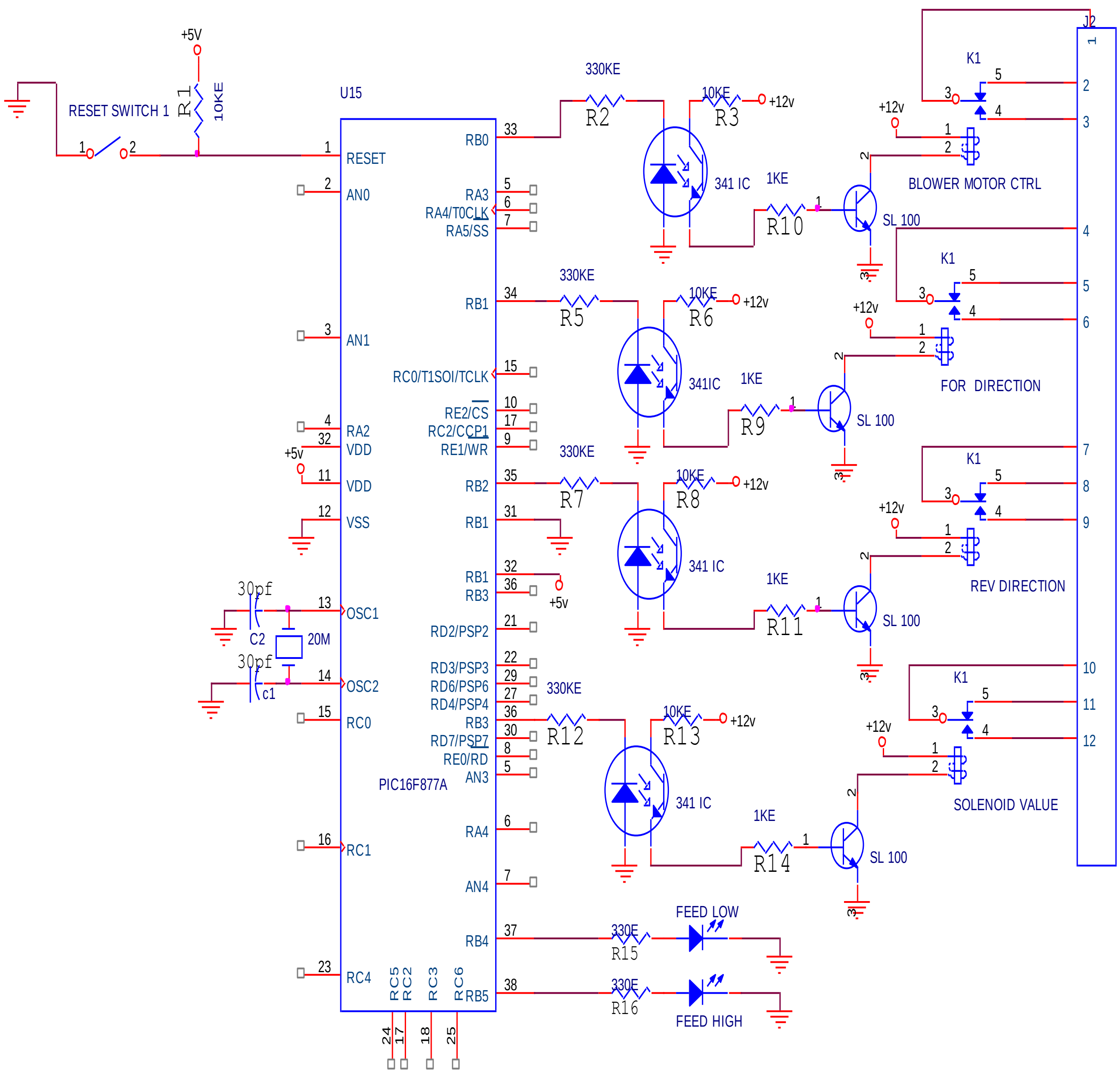


Fig 1.3 Circuit Diagram

CHAPTER 2

LITERATURE SURVEY

1. Ludwig Kronthaler,EURAC Research,Institute for Renewable Energy,Viale Druso 1,39100 Bolzano, Italy. This paper presents a screening methodology to evaluate the economic feasibility and environmental impact of Vehicle-integrated Photovoltaic (ViPV) Systems by means of various indicators.

2. Selver Senturk Turkish Agricultural Monitoring & Information Center Istanbul Technical University Maslak, Istanbul For structuring national irrigation policies and determining the exact yield production shares separately generated from irrigated and unirrigated farmland practices fast and simple to employ methods are of great importance. In this work, through utilizing entire satellite image frames, with no masking or cropping any parts out, a local, parcel-based Normalized Difference Vegetation Index (NDVI) and Normalized Difference Moisture Index (NDMI) means and variance techniques' mapping abilities were investigated.

CHAPTER 3

SOLAR PANEL

3.1 INTRODUCTION

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential application. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts.

Fig 3.1 Solar Panel

The efficiency of a module determines the area of a module given the same rated output an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

3.2 WORKING AND CONSTRUCTIONS

Solar modules use light energy photons from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin film cells based on cadmium telluride or silicon. The structural(load carrying)member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar

modules are rigid, but semi-flexible ones are available, based on thin-film cells. These early solar modules were first used in space in 1958.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wire that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals.

