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Design and Implementation of Smart Parcel Receiving System

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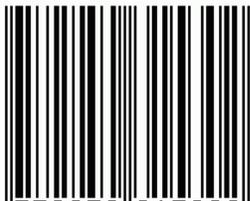
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Preface

This monograph introduces the Smart parcel receiving System which will solve the problem of missed deliveries, providing a smart and secure parcel delivery solution that we can monitor and control from our smart phone. The proliferation of online shopping has introduced a number of problems for the customer not present in what we might call the traditional shopping experience. One of the challenging issue is how to handle the receiving of a parcel when not at home. The idea is to introduce a Smart Parcel Receiving System which will be able to verify and accept the ordered parcel as well as acknowledging the customer and the e-retailers of parcel.

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1.1 Introduction

The growth of e-commerce and online shopping expanded use of Internet, and the increased efficiency of distribution and delivery systems, among other things, have led to an increase in parcel deliveries. Even in situations where products are not ordered using e-commerce or online methods, products are increasingly shipped from more centralized locations rather than being stocked at a larger number of widely distributed stores or warehouses. Customers order an increasing number of products and types of products for delivery to their home or business rather than visiting a local business in person to purchase the product. Delivery of parcels can be problematic, particularly to residential locations, for a number of reasons including the recipient is not home or available to receive the parcel, parcels left unattended may be subject to theft or environmental damage, parcel re-delivery is time consuming and costly, parcel return is costly, and returned or undelivered parcels often lead to dissatisfied customers. Hence automation of parcel/product receiving will certainly lead to an easy and safe fulfillment for an online ordering. This is the motive behind the proposal of an approach for automation of parcel receiving. Smart box is the electronic delivery box which includes an advanced locking system with keypad. Your packages will be safe and secure inside intelligent parcel drop box. Smart box is specially designed to simplify the delivery and collection of parcel. The major advantage of this system is the presence of the GSM modem enables the device to communicate with the receiver no matter wherever he was present on the globe.

However, we came across some of the parcel receiving boxes. Out of them one was a simple parcel receiving box without proper locking system. Anyone could retrieve the parcel from the box easily. But here in this box, we have provided the locking system which is under the control of customer which ensures the security of the box and parcel inside it. Another box we came across have the barcode sticker on the inside of the box, which the carrier is requested to scan as proof that he has made the delivery. But of course this really is not a proof as it is the same barcode time and time again. Carrier may often refuse to leave parcels in these existing boxes as they do not offer true proof of delivery. Our smart parcel receiving box has the ability to issue the multiple OTPs or PIN numbers every time the delivery driver arrives to attempt the delivery. This can provide the proper proof of delivery to the driver.

1.2 LITERATURE SURVEY

The author has presented the simple parcel receiving box without proper locking system.

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A box has a barcode sticker inside the box, which the delivery driver is requested to scan as proof that he has made the delivery. Delivery driver may often refuse to leave parcels in these existing boxes as they do not offer true proof of delivery.

The author has presented the smart box which is an intelligent parcel delivery box with the somewhat complex architecture with the GSM, Wi-Fi and blue tooth interfaces.

1.3 PROBLEM STATEMENT

A way to receive a package at home even when no one is there. This would mean providing a secure location in which the package can be stored until someone gets home to collect it, and also provide a means by which the courier can obtain some kind of signature as proof that they delivered the package.

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2.1 LITERATURE REVIEW

- The customer places an order in any e-retailer website. If the order is confirmed the e-retailer e.g. Amazon will send the One Time Password (OTP) for the order confirmation .This OTP will be checked by the courier driver at the time of parcel delivery. The same OTP will be used by the customer as a key to unlock the parcel receiving box and will be displayed on the LCD screen for the confirmation of the delivery driver when he/she receives the request for parcel delivery.
- If the e-retailer does not have the OTP system, then customer can either incorporate his/her own selected OTP/PIN number into the address field or enter it in the additional information field e.g. "Please leave the parcel in my parcel receiving box. The OTP/PIN number for the confirmation is 4975." The same number now will be used by the customer to unlock the box and will be displayed on the screen. In this way customer can make sure that the delivery driver will be able to read the number on the parcel or delivery note and match the number with the displayed number on the LCD screen. The delivery driver records this by simply copying the code into the data field on his hand held terminal or hard copy delivery document where normally customer would be required to sign. The delivery driver can now safely leave the goods in parcel receiving box and would get the proof of delivery also. The below list give the sequence of actions that take place for delivery of a package to customer premises.

3.1 Introduction

In this chapter, we discuss flowchart and block diagram of Smart parcel receiving System. The Smart Parcel Receiving System/box contains the two compartments.

The upper compartment is called the receiving compartment in which the delivery driver will drop the parcel.

