AUTOMATIC SIDE STAND RETRIEVING SYSTEM

A MAJOR PROJECT WORK

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

In

Mechanical Engineering

By

Mr. S. HUSSAIN BASHA	**(20091A0327)**
Mr. B. DEEPAK	**(20091A0315)**
Mr. T. RAJENDRA	**(21095A0316)**
Mr. T. CHANDRA SHEKAR REDDY	**(20091A0311)**
Mr. C. CHARAN	**(20091A0314)**

Under the Esteemed guidance of

B. SURESH M.Tech,
Assistant Professor of ME

EDUCATION FOR PEACE
(ESTD-1995)

Department of Mechanical Engineering

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

NANDYAL-518501, A.P

(Affiliated to J.N.T University, Anantapur, A.P, INDIA)

(Approved by AICTE, Accredited by NBA Tier-I & NAAC with A+ Grade)

YEAR: 2023-2024

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

NANDYAL-518501, NANDYAL (Dt) Andhra Pradesh, INDIA

(Affiliated to J.N.T University, Anantapur)

(Approved by AICTE, Accredited by NBA Tier-I & NAAC with A+ Grade, Sanctioned UGC-DDUK & CPE, APSSDC SIEMENS TSDI and CMs Skill Excellence Dassault Centre, Participated in TEQIP-I)

(ESTD-1995)

CERTIFICATE

This is to certify that the Major Project work entitled "AUTOMATIC SIDE STAND RETRIEVING SYSTEM" that is being submitted by

Mr. S. HUSSAIN BASHA	**(20091A0327)**
Mr. B. DEEPAK	**(20091A0315)**
Mr. T. RAJENDRA	**(21095A0316)**
Mr. T. CHANDRA SHEKAR REDDY	**(20091A0311)**
Mr. C. CHARAN	**(20091A0314)**

in partial fulfilment of the award of the degree of B.Tech in Mechanical Engineering of the RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS), NANDYAL - 518501(AFFILIATED TO J.N.T.U., ANANTAPUR**)** is a record of bonafide work carried out by them under our guidance and supervision.

The results embodied in this Major Project work have not been submitted to any other university or institute for the award of any degree.

Project Guide	**HOD**
B. SURESH	**Dr. K. THIRUPATHI REDDY**
M.Tech,	M.Tech, Ph.D.
Assistant Professor of ME	

Examiner:

Date:

ACKNOWLEDGEMENT

All endeavors over a long period can be successful only with the advice and support of many well-wishers. We take this opportunity to express our gratitude and appreciation to all of them.

We would like to express our gratitude to **B. SURESH, M. Tech,** Assistant Professor of Mechanical Engineering for his valuable guidance and suggestions without which we could not have completed this project.

We sincerely acknowledge our sense of gratitude and heartful thanks to our Head of ME **Dr. K. THIRUPATI REDDY, BE (Mech.), MTech, Ph.D., MISTE, ASME** for helping us with his timely and valuable solutions to the problems that we encountered in all stages.

We thank our reverend **Dr. JAYACHANDRA PRASAD, ME, Ph.D., Principal** for helping us in many records throughout the work.

We are greatly indebted to Sri **Dr. M. SANTHIRAMUDU**, chairman of the college and giving us the opportunity to fulfill the project.

We express our heartful thanks to teaching and non-teaching faculty staff, department of M.E, RGMCET, and NANDYAL for their warm encouragement and valuable time for completing project.

CONTENTS

LIST OF FIGURE

ABSTRACT

In today's world, two-wheelers serve as vital transportation means, facilitating our journeys to desired destinations. However, accidents often result from drivers' negligence, commonly due to excessive speed, lack of awareness, or simply forgetting to retract the side stand. The side stand is crucial for stabilizing parked two- wheelers. Therefore, we propose an innovative solution: an "Automatic Side Stand Retrieval System. This system operates through a microcontroller program, seamlessly integrated into the vehicle. It effectively addresses the issue by receiving input signals from the handlebar lock. Upon detection of the lock's status, the microcontroller initiates the motor's rotation, retracting the side stand mechanism. Importantly, this system is engineered to consume minimal power,ensuring it doesn't compromise the vehicle's efficiency. Furthermore, its universal design makes it suitable for implementation across all types of two-wheelers.

CHAPTER 1

1. INTRODUCTION

In the current era, the significance of two-wheelers in our daily lives has grown significantly. They are pivotal in facilitating our commutes to various destinations. However, accidents often stem from drivers' negligence, such as speeding, lack of awareness, or forgetting to retract the side stand while parking. The side stand plays a crucial role in stabilizing parked two-wheelers. Hence, we introduce an innovative solution: an "Automatic Side Stand Retrieval System."

This system operates via a microcontroller program seamlessly integrated into the vehicle. It effectively tackles the issue by receiving input signals from the handlebar lock. Upon detecting the lock's status, the microcontroller triggers the motor's rotation, retracting the side stand mechanism. Importantly, this system is designed to consume minimal power, ensuring it does not compromise the vehicle's efficiency. Moreover, its universal design makes it suitable for implementation across all types of two-wheelers. The system utilizes a spring mechanism to facilitate the side stand's retrieval. It requires minimal power, thus preserving the vehicle's efficiency. This feature eliminates the need for a specially designed automobile stand. As accidents continue to rise, primarily due to speeding and negligent driving, To mitigate this risk, various automatic side stand retrieval systems have been developed. These systems utilize electronic control units (ECUs), mechanical actuators, or a combination of both to detect when the motorcycle is in motion and retract the side stand accordingly. By automating this process, these systems offer an additional layer of safety and convenience for riders. In this introduction, we will explore the challenges posed by engaged side stands, the limitations of existing methods, and the rationale behind the development of automaticsidestandretrievalsystems.

project of an automatic side stand lifting mechanism addresses a commoncause by preventing for getfulness in lifting the stand. Technological advancements have made it easier to integrate this system into various two-wheelers, albeit limited to those equipped with foot gear arrangements. This innovation represents a significantstep forward in two-wheeler safety, potentially averting unnecessary accidents. Moreover, it's a simplemechanism that doesn't alter the original position of the two-wheeler and is cost-effectivetoimplement

Fig 1.1 EXPERIMENTAL EQUIPMENT AND INSTRUMENTATION

1.2 DC MOTOR:

A wiper is one of the most familiar of automotive accessories .wipers are used to clean vehicle windshields to give drivers a clear ,unobstructed view of the road ahead no matter what the weather ,in our project we are using DC Motor for retrieve sides stand.

Fig1.2 DC Motor

1.3 SIDE STAND

Side stand is a mechanical instrument which is used to support the vehicle when it is parked to stand still.It works on the spring mechanism which makes it more flexible when the side stand has to be retrieved back to ride the vehicle.

Figure 1.3 side stand

CHAPTER-2

2.1 LITERATURE SURVEY:

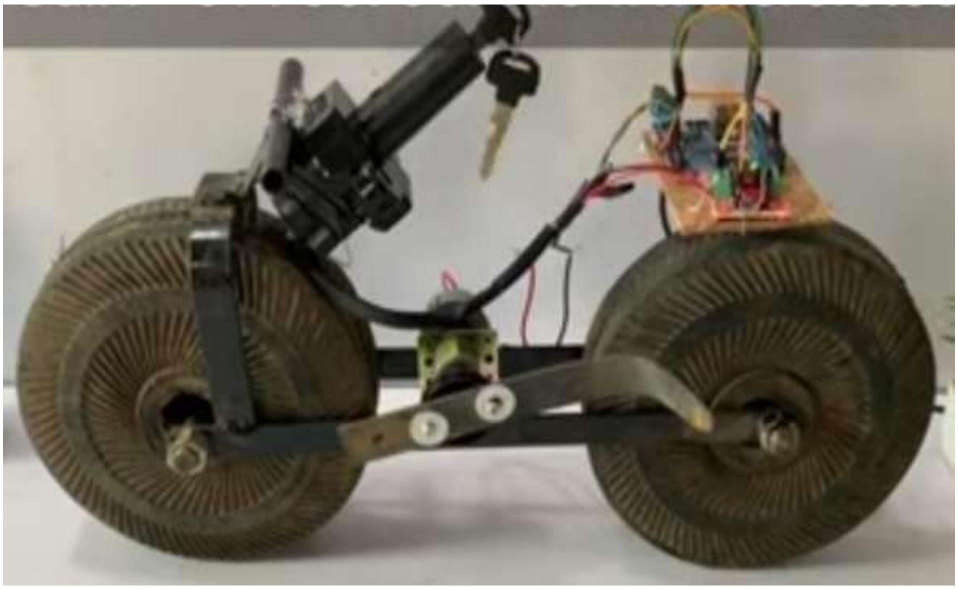
Sanjeev N K has developed a Bike Side Stand Unfolded Side Lock Link system, aiming to enhance rider safety. This mechanism involves the side stand lock link making contact with the gear lever, signaling to the rider if the side stand is unreleased when attempting to apply the gear. This prevents potential accidents and ensures a safe ride by alerting the rider to the unreleased position of the side stand. By avoiding riding in such a state, the system helps maintain the motorcycle's center of gravity, preventing imbalances or surface hindrances that could endanger the rider's life. Moreover, this side stand lock link can be easily fitted to any motorcycle with minor dimensional adjustments.In the past, some motorcycles were equipped with alarm systems for the side stand. However, these systems often faced issues such as battery and wiring problems, rendering them ineffective.

Additionally, other mechanisms requiring external power sources, like those powered by the chain drive, faced reliability issues due to regular power losses. As a result, these attempts to address the sidestand issue proved inadequate.

The engaged side stand poses a risk of accidental damage, while electric-based automatic retrieval systems are dependent on power, which can be risky due to moisture limitations. Existing methods to prevent such accidents include modern Electronic Control Units (ECUs) and mechanical projects.Modern ECUs, with their fast processors, monitor various motorcycle functions, including side stand position, through indicators on the dashboard. However, these indicators may be overlooked, leading to the need for mechanical.

.

2.2 METHODOLOGY



2. EXPERIMENTAL METHODS:

MICROCONTROLLER PROGRAM

Our experiment works on an Microcontroller program, where it takes the input signals from the hendel lock and it passes the signal to the Microcontroller board to start the motor to rotate, to retrieve the sidestand mechanism.

```
int encoder = 2, relay = 3; unsignedint rpm;

   volatile byte pulses; unsigned long tOld; unsignedintpulseturn = 12;
void counter(){pulses++;

}

voidmotorOn(){ digitalWrite(relay, HIGH); delay(500);
```

```
voidmotorOff(){
                              digitalWrite(r
      elay, LOW);delay(500)


 } void setup() { Serial.begin(9600); pinMode(encoder,
 INPUT); pinMode(relay, OUTPUT); attachInterrupt(0,
 counter,     FALLING); pulses = 0; rpm = 0; tOld = 0;
 }

 void loop() { if(millis() - tOld>= 1000){
 detachInterrupt(0); rpm = (60
 *1000/pulseturn)/(millis() - tOld)*pulses; tOld
 = millis(); pulses = 0;
 Serial.print("RPM: "); Serial.println(rpm); if(rpm > 50){
 motorOn(); }else{motorOff();
 }
            attachInte
         rrupt(0,
         counter,FAL
         LING);
 }}
```

CHAPTER-3

ATmega16Microcontroller

3.1 Introduction:

Microcontrollers are integral components, often serving as the central "brain" in mechatronic systems. They function akin to miniature, self-contained computers, programmable to interface with both system hardware and users. Even rudimentary microcontrollers can execute basic arithmetic operations, manage digital outputs, and monitor inputs. With the evolution of the computer industry, microcontroller technology has advanced significantly. Newer models boast enhanced speed, expanded memory, and a myriad of input and output capabilities surpassing predecessors. Modern controllers commonly feature analog-to-digital converters, high-speed timers, interrupt capabilities, pulse-width modulated outputs, and serial communication ports.The microcontroller and development board utilized in this lab were generously provided by Atmel. In the industry, the cost of development boards typically ranges from $50 to $400, while professionalcompilers and programming interfaces can add up to $1000. Given their delicate nature, it's essential to handle microcontrollers and development boards with care and respect. Static charges pose a particular risk, necessitating precautions. Before touching the STK500 board or any integrated circuit board, dissipate any static charge accumulated on your body. Utilizing an ESD wrist strap connected toa grounded mat is optimal. In the absence of such equipment, touching a grounded.

3.2 The ATmega16 microcontroller

In this lab, we utilize the ATmega16 microcontroller, housed in a 40-pin wide DIP (Dual In Line) package chip. The choice of this chip stems from its robust design, offering durability in various applications. Moreover, the DIP package facilitates seamless integration with common prototyping supplies like solderless breadboards and solder-type perf-boards. Alternatively, the same microcontroller is also available in a surface mount package, which is approximately the size of a dime.Surface mount devices excel in scenarios requiring mass production circuit boards.

Included in Figure 1 is the pin-out diagram of the ATmega16. This diagram serves as a crucial reference, detailing the appropriate connections for power and ground, as well as mapping out which pins correspond to specific functional hardware components. Understanding this pin-out layout is essential for proper configuration and interfacing within the system.