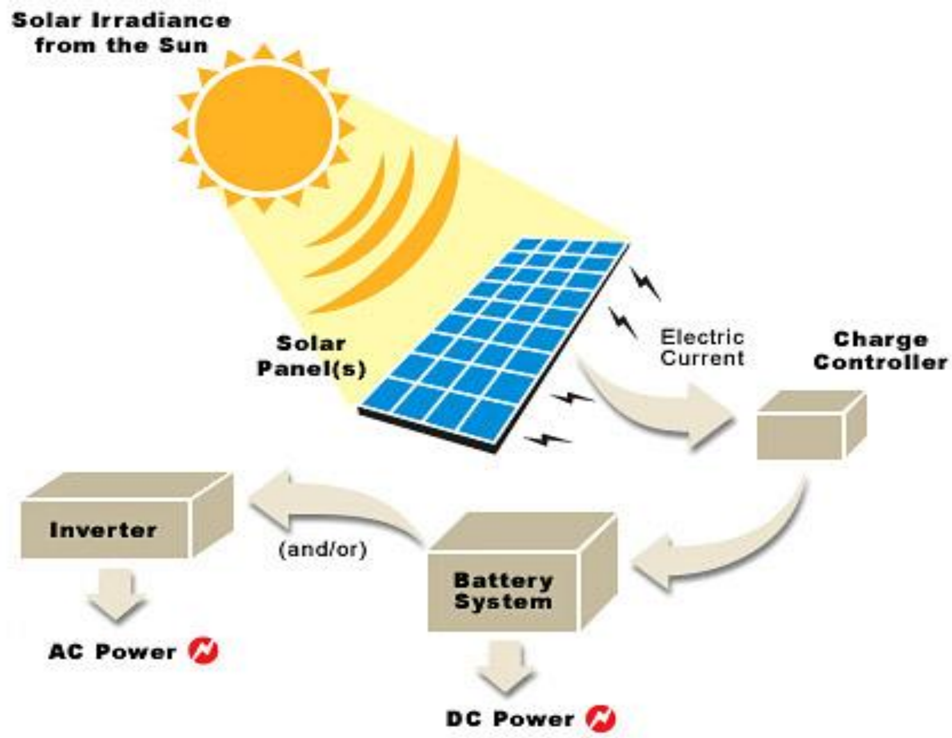


Fig 3.2 Solar Working

The cells must be connected electrically to one another and to the rest of the system .Externally popular terrestrial usage photovoltaic modules use MC3 (older) or MC4 connectors to facilitate easy weatherproof connections to the rest of the system.

Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.

Some recent solar module designs include concentrators in which light is focused by lenses or mirrors onto an array of smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost effective way.

3.3 SOLAR CELL

A solar cell made from a mono crystalline siliconwafer with its contact grid made from bus bars (the larger strips) and fingers (the smaller ones)Solar cells can be used in devices such as this portable mono crystalline solar charger. A solar cell(also called a photovoltaic cell)is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect.

It is a form of photoelectric cell (in that its electrical characteristics e.g. current, voltage, or resistance vary when light is incident upon it) which, when exposed to light, can generate and support an electric current without being attached to any external voltage source, but do require an external load for power consumption.

The term "photovoltaic" comes from the Greek meaning "light", and from "volt", the unit of electro-motive force, the volt, which in turn comes from the last name of the Italian physicist Alessandro Volta, inventor of the battery (electrochemical cell). The term "photo-voltaic" has been in use in English since 1849.

Photovoltaicis the field of technology and research related to the practical application of photovoltaic cells in producing electricity from light, though it is often used specifically to refer to the generation of electricity from sunlight. Cells can be described as photovoltaic even when the light source is not necessarily sunlight (lamplight, artificial light, etc.). In such cases the cell is sometimes used as a photo detector (for example infrared detectors), detecting light or other electromagnetic radiation near the visible range, or measuring light intensity.

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The operation of a photovoltaic (PV) cell requires 3 basic attributes:

1. The absorption of light, generating either electron-hole pairs or excitons.
2. The separation of charge carriers of opposite types.
3. The separate extraction of those carriers to an external circuit.

3.4 EQUIVALENT CIRCUIT OF A SOLAR CELL

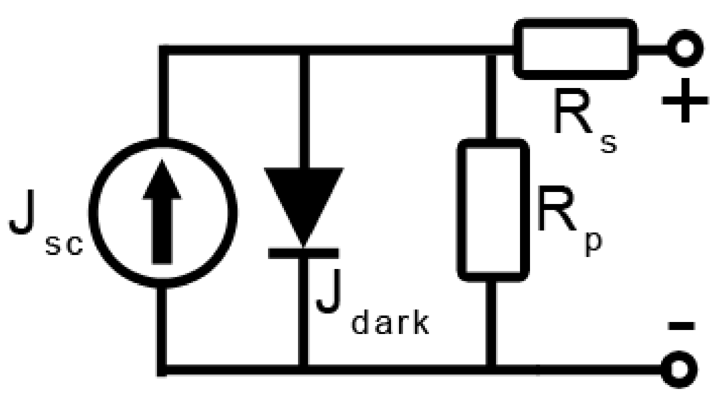

Fig 3.3 Equivalent Circuit

The solar cell can be seen as a current generator which generates the current (density) J_{sc}. The dark current flows in the opposite direction and is caused by a potential between the + and - terminals. In addition you would have two resistances; one in series (R_s) and one in parallel (R_p). The series resistance is caused by the fact that a solar cell is not a perfect conductor. The parallel resistance is caused by leakage of current from one terminal to the other due to poor insulation, for example on the edges of the cell. In an ideal solar cell, you would have $R_s = 0$ and $R_p = \infty$.

When these so called parasitic resistances are included, the current expression (1.3) becomes

$$J = J_{sc} - J_0(e^{q(V+JAR_s)/kT} - 1) - \frac{V + JAR_s}{R_p}$$

3.5 SOLAR REGULATOR

A solar regulator (also known as a charge controller) is used in conjunction with a stand alone (off grid) system, or a grid connect solar power system that incorporates a backup battery bank. For a grid connect solar power system that doesn't use batteries, a solar regulator is not needed.

A solar regulator is a small box consisting of solid state circuitry that is placed between a solar panel and a battery. Its function is to regulate the amount of charge coming from the panel that flows into the deep cycle battery bank in order to avoid the batteries being overcharged. A regulator can also provide a direct connection to appliances, while continuing to recharge the battery; i.e. you can run appliances directly from it, bypassing the battery bank; but the batteries will continue to be charged.

3.6 CHARGE CONTROLLER

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may prevent against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.

The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery recharger.

3.7 SOLAR PANEL POWER CHARACTERISTICS

The current and power output of photovoltaic solar panels are approximately proportional to the sun's intensity. At a given intensity, a solar panel's output current and operating voltage are determined by the characteristics of the load. If that load is a battery, the battery's internal resistance will dictate the module's operating voltage.

A solar panel, which is rated at 17 volts will put out less than its rated power when used in a battery system. That's because the working voltage will be between 12 and 15 volts. Because wattage (or power) is the product of volts multiplied by the amps, the module output will be reduced. For example, a 50-watt solar panel working at 13.0 volts will products 39.0 watts (13.0 volts x 3.0 amps = 39.0 watts). This is important to remember when sizing a PV system.

An I-V curve (see image on right) is simply all of a solar panel's possible operating points (voltage/current combinations) at a given cell temperature and light intensity. Increases in cell temperature increase a solar panel’s current slightly, but significantly decreases voltage and current.

Two important quantities to characterize a solar cell are

- Open circuit voltage (V_{oc}): The voltage between the terminals when no current is drawn (infinte load resistance)
- Short circuit current (I_{sc}): The current when the terminals are connected to eachother (zero load resistance)

The short circuit current increases with light intensity, as higher intensity means more photons, which in turn means more electrons. Since the short circuit current I_{sc} is roughly proportional to the area of the solar cell, the short circuit current density, $J_{sc} = I_{sc}/A$, is often used to compare solar cells.