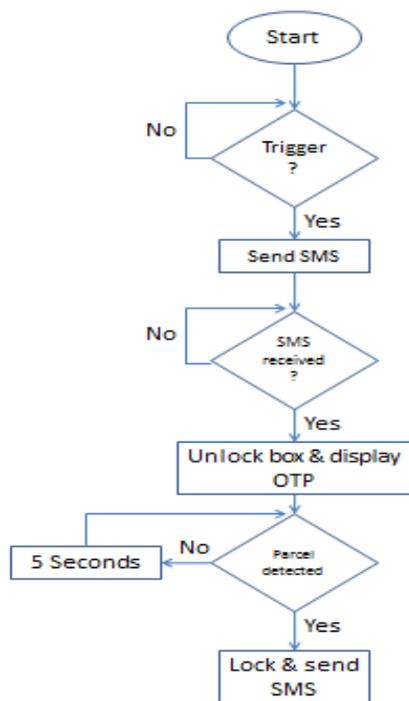


Fig.3.1 Flow Chart of the Receiving Compartment

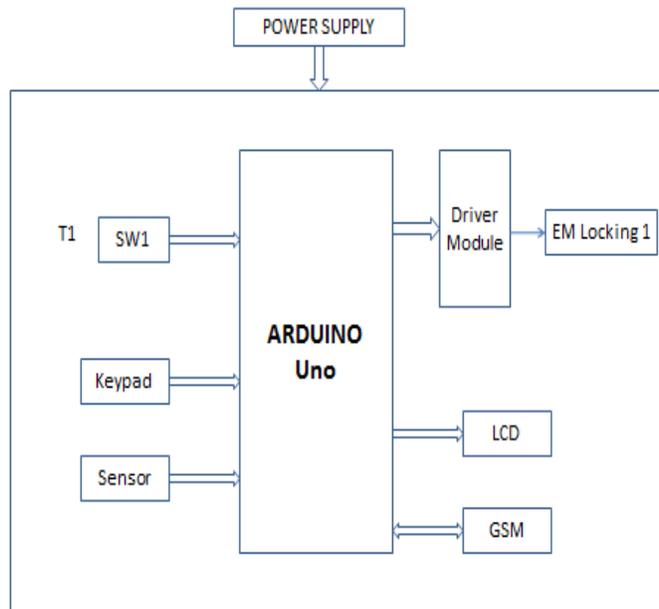


Fig.3.2 Block Diagram of the Receiving Compartment

The lower compartment is called the safety compartment. Below figure shows flowchart and block diagram of safety compartment.

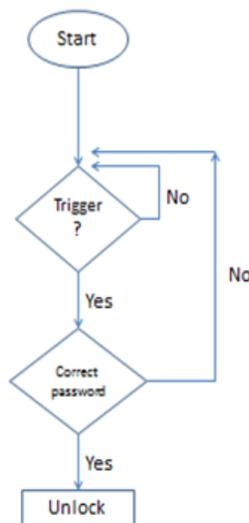


Fig 3.3 Flow Chart of the Safety Compartment

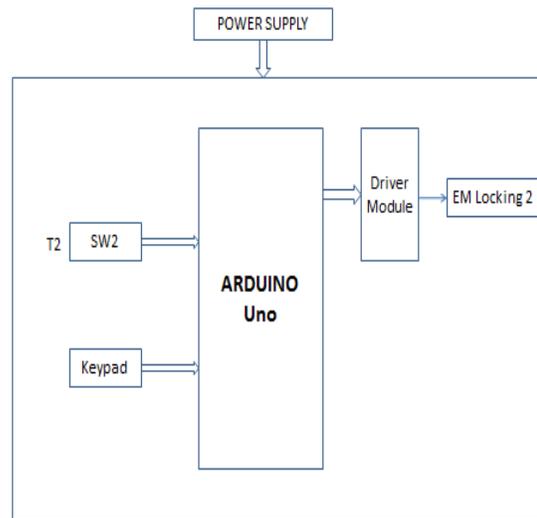


Fig 3.4 Block Diagram of the Safety Compartment

Procedure

Referring to the Fig 3.1 and Fig.3.3, the below list give the sequence of actions that take place for delivery of a package to customer premises.

- A Box will be having a request key which will provide trigger to delivery driver.
- The delivery driver simply presses the key on the box.
- System is having GSM module which send the notification of new parcel to the owner's smartphone.
- Owner will send the OTP in response to the notification message which will be received by the system in the parcel box.
- System will display the OTP for delivery person for confirmation.
- Further on validation the upper lid is opened and package is to be kept by the delivery person within stipulated time after which the lid is closed.
- Once the upper lid is closed another confirmation is made whether the package is placed by output of IR sensor placed inside compartment.
- After ensuring all the above events are correctly handled the package is transferred into bottom compartment and the second lid is retracted.
- A confirmation message is sent to the owner and now the upper compartment is empty and ready to receive next package in the same manner.

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- Depending on the courier company and retailer's system and practices, customer may receive a text message or email confirmation informing them that delivery was made successfully.
- When the owner gets back at home, will retrieve the parcel from the receiving compartment using the password which he/she has set for the safety compartment.

