AUTOMATIC RAILWAY GATE CONTROLLER SYSTEM USING ARDUINO AND ANDROID

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering Degree in

Electrical and Electronics Engineering

by

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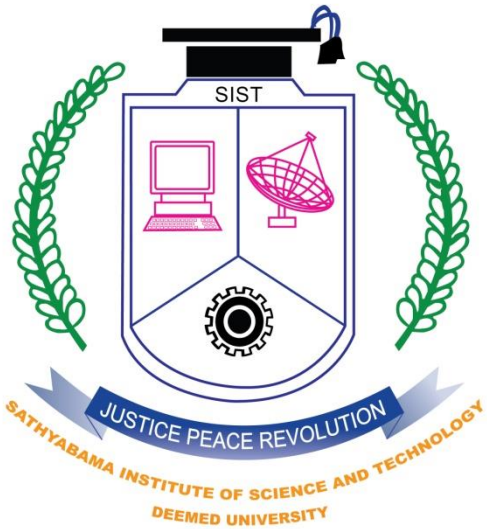

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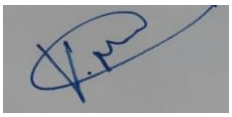
BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **NIKESH KUMAR**(Reg. No. 39140034) , **ASWIN RAJ**(Reg. No. 39140005) , **JEEVANATHAM(**Reg. No. 39140019) , **KARTHIK VISHVA**(Reg. No. 39140022) who carried out the project entitled **"AUTOMATIC RAILWAY GATE CONTROLLER SYSTEM USING ARDUINO AND ANDROID"** under our supervision from November 2021 to May 2022.



Dr. V.Meenakshi
Internal Guide

Dr. V. SIVACHIDAMBARANATHAN
Head of the Department

Submitted for Viva voce Examination held on_____

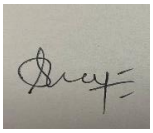
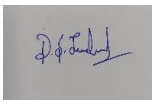
Name:

Signature:

Internal Examiner **External Examiner**

DECLARATION

We **NIKESH KUMAR**(Reg. No. 39140034) , **ASWIN RAJ**(Reg. No. 39140005) , **JEEVANATHAM(**Reg. No. 39140019) , **KARTHIK VISHVA**(Reg. No. 39140022) hereby declare that the Project Report entitled **"AUTOMATIC RAILWAY GATE CONTROLLER SYSTEM USING ARDUINO AND ANDROID"** done by us under the guidance of **Dr. V . MEENAKSHI** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering.

1. NIKESH KUMAR.S 
2. JEEVANATHAM.D.S 
3. ASWIN RAJ.R 
4. KARTHIK VISHVA 

DATE:
PLACE: **SIGNATURE OF THE CANDIDATES**

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. Nandhita., Dean, School of Electrical and Electronics Engineering** and **Dr. V. Sivachidambaranathan, Head of the Department, Dept. of Electrical and Electronics Engineering** for providing us necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide for **Dr. V. Meenakshi** his valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electrical and Electronics Engineering who were helpful in many ways for the completion of the project.

AUTOMATIC RAILWAY GATE CONTROL SYSTEM

ABSTRACT:

In the developing countries like India accidents at the railway crossing are increasing day by day. The main reason of these accidents is negligence of train drivers and gatekeepers. So this system is mostly designed to help railway. This system is also useful for various industries for safety purpose. After all security matters more. It includes opening and closing of gate by the use of Arduino Bluetooth app in our mobile. The project is designed to control over the railway level crossing gate using Android mobile phone by the gate keeper. Opening and closing of railway level crossing gate involves manpower, which could be often causes incorrect leading to accidents. This system prevents the need of any human involvement at the railway level crossing.

This system involves opening and closing of the level crossing gate by using an Android app. This Remote operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a Graphical User Interface based touch screen operation. A Bluetooth device is interfaced with the system. When the gate keeper sent command to close from the Android application device (when the train is approaching at the level crossing) to the Bluetooth device which while supply to the microcontroller, sends an output signal which activates a mechanism to switch on the motor to close the gate. To open the gate, another command needs to be sent for the microcontroller to open the gate using motor driver integrated circuit. Both manual and automatically are achieved in this project in case of manual if train arrives and gate open condition IR sensor will detect the train and automatically close the gate. Our system mostly concentrates on the security.

INTRODUCTION:

Indian railways have been in operation for 160 years and more. India is having the world's biggest railway network. The whole of nation is connected by railways. Over 100 of railway trains are running every day all over the country. Railways are one of the most consistent modes of transportation which has a very important role in day today life. Hence safety and reliability are very critical parameters of the Indian railways. However, railway related accidents are very dangerous compared with other accidents in terms of death rate, severity etc. We know that it is not possible for a running train to stop at an instant in some critical condition or when any condition arises. Train accidents are having a serious impact on loss of human life, damage to railway property, injury, and etc.

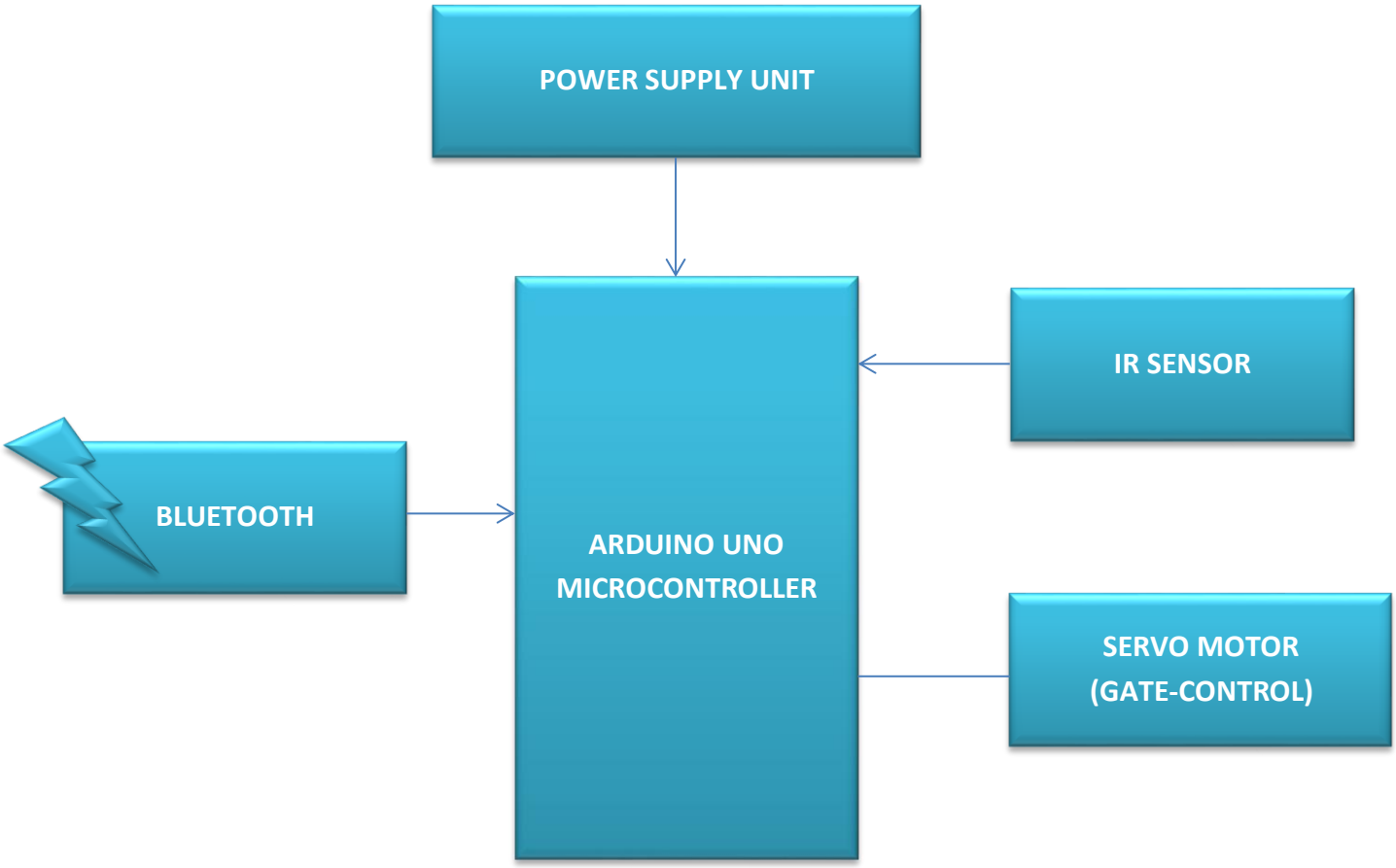
Considerable factors which lead to railway accidents are collision derailments, fire in trains, and Collision of trains at the level crossing. When vehicles or pedestrians are passing the level crossing there are chances for an accident to happen. The reasons for accidents are not easy to predict given all possibilities. If the train drivers solely depend on their ow on some kind of warning signals which are given by the detecting drivers, then they usually don't have much time to react to any such massacre happening. Also train drivers don't have enough time to take necessary measures or precautions, thereby accidents at the level crossing. So in order to avoid all

harsh things there arises a need for some independent system to overcome the problems faced at the level crossing. There are two types of level crossing namely manned and unmanned

The entire railway route includes nearly 14896 unmanned and 17839 manned level crossings. Railways being the cheapest and easy affordable modes of transportation for long travelling are mostly preferred all over the country over other means. When we take a glance over our daily newspaper we come to know across many types of accidents occurring at the railway level crossing. The reason is mostly because of lack of genuine workers, or may be due to carelessness nature in manual operations. Hence in order to make this accident undone at the railway crossing we are making use of simple electronic system and introducing android platform along with electronic components in order to control the operation performed at the railway gate crossing.

The project is designed to achieve control on the railway level crossing gate through Android Application by the gate keeper. Opening and closing of railway level crossing gate involves manpower, which could be often incorrect leading to the accidents. The proposed system preven any human involvement at the railway level crossing. This system consists opening and closing of the level crossing gate with help of an Android Application Device.

BLOCK DIAGRAM:



HARDWARE AND SOFTWARE REQUIREMENTS:

HARDWARE REQUIRED:

- ARDUINO – UNO MICRO CONTROLLER
- BLUETOOTH HC05
- IR SENSOR
- SERVO MOTOR
- POWER SUPPLY UNIT
- SOLDERING KIT
- CONNECTING WIRES

SOFTWARE USED:

- ARDUINO IDE
- EMBEDDED C

MODULES:

1. SENSOR INTERFACING
2. PREPARING POWER SUPPLY UNIT
3. MICRO-CONTROLLER PROGRAMMING
4. READING ANALOG DATA
5. TEST AND DEBUG
6. SUBMISSION

MODULE DESCRIPTION:

1. SENSOR INTERFACING

Sensor interfacing is a mix of amplification, filtering, and other signal conditioning as well as analog-to-digital conversion. The analog-to-digital converter (ADC) may be in your microcontroller, but you will still need to make the sensor compatible with the ADC input.

2. PREPARING POWER SUPPLY UNIT

A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a controller. A power supply is used to reduce the mains electricity at 240 volts AC down to something more useable, say 12 volts DC. There are two types of power supply, linear and switch mode. A linear power supply uses a transformer to reduce the voltage. The AC signal is rectified and regulated to produce a high DC voltage.