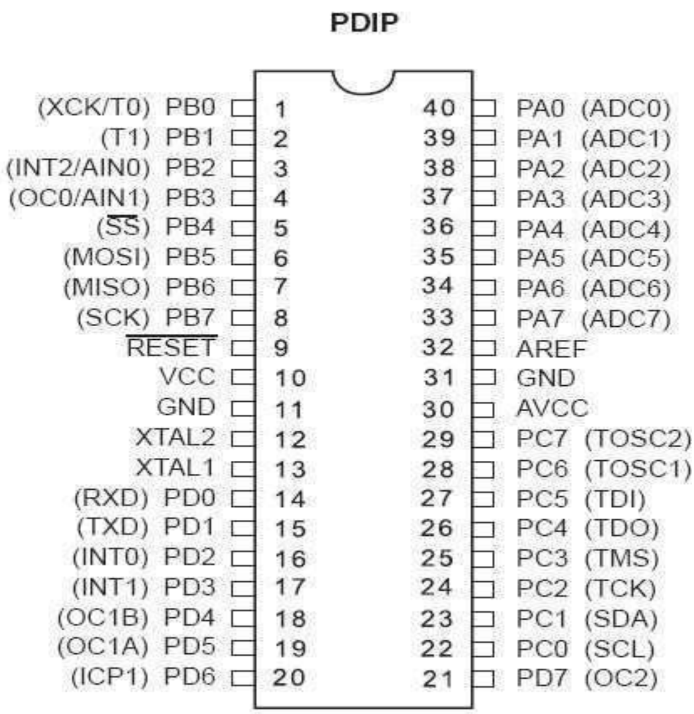


Figure 3.1PDIP

The lab instructions emphasize the importance of familiarizing oneself with the ATmega16 microcontroller beyond what's covered in the provided materials. This involves locating and saving the ATmega16 manual for future reference. The manual can be found in PDF format on Atmel's website(www.atmel.com), AVR Freaks (http://www.avrfreaks.net/), or through web searches. This document contains comprehensive information about the ATmega16's features and their utilization.An essential aspect highlighted is the necessity to determine certain specifications of the ATmega16, such as the number of channels for its 10-bit A/D converters and the amount of in- system reprogrammable flash memory. To acquire this information, one would refer to the manual.Specifically, the ATmega16 datasheet would provide details regarding these features.

3.3 STK 500 Interface Board

The hardware utilized in this setup includes the STK500 development board, which offers versatility by being compatible with various microcontrollers in the AVR family. Referencing the STK500 user guide enables users to understand its capabilities fully. This development board facilitates seamlessinteraction with Atmel microcontrollers, providing convenient access to their I/O pins. SThe STK500 features two serial port connectors, one designated for programming devices and the other serving as a spare RS232 port. Additionally, it includes a power supply switch and connector for powering the board. For general use, the board provides eight LEDs and eight switches. Various jumpers are also available for configuring the board to suit specific requirements.

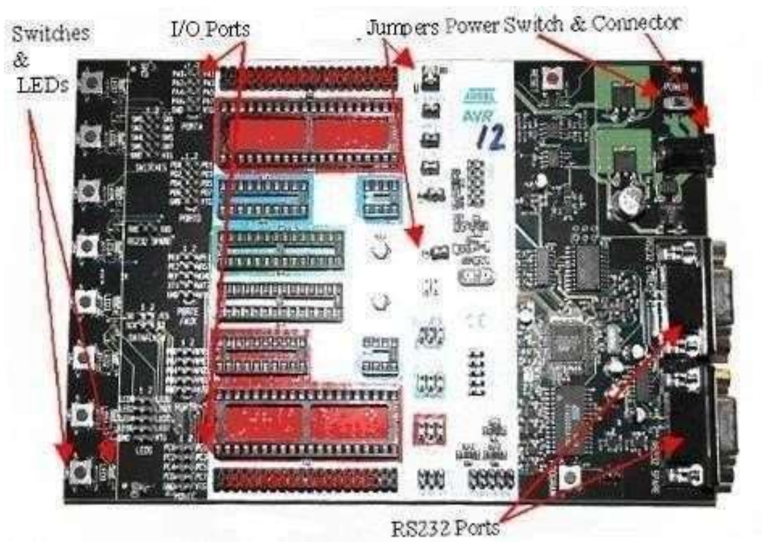


Figure 3.2 STK500 development board.

The development board mentioned is designed to be "universal," accommodating AVR microcontrollers. It's important to pay attention to the indicated features' locations, as highlighted bythe arrows. Before proceeding with the procedure, it's advisable to verify the default jumper settingson the STK500, as depicted in Figure 3. This ensures that the board is configured correctly for the intended use.

Figure 3.3

Interface board

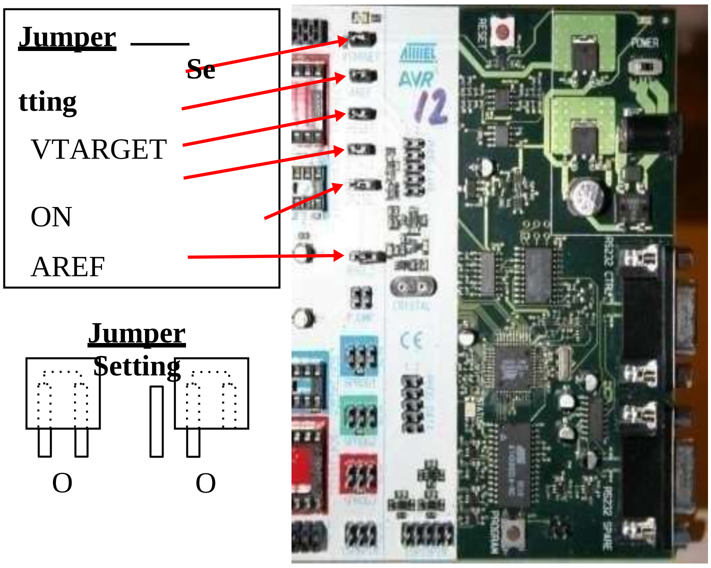


Figure 3.2 The default jumper settings for the STK500

For correct configuration, the STK500's default jumper values are essential. Jumpers are plastic housingswith two female sockets connected by a metal conductor that may be turned ON or OFF. The pins are linked when the pins are in the ON position. To prevent loss and guarantee availability for upcoming changes, the jumper is only placed on one of the two pins when the pins are in the OFF position. The tworightmost pins out of the three should be connected to the OSCSEL jumper in order to pick the on-board clock signal.

The ISP programming mode is used to communicate with the microcontroller and download programs. This requires connecting the 6-pin ISP ribbon cable from the STK500's ISP6PIN connector to the 6- pin SPROG3 header, which is shown in red above, as shown in Figure 4. It is critical to align the red pin1 stripe on the ribbon cable with pin 1 on each header. Once this connection is made, the STK500 interface board is ready to utilize in lab activities.

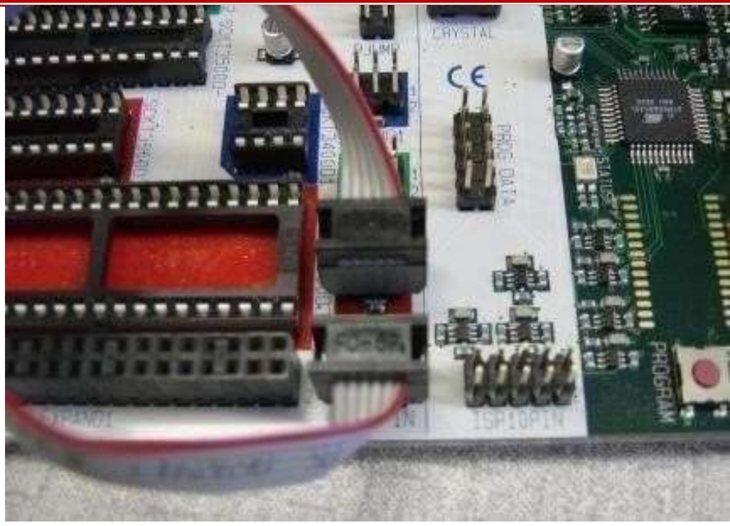


Figure 3.3 To program the ATmega16

Make a connection with the 6-Pin ISP ribbon cable. Connect the ISP6PIN header set on the STK500 to the SPROG3 header set shown in red, aligning the red stripe on the cable with pin 1 on both header sets.This connector facilitates communication between the microcontroller and Programs and data can be transferred with ease using 48 programming equipment.Programs and data can be transferred with ease using 48 programming equipment.

3.1 WinAVR:

There are several techniques of writing, compiling, and downloading programs for the ATmega16 microcontroller. Various text editors, compilers, and utilities support a variety of languages, including C, BASIC, and assembly code. Some of these tools are free, while others require a licence charge. In this course, we will use WinAVR, a freeware collection of software tools designed specifically for Atmel AVR family RISC microprocessors running on the Windows platform.

Although assembly language can produce code quickly and effectively, its use is limited by the specific instruction set of each processor type. Therefore, learning might not be useful until for tasks using particular microcontrollers or necessitating exact timing and memory utilization. On the other hand, cross-platform compatibility and widespread industry use are features of the C language. Programming on several microcontroller systems is possible with knowledge of C, as long as a compiler is able to convert C code into the assembly language required by the particular controller. Being freeware and open-source, the GNU-C compiler is a fundamental tool for writing code for many microcontrollers and operating systems, including Windows and UNIX.There are AVRFREAKS everywhere!

AvrFreaks.com (http://www.avrfreaks.net/) is a website devoted to Atmel AVR processor aficionados. Itoffers links to obtain the most recent versions of software, thorough details on Atmel CPUs, both old and new, including user guides, technical white papers, and other materials, as well as interactive discussion forums where users may exchange ideas and ask questions. Although user registration may be required for certain 54 chat boards and downloadable products, it is afree process. It is recommended that individuals (1) create an account on AvrFreaks.net in order to gain access to these materials. It is suggested that you read Eric Raymond's well-known piece, "How to Ask Questions the SmartWay,"whichmaybefoundathttp://catb.org/esr/faqs/smart-questions.html, before posing questions on the AvrFreaks forums or any other online forum. icon or select it from the Start Menu. Then, navigate to Project -> New Project from the drop-down menus, or select New Project from the pop-up window that appears upon launching AVR Studio.

- Choose AVR GCC and fill in the Project name field with a meaningful name (such as InitialAVR project).Uncheck the box labeled "Create initial file" since you will be utilizing the providedsource code. Verify the "Create folder" field.To make sure you know where you are saving files, browse to make sure the Location (where your projectwill be saved) already exists. Any files left on the lab computers could be changed or removed at any time, so make sure you eventually copy your project files onto a USB drive or email your source files to yourself.
- Press the Next >> button.
  Choose AVR Simulator from the list of platforms to debug.
  In the Device field, choose ATmega16 (not ATmega16A). (Scroll down to find it.)Press the "Finish"button.
  Utilize the Project -> Configuration Options drop-down menu to customize the settings for your project.

- 8000000 is the new frequency box to use. Eight million, excluding the commas. Keep in mind that you likely overlooked this step if you get an error about F_CPU undefined.) Set the Optimization box value to
  -O2.To include directories, click the button on the left. Using the browse ellipse "...", click the New Folder icon in the upper right corner of the screen to add your project folder (which looks as.\) that youcreated in Step #3. Select OK.

The frequency and optimization should be set as previously indicated, to the left. Additionally, you mustadd the directory containing your source code (denoted.\) by selecting the Include Directories option, creating a new folder, and navigating to the location on the computer as previously demonstrated.

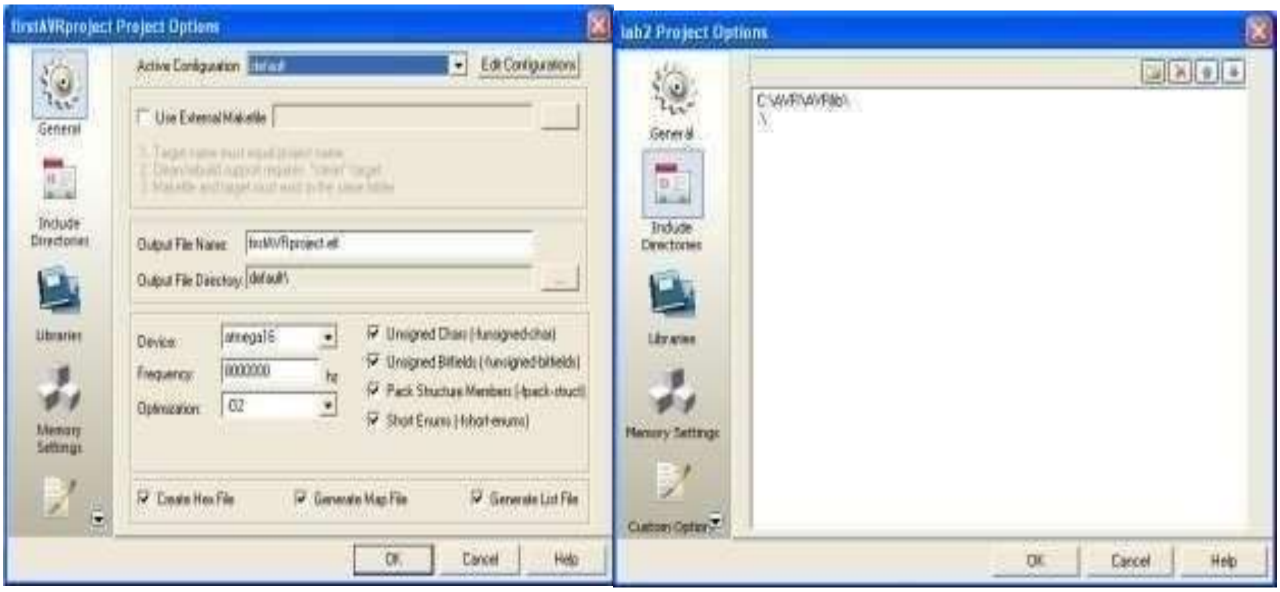


Figure 3.5 Utilizing AVR Studio, create a project.

rightward. You must specify the location of other project folders and libraries' directories if you utilize their code. Furthermore, AVRlib was used in the example above.

AVRlib is not required for this lab.

- Please get the lab code by visiting the class webpage. Put the files in the project file you made in stepthree. The necessary files are:

• uart.c	uart.h	main_intro.c

The purpose of this code is to demonstrate how to transfer text strings from the microcontroller to an other device—in this example, a PC. Serial RS-232 protocol is the one being utilized. You can learn more about RS232 by visiting http://en.wikipedia.org/wiki/RS-232.Sending binary data between two points will be possible with RS-232 connection, and this will be beneficial for interfacing with external devices, such as sensors on.

- Hold down the CTRL key and select the other option, then click OK. To add uart.h to the HeaderFiles folder, start by right-clicking on the folder icon

Figure 3.6 Adding source files.

Adding source files. Add the C source and header files to the relevant project folders.

You are now ready to put together your first project! Go to the main menu and pick Build. (You In the future, you can also use F7 or the Build button from the toolbar. "Build" compiles yoursoftware.If you find any mistakes, fix them before continuing. AVR Studio's bottom Build panel displays compiler messages. Double-clicking on an error line in this window will direct you to the corresponding line in your program. Consult a TA for assistance if necessary. Before proceeding,check the Build log window for the final message indicating no issues. You're almost ready to transfer your program to the ATmega16 microcontroller! Connect the serial connection from COM1 on your computer.