3.2 Description of components

The main components used in the receiving compartment are:

3.2.1 Arduino Uno AT mega328P

The Arduino Uno is one kind of microcontroller board based on ATmega328, and Uno is an Italian term which means one. Arduino Uno is named for marking the upcoming release of microcontroller board namely Arduino Uno Board 1.0. This board includes digital I/O pins-14, a power jack, analog i/ps-6, ceramic resonator-A16 MHz, a USB connection, an RST button, and an ICSP header. All these can support the microcontroller for further operation by connecting this board to the computer. The power supply of this board can be done with the help of an AC to DC adapter, a USB cable, otherwise a battery. This article discusses what is an Arduino Uno microcontroller, pin configuration, Arduino Uno specifications or features, and applications.

The ATmega328 is one kind of single-chip microcontroller formed with Atmel within the mega AVR family. The architecture of this Arduino Uno is a customized Harvard architecture with 8 bit RISC processor core. Other boards of Arduino Uno include Arduino Pro Mini, Arduino Nano, Arduino Due, Arduino Mega, and Arduino Leonardo.

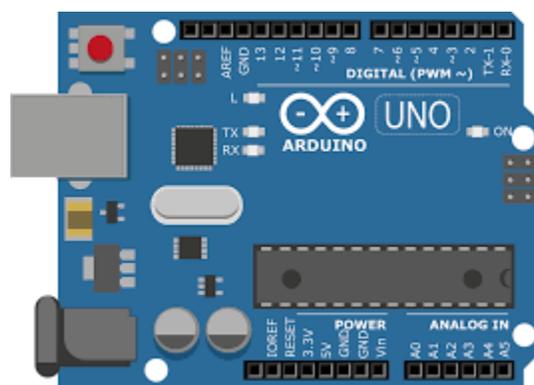


Fig 3.5 Arduino Uno Board

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Features of Arduino Uno Board

The **features of Arduino Uno ATmega328** includes the following.

- The operating voltage is 5V
- The recommended input voltage will range from 7v to 12V
- The input voltage ranges from 6v to 20V
- Digital input/output pins are 14
- Analog i/p pins are 6
- DC Current for each input/output pin is 40 mA
- DC Current for 3.3V Pin is 50 mA
- Flash Memory is 32 KB
- SRAM is 2 KB
- EEPROM is 1 KB
- CLK Speed is 16 MHz

Arduino Uno Pin Diagram

The Arduino Uno board can be built with power pins, analog pins, ATmegs328, ICSP header, Reset button, power LED, digital pins, test led 13, TX/RX pins, USB interface, an external power supply. The Arduino UNO board description is discussed below.

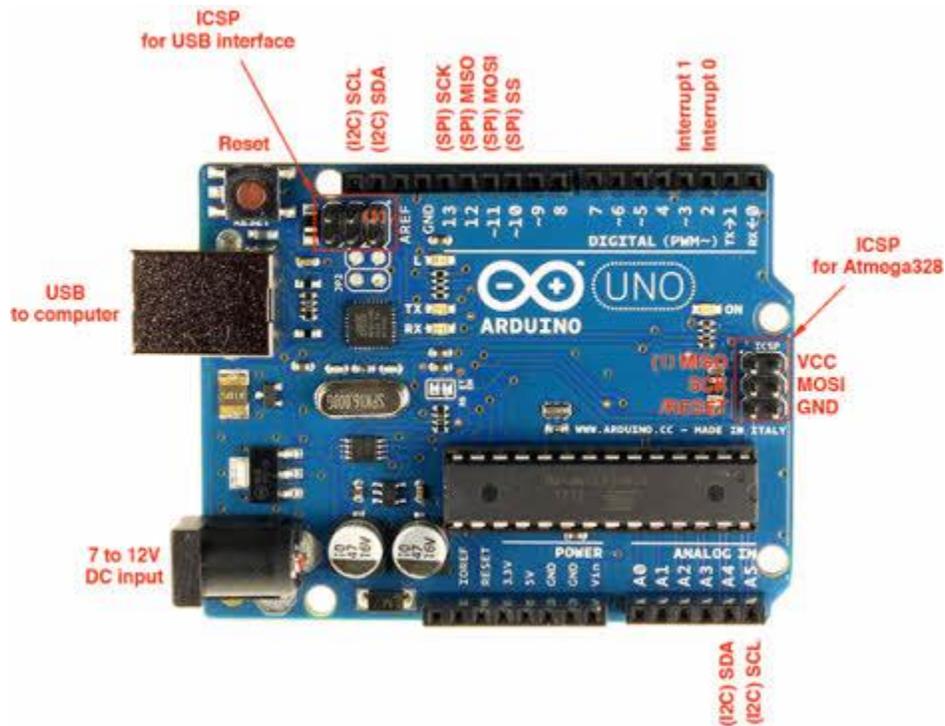


Fig 3.6 Pin diagram of Arduino Uno AT mega328p

Power Supply

The Arduino Uno power supply can be done with the help of a USB cable or an external power supply. The external power supplies mainly include AC to DC adapter otherwise a battery. The adapter can be connected to the Arduino Uno by plugging into the power jack of the Arduino board. Similarly, the battery leads can be connected to the Vin pin and the GND pin of the POWER connector. The suggested voltage range will be 7 volts to 12 volts.

Input & Output

The 14 digital pins on the Arduino Uno can be used as input & output with the help of the functions like pin Mode(), digital Write(), & Digital Read().