An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Adapters for battery-powered equipment may be described as chargers or rechargers (see also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from main power. The

internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply.

3. MICRO-CONTROLLER PROGRAMMING

A microcontroller is a programmable IC, capable of multiple functions depending on how it's programed. Many different kinds of microcontrollers exist that offer a wide range of functionality. The versatility of the microcontroller is what makes it one of the most powerful tools in modern design. This guide will explain the basics of microcontrollers and how they are programmed.

4. READING ANALOG DATA

The microcontroller of the board has a circuit inside called an analog-to-digital converter or ADC that reads this changing voltage and converts it to a number between 0 and 1023. When the shaft is turned all the way in one direction, there are 0 volts going to the pin, and the input value is 0. When the shaft is turned all the way in the opposite direction, there are 5 volts going to the pin and the input value is 1023. In between, analog Read() returns a number between 0 and 1023 that is proportional to the amount of voltage being applied to the pin.

5. TEST AND DEBUG

Testing means verifying correct behavior. Testing can be done at all stages of module development: requirements analysis, interface design, algorithm design, implementation, and integration with other modules. In the following, attention will be directed at implementation testing. Implementation testing is

not restricted to execution testing. An implementation can also be tested using correctness proofs, code tracing, and peer reviews, as described below.

Debugging is a cyclic activity involving execution testing and code correction. The testing that is done during debugging has a different aim than final module testing. Final module testing aims to demonstrate correctness, whereas testing during debugging is primarily aimed at locating errors. This difference has a significant effect on the choice of testing strategies.

6. SUBMISSION

Submitting the prototype for the presentation to the faculty guide for review purpose

LITERATURE REVIEW:

1 The author namely Krishnapriya K B1 , Sreelakshmi K U 2 , Vivek John(International Journal of Innovative Research in Science, Engineering and Technology (An International Organization for Standardization 3297: 2007 Certified Organization) Vol. 5, Issue 9, September 2016) describes the paper “Railway Level Crossing Gate Control & Measurement System for Railway Track Condition Monitoring”

At present people choose various modes of transportation such as by buses, flights, motor cycles, cycle, car, train etc. Out of this majority depend upon railway; people use this because they always seek for the service with more comfort with cheaper rates. As a demand for travel by trains increases, railway sector has followed a lot of safety standards in order to ensure life’s of travellers any problems in the same have the capacity to induce major damage to the economy factor. In spite of this safety measures followed by people, everyone could see a lot of accidents took happened in this sector; knowingly or unknowingly it may take away lives of many ones. The occurrences of these accidents are mainly because of defects of rails. Now railways are performing various fault detection by means of manual inspection by human beings, so it will be better if go for an advanced system where Railway track damage status is monitored transfer related information through wireless modules. Because majority of railway accident prime

reason is fault within the track such as occurrence of crack etc. As there need to ensure safety at all related aspects, unmanned railway crossing also need to be taken to account. This problem can be solved by introducing a fully automated system controlling railway level crossing gate more effectively.

2.2 The author namely Pranav Sharma, Rajesh Kumar, Sarika (Journal of Network Communi and Emerging Technologies (JNCET) Volume 5, Special Issue 2, December (2015)) describes “Automatic Railway Gate Control System Based on RFID, pressure sensor and servo motor”

The railway accidents at crossing level are increasing day by day due to unman railway crossings. This paper presents an automatic control gate system to prevent rail accidents. Pressure sensor, RFID card, Servo motor is used to control the open and close status of the railway crossing gate. In this paper we propose a model where pressure sensor is placed on the railway tracks, RFID tag on the engine and the open and close status of the gate is controlled with the help electric device called servo motor.

2.3. The author namely Rohini Jadhav, Harshal Patil, Prof. M. S. Wagh (International Research Journal of Engineering and Technology (IRJET) e 0056 Volume: 04 Issue: 04 | Apr p-ISSN: 2395-0072) describes “Automatic Railway Gate Control System Using RFID with High Alerting System”

The main objective of this paper is to prevent from the railway accidents happening at the level crossings. In India railway is the transportations and it is the low cost way for travelling. So there are more numbers of railway travellers. And it is not easy to stop railway anywhere to avoid accident or for any other reason. Due to that there are major drawbacks of that. At present manned system is available at level crossings. So, many accidents happens

at such crossings level, since there is nobody to take care of the functioning of the railway gate level when a train approaches the crossing. The objective of this paper is to manage the control system of railway gate by using the microcontroller. This model includes IR sensors, RFID, LCD, buzzer, light led, motor driver and microcontroller PIC16F877A. In the automatic railway gate control system, at the level crossing the arrival of the train is detected by the IR sensor and RFID placed near to the gate. In case of RFID it detects only arrival of train. Hence, the time for which it is closed is less compared to the manually operated gates and reduces the human labor. As the entire system is automated errors occurring due to manual operation are prevented because the accuracy of automated operation is more than the manned operation.

OBJECTIVE& SCOPE:

The main objective of this project is to create an automatic railway gate control system by using android which can be implemented easily in roads. Generally, there are manual gate control system which are maintained by person. As vehicles are increasing day by day it has become more difficult to control the gate manually. As a result, often many accidents occurs and many people become injured badly by accidents and sometimes it become very serious when people died and face many problems due to this type of accidents. This project can help us to reduce accidents in our country by applying automatic railway gate control system at crossing level.

PROBLEM DEFINITION:

The present system attempts to automate the opening and closing of gates at a railway level crossing using android application. In general, level crossing gates are operated manually by a gate keeper. The gate keeper receives the information about the train arrival from a near station. When the train starts to leave the railway station, the station in-charge or gate keeper this information to the closest gatekeeper to get ready for arriving of train. This human act be avoided by automating the process. Situations where the train is late due to some reasons or heavy rain, the gates remain closed for long durations causing dense traffic jam near the gates. This too can be prevented by automation.

HARDWARE DESCRIPTION:

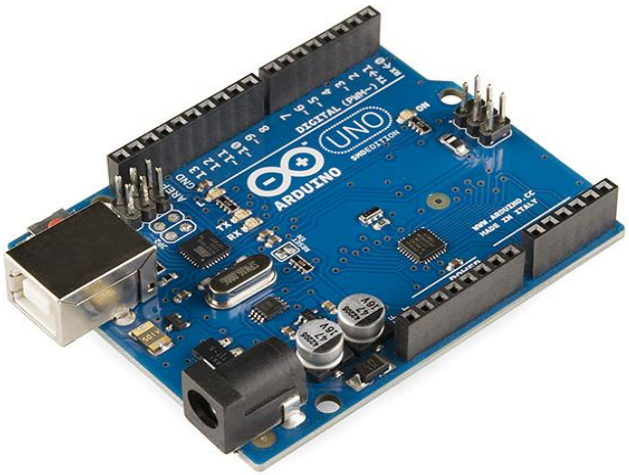
ARDUINO

DESCRIPTION

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures Single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

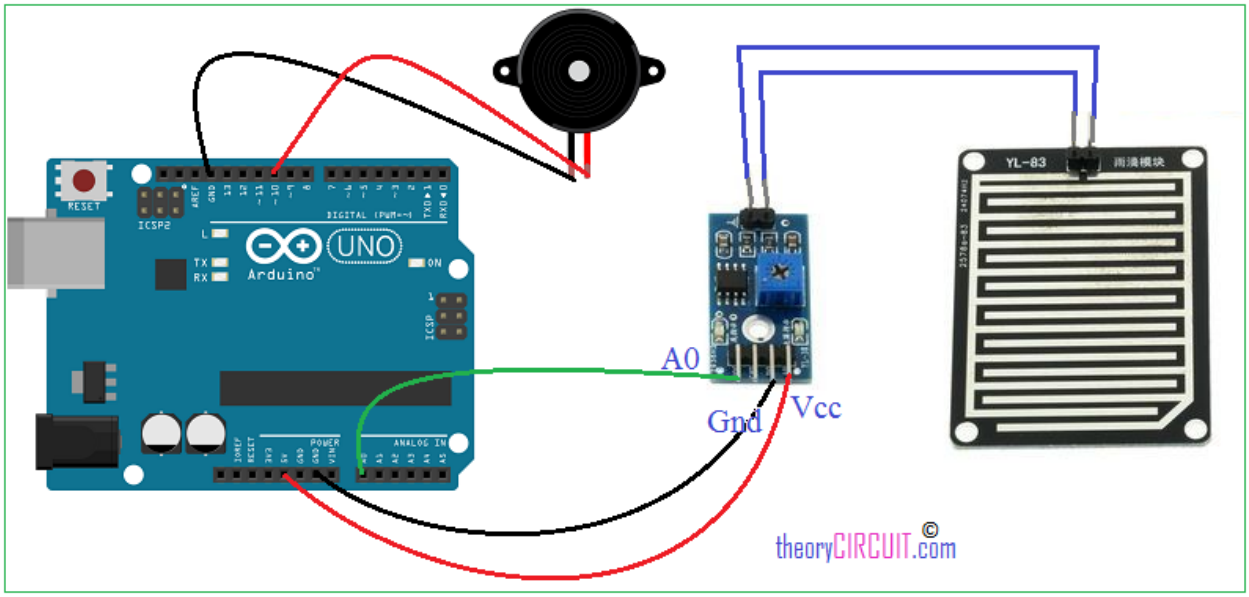
Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.



ARDUINO UNO

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.



ARDUINO UNO INTERFACE WITH SENSOR & BUZZER

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.

FEATURES

- Microcontroller: ATmega328P
- Operating voltage: 5V
- Input voltage: 7-12V
- Flash memory: 32KB
- SRAM: 2KB
- EEPROM: 1KB

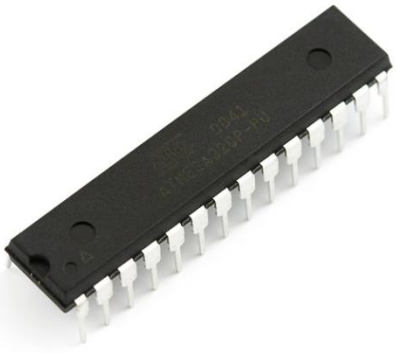
APPLICATIONS

- Real time biometrics
- Robotic applications
- Academic applications

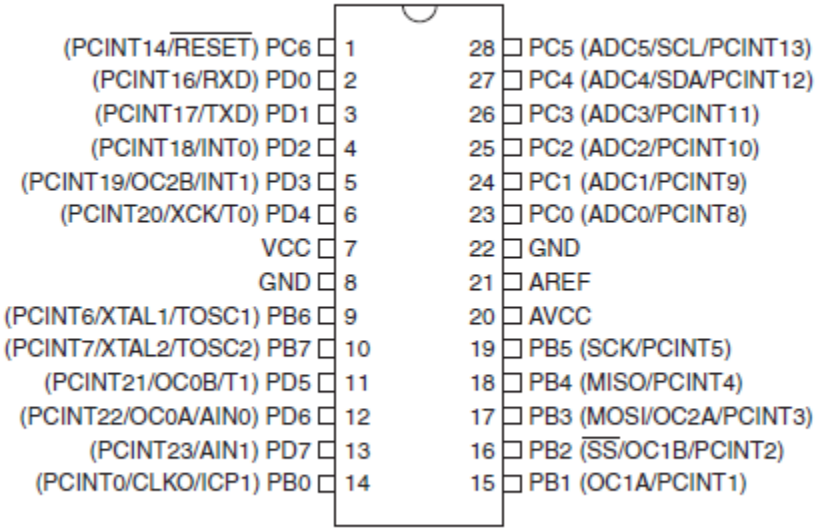
ATMEGA328 IC

DESCRIPTION

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.