When a load is connected to the solar cell, the current decreases and a voltage develops as charge builds up at the terminals. The resulting current can be viewed as a superposition of the short circuit current, caused by the absorbtion of photons, and a dark current, which is caused by the potential built up over the load and flows in the opposite direction. As a solar cell contains a PN-junction (LINK), just as a diode, it may be treated as a diode. For an ideal diode, the dark current density is given by

$$J_{dark}(V) = J_0(e^{qV/k_BT} - 1) \quad (1.1)$$

Here J_0 is a constant, q is the electron charge and V is the voltage between the terminals. The resulting current can be approximated as a superposition of the short circuit current and the dark current:

$$J = J_{sc} - J_0(e^{qV/k_BT} - 1) \quad (1.2)$$

To find an expression for the open circuit voltage, V_{oc}, we use (1.2) setting J = 0. This means that the two currents cancel out so that no current flows, which exactly is the case in an open circuit. The resulting expression is

$$V_{oc} = \frac{k_BT}{q} \ln\left(\frac{J_{sc}}{J_0} + 1\right) \quad (1.3)$$

3.8 EFFICIENCY

In general, the power delivered from a power source is P = IV, i.e. the product of voltage and current. If we instead use the current density J, we get the power density:

$$P_d = JV \quad (1.4)$$

The maximum power density occurs somewhere between V = 0 (short circuit) and V = V_{oc} (open circuit) at a voltage V_m. The corresponding current density is called J_m, and thus the maximum power density is $P_{d,m} = J_mV_m$.

The efficiency of a solar cell is defined as the power (density) output divided by the power (density) output. If the incoming light has a power density P_s, the efficiency will be

$$\eta = \frac{J_m V_m}{P_s} \quad (1.5)$$

The fill factor, FF, is another quantity which is used to characterize a solar cell. It is defined as

$$FF = \frac{J_m V_m}{J_{sc} V_{oc}} \quad (1.6)$$

gives a measure of how much of the open circuit voltage and short circuit current is "utilized" at maximum power. Using FF we can express the efficiency as

$$\eta = \frac{J_{sc} V_{oc} FF}{P_s} \quad (1.7)$$

The four quantities J_{sc}, V_{oc}, FF and η are frequently used to TThe characterize the performance of a solar cell. They are often measured under standard lighting conditions, which implies Air Mass 1.5 spectrum, light flux of $1000 W/m^2$ and temperature of 25°C.

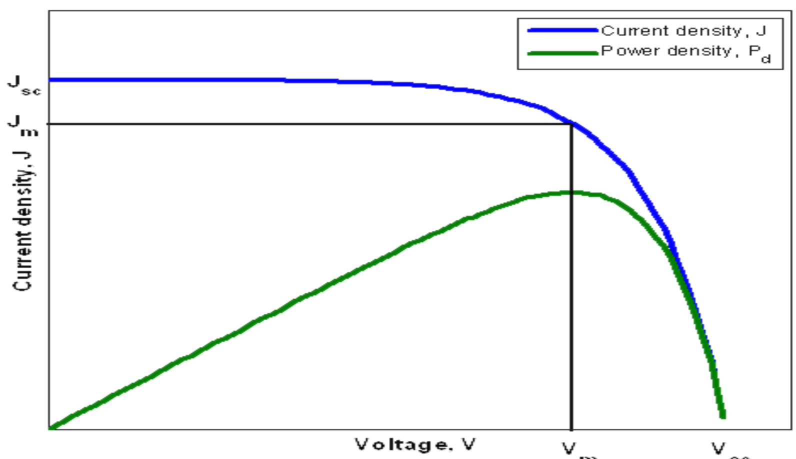

Fig 3.4 VOLTAGE VS CURRENT

CHAPTER 4

PIC MICRO CONTROLLER

4.1 INTRODUCTION

A Microcontroller is a programmable digital processor with necessary peripherals. Both microcontrollers and microprocessors are complex sequential digital circuits meant to carry out job according to the program / instructions. Sometimes analog input/output interface makes a part of microcontroller circuit of mixed mode(both analog and digital nature).

4.2 Microcontrollers Vs Microprocessors

A microprocessor requires an external memory for program/data storage. Instruction execution requires movement of data from the external memory to the microprocessor or vice versa. Usually, microprocessors have good computing power and they have higher clock speed to facilitate faster computation.

A microcontroller has required on-chip memory with associated peripherals. A microcontroller can be thought of a microprocessor with inbuilt peripherals.

A microcontroller does not require much additional interfacing ICs for operation and it functions as a stand alone system. The operation of a microcontroller is multipurpose, just like a Swiss knife.

Microcontrollers are also called embedded controllers. A microcontroller clock speed is limited only to a few tens of MHz. Microcontrollers are numerous and many of them are application specific.

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4.2.1 MICROCONTROLLER FEATURES

Real-Time Clock (RTC) Counts Seconds, Minutes, Hours, Date of the Month, Month, Day of the week, and Year with Leap-Year Compensation Valid Up to 2100

- 56-Byte, Battery-Backed, General-Purpose RAM with Unlimited Writes
- I2C Serial Interface
- Programmable Square-Wave Output Signal
- Automatic Power-Fail Detect and Switch Circuitry
- Consumes Less than 500nA in Battery-Backup Mode with Oscillator Running
- Optional Industrial Temperature Range:
- -40°C to +85°C
- Available in 8-Pin Plastic DIP or SO
- Underwriters Laboratories (UL) Recognized.