Pin1 (TX) & Pin0 (RX) (Serial)

This pin is used to transmit & receive TTL serial data, and these are connected to the ATmega8U2 USB to TTL Serial chip equivalent pins.

Pin 2 & Pin 3 (External Interrupts)

External pins can be connected to activate an interrupt over a low value, change in value.

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Pins 3, 5, 6, 9, 10, & 11 (PWM)

This pin gives 8-bit PWM o/p by the function of analog Write().

SPI Pins (Pin-10 (SS), Pin-11 (MOSI), Pin-12 (MISO), Pin-13 (SCK))

These pins maintain SPI-communication, even though offered by the fundamental hardware, is not presently included within the Arduino language.

Pin-13(LED)

The inbuilt LED can be connected to pin-13 (digital pin). As the HIGH-value pin, the light emitting diode is activated, whenever the pin is LOW.

Pin-4 (SDA) & Pin-5 (SCL) (I2C)

It supports TWI-communication with the help of the Wire library.

AREF (Reference Voltage)

The reference voltage is for the analog i/ps with analog Reference().

Reset Pin

This pin is used for reset (RST) the microcontroller.

Memory

The memory of this Atmega328 Arduino microcontroller includes flash memory-32 KB for storing code, SRAM-2 KB EEPROM-1 KB.

Communication

The Arduino Uno ATmega328 offers UART TTL-serial communication, and it is accessible on digital pins like TX (1) and RX (0). The software of an Arduino has a serial monitor that permits easy data. There are two LEDs on the board like RX & TX which will blink whenever data is being broadcasted through the USB.

A Software Serial library permits for serial communication on Arduino Uno digital pins and the ATmega328P supports TWI (I2C) as well as SPI-communication. The Arduino software contains a wired library for simplifying the utilization of the I2C bus.

How to Use an Arduino Uno?

Arduino Uno can detect the surroundings from the input. Here the input is a variety of sensors and these can affect its surroundings through controlling motors, lights, other actuators, etc. The ATmega328 microcontroller on the Arduino board can be programmed with the help of an Arduino programming language and the IDE (Integrated Development Environment). Arduino projects can communicate by software while running on a PC.

Arduino Programming

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Once the Arduino IDE tool is installed in the PC, attach the Arduino board to the computer with the help of USB cable. Open the Arduino IDE & select the right board by choosing Tools->Board>Arduino Uno, and select the right Port by choosing Tools->Port. This board can be programmed with the help of an Arduino programming language depends on Wiring.

3.2.2 Push to ON switch

A push-button or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state. Terms for the "pushing" of a button include pressing, depressing, mashing, slapping, hitting, and punching.



Fig 3.7 Push button

3.2.3 LCD 16x2 character display

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main

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benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.



Fig 3.8 LCD 16x2 character display

LCD 16x2 Pin Diagram

The 16x2 LCD pinout is shown below.

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to

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the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.

- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.



Fig 3.9 Pin diagram of LCD 16x2 character display

Features of LCD16x2

The features of this LCD mainly include the following.

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- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Its display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

Registers of LCD

A 16×2 LCD has two registers like data register and command register. The RS (register select) is mainly used to change from one register to another. When the register set is '0', then it is known as command register. Similarly, when the register set is '1', then it is known as data register.

Command Register

The main function of the command register is to store the instructions of command which are given to the display. So that predefined tasks can be performed such as clearing the display, initializing, set the cursor place, and display control. Here commands processing can occur within the register.

Data Register

The main function of the data register is to store the information which is to be exhibited on the LCD screen. Here, the ASCII value of the character is the information which is to be exhibited on the screen of LCD. Whenever we send the information to LCD, it transmits to the data register, and then the process will be starting there. When register set =1, then the data register will be selected.

3.2.4 GSM module sim 300

GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services. ... GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals. GSM was developed using digital technology.

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GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). ... A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot.

Basically, GSM was built to aid 2g connectivity in mobile phones. Earlier, the network incorporated a circuit switching network but with time and need, it had to collaborate with GPRS, implementing the packet switching protocol. The frequency of operation of the GSM network falls within the range of 900-1800 MHz.



Fig 3.10 GSM module sim 300

GSM Modem Features

- This GSM modem is a highly flexible plug and play modem based on tri-band SIM300 GSM module.
- Industrial quality PCB with adequate grounding for better performance and noise immunity.
- RS232 Interface with Hardware Flow Control Support. (5 wire Serial interface with TX, RX, RTS, CTS & GND signals).
- Power ON/OFF control pin for auto-reset by Micro-controller. It will be useful for Auto-Reset functionality in Self monitoring Applications running 24x7x365.
- Antenna connector has separate ground plane for additional safety. It will isolate modem circuit ground plan in case antenna connector is exposed to inappropriate voltages. Modem Circuit ground plan and antenna ground plan can be connected simply by solder jumper, if required.
- Supports features like voice, data / fax, SMS, GPRS and integrated TCP / IP stack.
- Control via AT commands (GSM 07.07, 07.05 and enhanced AT commands).
- AC/DC 9-12 V /1.5 A Power Input.
- 4 Pin 0.1" connector for Speaker & Mic connectivity.
- RTC Battery holder (Optional).