Figure 3.7 AVR Programmer Toolbar

AVR Programmer's Toolbar. The "Connect" button opens the STK500 Programming Dialog Box. To access a list of available programming hardware, connect and power on your STK500, then select "STK500" and "Auto."

- In the Fuse tab, ensure that the fuses are properly set, as indicated in Table 1 and Figure 9. Fuses are bits in the ATmega16 EEPROM that control clock source, oscillator options, and brown-out detection. To learn more about fuse bits, go to the ATmega16 manual pages. The fuse bits only have to be programmed once.

- Make sure they are configured so that your ATmega16 can function properly! Since we are not utilizing a bootloader, it is unlikely that the Boot Flash will affect any applications written in ME 106.You may customize the size of the sections. Choosing the least number provides more room for yourprogram code.

Check the fuse settings for the ATmega16

- Boot Flash section size: 256 or 512 words, starting at $1F00 or $1E00, respectively.
- The brown-out detection level is set at VCC=2.7 V.
-
- The internal RC oscillator is tuned at 8MHz with a starting

Table 1: ATmega16 Fuse Settings

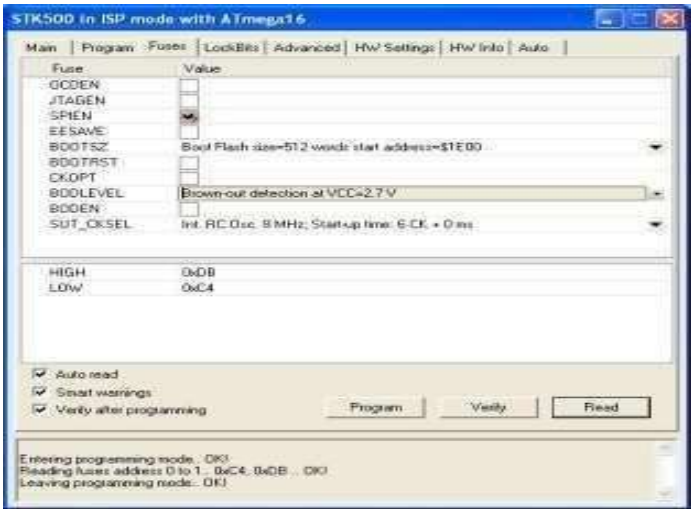


Figure 3.8 AVR Fuse Selection

AVR Fuse Selection. These fuses should only be set the first time a new chip is used. In the HW Settings tab, ensure that the STK500 clock generator frequency is set to 3.686 MHz and the ISP frequency field is less than 1/4 of the ATmega16 clock speed (the ATmega's internal clock is set to 8 MHz, thus 1.843 MHzshould enough.) Figure 10 displays the HW Settings tab on the right and the Main tab on the left, which allows for selection of the ISP frequency. If you changed the fuse settings or ISP frequency, hit "Program" to burn the fuses to the ATmega16

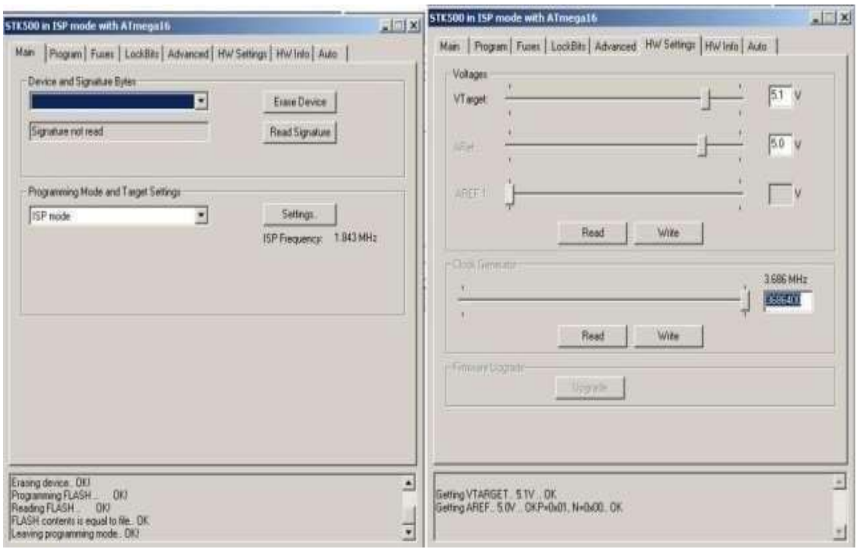


Figure 3.9 STK500 ISP

STK500 ISP and hardware settings. The STK500 employs the ISP (In System Programming) protocol to program the ATMega16. Setting the ISP frequency too high might cause communication issues. If the ISPfrequency is too low, it will take a long time.It's time for your software to be downloaded to the microcontroller.If you see a "ISP Mode Error" dialog box with text such as "A problem occurred...", ensure that your RS-232 cable and 6-pin jumpers are correctly connected. Your STK500 is switched on.

The serial cable is attached to the 9-pin connection designated "RS-232" rather than "SPARE".The 6-pin ribbon cable is attached to the ISP6PIN and SPROG3 headers. Hyperterminal is not linked to the COM.Now you may download the software to the chip! See Figure 11 below. Select the Programs tab. To pick the hex file for your application, click the browse button ("...") next to the "Input .

The default folder. The hex file's extension will be.hex. The hex file includes the compiled program,converted into byte code for the microcontroller.To download the hex file to the microcontroller, navigate to the Flash area and click the Program button.The progress meter will refresh for a second or two, followed by a succession of "OK" notifications.If any one of these Now that you've downloaded your software, it should start! To validate, use HyperTerminal to recordyour program's output to the PC monitor. Power off the STK500.

Using the power switch. Disconnect the serial cable from the RS232 CTRL connection and attach it to theRS232 SPARE connector on the STK500. Connect the transmit and receive pins of the ATmega16's UART0 port to the RS232 SPARE connection. Connect the PD0 and PD1 pins of the PORTD header to the RXD and TXD pins (respectively) of the RS232 using the two-wire jumper included in your lab kit.In this lab, we will utilize two 10-pin ribbon wire jumpers to link the SWITCHES header to the PORTA HEADER and the LED header to the PORTB header.

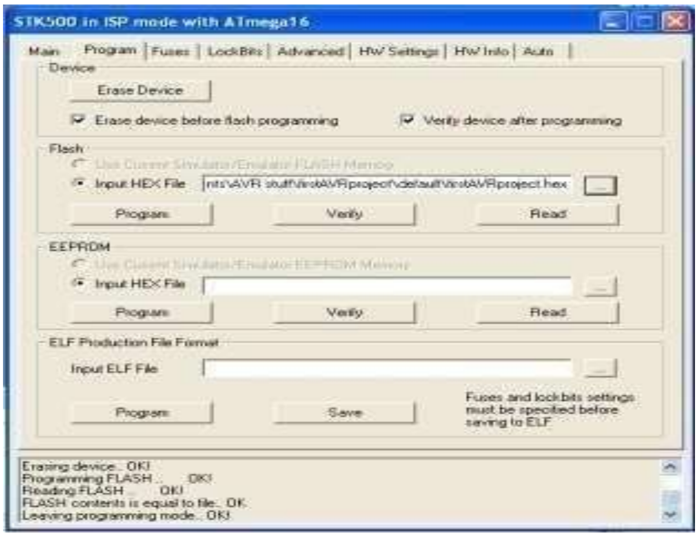


Figure 3.10

STK500 programming dialog box.

What is seen on your screen? Was this what you expected? Please note that the floating point numberis not properly shown. To resolve this issue, go to the uart.h program header file comments.

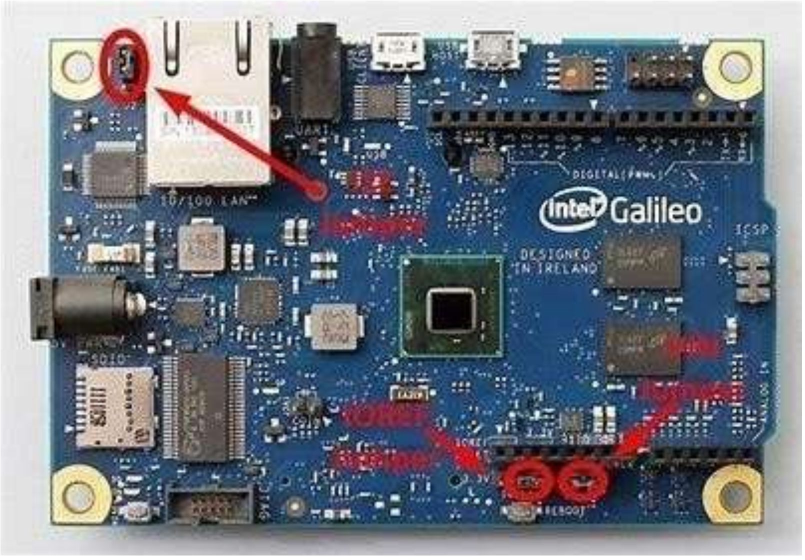


Figure 3.11 Connection of 2-pin jumper and 10-pin jumpers

Connection of 2- and 10-pin jumpers. The RS232 SPARE header's RXD and TXD pins link to pins PD0and PD1 via a two-wire jumper. Two 10-pin ribboncable jumpers link the SWITCHES header to the PORTA HEADER.Combine the LED header with the PORTB header. When connecting the jumper, ensure the red stripe isconnected to pin 1 at both ends of the headers.

We appreciate Atmel Corporation's tremendous assistance in supplying AVR Starter Kits, STK500boards, and AVR devices to San José State students and teachers.

1. Appendix A: Installing WinAVR and AVR Studio. The steps below will show you how to install WinAVR and AVR Studio. Visit www.avrfreaks.net for assistance with installation on your operating system. Please note that the default folders are utilized, however you can modify them if required while constructing.

To install WinAVR, follow these steps: - Download the latest version from http://sourceforge.net/projects/winavr - Run the installation application by double-clicking the self-extracted file.

- versioninstall.exe (where version represents the current version).
- Use the default options unless there are compelling reasons to do differently.

After installation, the README file will be shown in your browser window. Please read thefollowing!Installing AVR Studio.

- Download the current version of AVR Studio (free registration needed)andanyapplicableServicePacksfrom http://www.atmel.com/dyn/products/tools_card.asp?tool_id=272 5 Double- click the installation file.
- During installation, maintain all of the default parameters and program placements. During installation,if AVRStudio prompts you to install the Jungo USB Driver, choose Yes.

This allows you to use USB-based AVR programmers, like the AVRISP mkII and AVR Dragon. Congratulations! You are ready to program the ATmega16 with WinAVR and AVR Studio.Appenix B:Handling ISP Mode Error

Figure 3.12 ISP Mode Error

B1: ISP Mode Error. This error may occur when programming a new Atmega microcontroller or when theRS232 or ISP programming connection is not correctly attached.If you see this problem, ensure that both the RS232 and ISP programming cables are properly connected.connectedproperly. If the issue persists after double-checking cable connections and retrying the download, you may need to temporarily alter the ISP's programming frequency.To accomplish this:

- Click the Connect icon to open the programming dialog box.

  To change the ISP frequency to 57.6 kHz, navigate to the Main page, then select the Settings button in the"Programming Mode and Target Settings" section (see Figure B2).
- Click the Write button, then the Close button.

  Return to the Fuses tab and choose the checkboxes and pull-downs as instructed.Click "Program" toignite the fuses. Verify that the fuses have been set.

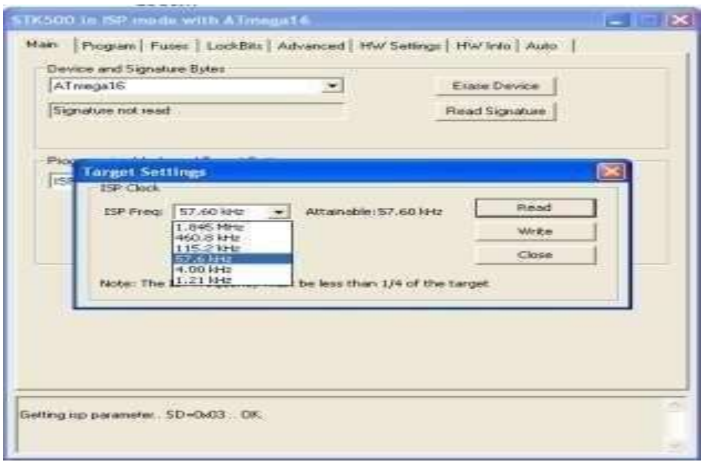


Figure 3.13 Temporarily changing the ISP frequency

Changing the ISP frequency on a temporary basis. When programming a new microcontroller, it may berequired to utilize a slower frequency to correctly establish fuses. Try 57.6 kHz. After programming the fuses, reset the frequency to 1.845 MHz before proceeding to Program your microcontro

Figure 3.14 L293D Motor Driver I

Pin Number	Pin Name	Descripton
1	Enable 1,2	This pin activates Input 1(2) and Input 2(7) pins.
2	Input 1	Directly governs Output 1 pin and is Controlled bydigital Circuits
3	Output 1	Linked to one terminal of Motor 1.
4	Ground	These pins are Grounded, connected to the circuit's ground(0V)
5	Ground	These pins are also Grounded, connected to the circuit's ground(0V)
6	Output 2	Connected to the other terminal of Motor 1.
7	Input 2	Directly governs Output 2 pin and is Controlled bydigital
		Circuits.
8	Vcc2 (Vs)	Linked to the Voltage pin for motor operation (4.5Vto 36V).

Table: DC Motor Inputs And Outputs

FEARURES:

- FEATURES: Peak motor current: 1.2A
- Maximum Can be used to run Two DC
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V

3.1 H bridge:

An H directions. These circuits, commonly used in robotics and other applications, enable the forwardand backward operation of DC motors.

They are essential components in DC-to-AC converters (power inverters), AC/AC converters, DC-toDC push-pull converters, motor controllers, and a variety of other power electronics applications

Bipolar stepper motors frequently use motor controllers with two H bridges for operation. H bridges are availableas integrated circuits or discrete components. The term "H bridge" is derived from the standard graphical representation of such a circuit. An H bridgeconsists of four switches, either solid-state or mechanical.