4.3 PIN DIAGRAM

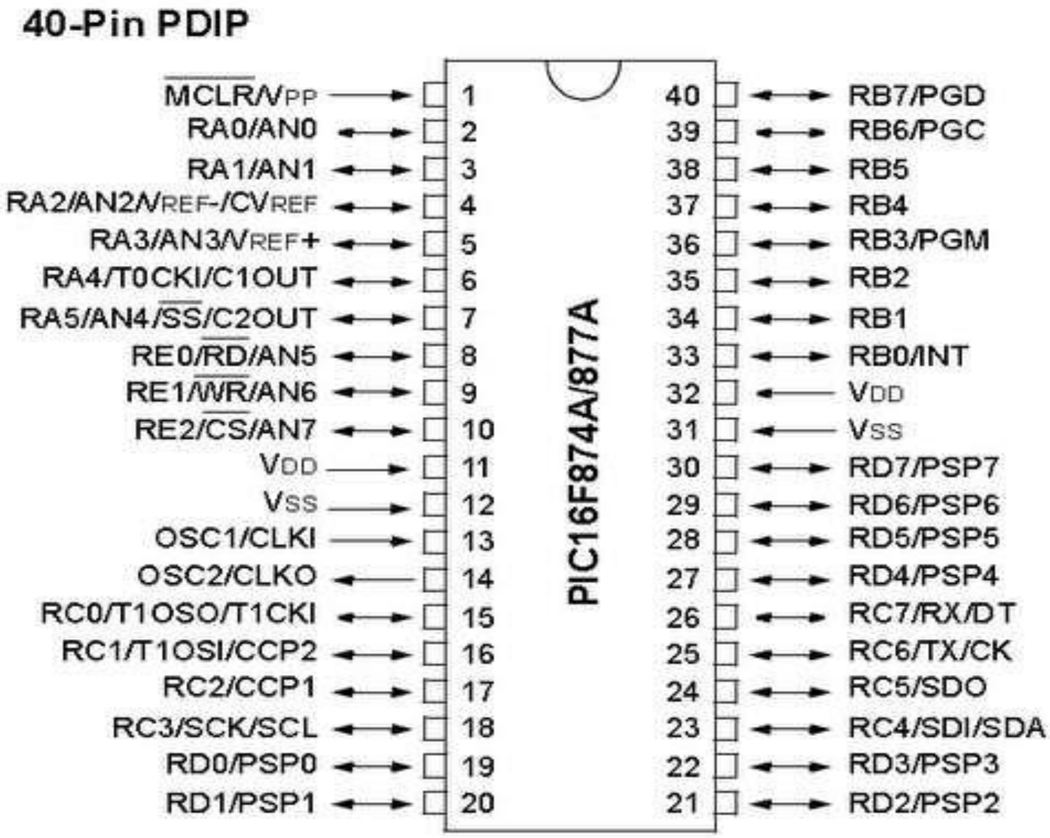


Figure 4.1 PIN DIAGRAM

4.3.1 PERIPHERAL FEATURES

- Timer0: 8-bit timer/counter with 8-bit prescaler
- Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two Capture, Compare, PWM modules
    - Capture is 16-bit, max. resolution is 12.5 ns
    - Compare is 16-bit, max. resolution is 200 ns
    - PWM max. resolution is 10-bit

• Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave)

• Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection

• Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only)

• Brown-out detection circuitry for Brown-out Reset (BOR)

4.3.2 ANALOG FEATURES

• 10-bit, up to 8-channel Analog-to-Digital Converter (A/D)

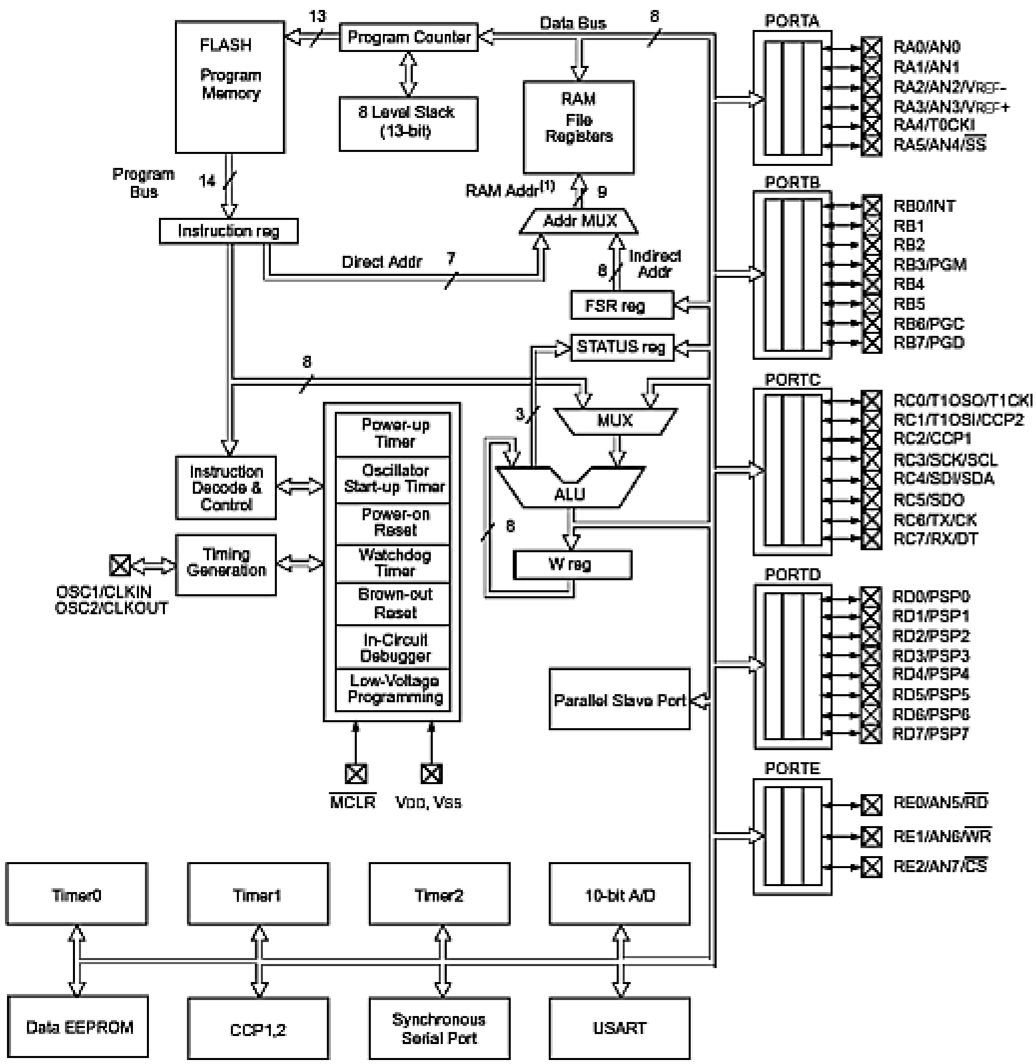
• Brown-out Reset (BOR)

• Analog Comparator module with:

- Two analog comparators
- Programmable on-chip voltage reference (VREF) module
- Programmable input multiplexing from device inputs and internal voltage reference
- Comparator outputs are externally accessible

4.4 ARCHITECTURE DIAGRAM OF 16F877A

Device	Program FLASH	Data Memory	Data EEPROM
PIC16F874	4K	192 Bytes	128 Bytes
PIC16F877	8K	368 Bytes	256 Bytes



Note 1: Higher order bits are from the STATUS register.