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- Average Current consumption in normal operation 250 mA, can rise up to 500-700 mA during Voice and GPRS connections. Current pulse can be high as 1.5-2 A.

3.2.5 Electromagnet

This DC 12V KK-P30/25 Lifting Solenoid Electromagnet consists of an iron core and a coil to attract magnetic substances, using the magnetic action induced by electric current, only while the current is applied. This compact functional device offers high power with high reliability. The structure and design to release the residual magnetism left after de-energization is also one of its unique features.

Working Principle

An electromagnet is simply a coil of wire. It is usually wound around an iron core. However, it could be wound around an air core, in which case it is called a solenoid. When connected to a DC voltage or current source, the electromagnet becomes energized, creating a magnetic field just like a permanent magnet. The magnetic flux density is proportional to the magnitude of the current flowing in the wire of the electromagnet.

The polarity of the electromagnet is determined by the direction of the current. The north pole of the electromagnet is determined by using your right hand. Wrap your fingers around the coil in the same direction as the current is flowing (conventional current flows from + to -). The direction your thumb is pointing in the direction of the magnetic field so north would come out of the electromagnet in the direction of your thumb. DC electromagnets are principally used to pick up or hold objects

Features

1. Our DC-powered electromagnet generates a magnetic field of high-power with high efficiency.

This highly efficient electromagnet generates a magnetic field of a strong pull (high attractive force) with low energy consumption. You can adjust to the desired attractive force by changing the power applied and the magnetic gap between the electromagnet and the substance.

2. Minimized in residual magnetic.

When an electromagnet is energized, the problem is how to release the magnetic force which remains on the device after the power is turned off. Our electromagnet is designed with measures to release and minimize this residual magnetic force.

3. Lightweight, compact design for space-saving.

Compact mechanism with high reliability.

4. Long life

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High mechanical strength and excellent durability.

5. Widely applied in automation: assembly line, sorting machine, mechanical arm, experimental facility, etc



Fig 3.11 Electromagnet

3.2.6 Motor driver IC L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

Concept

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right

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H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