ATmega328P IC

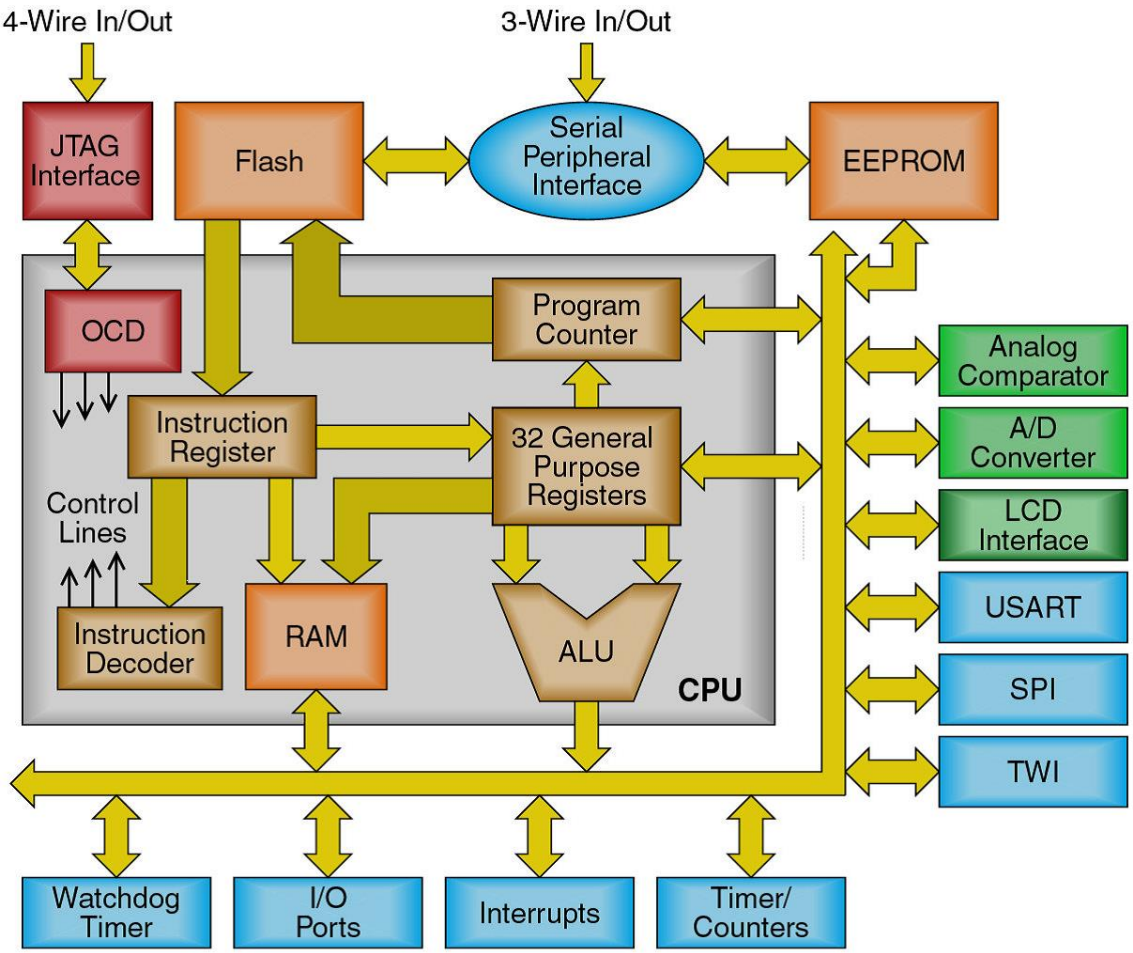


PIN DIAGRAM

- High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family
- Advanced RISC Architecture
    - 131 Powerful Instructions
    - Most Single Clock Cycle Execution
    - 32 x 8 General Purpose Working Registers
    - Fully Static Operation
    - Up to 20 MIPS Throughput at 20MHz
    - On-chip 2-cycle Multiplier

- High Endurance Non-volatile Memory Segments
    - 4/8/16/32KBytes of In-System Self-Programmable Flash program memory
    - 256/512/512/1KBytes EEPROM
    - 512/1K/1K/2KBytes Internal SRAM
    - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM C(1)◦C/100 years at 25◦–Data retention: 20 years at 85
    - Optional Boot Code Section with Independent Lock Bits In-System Programming by On-chip Boot Program
    - True Read-While-Write Operation
    - Programming Lock for Software Security Atmel® QTouch® library support
    - Capacitive touch buttons, sliders and wheels–QTouch and QMatrix® acquisition
    - Up to 64 sense channels
- Peripheral Features
    - Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
    - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
    - Real Time Counter with Separate Oscillator
    - Six PWM Channels

- 8-channel 10-bit ADC in TQFP and QFN/MLF package
- Temperature Measurement
- 6-channel 10-bit ADC in PDIP Package
- Temperature Measurement
- Programmable Serial USART– Master/Slave SPI Serial Interface
- Byte-oriented 2-wire Serial Interface (Philips I2 C compatible)
- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator
- Interrupt and Wake-up on Pin Change



ARCHITECTURE DIAGRAM

- Special Microcontroller Features
    - Power-on Reset and Programmable Brown-out Detection
    - Internal Calibrated Oscillator
    - External and Internal Interrupt Sources
    - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby

- I/O and Packages

    - 23 Programmable I/O Lines
    - 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF

- Operating Voltage: 1.8 - 5.5V
- Temperature Range: -40 C◦C to 85◦
- Speed Grade: 0 - 4MHz@1.8 - 5.5V, 0 - 10MHz@2.7 - 5.5.V, 0 - 20MHz @ 4.5 - 5.5V C◦
- Power Consumption at 1MHz, 1.8V, 25
    - Active Mode: 0.2Ma
    - Power-down Mode: 0.1µA
    - Power-save Mode: 0.75µA (Including 32kHz RTC)

PIN DISCRIPTION

VCC Digital supply voltage

GND Ground.

Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors

are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7..6 is used as TOSC2..1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC5:0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5 0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. The minimum pulse

length is given in Table 28-3 on page 308. Shorter pulses are not guaranteed to generate a Reset.

Port D (PD7:0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC

AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6..4 use digital supply voltage, VCC

AREF

AREF is the analog reference pin for the A/D Converter

ADC7:6 (TQFP and QFN/MLF Package Only)

In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

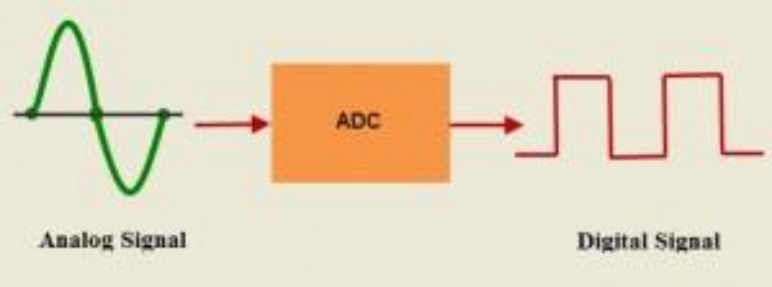
ANALOG PORTS

DESCRIPTION

In electronics, an analog-to-digital converter (ADC, A/D, A–D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as

an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current.

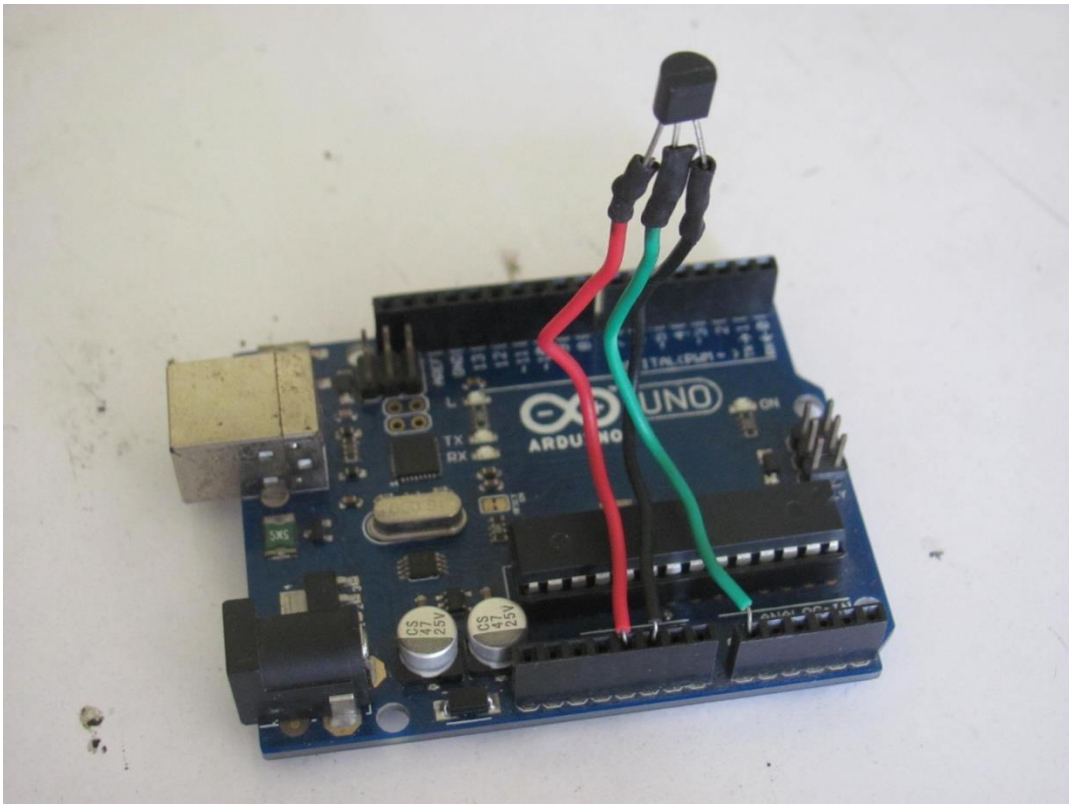
In an embedded system, A/D conversion is very important as embedded systems deal with digital values; their surroundings usually occupy various analog signals. Analog signals need to be altered into digital before being treated by the microcontroller. At present, we can observe how to read an external analog signal using PIC microcontroller and exhibit the digital o/p conversion on an LCD display. The i/p signal can be a varying voltage between 0 to 5v.



ADC Conversion

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

In the world of Arduino an Analog signal is simply a signal that can be HIGH (on), LOW (off) or anything in between these two states. This means an Analog signal has a voltage value that can be anything between 0V and 5V (unless you mess with the Analog Reference pin). Analog allows you to send output or receive input about devices that run at percentages as well as on and off. The Arduino does this by sampling the voltage signal sent to these pins and comparing it to a voltage reference signal (5V). Depending on the voltage of the Analog signal when compared to the Analog Reference signal the Arduino then assigns a numerical value to the signal somewhere between 0 (0%) and 1023 (100%). The digital system of the Arduino can then use this number in calculations and sketches.