FIG 4.2 ARCHITECTURE DIAGRAM

4.5 MEMORY ORGANIZATION

The memory of a PIC 16F877 chip is divided into 3 sections. They are

- Program memory
- Data memory and
- Data EEPROM

4.5.1. PROGRAM MEMORY

Program memory contains the programs that are written by the user. The program counter (PC) executes these stored commands one by one. Usually PIC16F877 devices have a 13 bit wide program counter that is capable of addressing 8K×14 bit program memory space. This memory is primarily used for storing the programs that are written (burned) to be used by the PIC. These devices also have 8K*14 bits of flash memory that can be electrically erasable /reprogrammed. Each time we write a new program to the controller, we must delete the old one at that time. The figure below shows the program memory map and stack.

4.5.2 DATA MEMORY ORGANITATION

The data memory is partitioned into multiple banks which contain the General Purpose Registers and the Special Function Registers. Bits RP1 (Status<6>) and RP0 (Status<5>) are the bank select bits. Each bank extends up to 7Fh (128 bytes). The lower locations of each bank are reserved for the Special Function Registers. Above the Special Function Registers are General Purpose Registers, implemented as static RAM. All implemented banks contain Special Function Registers. Some frequently used Special Function Registers from one bank may be mirrored in another bank for code reduction and quicker access.

4.6 REGISTERS

The MSSP module has four registers for SPI mode operation. These are:

- MSSSP Control Register(SSPCON)
- MSSP Status Register(SSPSTAT) SerialReceive/Transmit Buffer Register(SSPBUF)
- Register (SSPSR) – Not directly accessible

SSPCON and SSPSTAT are the control and status registers in SPI mode operation. The SSPCON register is readable and writable. The lower six bits of the SSPSTAT are read-only. The upper two bits of the SSPSTAT are read/write.

4.6.1 SPECIAL FUNCTIONS REGISTER

The Special Function Registers are registers used by the CPU and peripheral modules for controlling the desired operation of the device. The Special Function Registers can be classified into two sets: core (CPU) and peripheral.

4.6.2 STATUS REGISTER

The Status register contains the arithmetic status of the ALU, the Reset status and the bank select bits for data memory.

4.6.3 PCON REGISTER

The Power Control (PCON) register contains flag bits to allow differentiation between a Power-on Reset (POR), a Brown-out Reset (BOR), a Watchdog Reset (WDT) and an external MCLR Reset.

4.6.4 PORTA AND TRISB REGISTER PORTA is a 6-bit wide, bidirectional port. The corresponding data direction register is TRISA. Setting a TRISA bit (= 1) will make the corresponding PORTA pin an input (i.e., put the corresponding output driver in a High-Impedance mode). Clearing a TRISA bit (= 0) will make the corresponding PORTA pin an output (i.e., put the contents of the output latch on the selected pin).

4.6.5 PORTB AND TRISB REGISTER

PORTB is an 8-bit wide, bidirectional port. The corresponding data direction register is TRISB. Setting a TRISB bit (= 1) will make the corresponding PORTB pin an input (i.e., put the corresponding output driver in a High-Impedance mode). Clearing a TRISB bit (= 0)
will make the corresponding PORTB pin an output.

4.6.6 PORTC AND TRISC REGISTER

PORTC is an 8-bit wide, bidirectional port. The corresponding data direction register is TRISC. Setting a TRISC bit (= 1) will make the corresponding PORTC pin an input (i.e., put the corresponding output driver in a High-Impedance mode). Clearing a TRISC bit (= 0)
will make the corresponding PORTC pin an output.

4.6.7 PORTD AND TRISD REGISTER

PORTD is an 8-bit port with Schmitt Trigger input buffers. Each pin is individually configurable as an input or output.

PORTD can be configured as an 8-bit wide microprocessor port (Parallel Slave Port) by setting control bit, PSPMODE (TRISE<4>). In this mode, the input buffers are TTL.

4.6.8 PORTE AND TRISE REGISTER

PORTE has three pins (RE0/RD/AN5, RE1/WR/AN6 and RE2/CS/AN7) which are individually configurable as inputs or outputs. These pins have Schmitt Trigger input buffers.

4.7REAL TIME CLOCK (DS 1307)

The DS1307 serial real-time clock (RTC) is a low-power, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially through an I2C, bidirectional bus. The clock operates in either the 24-hour or 12- hour format with AM/PM indicator.

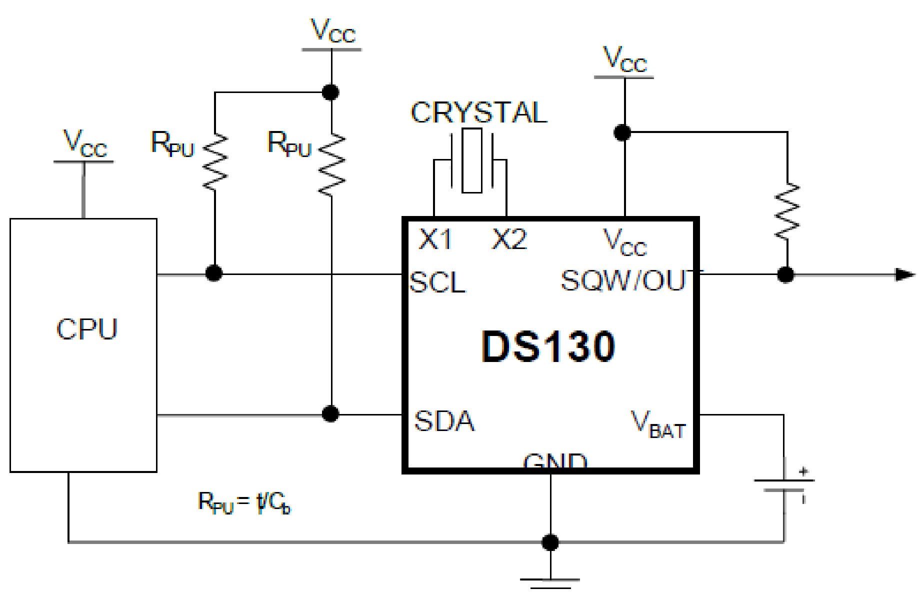


FIG 4.3 DS130 OPERATING CIRCUIT

4.8 ANALOG TO DIGITAL CONVERTER MODULE

The Analog-to-Digital (A/D) Converter module has five inputs for the 28-pin devices and eight for the 40/44-pin devices.