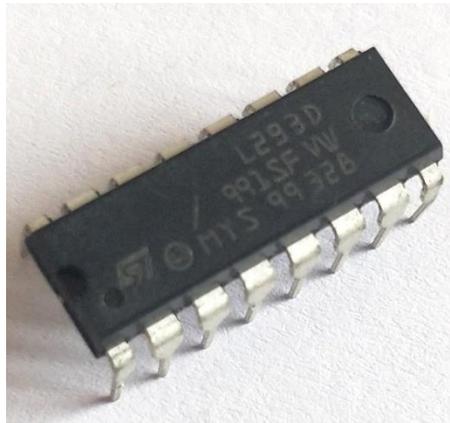


Fig 3.12 Motor driver IC L293D

L293D Pin Diagram

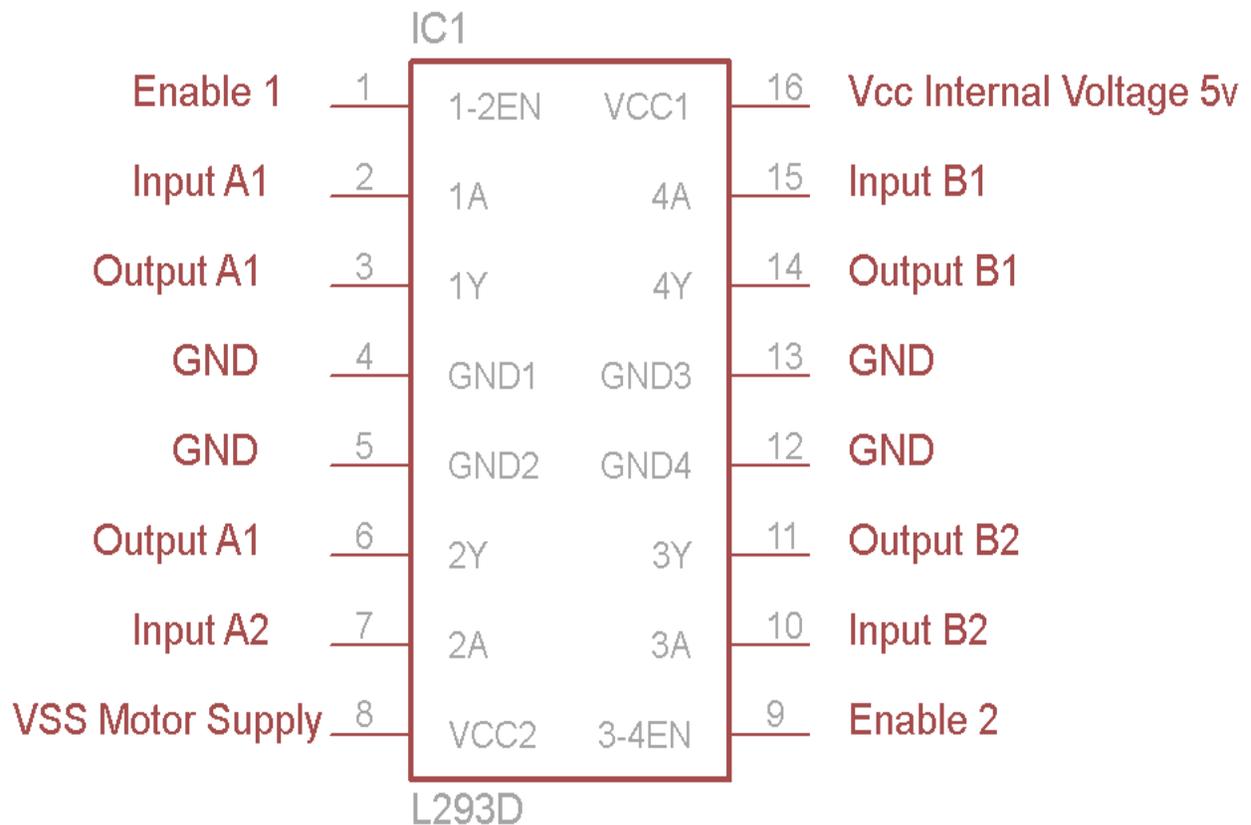


Fig 3.13 Pin diagram of Motor driver IC L293D

Working of L293D

There are 4 input pins for L293d, pin 2, 7 on the left and pin 15, 10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

L293D Logic Table.

Let us consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

- Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
- Pin 2 = Logic 1 and Pin 7 = Logic 1 | Idle [No rotation]

Circuit Diagram for L293d motor driver IC controller.

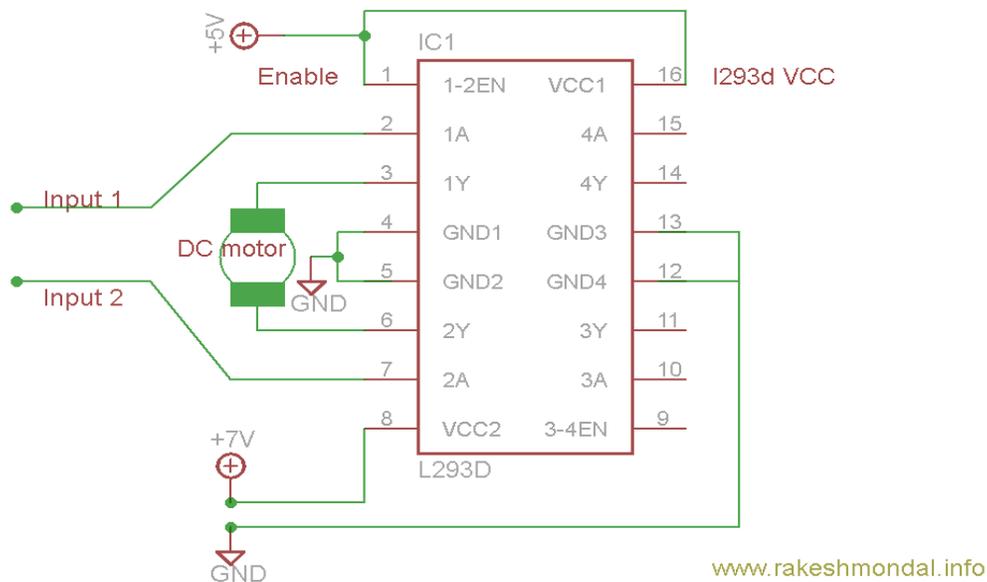


Fig 3.14 Circuit diagram of Motor driver IC L293D

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Features

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage V_{cc2} (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to V_{cc1} (VSS): 4.5V to 7V
- Transition time: 300ns (at 5V and 24V)
- Automatic Thermal shutdown is available
- Available in 16-pin DIP, TSSOP, SOIC packages

3.2.7 Voltage Regulator IC 7805

- Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So our 7805 will provide a +5V output voltage.
- The output current of this IC can go up to 1.5A. But, the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current. For example if the input voltage is 12V and you are consuming 1A, then $(12-5) * 1 = 7W$. This 7 Watts will be dissipated as heat.
- 7805 is a three terminal linear voltage regulator IC with a fixed output voltage of 5V which is useful in a wide range of applications. Currently, the 7805 Voltage Regulator IC is manufactured by Texas Instruments, ON Semiconductor, STMicroelectronics, Diodes incorporated, Infineon Technologies, etc.
- Some of the important features of the 7805 IC are as follows:
- It can deliver up to 1.5 A of current (with heat sink).
- Has both internal current limiting and thermal shutdown features.
- Requires very minimum external components to fully function.
- Pin Diagram of 7805 Voltage Regulator IC
- As mentioned earlier, 7805 is a three terminal device with the three pins being 1. INPUT, 2. GROUND and 3. OUTPUT. The following image shows the pins on a typical 7805 IC in To-220 Package.
-