When switches S1 and S4 are closed (but S2 and S3 are open), a positive voltage is provided to the motor, allowing for forward operation The term "H bridge" is derived from the standard graphical representation of such a circuit. An H bridgeconsists of four switches, either solid-state or mechanical.

When switches S1 and S4 are closed (but S2 and S3 are open), a positive voltage is provided to the motor, allowing for forward operation.

To reverse the voltage, open switches S1 and S4 and close switches S2 and S3, which allows the motor tooperate in reverse. To avoid short circuits on the input voltage source, switches S1 and S2 should not be closed simultaneously, nor should switches S3 and S4. This circumstance, known as shoot-through, should be avoided.

Reversing the voltage is achieved by opening switches S1 and S4 and closingswitches S2 and S3,facilitating reverse operation of the motor.

The term "H bridge" is derived from the standard graphical representation of such a circuit. An H bridgeconsists of four switches, either solid-state or mechanical.

When switches S1 and S4 are closed (but S2 and S3 are open), a positive voltage is provided to the motor, allowing for forward operation.

To reverse the voltage, open switches S1 and S4 and close switches S2 and S3, which allows the motor tooperate in reverse.

To avoid short circuits on the input voltage source, switches S1 and S2 should not be closed simultaneously, nor should switches S3 and S4. This circumstance, known as shoot-through, should be avoided.

The H-bridge arrangement is generally used to reverse the polarity or direction of the motor.It can also be used to brake the motor by shorting its terminals, resulting in a quick stop, or to enable it to"free run" to a stop by detaching it from the circuit.

The operation summary is shown in the table below, with S1-S4 matching the picture above.Structure of an H bridge (highlighted in red).

Ensuring an optimal transformer design is crucial, aiming to minimize leakage inductance to prevent cross-conduction. Additionally, the transformer outputs usually require clamping by Zener diodes to protect the MOSFET gates from potential high voltage spikes

CHAPTER-4

PCB DESIGNING

Figure 4.1 PCB designing

For electronics enthusiasts, printed circuit boards (PCBs) are ubiquitous and immensely useful. Theseboards streamline projects by replacing messy wiring and breadboards, providing both mechanical support and electrical connectivity to electronic components. Typically composed of conductive tracks,pads, and features etched onto copper sheets laminated onto a non-conductive substrate, PCBs simplify the assembly process. With pre-designed copper tracks, PCBs reduce the need for extensive wiring, minimizing the risk of loose connections and faults. Components can be easily placed and soldered onto the PCB, saving time on debugging and verifying connections compared to traditional breadboarding methods.Components can be easily placed and soldered onto the PCB, saving time on debugging and verifying connections compared to traditional breadboarding methods.

Space What are the different ways to make a Circuit Board?

There are three primary methods for creating PCBs:

1. Iron-on Glossy Paper Method: This technique involves transferring the circuit design onto glossypaper using an iron.

2. Circuit by Hand on PCB: With this method, the circuit is directly drawn or etched onto the PCB

3. Iron-on Glossy Paper Method: This technique involves transferring the circuit design onto glossypaper using an iron.Circuit by Hand on PCB: With this method, the circuit is directly drawn or etched onto the PCBusing various tools.While the laser cutting edge etching method is typically an industrial process, we'll focus on exploringthe details of the first two methods for creating PCBs at home

4.1 PCB DESIGN

PCB design typically involves translating your circuit's schematic diagram into a PCB layout using specialized PCB layout software. Fortunately, there are numerous open-source software packages available for creating and designing PCB layouts. Here are some notable examples to help you get started:

To design your circuit schematic in Eagle, follow these steps

Additionally, you'll require the following materials and tools: $FeCl_3$ powder or solution (commonly used as the etching solution), photo or glossy paper, a permanent black marker, a blade cutter, sandpaper, kitchen paper, and cotton wool.

For the purpose of this tutorial, let's focus on creating a PCB for a straightforward project: a TouchSwitch utilizing an IC555.

4.2 What materials are needed to create a circuit board

Required materials	
	Magazines or advertising brochures (More on this later).
	Laser printer Alternately, a photocopier should work
	Household clothes iron
	Copper clad laminate
	Etching solution
	Kitchen scrubs
	Thinner (e.g. acetone)
	Plastic coated wire

Figure 4.2 Materials Required

STEP 1: Take printout of circuit board layout

To obtain a printout of your PCB layout, utilize a laser printer and A4 photo or glossy paper. Ensurethe following considerations:

- Print the layout in mirror mode.
- Set the output color to black in both the PCB design software and printer driver settings.
- Ensure that the print is made on the glossy side of the paper for optimal results.

.

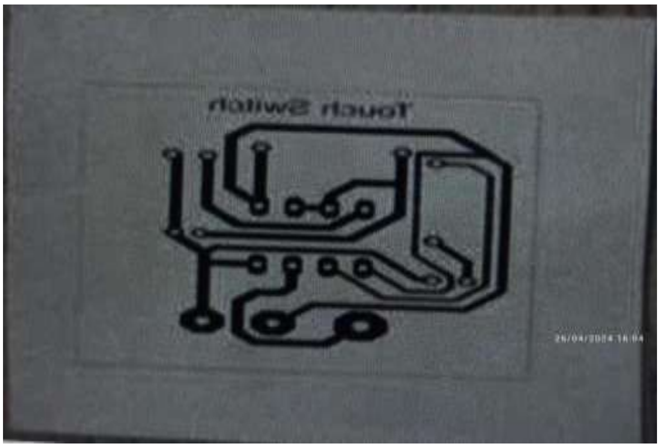


Figure 4.3 LAYOUT

STEP 2: Cutting the copper plate for the circuit board

Cut the copper board according to the size of layout using a hacksaw or a cutter.

Figure 4.4 Cutting the plate

Afterward, gently rub the copper side of the PCB using steel wool or abrasive sponges to eliminatethe top oxide layer of copper and the photoresist layer. This process also enhances adhesion for theimage from the paper.

Figure 4.5 Rubbing away the top oxide layer

STEP 3: Transferring the PCB print onto the copper plate

Method 1 Iron on glossy paper method (for complex circuits)

Transfer the printed image obtainedfrom a laser printer onto the board. Remember to horizontally flip the top layer. Position the copper surface of the board onto the printed layout, ensuring proper alignment along the borders. Securely hold the board and the Pay close attention to the edgesof the board, applying pressureand ironing slowly.

STEP 3: Transferring the PCB print onto the copper plate

- **Method 1 Iron on glossy paper method (for complex circuits):** Transfer the printed image obtainedfrom a laser printer onto the board. Remember to horizontally flip the top layer. Position the copper surface of the board onto the printed layout, ensuring proper alignment along the borders. Securely hold the board and the printed paper in place using tape.

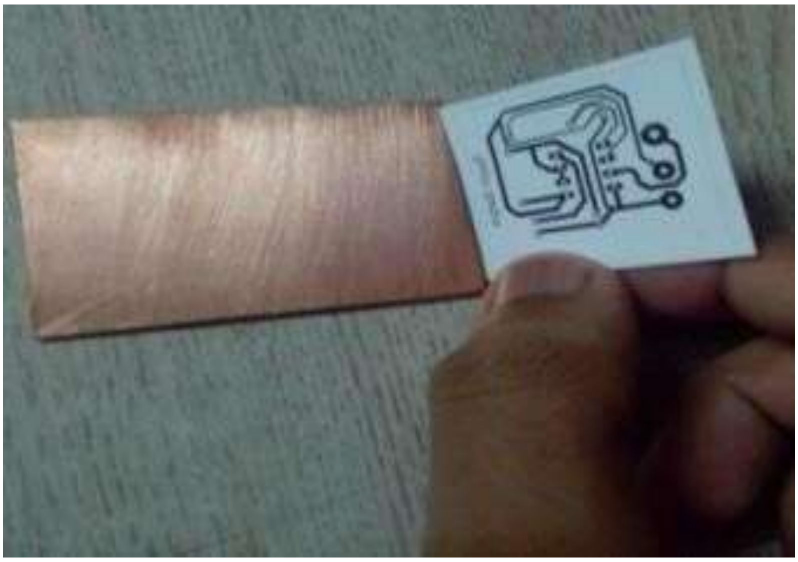


Figure 4.5 Place the printed side of the paper on the plate

Method 2 Circuit by hand on PCB (for simple and small circuits):

Referencing the circuit, sketch abasic outline on the copper plate using a pencil.

Figure 4.6 Darkening the trace

STEP 4: Ironing the circuit from the paper onto the PCB plate

After printing on glossy paper, place it image side down onto the copper side of the board. Heatup anelectric iron to its maximum temperature. Position the board and photo paper setup on aclean woodentable covered with a tablecloth, ensuring the back of the photo paper faces you. Hold one end of the arrangement steady using pliers or a spatula while placing the hot iron onthe other end for approximately 10 seconds. Proceed to iron the photo paper along its entirety using the iron's tip with light pressure for about 5 to 15 minutes. Pay close attention to the edgesof the board, applying pressureand ironing slowly. A sustained, firm press typically yields better results than moving the iron around. Through this process, the heat from the iron transfersthe ink printed**.**

Figure 4.7 Iron the paper onto the plate

Figure 4.8 Peeling the paper

CAUTION:

it will be very hot. Following ironing, immerse the printed plate in lukewarm water for approximately 10 minutes. Allow the paper to dissolve, then gently remove it. Peel off the paper from a low angle to ensure smooth

. Occasionally, during the paper removal process, some of the tracks may appear faint. If this occurs, use a black marker to darken them. In the figure below, you can observe that the track is light.

Figure 4.9 Darkening the trace

STEP 5: Etching the plate

During this step, it's crucial to exercise extreme caution. Follow these precautions:

1. Wear rubber or plastic gloves before proceeding.
2. Lay down newspaper on the surface to prevent the etching solution from damaging the floor.
3. Prepare a plastic box and fill it with water.
4. Dissolve 2-3 teaspoons of ferric chloride powder in the water to create the etching solution.
5. Submerge the PCB into the etching solution (Ferric chloride solution,$FeCl_3$)forapproximately30minutes.

6. The $FeCl_3$ will react with the unmasked copper, removing the unwanted copper from the PCBthrough a process called etching.
7. Use pliers to carefully remove the PCB from the solution and inspect whether the entire unmaskedarea has been etched. If not, return it to the solution for additional time.

Figure 4.10 Etching the plate

Carefully agitate the plastic box back and forth to ensure thorough interaction between the etching solution and the exposed copper. The chemical reaction is represented as follows: $Cu + FeCl_3 = CuCl_3 + Fe$. Every two minutes, inspect the PCB to determine if all the copper has been removed. If not,return it to the solution and continue waiting.

CAUTION: Always wear gloves when handling the plate containing the solution.

Figure 4.11 Etched copper plate

STEPS TO MICROCONTROLLER:

In this guide, I'll lead you through the process of programming an AVR chip using the AVRISP mkII.

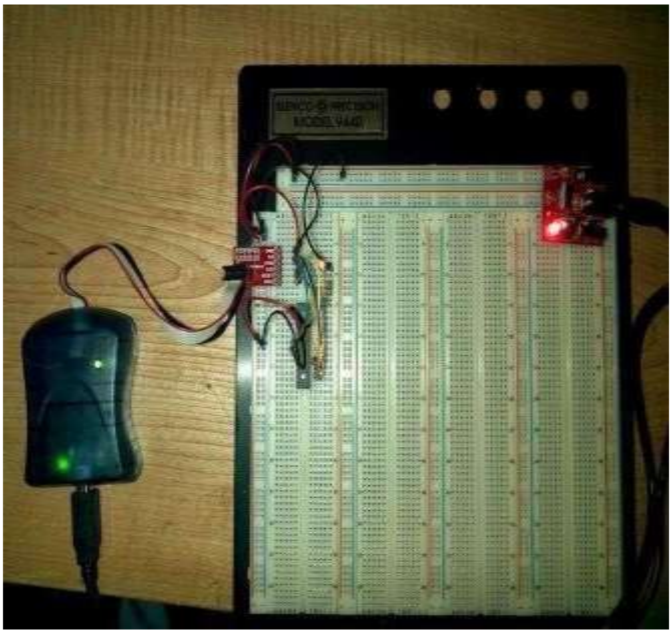


Figure 4.12 AVRISP

To program an AVR chip, you'll need the AVRISP mkII programmer, an adapter, abreadboard, and apower supply.

4.1 Hardware and Software Required

"Below is a compilation of items required."

Hardware

- 4.7K resistor
- 1k resistor
- LED
- AVR Chip: I‟ll use the atmega328p
- Programmer: AVRISP mkII
- AVR Programmer Adapter (optional)
- Jumper Wires

- 5V Power supply.

Software

Arrange the circuit For AVR Studio 5.

Simply find the pins in your programmer, match them to the pins in your chip and connect them.Also connect the resistor from

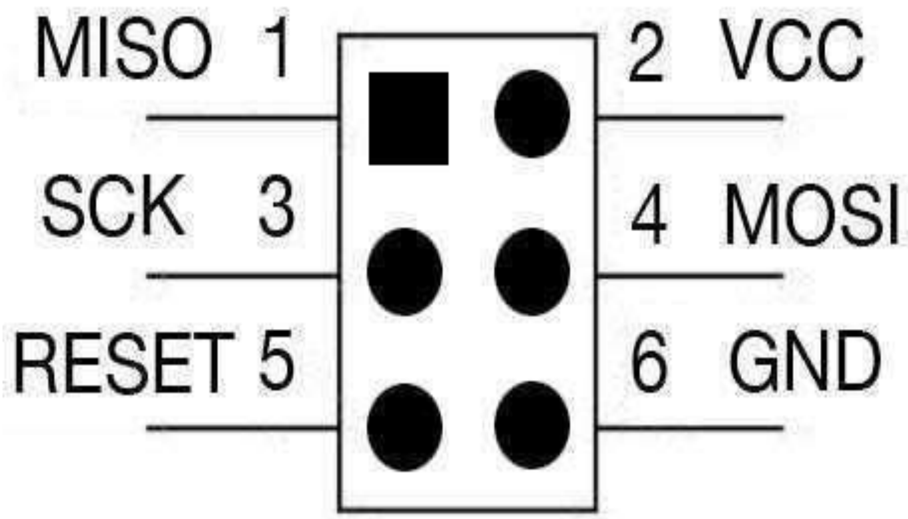


Figure 4.13 AVRISP MKII pins

Setting up a circuit for AVR Studio 5 involves several steps to ensure seamless integration between the hardware and software components. First and foremost, gather all the necessary components for your circuit, including the AVR microcontroller, power supply, crystal oscillator (if needed), and any peripheral devices such as sensors, LEDs, or input/output modules. Once you have the components ready, begin by carefully designing the circuit diagram using a schematic design tool or software. Ensure that all connections between the components are correctly represented, taking into account the pin configurations of the AVR microcontroller and the specifications of the peripheral devices. Next, proceed to assemble the circuit on a breadboard or a printed circuit board (PCB), following the schematic diagram as a guide. Take care to make secure and reliable connections, double-checking the wiring to avoid any potential short circuits or open connections.