The conversion of an analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low-voltage reference input that is software selectable to some combination of VDD, VSS, RA2 or RA3.

The A/D converter has a unique feature of being able to operate while the device is in Sleep mode. To operate in Sleep, the A/D clock must be derived from the A/D's internal RC oscillator.

The A/D module has four registers. These registers are:

- A/D Result High Register (ADRESH)
- A/D Result Low Register (ADRESL)
- A/D Control Register 0 (ADCON0)
- A/D Control Register 1 (ADCON1)

The ADCON0 register, shown in Register 11-1, controls the operation of the A/D module.

The port pins can be configured as analog inputs (RA3 can also be the voltage reference) or as digital I/O.

4.9 SPECIAL FEATURES OF CPU

All PIC16F87XA devices have a host of features intended to maximize system reliability, minimize cost through elimination of external components, provide power saving operating modes and offer code protection. These are:

- Oscillator Selection
- Reset
    - Power-on Reset (POR)
    - Power-up Timer (PWRT)

- Oscillator Start-up Timer (OST)
- Brown-out Reset (BOR)

• Interrupts

• Watchdog Timer (WDT)

• Sleep

• Code Protection

• ID Locations

• In-Circuit Serial Programming

• Low-Voltage In-Circuit Serial Programming

4.10 INSTRUCTION SET

The PIC16 instruction set is highly orthogonal and is comprised of three basic categories:

•Byte-oriented operations

•Bit-oriented operations

•Literal and control operations

Each PIC16 instruction is a 14-bit word divided into an opcodewhich specifies the instruction type and one or more operands which further specify the operation of the instruction.

For byte-oriented instructions, ‘f’ represents a file register designator and ‘d’ represents a destination designator. The file register designator specifies which file register is to be used by the instruction.

The destination designator specifies where the result of the operation is to be placed. If ‘d’ is zero, the result is placed in the W register. If ‘d’ is one, the result is placed in the file register specified in the instruction.

For bit-oriented instructions, ‘b’ represents a bit field designator which selects the bit affected by the operation, while ‘f’ represents the address of the file in which the bit is located.

For literal and control operations, ‘k’ represents an eight or eleven-bit constant or literal value.

One instruction cycle consists of four oscillator periods; for an oscillator frequency of 4 MHz, this gives a normal instruction execution time of 1s.

All instructions are executed within a single instruction cycle, unless a conditional test is true, or the program counter is changed as a result of an instruction. When this occurs, the execution takes two instruction cycles with the second cycle executed as a NOP.

CHAPTER 5

MECHANICAL SYSTEM

5.1 DC MOTOR

5.1.1 D.C. MOTOR PRINCIPLE

A machine that converts d.c. power into mechanical power is known as a d.c. motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

5.1.2 WORKING OF D.C. MOTOR

When the terminals of the motor are connected to an external source of d.c. supply:

(i) The field magnets are excited developing alternate N and S poles

(ii) The armature conductors carry currents. All conductors under N-pole carry currents in one direction while all the conductors under S-pole carry currents in the opposite direction.

5.1.3 BACK OR COUNTER E.M.F

When the armature of a d.c. motor rotates under the influence of the driving torque, the armature conductors move through the magnetic field and hence e.m.f. is induced in them as in a generator The induced e.m.f. acts in opposite direction to the applied voltage V (Lenz's law) and in known as back or counter e.m.f. Eb. The back e.m.f. Eb(= P f ZN/60 A) is always less than the applied voltage V, although this difference is small when the motor is running under normal conditions.

5.2 TYPES OF D.C. MOTORS

Like generators, there are three types of d.c. motors characterized by the connections of field winding in relation to the armature viz.:

(i) Shunt-wound motor in which the field winding is connected in parallel with the armature. The current through the shunt field winding is not the same as the armature current. Shunt field windings are designed to produce the necessary m.m.f. by means of a relatively large number of turns of wire having high resistance. Therefore, shunt field current is relatively small compared with the armature current.

(ii) Series-wound motor in which the field winding is connected in series with the armature. Therefore, series field winding carries the armature current. Since the current passing through a series field winding is the same as the armature current, series field windings must be designed with much fewer turns than shunt field windings for the same m.m.f. Therefore, a series field winding has a relatively small number of turns of thick wire and, therefore, will possess a low resistance.

(iii) Compound-wound motor which has two field windings; one connected in parallel with the armature and the other in series with it. There are two types of compound motor connections (like generators). When the shunt field winding is directly connected across the armature terminals, it is called short-shunt connection. When the shunt winding is so connected that it shunts the series combination of armature and series field, it is called long-shunt connection.

5.2.1 SPEED REGULATION

The speed regulation of a motor is the change in speed from full-load to no-loud and is expressed as a percentage of the speed at full-load i.e.

$$\% \text{ Speed regulation } = \frac{\text{N.L. speed} - \text{F.L.speed}}{\text{F.L. speed}} \times 100$$

$$= \frac{N_0 - N}{N} \times 100$$

where N0 = No - load .speed

N = Full - load speed

5.2.2 EFFICIENCY OF A D.C. MOTOR

Like a d.c. generator, the efficiency of a d.c. motor is the ratio of output power to the input power i.e. Efficiency =output/input*100

5.2.3 D.C. MOTOR CHARACTERISTIC

There are three principal types of d.c. motors viz., shunt motors, series motors and compound motors. Both shunt and series types have only one field winding wound on the core of each pole of the motor. The compound type has two separate field windings wound on the core of each pole. The performance of a d.c. motor can be judged from its characteristic curves known as motor characteristics, following are the three important characteristics of a d.c. motor:

(i) Torque and Armature current characteristic (Ta/Ia)

It is the curve between armature torque Ta and armature current Ia of a d.c. motor. It is also known as electrical characteristic of the motor.

(ii) Speed and armature current characteristic (N/Ia)

It is the curve between speed N and armature current Ia of a d.c. motor. It is very important characteristic as it is often the deciding factor in the selection of the motor for a particular application.

(iii) Speed and torque characteristic (N/Ta)

It is the curve between speed N and armature torque Ta of a d.c. motor. It is also known as mechanical characteristic.

CHAPTER 6
WIRELESS COMMUNICATION

6.1. HARDWARE MODULE DESCRIPTION

6.2. GENERAL ENCODER AND DECODER OPERATION

The Holtek HT-12E IC encodes 12-bits of information and serially transmits this data on receipt of a Transmit Enable, or a LOW signal on pin-14 /TE. Pin-17 the D_OUT pin of the HT-12E serially transmits whatever data is available on pins 10,11,12 and 13, or D0,D1,D2 and D3. Data is transmitted at a frequency selected by the external oscillator resistor. See the encoder/decoder datasheets for details.