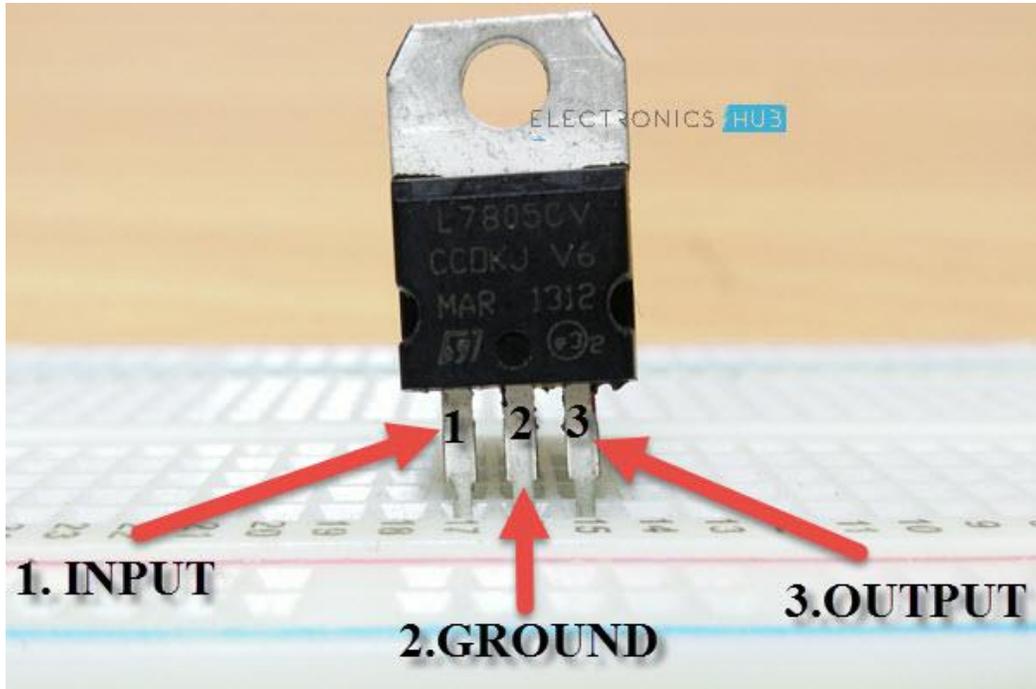


Fig 3.15 Pin Diagram of 7805 Voltage Regulator IC

Pin No.	Pin	Function	Description
1	INPUT	Input voltage (7V-35V)	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	Ground (0V)	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	Regulated output; 5V (4.8V-5.2V)	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

Basic Circuit of 7805

As I have previously talked about regulated power supply as a device that works on DC voltages and it can uphold its output accurately at a fixed voltage all the time even if there is a significant alteration in the DC input voltage.

As per the datasheets of 7805 IC, the basic circuit required for 7805 to work as a complete regulator is very simple. In fact, if the input supply is an unregulated DC Voltage, then all you need are two capacitor (even those are not mandatory depending on the implementation).

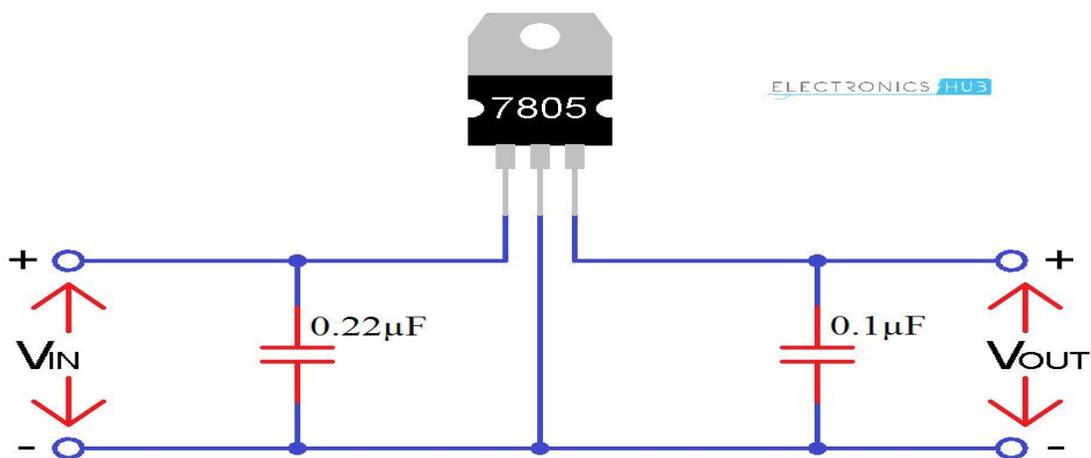


Fig 3.16 Circuit diagram of Voltage Regulator IC 7805

The above circuit shows all the components required for a 7805 IC to work properly. The 0.22µF Capacitor near the input is required only if the distance between the regulator IC and the power supply filter is high. Also, the 0.1µF Capacitor near the output is optional and if used, it helps in the transient response.

In this circuit, VIN is the input voltage to the 7805 IC and the source can be from either a battery or an unregulated DC. VOUT is the output of the 7805 IC, which is a Regulated 5V.