After assembling the circuit, it's essential to verify its functionality by performing basic electrical tests, such as continuity checks and voltage measurements, to ensure that all components are properly connected and powered. Once the hardware circuit is confirmed to be operational, it's time to interface it with AVR Studio 5. Connect the AVR microcontroller to your computer using a suitable programmer/debugger, such as Atmel-ICE or AVRISP MkII, ensuring that the connections are secure and correctly aligned.Launch AVR Studio 5 on your computer and create a new project, selecting the appropriate AVR microcontroller model and configuration settings that match your circuit design. AVR Studio 5 provides a user-friendly interface for writing, compiling, and debugging code for AVR microcontrollers, making it easy to develop and test embedded applications. Write your code in AVR Studio 5 using the integrated development environment (IDE), incorporating functions and libraries as needed to interact with the peripheral devices connected to your circuit. Compile the code to generate the corresponding hex file, which contains the machine-readable instructions for the AVR microcontroller.

Figure 4.14 ATmega328p pin out

Certainly! Here's a rephrased version: "Since the programmer doesn't feature a single square hole—mine certainly doesn't—it boasts several. Let me demonstrate how that translates into reality. Interestingly, it resembles a mirrored image of the aforementioned illustration. Strange, isn't it?"

Figure 4.15 AVRisp mkII holes

Now that all the connections are in place...

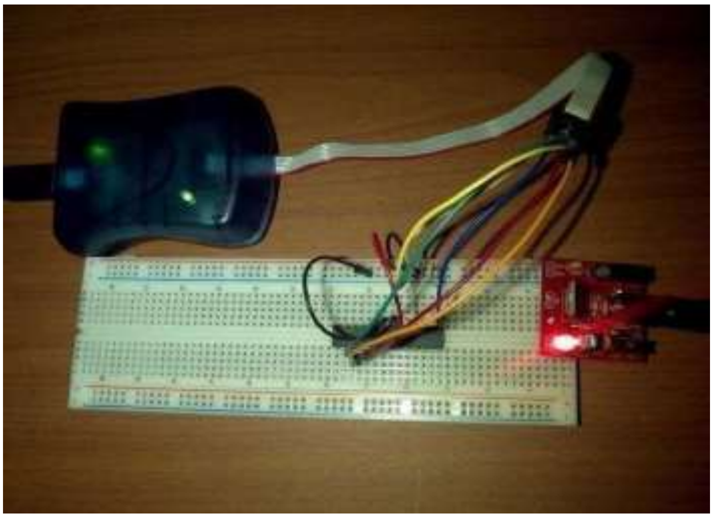


Figure 4.16 AVRISP mkII: circuit to program

Sure, here's a rephrased version: "Now, let's shift our focus to the software aspect. Refer to the image located at the top of this page to witness the improved organization of your circuit achieved with the programming adapter.". **Your First AVR Program**

Allow me to guide you through the process of using AVR Studio 5.Upon launching AVR Studio, proceed to select File, then New, and finally, Project.

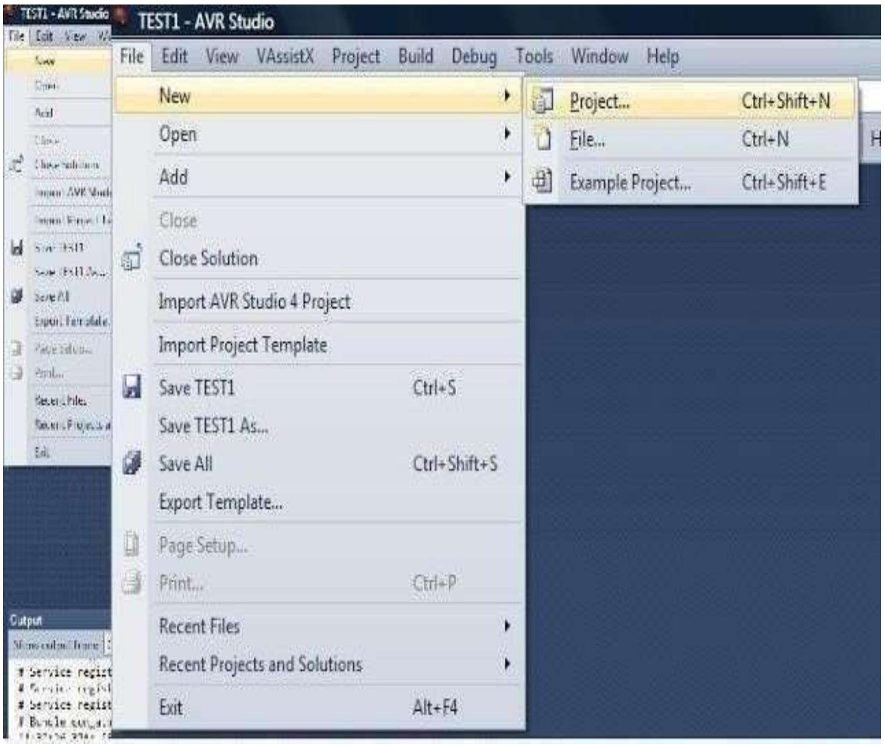


Figure 4.17 Starting a new project in AVR Studio 5 involves namingyour project;

for example, I named mine "firstprogram". Then, process and click ok

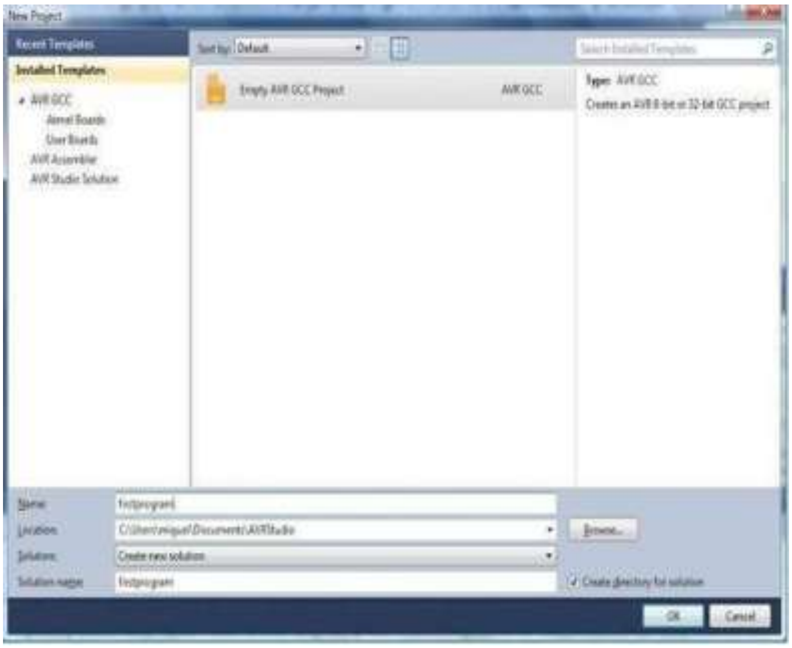


Figure 4.18 Giving Name

After naming your project, you'll encounter a nearly empty C file

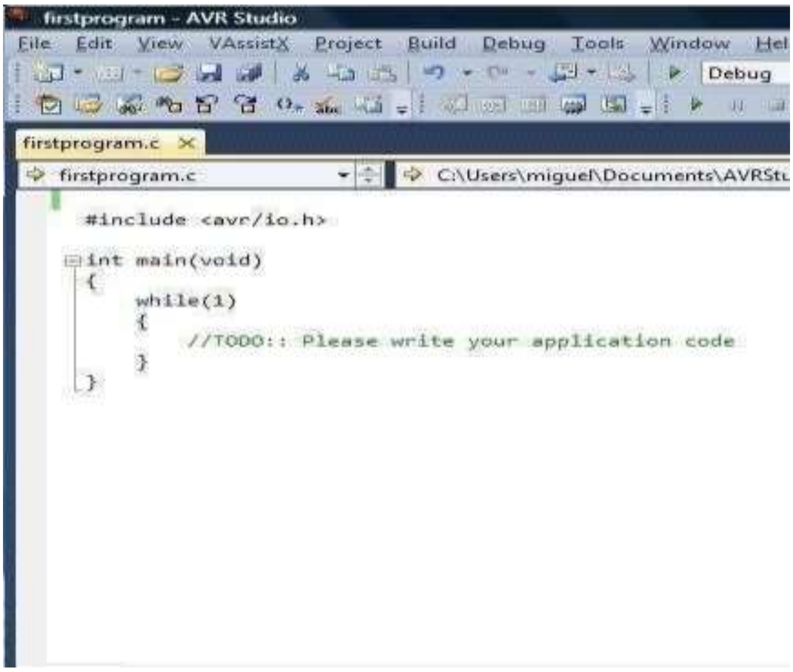


Figure 4.19 A blank template C file for AVR Studio is available.

Let's decide on the software we'll be creating. How about a simple LED blinker program? Connect anLED to port C5 of your microcontroller, ensuring it's connected through a 1k resistor and then grounded.

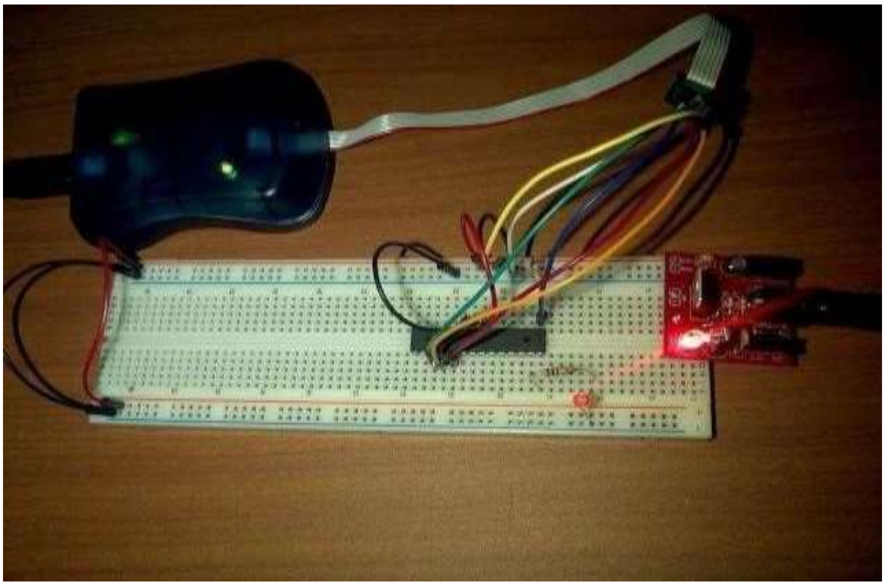


Figure 4.20 Attach a red LED to port C5 (pin 28) ofthe at me

Returning to AVR Studio, overwrite the content in the file with the

following text.#include <avr/io.h>

```
#include <util/delay.h>  //  Utilize delay  functions
from  avr-libcint  main(void) {

   // Set all C ports
   as outputDDRC =
   0xFF;while(1) {

      // Turn on all
      CportsPORTC
      = 0xFF

      // Wait for 200 milliseconds

      _delay_ms(200);
```

```
        // Turn
    off all C
    portsPORTC =
    0x00;
    // Wait for 200 milliseconds

    _delay_ms(200);

  }



  return 0;

}
```