Note that if you use anything other than 5V on both encoder/decoder circuits (you will need to change these oscillator resistor values). Refer to the tables in the HT12D/HT-12E datasheet.

By using the switches attached to the data pins on the HT-12E, as shown in the schematic, we can select the information in binary format to send to the receiver. The receiver section consists of the Ming RE-99 and the HT-12D decoder IC. The DATA_IN pin-14 of the HT-12D reads the 12-bit binary information sent by the HT-12E and then places this data on its output pins. Pins 10,11,12 and 13 are the data out pins of the HT-12D, D0,D1,D2 and D3.

The HT-12D receives the 12-bit word and interprets the first 8-bits as address and the last 4-bits as data. Pins 1-8 of the HT-12E are the address pins. Using the address pins of the HT-12E, we can select different addresses for up to 256 receivers. The address is determined by setting pins 1-8 on the HT-12E to ground, or just leaving them open. The address selected on the HT-12E circuit must match the address selected on the HT-12D circuit (exactly), or the information will be ignored by the receiving circuit.

When the received addresses from the encoder matches the decoders, the Valid Transmission pin-17 of the HT-12D will go HIGH to indicate that a valid transmission has been received and the 4-bits of data are latched to the data output pins, 10-13. The transistor circuit shown in the schematic will use the VT, or valid transmission pin to light the LED. When the VT pin goes HIGH it turns on the 2N2222 transistor which in turn delivers power to the LED providing a visual indication of a valid transmission reception.

6.3. CONTROLING THE PROJECT WITH MICROCONTROLLER

Using these RF transmitter & receiver circuits with a Microcontroller would be simple. We can simply replace the switches used for selecting data on the HT-12E with the output pins of the microcontroller. Also we can use another output pin to select TE, or transmit enable on the HT-12E. By taking pin-14 LOW we cause the transmitter section to transmit the data on pins 10-13.

To receive information simply hook up the HT-12D output pins to the microcontroller. The VT, or valid transmission pin of the HT-12D could signal the microcontroller to grab the 4-bits of data from the data output pins. If you are using a microcontroller with interrupt capabilities, use the VT pin to cause a jump to an interrupt vector and process the received data.

The HT-12D data output pins will LATCH and remain in this state until another valid transmission is received.

NOTE: You will notice that in both schematics each of the Holtek chips have resistors attached to pins 15 and 16. These resistors must be the exact values shown in the schematic. These resistors set the internal oscillators of the HT-12E/HT-12D. It is recommended that you choose a 1% resistor for each of these resistors to ensure the correct circuit oscillation.

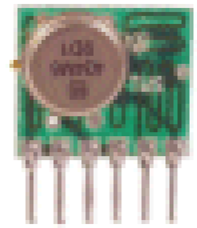
6.4. RANGE OF OPERATION

The normal operating range using (only) the LOOP TRACE ANTENNA on the transmitter board is about 50 feet. By connecting a quarter wave antenna using 9.36 inches of 22 gauge wire to both circuits, you can extend this range to several hundred feet. Your actual range may vary due to your finished circuit design and environmental conditions.

The transistors and diodes can be substituted with any common equivalent type. These will normally depend on the types and capacities of the particular loads you want to control and should be selected accordingly for your intended application.

6.5. RF MODULE (RADIO FREQUENCY)

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.



Receiver Module **Transmitter Module**

Figure - 6.5

Radio Frequency. The 10 kHz to 300 GHz frequency range that can be used for wireless communication

Radio Frequency. Also used generally to refer to the radio signal generated by the system transmitter, or to energy present from other sources that may be picked up by a wireless receiver.

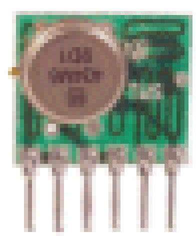
- Wireless mouse, keyboard
- Wireless data communication
- Alarm and security systems
- Home Automation, Remote control
- Automotive Telemetry
- Intelligent sports equipment
- Handheld terminals, Data loggers
- Industrial telemetry and tele-communications
- alarms In-building environmental monitoring and control
- High-end security and fire

6.5.1. TRANSMITTER

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter module is only 1

The size of a standard postage stamp, and can easily be placed inside a small plastic enclosure.

TWS-434: The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.



The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The TWS-434 is approximately 1/3 the size of a standard postage stamp.