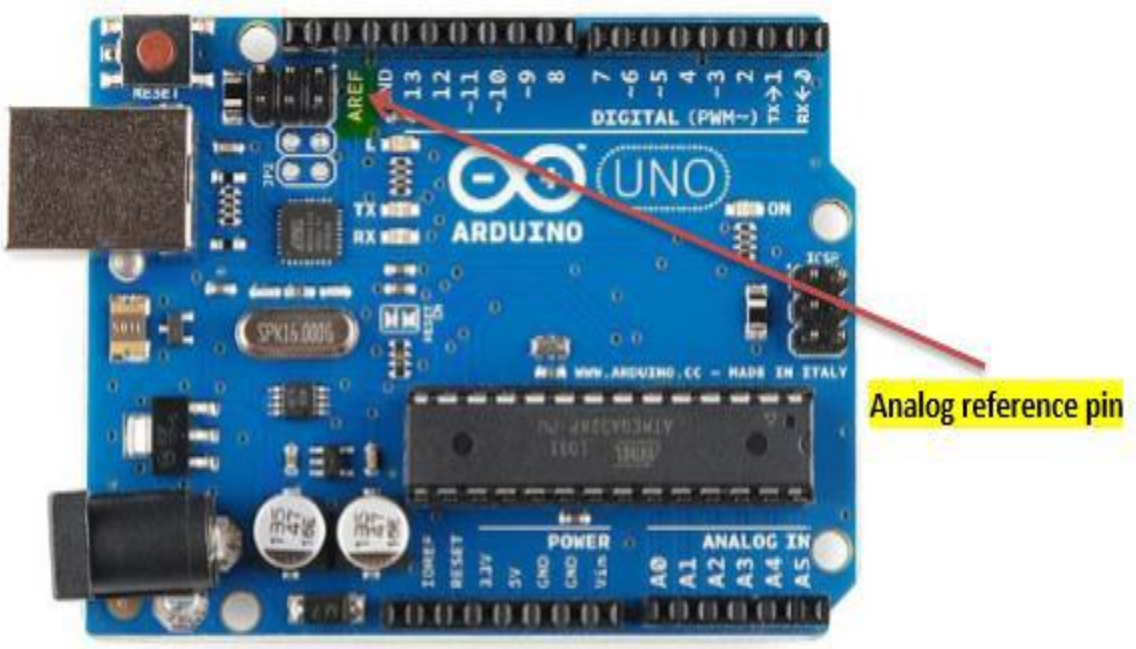
TEMPERATURE SENSOR INTERFACE WITH ARDUINO

To receive Analog Input the Arduino uses Analog pins # 0 - # 5. These pins are designed for use with components that output Analog information and can be used for Analog Input. There is no setup necessary, and to read them use the command: analogRead(pinNumber); where pinNumber is the Analog In pin to which the the Analog component is connected. The analogRead command will return a number including or between 0 and 1023.

AREF PIN

DESCRIPTION

AREF means **A**nalogue **REF**erence. It allows us to feed the Arduino a reference voltage from an external power supply. For example, if we want to measure voltages with a maximum range of 3.3V, we would feed a nice smooth 3.3V into the AREF pin – perhaps from a voltage regulator IC. Then the each step of the ADC would represent 3.22 millivolts.



ANALOG REFERENCE PIN IN ARDUINO

- DEFAULT: the default analog reference are 5V or 3.3V;
- INTERNAL: an built-in reference, equal to 1.1 volts on the ATmega168 or ATmega328 and 2.56 volts on the ATmega8 and Atmega32u4;
- INTERNAL1V1: built-in 1.1V reference;
- INTERNAL2V56: built-in 2.56V reference;
- EXTERNAL: use as reference the voltage applied to AREF pin in the range 0-5V only.

CRYSTAL OSCILLATOR

DESCRIPTION

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.

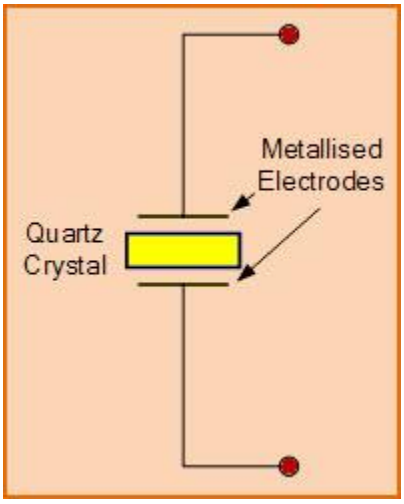
An electronic oscillator is an electronic circuit that produces a periodic, oscillating electronic signal, often a sine wave or a square wave. Oscillators convert direct current (DC) from a power supply to an alternating current (AC) signal. They are widely used in many electronic devices.

CRYSTAL OSCILLATOR

Inside a quartz clock or watch, the battery sends electricity to the quartz crystalthrough an electronic circuit. The quartz crystal oscillates (vibrates back and forth) at a precise frequency: exactly 32768 times each second.

An oscillator is a device that can give you a clock at a certain frequency given a constant voltage. One part of the oscillator is a crystal that is basically a

very good filter. Most microcontrollers only require a crystal because they contain all other parts of an oscillator already.



CIRCUIT DIAGRAM

In general, we know that, crystal oscillators are used in the microprocessors and microcontrollers for providing the clock signals. Let us consider 8051 microcontroller for which an external crystal oscillator circuit of 12MHz is essential, even though (based on model) 8051 microcontroller is capable to run at 40 MHz (max). 8051 requires 12 clock cycles for one machine cycle, such that to give effective cycle rate at 1MHz (considering 12MHz clock) to 3.33MHz (considering maximum 40MHz clock). This crystal oscillator is used to generate clock pulses required for the synchronization of all the internal operations.

Application of Crystal Oscillator in Military and Aerospace

The use of crystal oscillator in military and aerospace, is to establish an efficient communication system, for the navigation purpose, electronic warfare, in the guidance systems, and so on.

Use of Crystal Oscillator in Research and Measurement

The crystal oscillator is used in research and measurement for celestrial navigation, space tracking purpose, in the measuring instruments and medical devices, and so on.

Industrial Applications of Crystal Oscillator

There are a huge number of industrial applications of crystal oscillator such as in computers, digital systems, instrumentation, phase locked loop systems, marine, modems, sensors, telecommunications, disk drives, and so on.

Use of Crystal Oscillator in Automotive

Crystal oscillator is used for engine controlling, stereo, clock and to trip computer, and in GPS system.

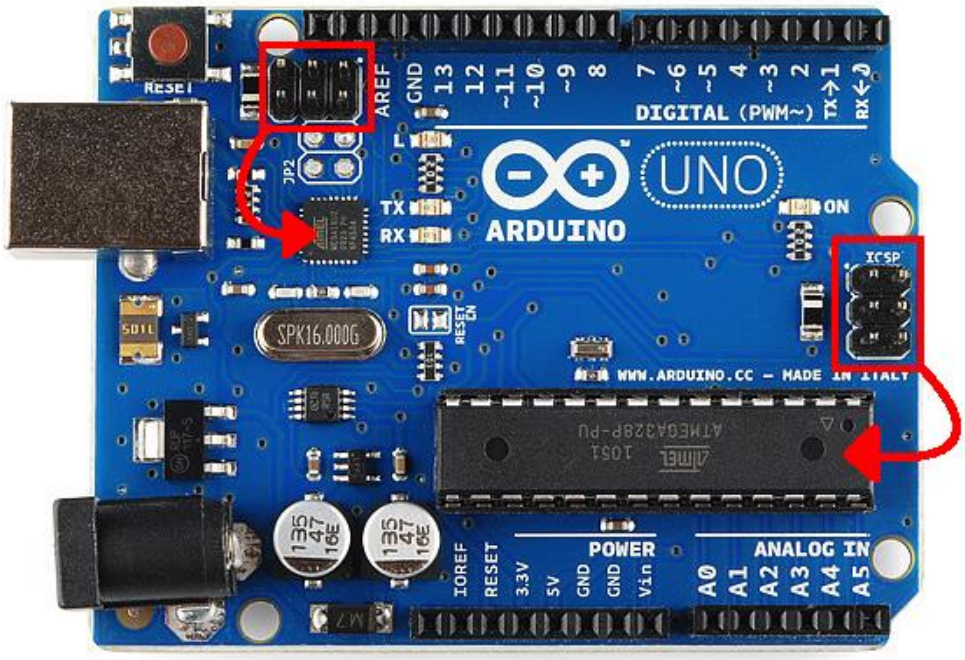
Consumer Applications of Crystal Oscillator

Crystal oscillators are used in many consumer goods such as cable television systems, personal computers, video cameras, toys and video games, radio systems, cellular phones, and so on.

ICSP PORTS

DESCRIPTION

In-system programming (ISP), also called In-Circuit Serial Programming (ICSP), is the ability of some programmable logic devices, microcontrollers, and other embedded devices to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system



ARDUINO ICSP PIN'S

The primary advantage of this feature is that it allows manufacturers of electronic devices to integrate programming and testing into a single production phase, and save money, rather than requiring a separate programming stage prior to assembling the system. This may allow manufacturers to program the chips in their own system's production line instead of buying preprogrammed chips from a manufacturer or distributor, making it feasible to apply code or design changes in the middle of a production run.

Microcontrollers are typically soldered directly to a printed circuit board and usually do not have the circuitry or space for a large external programming cable to another computer.

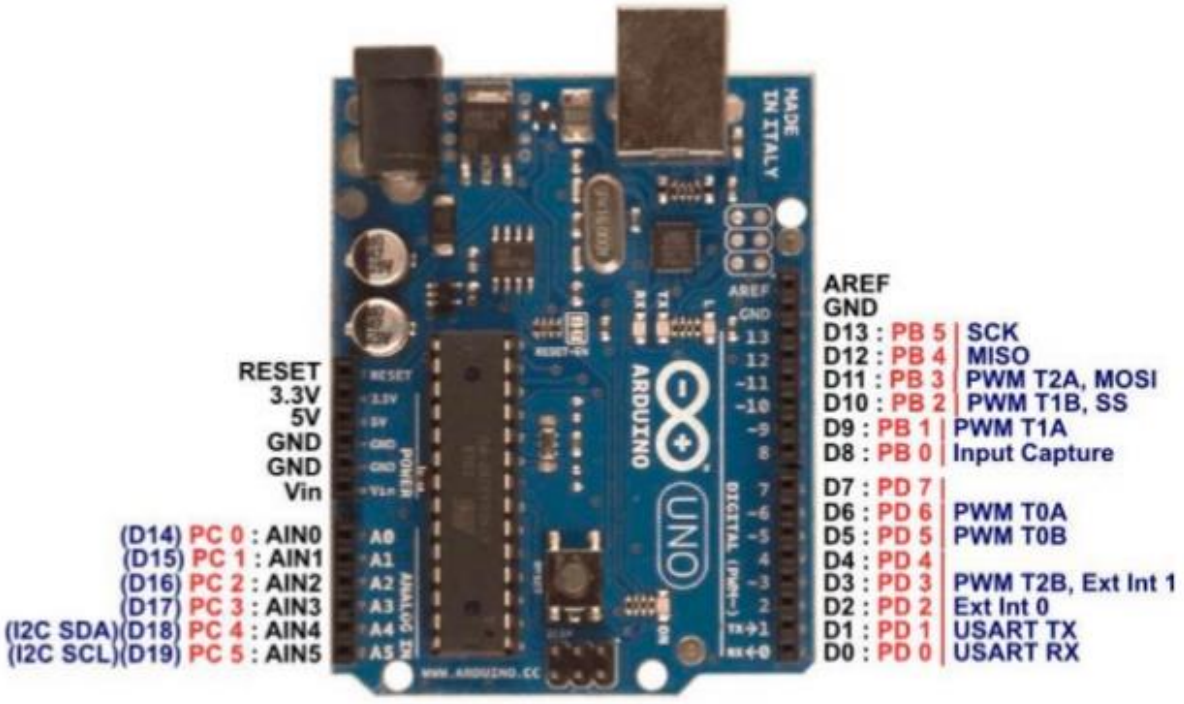
Typically, chips supporting ISP have internal circuitry to generate any necessary programming voltage from the system's normal supply voltage, and communicate with the programmer via a serial protocol. Most programmable logic devices use a variant of the JTAG protocol for ISP, in order to facilitate easier integration with automated testing procedures. Other devices usually use proprietary protocols or protocols defined by older standards. In systems complex enough to require moderately large glue logic, designers may implement a JTAG-controlled programming subsystem for non-JTAG devices such as flash memory and microcontrollers, allowing the entire programming and test procedure to be accomplished under the control of a single protocol.