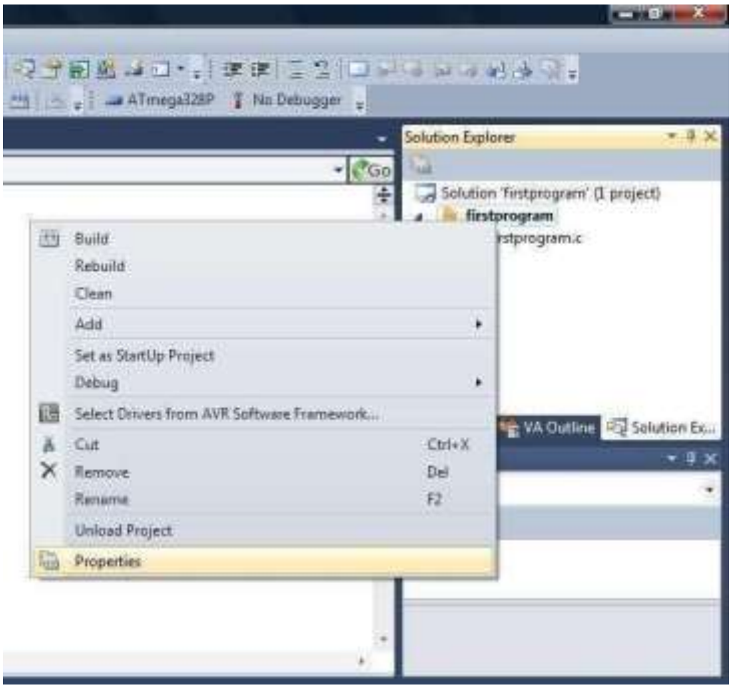


Figure 4.21 Selection of properties

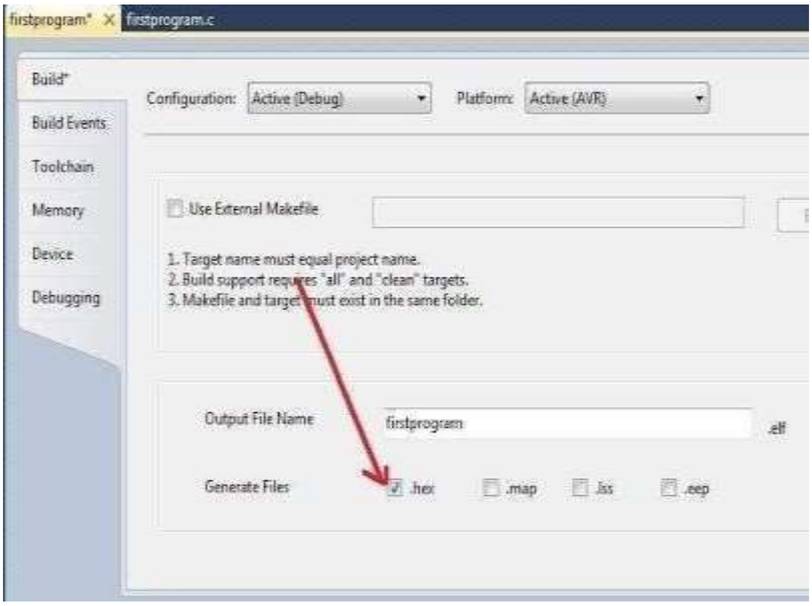


Figure 4.22 Use External Make file

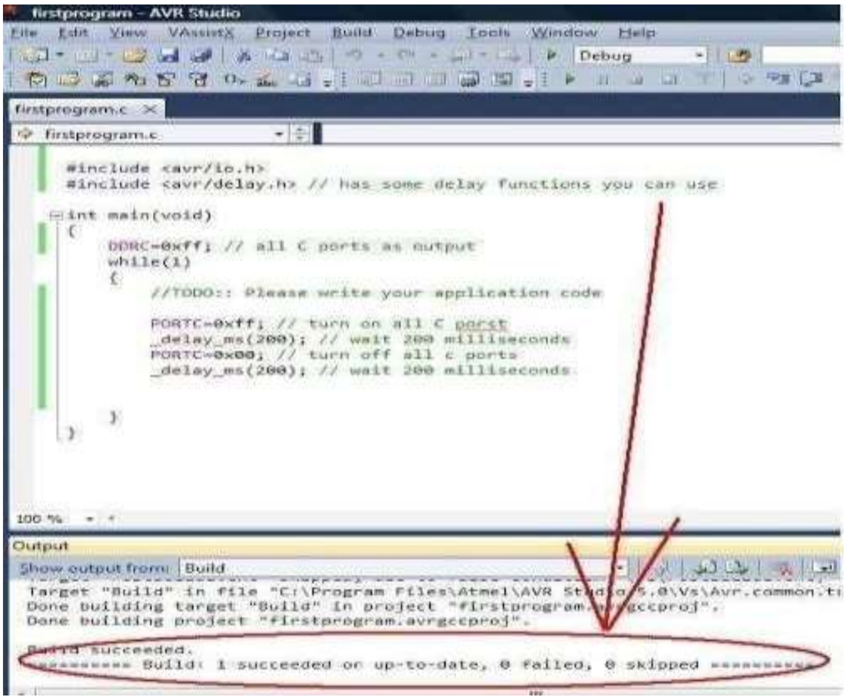


Figure 4.23 Building a solution

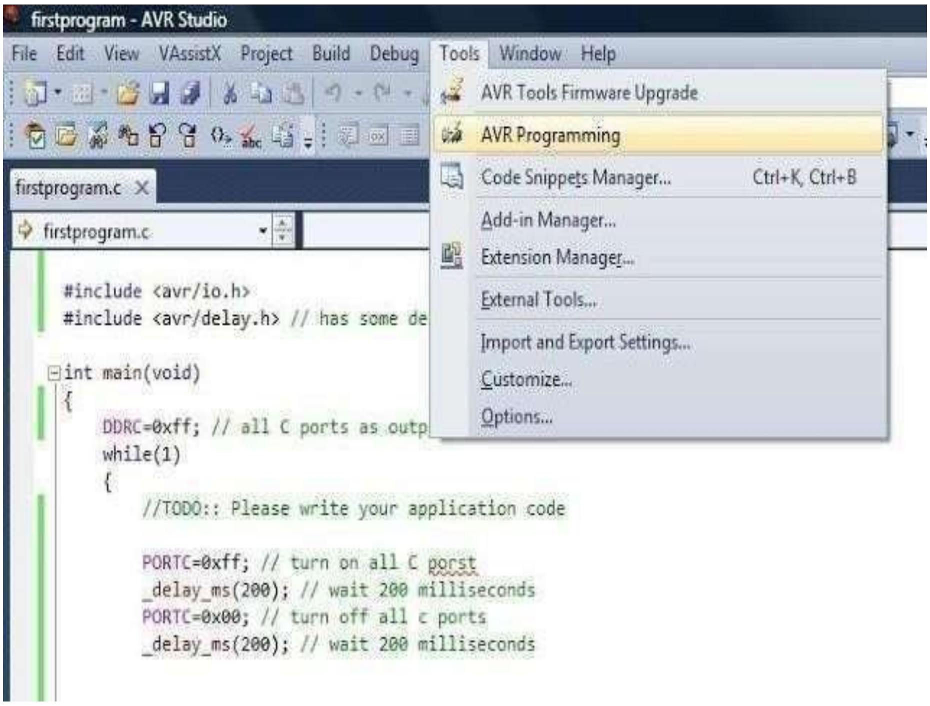


Figure 4.24 AVR Programming

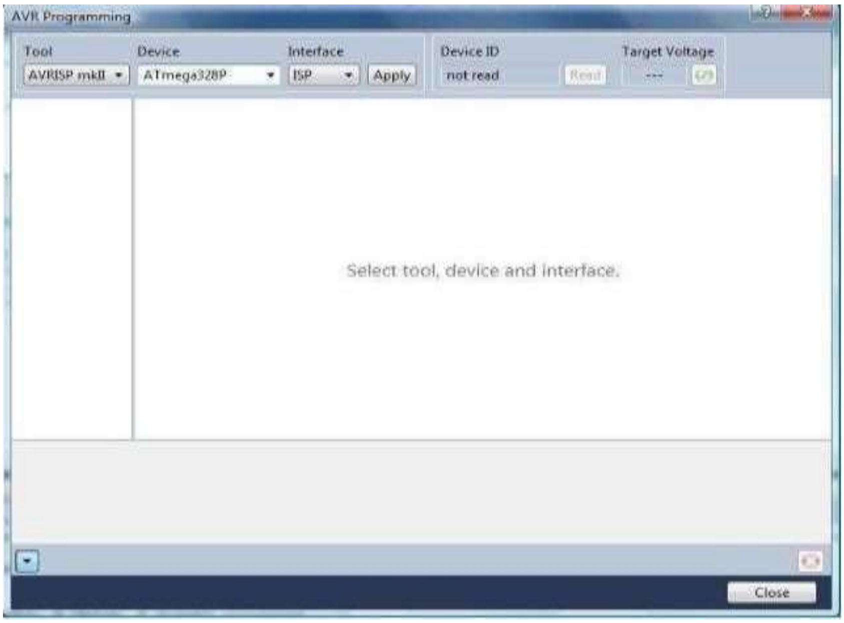


Figure 4.25 Select tools, device and interface

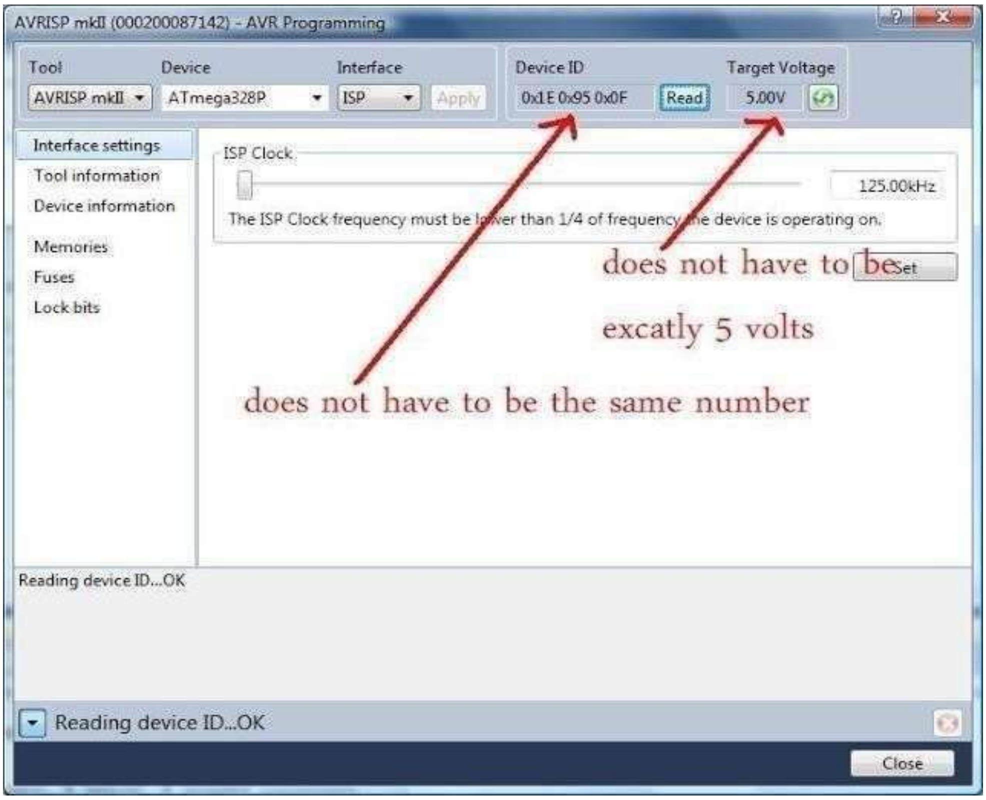


Figure 4.26 Interface setting

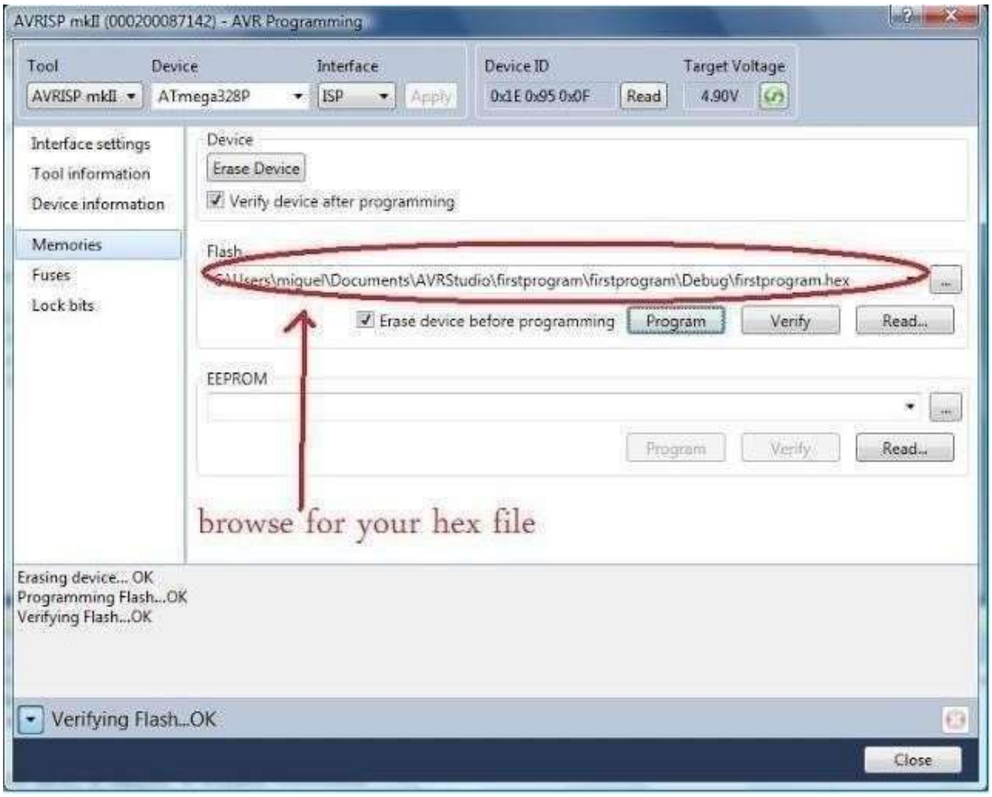


Figure 4.27 Memories

To generate the hex file, proceed by selecting "Build" from the AVR Studio build menu.This action compiles the program and generates the necessary hex file withoutencountering any errors. Confirm that there are no compilation errors, ensuring a smooth process.Next, to upload the code to the microcontroller, follow these steps: navigate to "Tools" and select "AVR Programming" from the AVR Studio tools menu. This action opens the programming window. Ensure that your device is correctly selected.

Then, in the specified sequence, click on the "Apply" button followed by the voltage button, indicated by a recycling or refresh icon. This action activates the voltage check, displaying a value close to 5 volts. Proceed by clicking on the "Read" button. If no errorwindows appear, you're ready to proceed without any issues

Pressing the Read and Voltage buttons isn't essential, but the Apply button is crucial. In the AVR Studioprogramming window, set the voltage to 5 volts and program the device ID. Afterwards, navigate to Memories, choose your hex file, and hit Program. Watch as the programmer blinks, signaling the upload progress, until it stops once the upload is complete. In the AVR Studio Memories window, ensure your hex file is prepared for upload. For the power supply, follow the provided instructions to set it up accordingly.