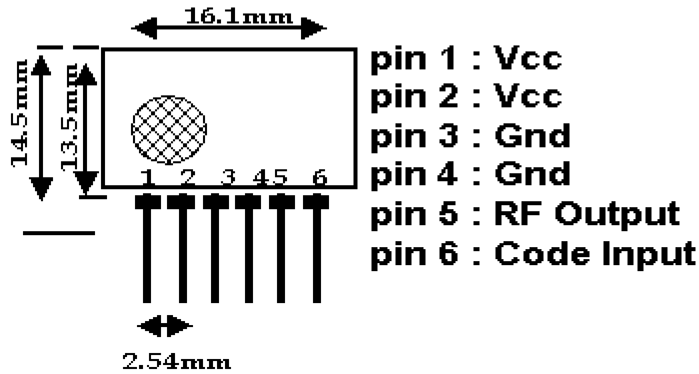


Figure – 6.2 **TWS-434 Pin Diagram**

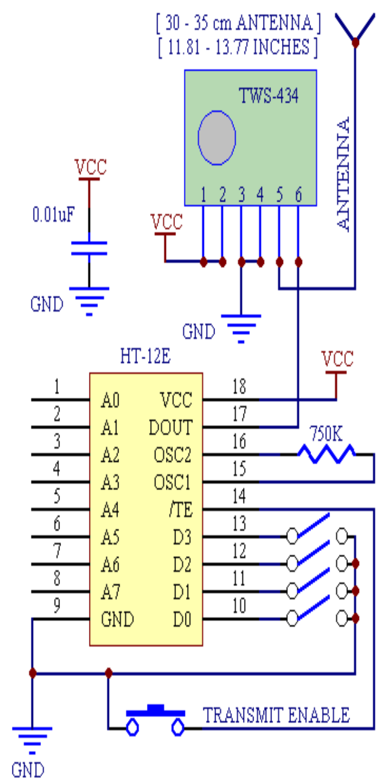


Figure 4 - **Transmitter Application Circuit**

6.5.2. RECEIVER

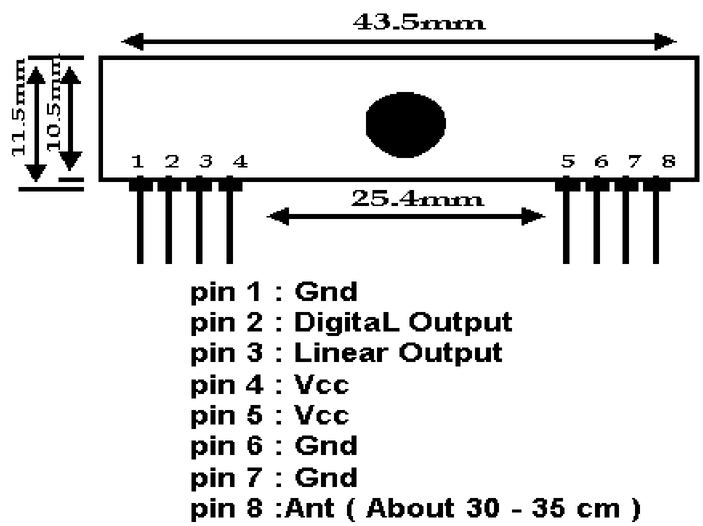


Figure 6.3- Pin Out Diagram

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

6.6.TRANSMIT AND RECEIVE DATA

6.6.1. GENERATING DATA

The TWS-434 modules do not incorporate internal encoding. If you want to send simple control or status signals such as button presses or switch colsures, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functions. These chips are made by Motorola and Holtek. They are an excellent way to implement basic wireless transmission control.

6.6.2. RECEIVER DATA OUTPUT

A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances when no carrier is present the output will remain low.

6.6.3. DECODINGDATA

The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch colsures, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available.

6.6.4. TRANSMITTING AND RECEIVING

Full duplex or simultaneous two-way operation is not possible with these modules. If a transmit and receive module are in close proximity and data is sent to a remote receive module while attempting to simultaneously receive data from a remote transmit module, the receiver will be overloaded by its close proximity transmitter. This will happen even if encoders and decoders are used with different address settings for each transmitter and receiver pair. If two way communications is required, only half duplex operation is allowed.

6.6.5. ANTENNAS- WIRE WHIP

The WC418 is made of 26 gauge carbon steel music wire that can be soldered to a PC board. This antenna has a plastic coated tip for safety and is 6.8 inches long, allowing .1 inch for insertion in a terminal or PC board.

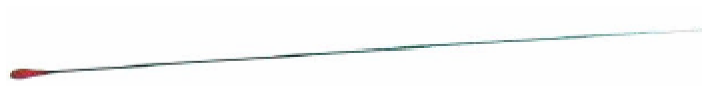


Figure 6.6.5- Antenna

6.7ANTENNA

The following should help in achieving optimum antenna performance:

- Proximity to objects such a users hand or body, or metal objects will cause an antenna to detune. For this reason the antenna shaft and tip should be positioned as far away from such objects as possible.

- Optimum performance will be obtained from a 1/4 or 1/2 wave straight whip mounted at a right angle to the ground plane. A 1/4 wave antenna for 418 Mhz is 6.7 inches long.
- In many antenna designs, particularly 1/4 wave whips, the ground plane acts as a counterpoise, forming in essence, a 1/2 wave dipole. Adequate ground plane area will give maximum performance. As a general rule the ground plane to be used as counterpoise should have a surface area => the overall

length of the 1/4 wave radiating element (2.6 X 2.6 inches for a 6.7 inch long antenna).

- Remove the antenna as far as possible from potential interference sources. Place adequate ground plane under all potential sources of noise.

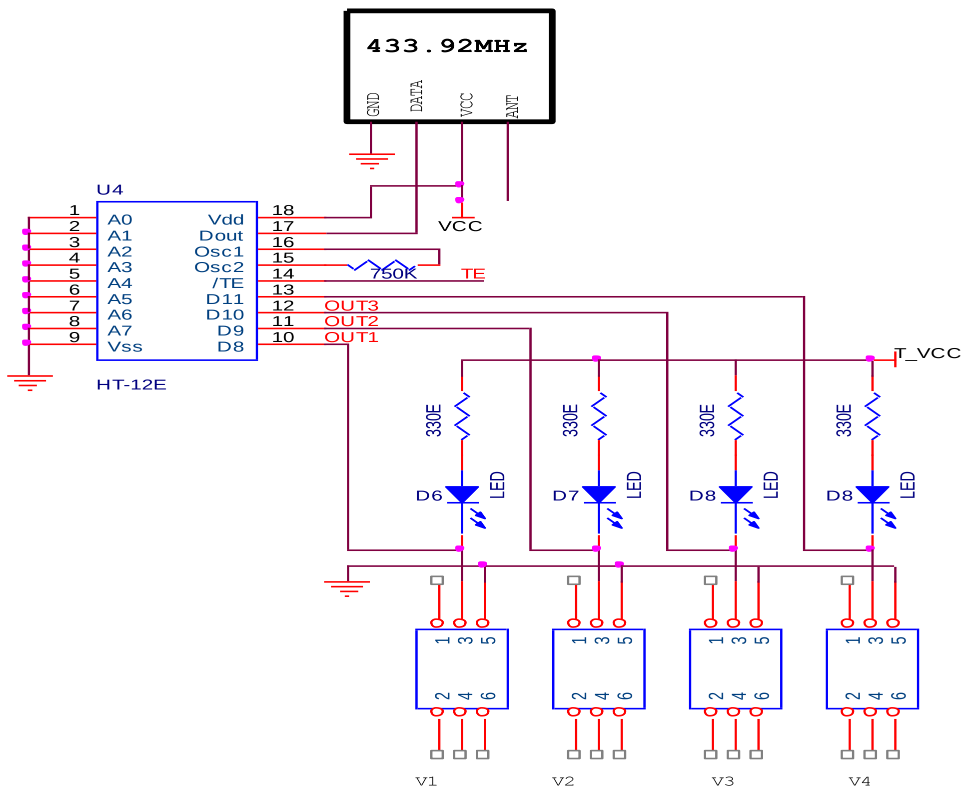


Fig.6.6 circuit diagram

CHAPTER-7

CONCLUSION

In order to reduce the cost of cultivation and to encourage farmers to use cost effective and smart mechanisms engineering students have worked hard to design this device effectively. This mechanism reduces human labor and it is a eco friendly (Zero emission) method of ploughing .

Operating this machine requires no technical knowledge or training and is very much user friendly. Sensor are fixed in the front wheel of the machine using which the machine deviates itself from stones and other obstacles in the ploughing field.

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Received check from our Chief Minister Puducherry