I/O PORTS

DESCRIPTION

Input/output port. Alternatively referred to as I/O address, I/O ports, and I/O portaddress, the input/output port is what allows the software drivers to communicate with hardware devices on your computer. In your computer there are 65,535 portsthat are numbered from 0000h to FFFFh

General-purpose input/output (GPIO) is a generic pin on an integrated circuit or computer board whose behavior including whether it is an input or output pin is controllable by the user at run time.



ANALOG PIN DETAILS

GPIO pins have no predefined purpose, and go unused by default.[1][2] The idea is that sometimes a system integrator who is building a full system might need a handful of additional digital control lines and having these available from a chip avoids having to arrange additional circuitry to provide them. For example, the Realtek ALC260 chips (audio codec) have 8 GPIO pins, which go unused by default. Some system integrators (Acer Inc. laptops) use the first GPIO (GPIO0) on the ALC260 to turn on the amplifier for the laptop's internal speakers and external headphone jack.

GPIO capabilities may include

- GPIO pins can be configured to be input or output
- GPIO pins can be enabled/disabled
- Input values are readable (typically high or low)
- Output values are writable/readable
- Input values can often be used as IRQs (typically for wakeup events)

GPIO peripherals vary widely. In some cases, they are simple a group of pins that can switch as a group to either input or output. In others, each pin can be set up to accept or source different logic voltages, with configurable drive strengths and pull ups/downs. Input and output voltages are typically though not always limited to the supply voltage of the device with the GPIOs, and may be damaged by greater voltages.

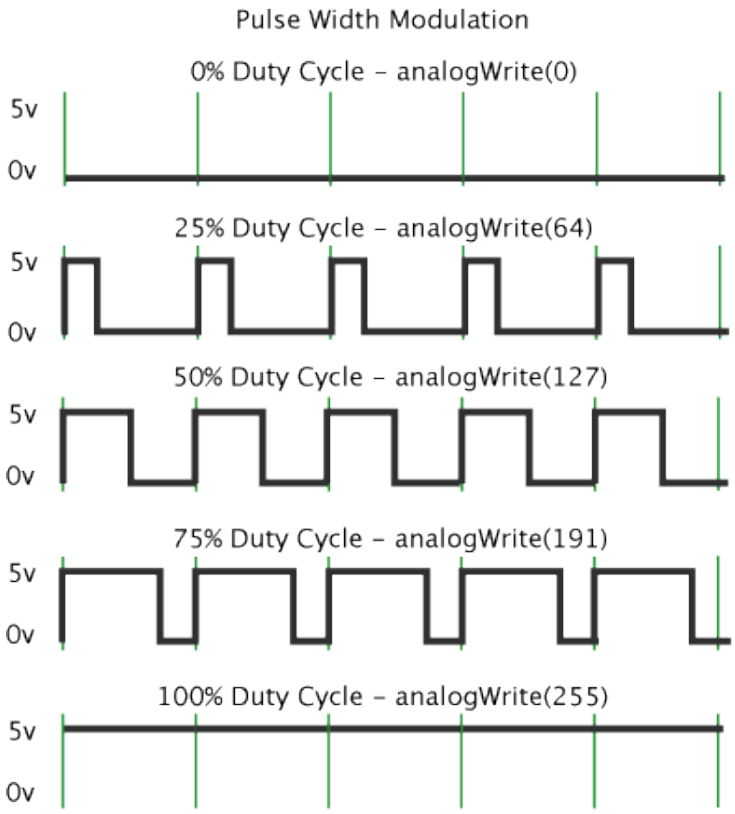
A GPIO pin's state may be exposed to the software developer through one of a number of different interfaces, such as a memory mapped peripheral, or through dedicated IO port instructions. Some GPIOs have 5 V tolerant inputs: even when the device has a low supply voltage (such as 2 V), the device can accept 5 V without damage.

PWM PIN’S

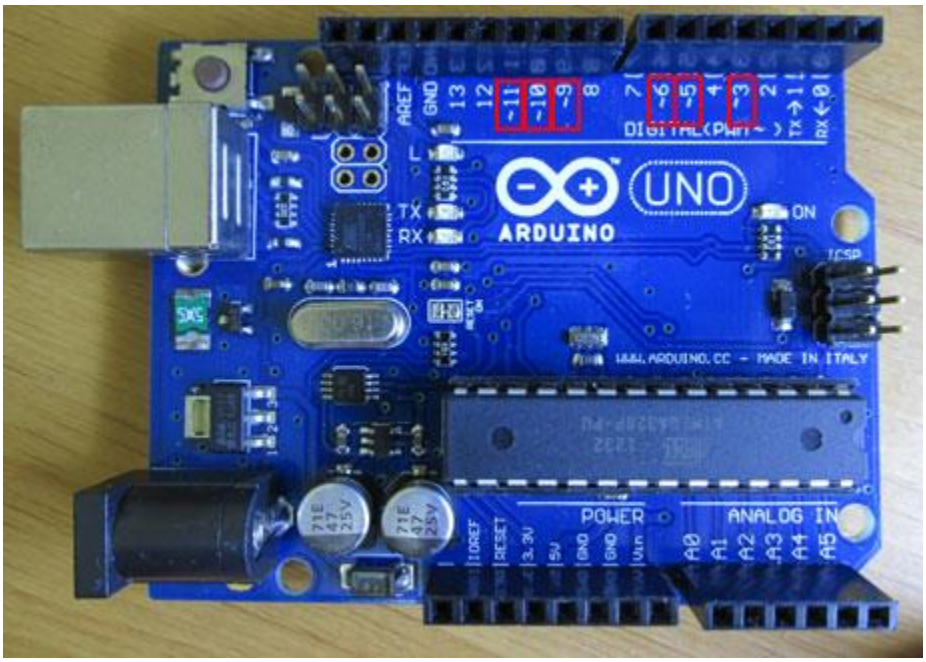
DESCRIPTION

PWM stands for Pulse Width Modulation, which in itself is not very useful if you don't know what modulation is. In the electronics world, modulation is the technique of superimposing information on a high speed signal or carrier.

verage wattage. a number of APV's use pulse width to regulate power down below the battery's supplied voltage, since most lipo packs and all 18650 style batteries output 3.7 volts at a nominal charge level. ... DC-DC is a flat signal.



Pulse width modulation (PWM) is a fancy term for describing a type of digital signal. Pulse width modulation is used in a variety of applications including sophisticated control circuitry. A common way we use them here at SparkFun is to control dimming of RGB LEDs or to control the direction of a servo motor.



PWM PIN'S ARDUINO

Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To get varying analog values, you change, or modulate, that pulse width. If you repeat this on-off pattern fast enough with an LED for example, the result is as if the signal is a steady voltage between 0 and 5v controlling the brightness of the LED.

In the graphic below, the green lines represent a regular time period. This duration or period is the inverse of the PWM frequency. In other words, with Arduino's PWM frequency at about 500Hz, the green lines would measure 2 milliseconds each. A call to analogWrite() is on a scale of 0 - 255, such that

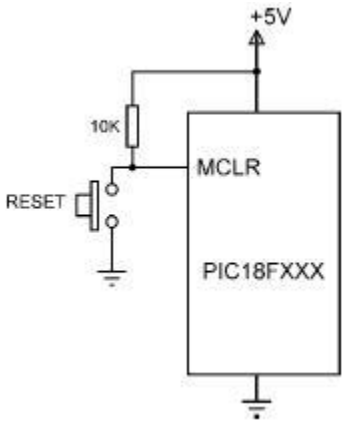
analogWrite(255) requests a 100% duty cycle (always on), and analogWrite(127) is a 50% duty cycle (on half the time) for example.

RESET BUTTON

DESCRIPTION

The first circuit pulls the RESET pin low to enable the chip. The second circuit is the same, but with a reset button. If you press that, the chip will get reset. When the 5V power is switched on, the capacitor shorts to 5V, and then gradually the RC circuit discharges to bring the reset pin to 0.

A power-on reset (PoR) generator is a microcontroller or microprocessor peripheral that generates a reset signal when power is applied to the device. It ensures that the device starts operating in a known state.



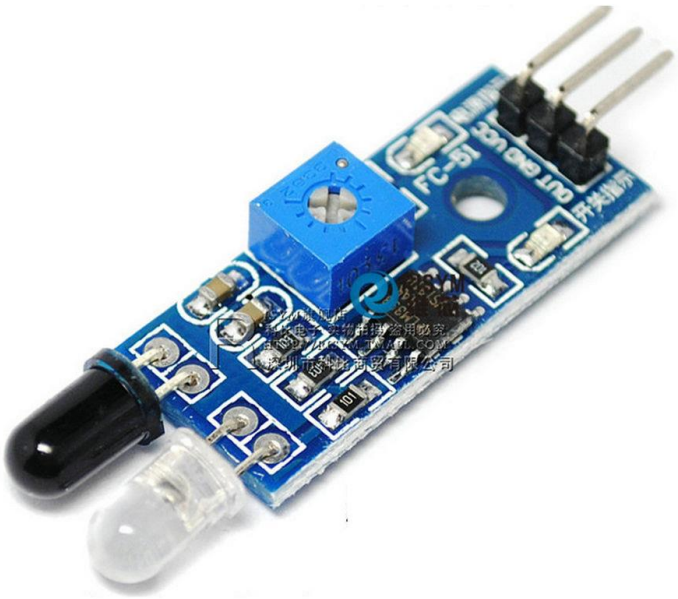
CIRCUIT DIAGRAM FOR RESET BUTTON CONNECT WITH CONTROLLER

A power-on reset (PoR) is a circuit that provides a predictable, regulated voltage to a microprocessor or microcontroller with the initial application of power. A PoR system can be a peripheral, but in sophisticated processors or controllers the PoR is integrated on the main chip.