3.2.8 Power supply

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A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connections that deliver current to the load. The source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or another power supply. The input and output are usually hardwired circuit connections, though some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

AC-to-DC supply

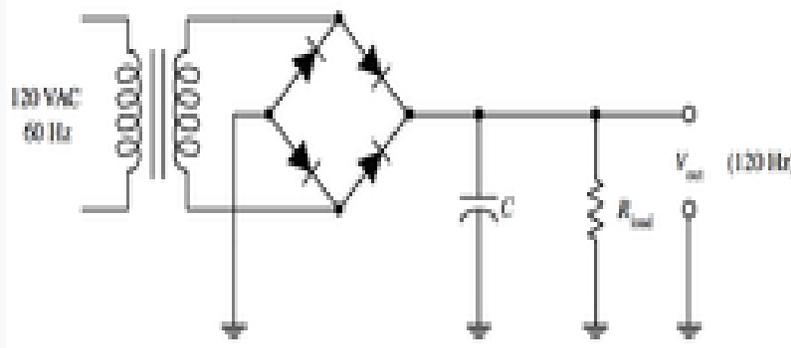


Fig 3.17 Schematic of basic AC-to-DC power supply

DC power supplies use AC mains electricity as an energy source. Such power supplies will employ a transformer to convert the input voltage to a higher or lower AC voltage. A rectifier is used to convert the transformer output

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voltage to a varying DC voltage, which in turn is passed through an electronic filter to convert it to an unregulated DC voltage.

The filter removes most, but not all of the AC voltage variations; the remaining AC voltage is known as ripple. The electric load's tolerance of ripple dictates the minimum amount of filtering that must be provided by a power supply. In some applications, high ripple is tolerated and therefore no filtering is required. For example, in some battery charging applications it is possible to implement a mains-powered DC power supply with nothing more than a transformer and a single rectifier diode, with a resistor in series with the output to limit charging current.

4.1 Result

- The below list of images give the sequence of actions that take place for delivery of a package to customer premises.



Fig.4.1 Displayed message on the LCD screen

- As soon as the delivery driver arrives for making the delivery, will see the message displayed on the LCD screen and will press the key which will send the notification to the customer's smartphone.

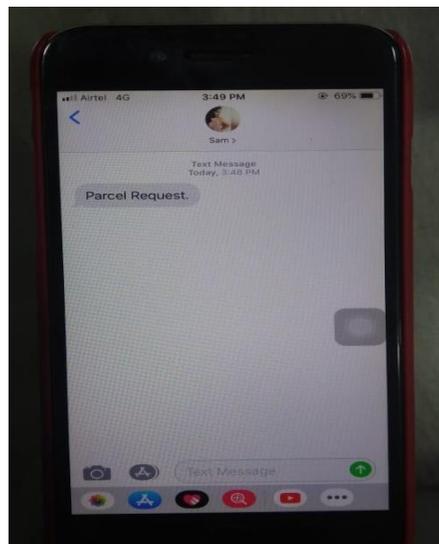


Fig.4.2 Message received on the customer's smartphone

- When the customer receives the notification for the parcel request, he/she will send the OTP in response to the notification.

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Fig.4.3 OTP send by the customer

- This OTP will unlock the box and the same OTP will be displayed on the LCD screen for the confirmation of the delivery driver and to provide him the proof of delivery.



Fig.4.4 OTP displayed on the LCD screen

- When the parcel is placed by the delivery driver in the box, it will be detected by the sensor. As soon as the parcel is detected, customer will receive the confirmation message.

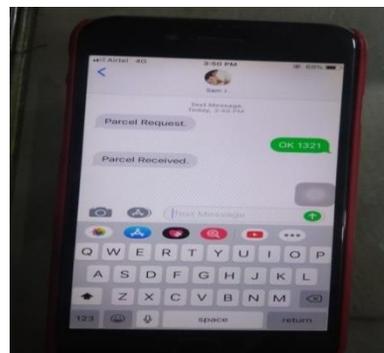


Fig.4.5 Confirmation Message received by the smartphone

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- When the package is received, the customer will send an acknowledgement to the courier driver that the parcel has been received successfully. This can be done by displaying the “Thank you!” message on the LCD screen.



Fig.4.6 Acknowledgement message displayed on the LCD screen for the courier driver

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5.1 Future Scope

- Future work can be focused on customizing the smart parcel receiving box which improves security and scalability. With the blooming of IoT (Internet of Things) tracking of packages becomes easier. Using internet instead of GSM services also reduces the cost for communication. The mechanical part of the system could be improvised for smoother handling of the packages.
- Also by installing the compatible CCTV or Webcam the owner can keep eye on parcel from anywhere on the globe. A software application can be designed to handle all these activity. The system requires just one time investment and easy to handle thereby making it affordable for common man.

5.2 Conclusion

- The aim of engineering studies is to increase the quality of living by constant innovation and research. Introducing technology into common man's life by exploiting the advancements in GSM technology an effort has been made to simplify the delivery procedure which usually involves lot of human effort and time. Currently handling of packages and delivery is a major concern for delivery and logistic companies.
- This has provided a platform for us to act and resolve the problem by making the best use of technology and skill set we have developed as engineering students. An attempt has been made by realizing the space that exists and a fully automated receiver system has been developed which is to be installed in customer premises.

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