CHAPTER-5

5.1 Component List :

1. Step down transformer
2. Voltage regulator
3. Capacitors
4. Diodes

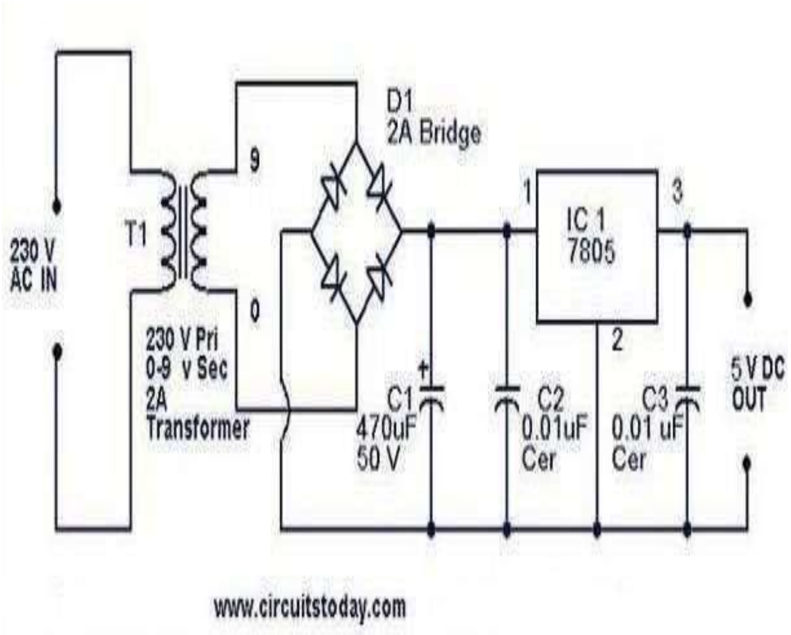


Figure 5.1 Circuit

The 7805 is a 5V fixed three-terminal positive voltage regulator integrated circuit.

The IC's characteristics include safe working area protection, thermal shutdown, and internal current. limitation, which makes the IC extremely robust.

• The IC can handle output currents up to 1A with a suitable heat sink.

The primary voltage is stepped down by a 9V transformer, rectified by a 1A bridge, filtered by capacitorC1, and regulated by 7805 to create a stable 5VDC.

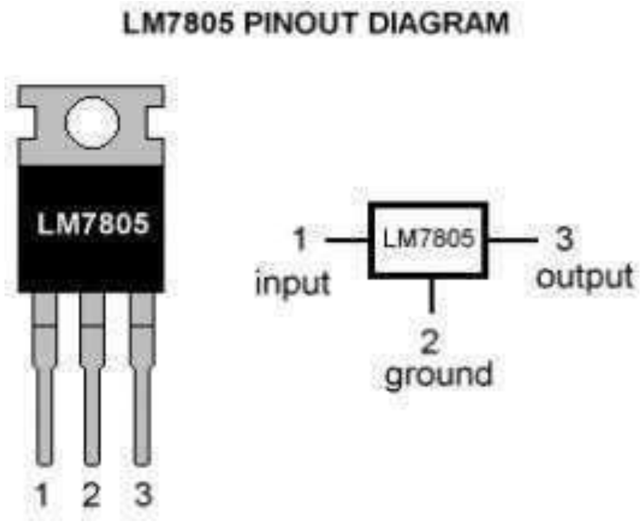


Figure 5.2 PINOUT DIAGRAM

5.3 Voltage regulator :

To achieve a stable 5V output, we opt for the LM7805 Voltage Regulator IC. Rated specifications forthe 7805 IC are as follows:

- Acceptable input voltage: 7V to 35V
- Current capacity: Up to 1A
- Output voltage range: Maintained between 4.8V to 5.2V

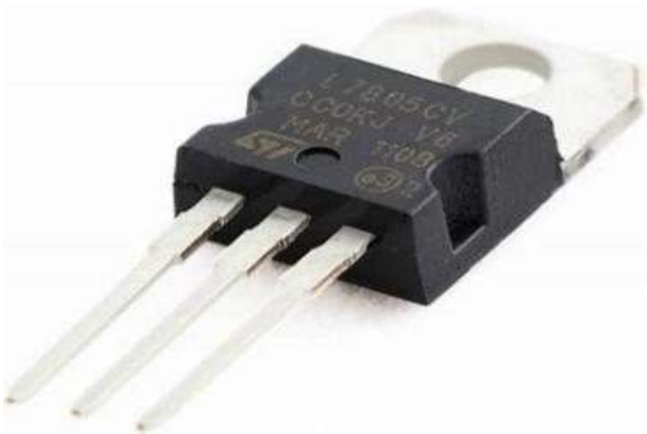


Figure 5.3 voltage regulator

Transformer :

Choosing the right transformer is essential, considering factors like current rating and secondaryvoltage.
The transformer's current rating should match the load's current requirements.

Rectifying circuit :

Opting for a full wave rectifier is the optimal choice.

- Its advantage is DC saturation is less as in both cycle diodes conduct.

- Higher Transformer Utilization Factor (TUF).

- Since 1N4007 diodes can tolerate a larger reverse voltage of 1000 volts (15), they are utilized insteadof 1N4001, which can only handle 50V.

Rectifier with Center Tap Full Wave

Capacitors :
Understanding the ripple factor is crucial when determining capacitor values, particularly in capacitor filter design. The ripple factor (Y) is calculated using the formula $Y = 1 / (4\sqrt{3}fRC)$, where f representsthe AC frequency (typically 50 Hz) and R is the resistance. The resistance (R) is often derived from the secondary voltage of a transformer (V) divided by the load current (Ic). For instance, with a secondary voltage of 8.4 V and a load current of 500 mA, R equals approximately 18 ohms.
To ascertain the filtering capacitance (C), we utilize the relationship Y = Vac-rms / Vdc, where Vac- rms denotes the RMS voltage of the AC component and Vdc represents the DC voltage. Vac-rms is half the peak-to-peak voltage (Vr) divided by$2\sqrt{3}$, and Vdc is the maximum voltage minus half the peak-to-peak voltage. By plugging in specific values

(e.g., Vr = 0.4 V, Vac-rms = 0.3464 V, and Vdc =5 V), we compute a ripple factor of 0.06928.

Substituting this ripple factor back into the initial formula, we determine the necessary capacitance (C), resulting in approximately 2314 μF, rounded to a standard value of 2200 μF.
Additionally, according to the datasheet of the 7805 regulator, it's advisable to use a

0.01 μF capacitor at the output to mitigate transient voltage changes due to load fluctuations and a 0.33 μF capacitor at the input to suppress ripples, particularly if the filtering is distant from the regulator.

Notes.

- The bridge D1 can be also made by yourself by using four 1N 4007 diodes.

If more than 400mA current is supposed to be taken from the circuit, fit a heat sink.

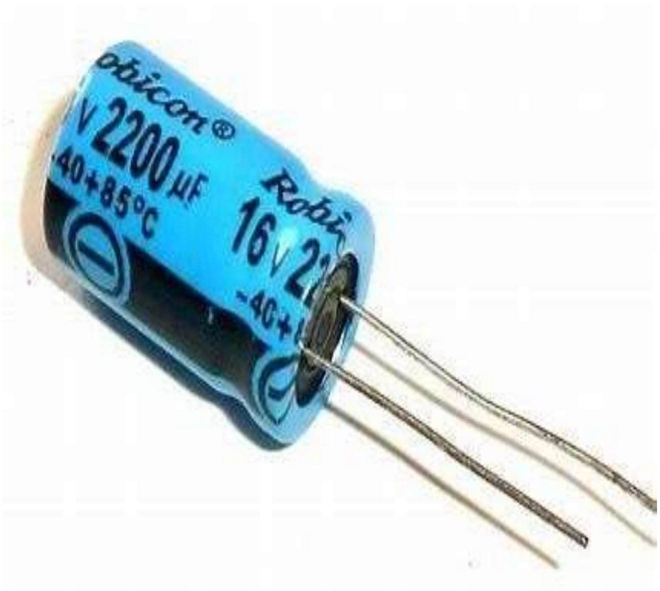


Figure 5.4 Capacitor

In our previous discussion on power supplies, we delved into the simplicity of the unregulated powersupply design. However, we discovered that for most applications beyond the basic ones, the unregulated design falls short in maintaining the output voltage at the desired set point, especially whenfaced with fluctuations in line voltage and load current. Consequently, various regulation techniques have been devised toensure consistent output voltage or current levels. The initial solution to this issue came in the form of the linear regulator power supply.

Commonly associated with AC/DC systems, a linear power supply features a regulated output. However, it's essential to note that the term "linear power supply" primarily refers to the functionality of the linear regulator within the system, responsible for the regulation process.

5.3Linear Regulator Theory:

Linear regulators utilize a pass element that acts as a variable resistor. This element, in conjunctionwith the load, creates a voltage divider.

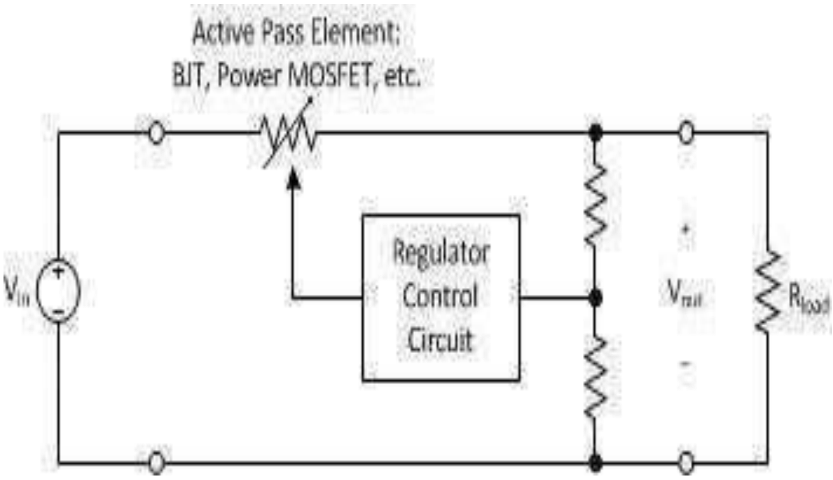


Figure 5.5 Linear Regulator

The pass element functioning as a variable resistor can be semiconductor devices such as a bipolarjunction transistor (BJT), power metal oxide semiconductor field effect transistor (MOSFET), insulated gate bipolar transistor (IGBT), or an electron tube such as a triode, tetrode, or pentode.

Electron tubes would be used in highly specialized applications where there are no semiconductordevices suitable.

5.3 Power Output Capability:

A linear regulator is indeed a versatile component in the realm of power electronics, capable of efficiently handling low-power outputs, typically up to a watt or even less. In standalone applications,it effectively serves as a DC/DC converter, regulating the output voltage with minimal ripple and noise.However, when higher power demands arise, especially in applications requiring several tens of kilowatts or even higher, linear power supplies come into play. Linear power supplies extend thecapabilities of linear regulators by incorporating additional circuitry for AC/DC conversion, rectification, and filtering.The process begins with AC/DC conversion, where the incoming alternating current (AC) voltage from the mains power supply is converted into direct current (DC) voltage. This conversion typicallyinvolves a rectifier circuit, which converts the AC signal into a pulsating DC signal. Depending on the specific requirements of the application, different types of rectifiers such as half-wave, full-wave, or bridge rectifiers may be employed.Following rectification, the resulting pulsating DC voltage undergoes filtering to remove unwantedharmonics and ripple. Capacitors are commonly used for filtering purposes, smoothing out the pulsating DC signal to produce a more stable DC output voltage.

Once the voltage has been rectified and filtered, it is then fed into the linear regulator. The linear regulator operates by continuously adjusting its resistance to maintain a constant output voltage, regardless of variations in input voltage or load conditions. This ensures that the output voltage remains stable and within the desired range, suitable for powering sensitive electronic devices orsystems.

In high-power applications, linear power supplies may incorporate additional features such as overcurrent protection, overvoltage protection, and thermal shutdown mechanisms to ensure safe and reliable operation under various conditions.

On a first order basis, the efficiency of a linear regulator is very simple to determine. The efficiency issimply the output voltage divided by the input voltage. If determined effort is made to keep the difference between the pass element input voltage and the output voltage as small as possible, the efficiency can be very good. This type of linear regulator is called a “low-dropout regulator”. For other cases where the operating point is not conducive to maintaining a low dropout, the linear regulator efficiency can suffer greatly.As an example, if the input voltage in the figure above is 13.6 volts, and the regulator maintains anoutput voltage of 12 volts, for a voltage drop of 1.6 volts, the efficiency of the linear regulator is 12V/13.6V = 88.2%. The efficiency in this case is very good by most standards. As another example, if the input voltage is 5 volts and the output voltage is 3.3 volts, for a voltage dropof 1.7 volts, the efficiency is 3.3V/5V = 66%. The efficiency in this case is not very good by most standards.

As a last example, if the input voltage is 5 volts and the output voltage is 1.8 volts, for a pass element voltage drop of 3.2 volts, the efficiency is 1.8V/5V = 36%. This efficiency in this case is very poor

5.3 Summary:

According to the article, linear power supplies are known for their ability to generate outputs with minimal noise and ripple, along with low electromagnetic emissions and impressive transient response. Despite these advantages, they tend to be bulky and heavy compared to switching power supplies

Linear power supplies are typically favored in situations where maintaining low ripple and noise levels is critical, even if it means accepting larger dimensions and significantly heavier weight. On the otherhand, switched-mode power supplies offer an alternative with their own set of characteristics and advantages

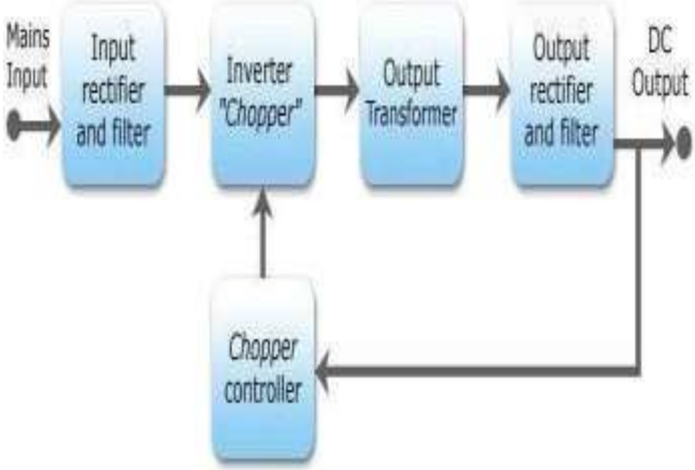
Figure 5.7 SMPS

A switched-mode power supply (SMPS), also known as a switching-mode power supply or switcher,is an electronic device utilized for efficiently converting electrical power. Unlike traditional linear power supplies, SMPS employ a switching regulator, which enables the pass transistor to rapidly switch between low-dissipation, full- on, and full-off states, minimizing energy wastage. The primaryfunction of an SMPSis to transfer power from a source (such as mains power) to a load (like a personal computer), while simultaneously adjusting voltage and current characteristics. By adjusting the ratio of on-to-off time, voltage regulation is achieved in SMPS, whereas linear power supplies regulate output voltage by dissipating power continuously in the pass transistor. This inherent efficiency inpower conversion and reduced weight, switched-mode power supplies are often smaller and lighter compared to linear supplies. However, while SMPS offer higher efficiency, smaller size, and lighter weight, they are also more complex. Switching currents in SMPS can potentially cause electrical noise issues if not adequately suppressed, and simpler designs may exhibit poor power factor. Therefore, the selection of SMPS should consider these factors alongside their advantages.A linear regulator achieves the desired output voltage by dissipating excess power through ohmic losses, such as in a resistor or in the collector-emitter region of a pass transistor when it's in its activemode.