IR SENSOR

DESCRIPTION

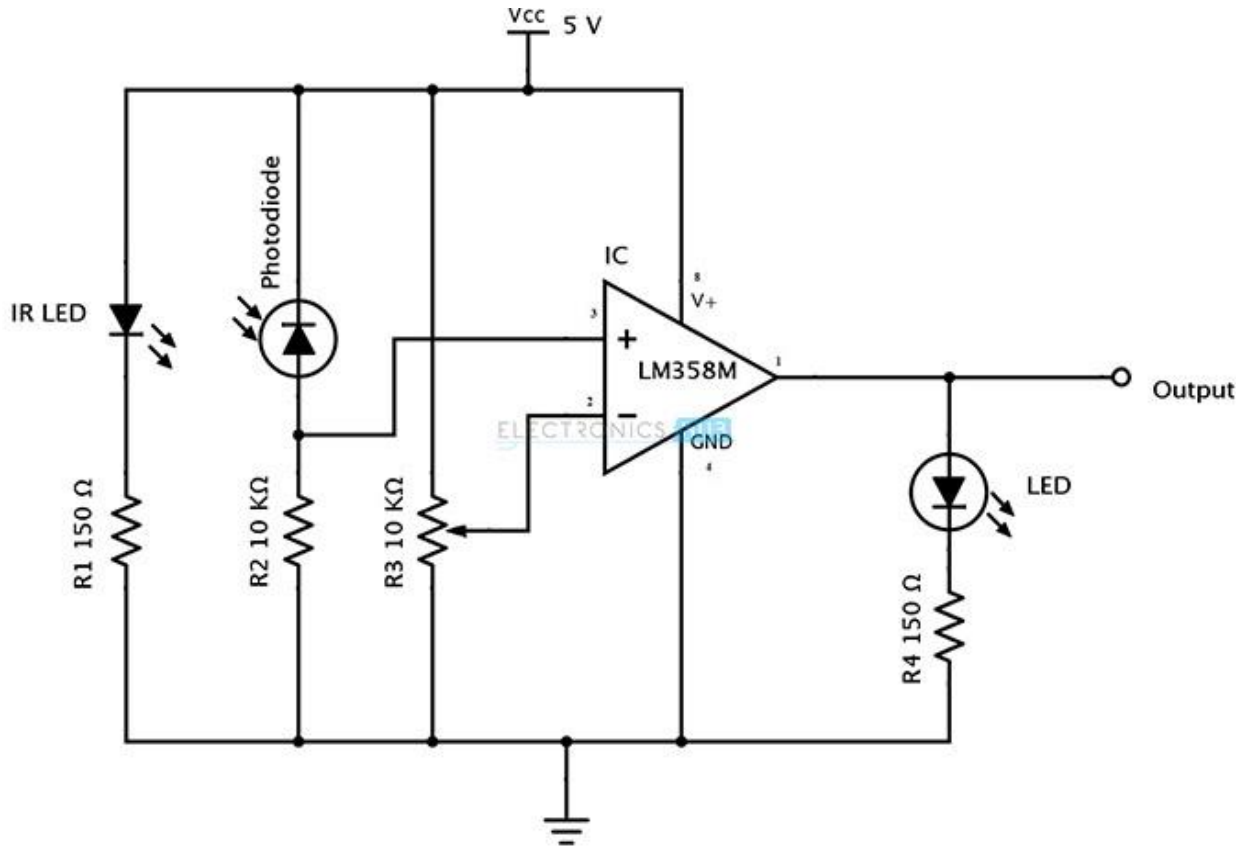
An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.



IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be

detected by an infrared sensor.The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.



CIRCUIT DIAGRAM

FEATURES

- Input voltage : 3.3v
- Output : analog

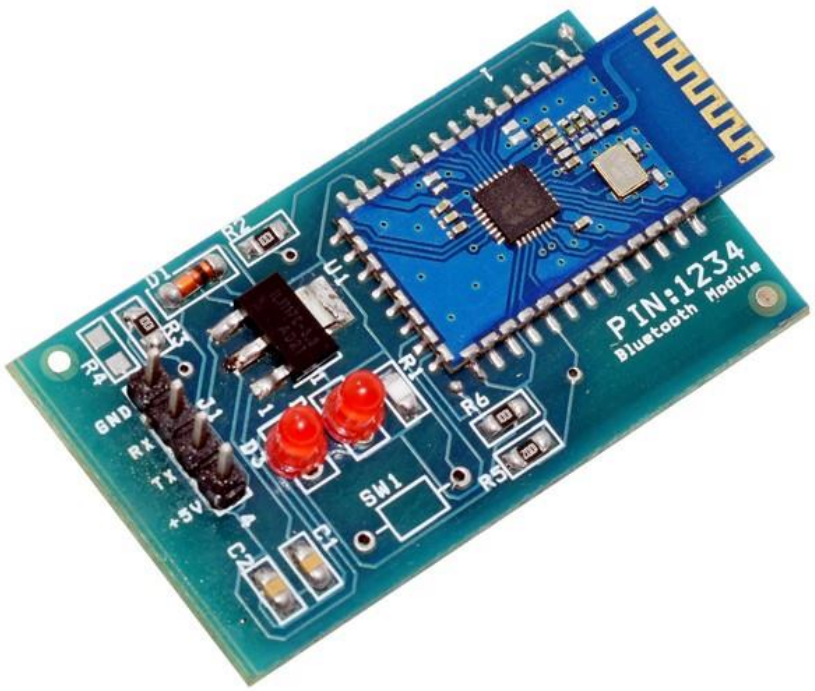
APPLICATION

- Radiation Thermometers
- Flame Monitor
- Moisture Analyzers
- Gas Analyzers

BLUETOOTH

DESCRIPTION

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs).



BLUETOOTH MODULE

Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

Bluetooth UART enables you to wireless transmit & receive serial data. Devices equipped with Bluetooth technology support wireless point-to-point connections, as well as wireless access to mobile phones. You can simply use it for serial port replacement to establish connection between MCU and PC for data transfer.

BLUETOOTH INTERFACE WITH ARDUINO

It delivers the received data and receives the data to be transmitted to and from a host system through a host controller interface.

FEATURES

- Supply voltage: 5VDC
- Distance range: 20m
- Paired with mobile phone
- UART interface

APPLICATONS

- Wireless Telemetry
- Remote Data Logging
- Robotics

SERVO MOTOR

DESCRIPTION

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

The servo motor is controlled by a signal (data) better known as a pulse-width modulator (PWM). Here are several of the more common servo motor applications in use today. Robotics: A servo motor at every "joint" of a robot is used to actuate movements, giving the robot arm its precise angle.

Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement.

SERVO MOTOR

Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller.

If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

SERVO MOTOR INTERFACE WITH ARDUINO

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

A servomotor is closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is some signal, either analog or digital, representing the position commanded for the output shaft.

FEATURES

- Supply voltage: 5VDC
- Control signal: Analog or D1igital
- High-precision positioning.

APPLICATIONS

- Conveyors
- Solar Tracking System
- Antenna Positioning
- Camera Auto Focus
- It is used to measure the speed of the output shaft

POWER SUPPLY UNIT

DESCRIPTION

A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage.

A power supply is used to reduce the mains electricity at 240 volts AC down to some thing more useable, say 12 volts DC. There are two types

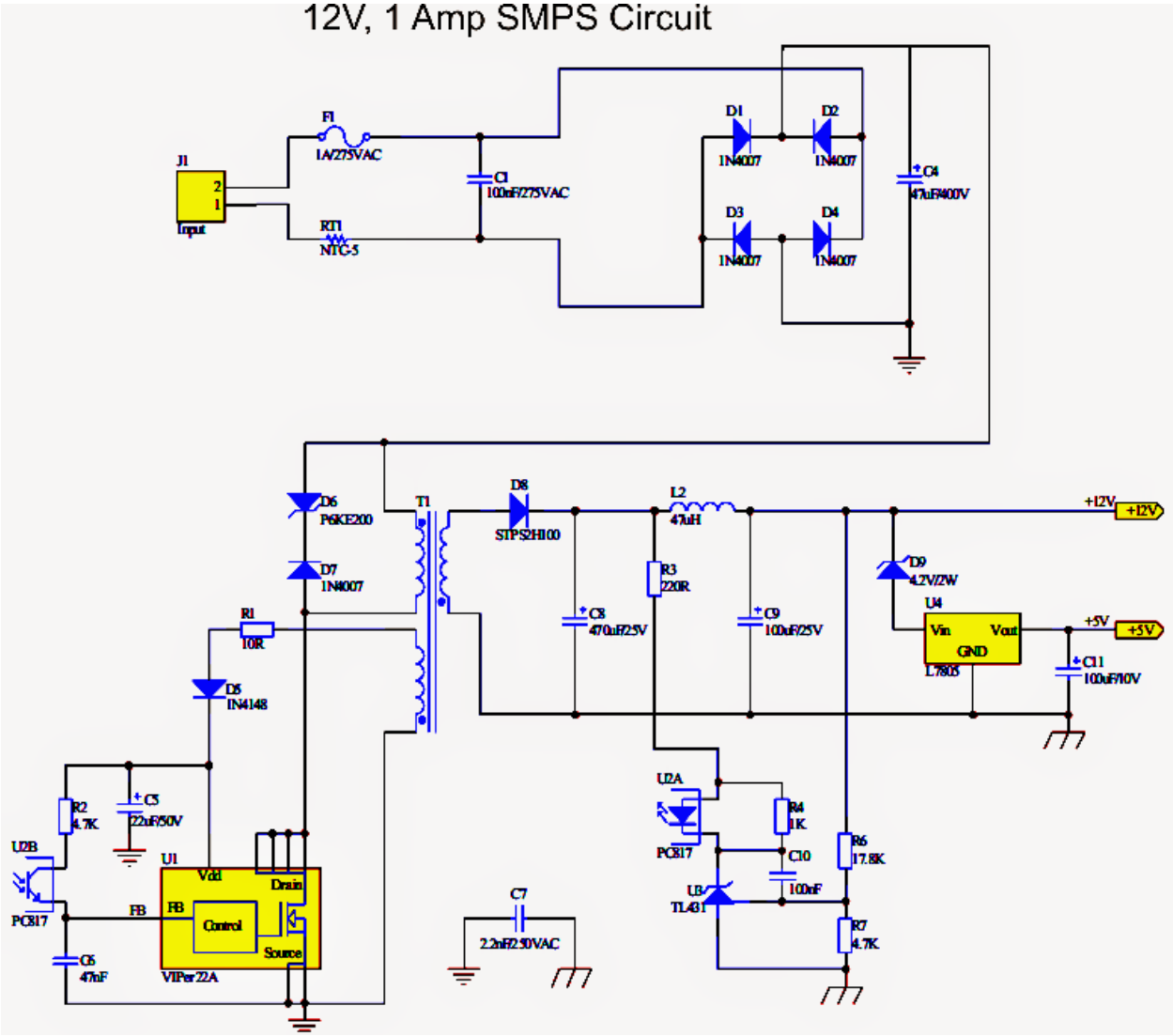
of power supply, linear and switch mode. A linear power supply uses a transformer to reduce the voltage. The AC signal is rectified and regulated to produce a high DC voltage.

An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Adapters for battery-powered equipment may be described as chargers or rechargers (see also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from main power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply.

ADAPTER (12V 1AMP)

An adapter is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one electrical connector to another. In a computer, an adapter is often built into a card that can be inserted into a slot on the computer's motherboard.

The card adapts information that is exchanged between the computer's microprocessor and the devices that the card supports.



CIRCUIT DIAGRAM

An electric power adapter may enable connection of a power plug, sometimes called, used in one region to a AC power socket used in another, by offering connections for the disparate contact arrangements, while not changing the voltage. An AC adapter, also called a "recharger", is a small

power supply that changes household electric current from distribution voltage) to low voltage DC suitable for consumer electronics.

Some modify power or signal attributes, while others merely adapt the physical form of one electrical connector to another. For computers and related items, one kind of serial port adapter enables connections between 25-contact and nine-contact connectors, but does not affect electrical power- and signalling-related attributes

FEATURES

- Output current:1A
- Supply voltage: 220-230VAC
- Output voltage: 12VDC
- Reduced costs
- Increased value across front-office and back-office functions
- Access to current, accurate, and consistent data
- It generates adapter metadata as WSDL files with J2CA extension.

APPLICATIONS

- Back-end systems which need to send purchase order data to oracle applications send it to the integration service via a integration server client.
- SMPS applications.

REGULATOR

DESCRIPTION

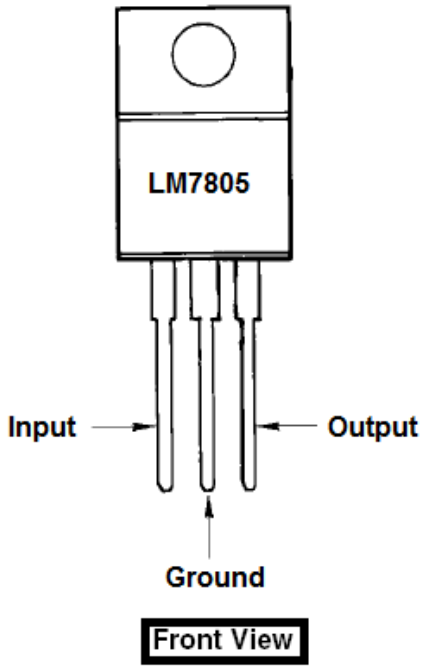
A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components.

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current.

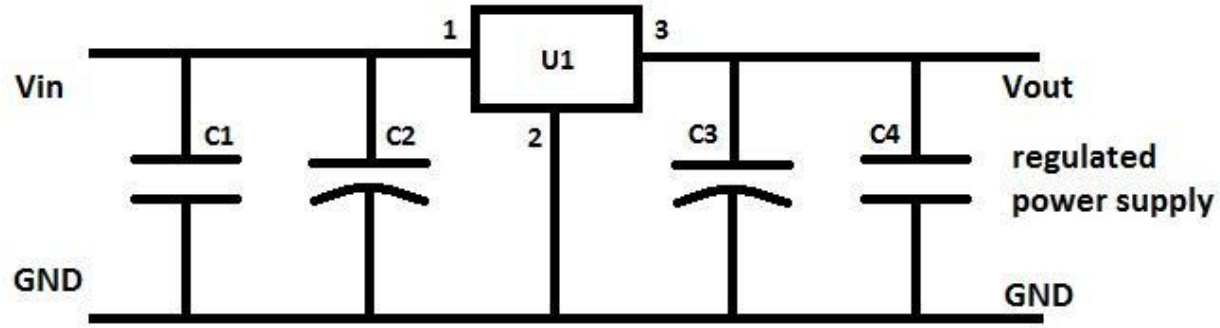
REGULATOR

The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators.

The LM78XX series of three terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible.



PIN DIAGRAM



CIRCUIT DIAGRAM

If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

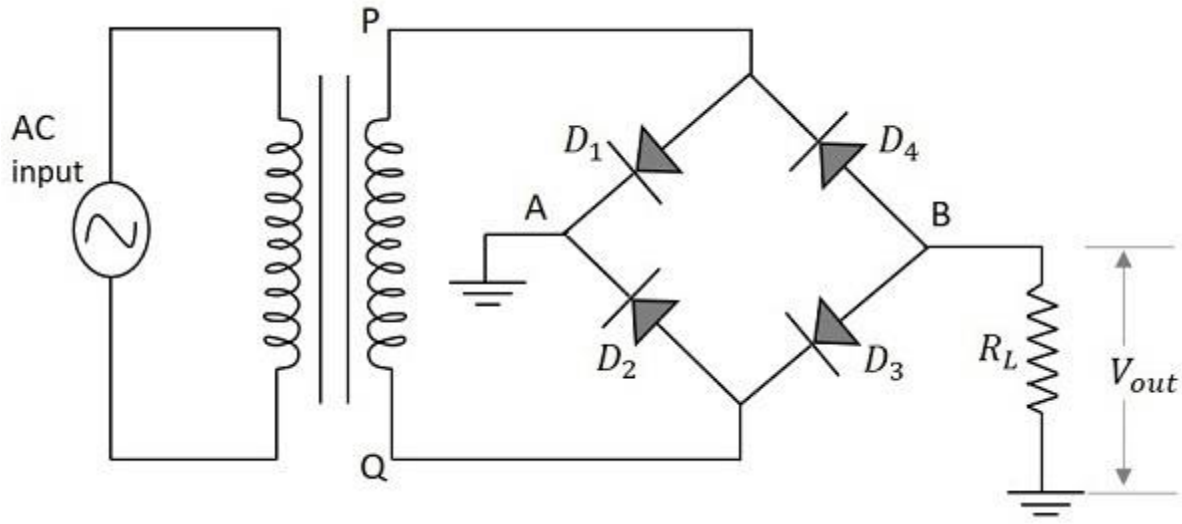
FEATURES

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

BRIDGE FULL-WAVE RECTIFIER:

This is such a full wave rectifier circuit which utilizes four diodes connected in bridge form so as not only to produce the output during the full cycle of input, but also to eliminate the disadvantages of the center-tapped full wave rectifier circuit.

There is no need of any center-tapping of the transformer in this circuit. Four diodes called D1D1, D2D2, D3D3 and D4D4 are used in constructing a bridge type network so that two of the diodes conduct for one half cycle and two conduct for the other half cycle of the input supply. The circuit of a bridge full wave rectifier is as shown in the following figure.

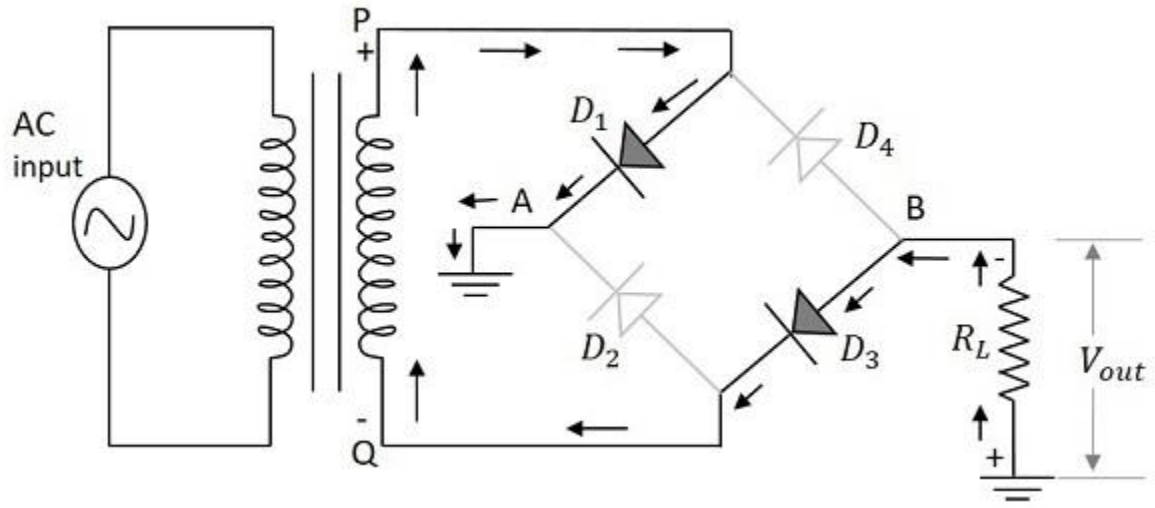


WORKING BRIDGE FULL-WAVE RECTIFIER:

The full wave rectifier with four diodes connected in bridge circuit is employed to get a better full wave output response. When the positive half cycle of the input supply is given, point P becomes positive with respect to the point **Q**. This makes the diode D1D1 and D3D3 forward biased

while D2D2 and D4D4 reverse biased. These two diodes will now be in series with the load resistor.

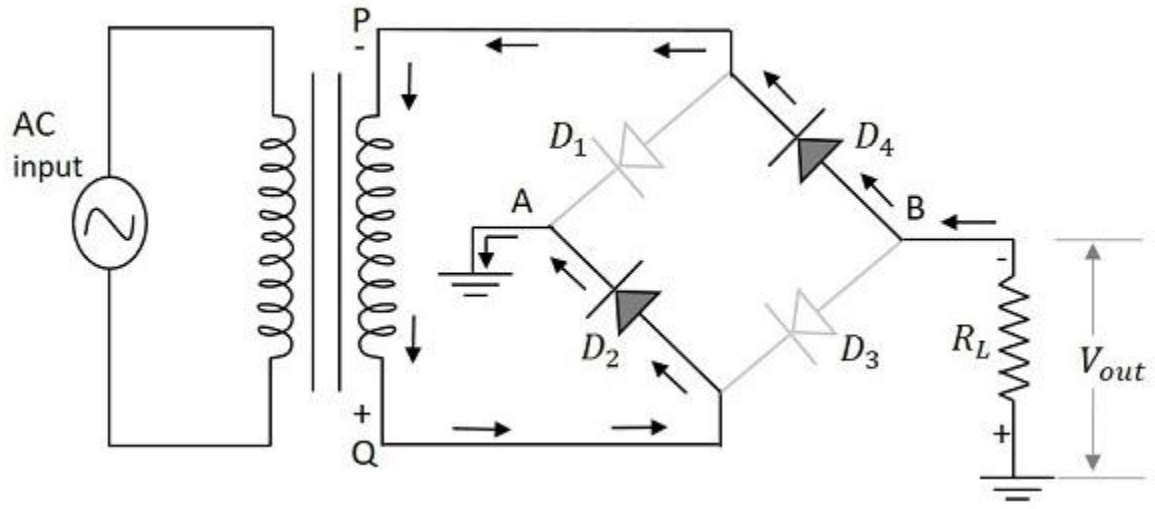
The following figure indicates this along with the conventional current flow in the circuit.



Hence the diodes D1D1 and D3D3 conduct during the positive half cycle of the input supply to produce the output along the load resistor. As two diodes work in order to produce the output, the voltage will be twice the output voltage of the center tapped full wave rectifier.

When the negative half cycle of the input supply is given, point P becomes negative with respect to the point **Q**. This makes the diode D1D1 and D3D3 reverse biased while D2D2 and D4D4 forward biased. These two diodes will now be in series with the load resistor.

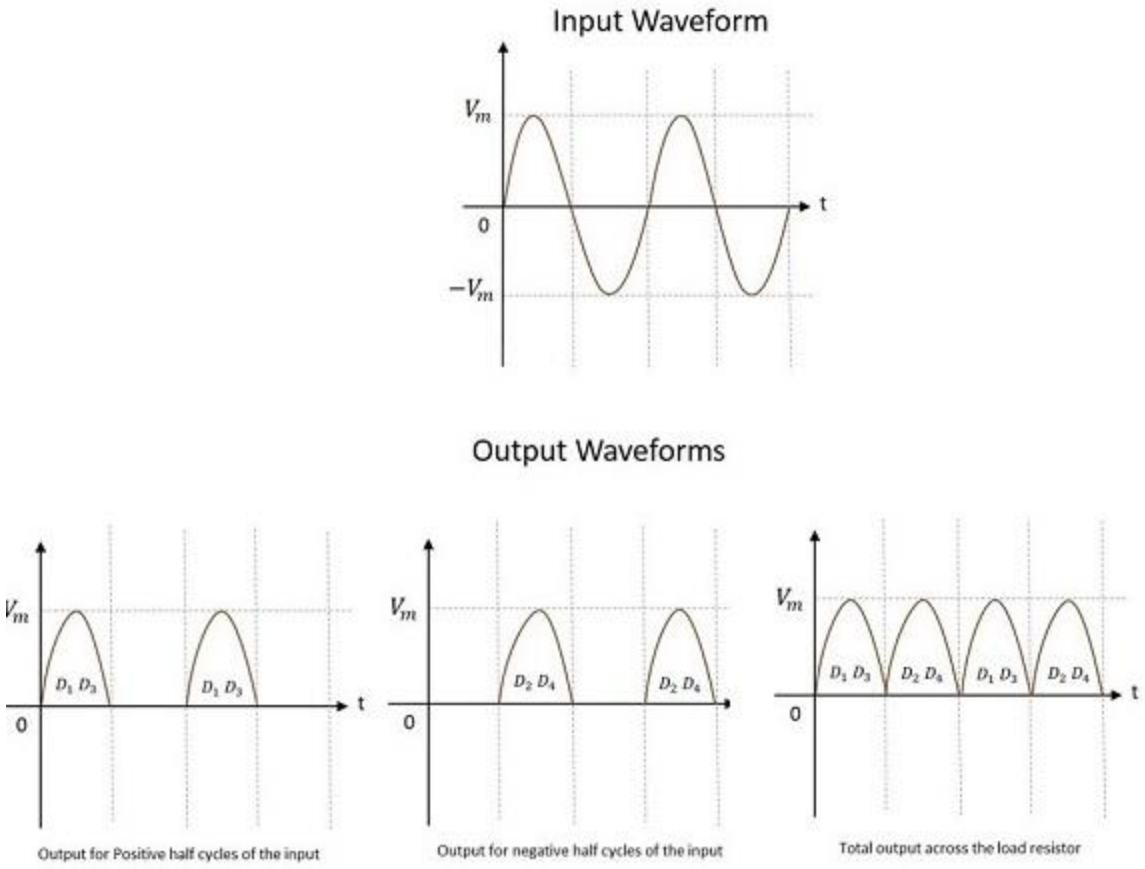
The following figure indicates this along with the conventional current flow in the circuit.



Hence the diodes D2D2 and D4D4 conduct during the negative half cycle of the input supply to produce the output along the load resistor. Here also two diodes work to produce the output voltage. The current flows in the same direction as during the positive half cycle of the input.

WAVEFORMS:

The input and output waveforms of the center-tapped full wave rectifier are as follows.



From the above figure, it is evident that the output is obtained for both the positive and negative half cycles. It is also observed that the output across the load resistor is in the **same direction** for both the half cycles.

PEAK INVERSE VOLTAGE:

Whenever two of the diodes are being in parallel to the secondary of the transformer, the maximum secondary voltage across the transformer appears at the non-conducting diodes which makes the PIV of the rectifier circuit. Hence the **peak inverse voltage** is the maximum voltage across the secondary winding, i.e.

PIV=VmPIV=Vm

ADVANTAGES:

There are many advantages for a bridge full wave rectifier, such as −

- No need of center-tapping.
- The dc output voltage is twice that of the center-tapper FWR.
- PIV of the diodes is of the half value that of the center-tapper FWR.
- The design of the circuit is easier with better output.

Let us now analyze the characteristics of a full-wave rectifier.

SOFTWARE DESCRIPTION:

ARDUINO IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port.

The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Before uploading your sketch, you need to select the correct items from the **Tools > Board** and **Tools > Port** menus. The boards are described below. On the Mac, the serial port is probably something like **/dev/tty.usbmodem241** (for an Uno or Mega2560 or Leonardo) or **/dev/tty.usbserial-1B1** (for a Duemilanove or earlier USB board), or **/dev/**tty.USA19QW1b1P1**.1** (for a serial board connected with a Keyspan USB-to-Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should be **/dev/ttyACMx** , **/dev/ttyUSBx** or similar. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the **Upload** item from the **Sketch** menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila) that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

When you upload a sketch, you're using the Arduino **bootloader**, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The

bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

PROGRAMMING LANGUAGE:

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between Cextensions for different embedded systems.

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms

on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. CPU's with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

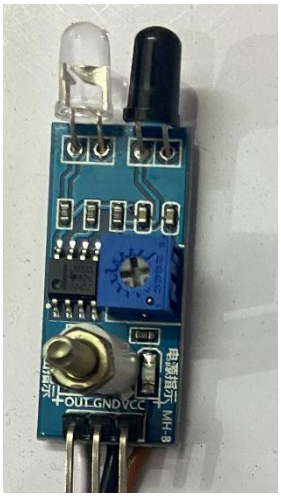
Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

HARDWARE MODELS

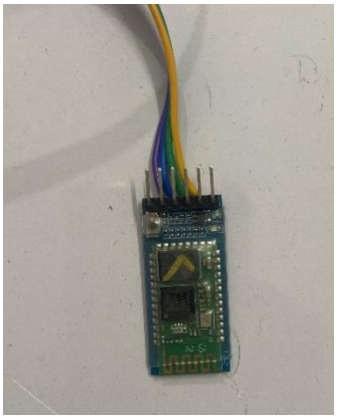
SERVO MOTOR

ARDUINO UNO



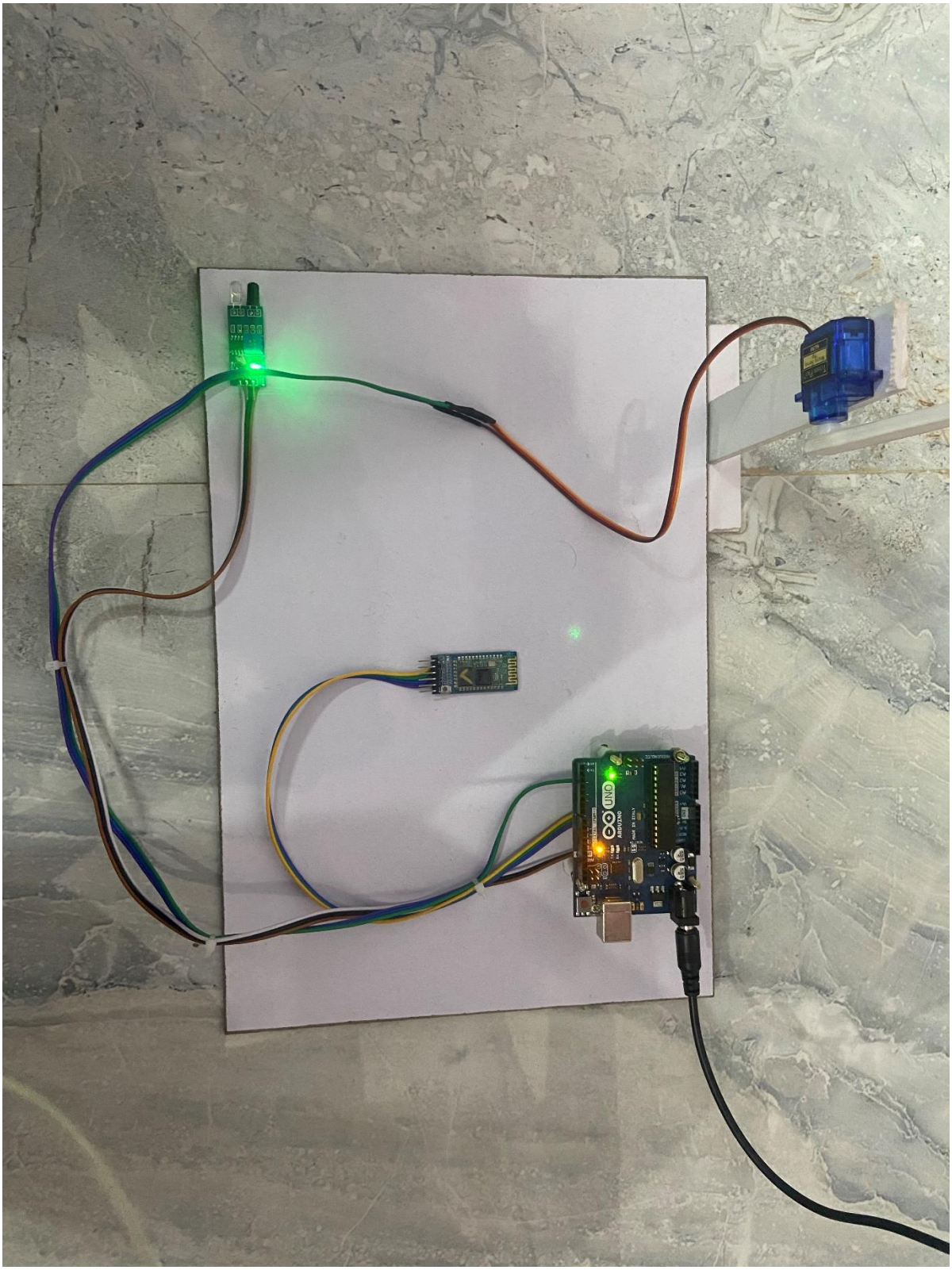
IR SENSOR

1AMP POWER ADAPTER



BLUTOOTH MODULE

FULL MODEL



CONCLUSION:

Nearly thousand people being injured and /or killed by suburban trains every year. In India, railway gate was manually operated by liver pulling method to open and close the gate. In India, city like Mumbai, Kolkata, Delhi will have train is most popular transport for middle class person and there will more railway gate in that place. For that place, our technique will helps to reduce the accident. We are improving technologically in various fields so we liked it to do the whole process automatically which reduce the human efforts and is very easy to operate. This technique helps to reduce the future accident rate occurring in many country. Thus in future we can reduce the accident rate to the countable numbers. Automatic railway gate control system is cantered on the idea of reducing human involvement for closing and opening the railway gate which allows and prevents cars and humans from crossing railway tracks. The railway gate is a cause of many deaths and accidents. Hence, automating the gate can bring about a ring of surety to controlling the gates. Human may make errors or mistakes so automating this process will reduce the chances of gate failures. Automation of the closing and opening of the railway gate using the switch circuit reduces the accidents to a greater extend. So this technique is eco-friendly in nature. It will reduce man power in practical.

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