Switching power supplies offer several key advantages over linear power supplies. Firstly, they boast superior efficiency since the switching transistor dissipates minimal power when functioning as a switch. Additionally, they are characterized by their smaller size and lighter weight, attributable to the absence of bulky line- frequency transformers. Their heightened efficiency also translates to lower heat generation, minimizing thermal concerns.

Despite these benefits, switching power supplies come with their own set of drawbacks. They tend to be more complex, requiring careful design and implementation. Moreover, they generate high-amplitude, high-frequency energy that necessitates effective filtering to prevent electromagnetic interference (EMI). This filtering is crucial for blocking ripple voltage at the switching frequency andits harmonic frequencies. Inexpensive switching power supplies may inadvertently introduce electrical switching noise onto the mains power line, potentially causing interference with other connected equipment such as audio/visual devices. Furthermore, non-power-factor-corrected switching power supplies can contribute to harmonic distortion.

When comparing regulated power supplies, two main types emerge: linear and switching. Linear power supplies, whether regulated or unregulated, operate differently from switching regulators. While bothserve the purpose of converting AC to DC, switching regulators excel in efficiency and compactness, albeit with added complexity and potential EMI concerns.



5.8 Create a schematic representation of an AC/DC Switched-Mode Power Supply (SMPS) thatoperates Figure on mains power and includes output voltage regulation

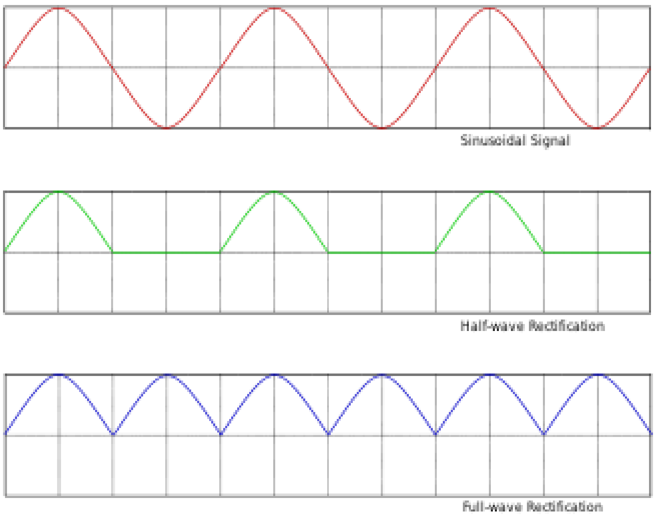


Figure 5.9 Input rectifier stage

AC, half-wave, and full-wave rectified signals. When using an AC input, a Switch Mode Power Supply(SMPS) performs an initial job of 5.

Rectification is the process of transforming an input into direct current. If the SMPS uses a DC input, this step is optional. Some SMPS versions, particularly those in computer ATX power supply, may have a rectifier circuit that can double voltage. This arrangement, which can be managed manually or automatically, allows for operation with power sources at 115V or 230V.

During rectification, an unregulated DC voltage is generated and passed through a large filter capacitor.The rectifier draws current from the mains supply in brief pulses around AC voltage peaks, producing high-frequency energy and reducing power.

Modern SMPS often include a Power Factor Correction (PFC) circuit to solve this issue. This PFCcircuit adjusts input current to match the sinusoidal shape of the AC input voltage, correcting the power factor. SMPS devices with Active PFC typically auto-range input voltages from 100 VAC to 250 VAC, eliminating the requirement for an input voltage selector switch.

Surprisingly, an SMPS built for AC input can typically operate from a DC supply.

Figure 5.10 Charger

This charger, meant for tiny devices like mobile phones, uses an off-line switching power source with a European connector. A feedback circuit plays an important role Monitor output voltage against reference voltage for exact control. To ensure safety, the controller may use isolation methods like opto-couplers to separate it from the DC output. Isolation is commonly used in switching supplies for computers, TVs, andVCRs to ensure precise output voltage control. In contrast, open-loop regulators don't have a feedback circuit. Instead, they maintain a steady voltage input to the transformer or inductor, expecting the output will be accurate. Regulated designs consider the impedance of the transformer or coil, while monopolar systems do not.Since the feedback circuit requires power to operate before generating power, an additional non-switching power supply for standby mode is often included.

Transformers are integral to switched-mode power supplies drawing power from AC lines, necessitating galvanic isolation. While some DC-to-DC converters may also feature transformers, isolation might not be critical. These transformers operate at high frequencies, allowing for smaller sizes and cost savings compared to traditional 50/60 Hz transformers. However, there are tradeoffs; higher frequencies increase core losses, necessitating careful consideration of design. Ferrite materialsare commonly used due to their low loss at high frequencies and high flux densities.Copper loss is a concern in switching power supplies due to the skin effect, which becomes more pronounced at higher frequencies. Ferrite materials are commonly used due to their low loss at high frequencies and high flux densities.Copper loss is a concern in switching power supplies due to the skin effect, which becomes more pronounced at higher frequencies.

5.6 DC motor:

Figure 5.11 DC Motor

The brushed electric motor discussed features a two-pole rotor, or armature, alongside a stator composed of permanent magnets. Within this motor, the "N" and "S" denote the polarities on the insidefaces of the magnets, while the outer faces exhibit opposite polarities. Direct current (DC) is applied to the commutator, indicated by the + and - signs, which in turn supplies current to the armature coils.

The locomotive gear of the Pennsylvania Railroad's class DD1 was designed as a pair of third rail direct current electric locomotive motors. These were specifically constructed for the initial electrification of the New York area, implemented when steam locomotives were prohibited within the city. It's worth noting that the locomotive cab has been omitted in this description.

DC motors represent a diverse group of electrical machines designed to convert direct current electrical power into mechanical power, often relying on magnetic fields to achieve this conversion.

5.6 Electromagnetic motors:

A coil of wire carrying an electric current produces an electromagnetic field that is aligned with its center.Adjusting the current flow allows you to control the strength and direction of the magnetic field. A basic DC motor consists of stationary magnets in the stator and an armature with insulated wire.
winds around a soft iron core. Windings with many turns are connected to a commutator, which connects them to the power source using brushes. The commutator allows for rotation by sequentially energizing each armature coil. Brushless DC motors use electronics to switch coils instead of traditional brushes. The strength of the electromagnetic field produced depends on factors like current, coil size, and its core material. By controlling which coils are activated, a rotating magnetic field is created, interactingwith the stator's magnetic field to drive rotation. Variations in stator and armature fields, along with their connections, yield different speed and torque characteristics. Speed control traditionally involved adjusting voltage or introducing variable resistance. Modern DC motors utilize power electronics for voltage modulation.

Series-wound DC motors, offering high torque at low speeds, find use in traction applications likelocomotives and trams. They were instrumental in the second Industrial Revolution, powering machinery since the 1870s. From electric vehicles to industrial machinery, DC motors remain prevalent. In mining, large DC motors provided torque and speed control, later supplanted by AC motors with variable frequency drives. DC motors can act as generators when external power is applied, useful in regenerative braking for hybrid and electric cars, or returning power to the grid in electric trains. Diesel-electric locomotives dissipate braking energy in resistor stacks but are now integrating battery packs for energy recapture.

- **Brush:**

The brushed DC electric motor uses internal mechanical commutation to create torque from a DC power supply. The stator field is formed by stationary permanent magnets inside the motor. Torque is generatedusing the Lorentz force theory, which states that any current-carrying circuit When put within an externalmagnetic field, it experiences a force. Torque ripple occurs when the magnitude of a force (shown bya green arrow) fluctuates with rotor angle. This single-phase, two-pole motor uses a split ring commutator, which causes the current to reverse every 180 degrees of rotation.

- **Brushless:**

Typical brushless DC motors feature a rotor with a permanent magnet that rotates, while stationary electrical coils within the motor housing serve as the stator. Unlikebrushed motors, they eliminate theneed for transferring power from outside to thespinning rotor, resulting in a mechanically simpler design. A motor controller is employed to convert DC power to AC, enhancing control over various parameters such as timing and phase of the current in the rotor coils. This precise control enables optimization of torque, power conservation, speed regulation, and even braking. Hall effect sensors orsimilar mechanisms allow the motor controller to sense the rotor's position accurately. The advantages of brushless motors encompass an extended lifespan, minimal maintenance requirements, and high efficiency. However, they come with drawbacks such as a higher initial cost and more complex motor speed controllers. Despite lacking an external power supply forsynchronization, some brushless motors are colloquially referred to as "synchronous motors."

- **Permanent magnet stators:**

A permanent magnet (PM) electric motor functions without a field winding on the stator frame, relying instead rely on permanent magnets to create the magnetic field required for interaction with the rotor. field, resulting in torque. In larger motors, compensatory windings in series with the armature can improve commutation under load. However, the fixed PM field does not allow for adjustable speed control. Miniature motors commonly use permanent magnet fields (stators) to reduce power consumptionfrom field windings.Larger DC motors often use stator windings.

- **Wound stators:**

The armature of a DC machine, whether it's a motor or a generator, can be linked with the field coil inone of three configurations: shunt, series, or compound. These connections, which determine the relationship between the stator and rotor, play asignificant role in the motor's performance.

Specifically, they influence the speed/torque characteristics, making them suitable for various torque profiles or loading signatures. These configurations include series, shunt/parallel, and compound setups, each offering distinct advantages for different application

- **Series connection:**

A series DC motor is a type where the armature and field windings are connected in series with a common DC power source. Its speed varies in a non-linear manner with changes in load torque and armature current, exhibiting a characteristic where speed and torque are interdependent. This motor design offers exceptionally high starting torque, making it ideal for initiating heavy inertia loads likethose found intrains, elevators, or hoists.

Under no mechanical load, the series motor experiences low current flow. Consequently, the counter-electromotive force (EMF) generated by the field winding is weak. To balance the supply voltage, the armature must rotate faster to produce adequate counter-EMF. However, this can lead to a dangerous condition known as runaway, potentially causing motor damage take by the motor within the space on . Series motors, often referred to as universal motors, can operate on alternating current as well. Due to the simultaneous reversal of armature voltage and field direction, torque production remains consistent.Unlike induction motors, the speed of universal motors isn't tied to the line frequency. As a result, they can achieve speeds higher than synchronous, making them lightweight and suitable for handheld powertools. Typically, commercial universal motors have modest capacities, usually not exceeding 1 kW. However, larger universal motors were once employed in electric locomotives, utilizing specialized low-frequency traction power networks to manage commutation challenges under varying loads.

CHAPTER-6

1. RESULTS

An automatic side stand reverting system is a safety feature commonly found in modern motorcycles. This system is designed to prevent accidents that can occur when a rider forgets to retract the side stand before riding off.

When engaged, the system automatically retracts the side stand if the motorcycle is put into gear while the stand is still down. This prevents the motorcycle from leaning too far to one side during movement, which can lead to loss of control and accidents.The mechanism typically works by utilizing sensors that detect the position of the side stand and the gear shift lever. If the sensors detect that the motorcycle is in gear while the side stand is down, the system triggers a mechanism to retract the stand automatically.

This feature adds an extra layer of safety to motorcycle riding, reducing the risk of accidents caused by human error or forgetfulness. It's particularly useful in situations where riders may be distracted or in a rush, helping to prevent potentially dangerous situations on the roadAdditionally, the automatic side stand reverting system contributes to rider convenience and peace of mind. Riders can confidently focus on navigating their surroundings without the need to constantly monitor the position of the side stand. This not only streamlines the riding experience but also minimizes the potential for rider error.

In conclusion, the automatic side stand reverting system represents a commendable advancement in motorcycle safety technology. By proactively addressing the risk of side stand engagement during motion, this system enhances rider safety, convenience, and overall riding experience while underscoring the industry's dedication to innovation and safety.

2. CONCLUSION:

Operating a bike with the side stand still down can lead to various issues, but our accessories offer solutions to mitigate these problems. The primary aim of this project is to introduce a robust and safe mechanism without altering the standard design of two-wheelers. Additionally, it should remain affordable for all segments of society. Based on the aforementioned evaluation, it meets consumer requirements and offers versatility. Furthermore, being a novel product, it has the potential to stimulatejob creation and foster broad advancements in engineering within a short timeframe

An automatic side stand retrieval system provides convenience, safety, and perhaps extends the life of theside stand mechanism. By automating the procedure for retracting the Riders can avoid mishaps caused by neglecting to use the side stand when riding their motorcycle.Retract the stand before riding away. This solution protects the side stand and reduces wear and tear overtime. However, establishing such a system would require thorough engineering to ensure reliability.Durability is especially important in a variety of riding circumstances and environments. Sensor accuracy, response time, battery consumption, and connection with current motorbike systems are all important factors to consider. Furthermore, the cost-effectiveness of such a system would be a key factor.Beyond safety benefits, an automatic side stand retrieval system enhances the overall riding experience bystreamlining the pre-ride checklist and allowing riders to focus more on enjoying the journey ahead. With the side stand automatically stowed away as the motorcycle begins to move, riders can maintain their momentum without interruption, enhancing both efficiency and comfort.

Moreover, this system contributes to the longevity of the motorcycle by minimizing wear and tear on the side stand mechanism and reducing the risk of damage from accidental contact with the ground while riding. Additionally, it may offer customization options, such as adjustable sensitivity settings or integration with other electronic systems, to cater to the preferences and needs of individual riders.

CHAPTER-7

REFERENCES

1. AniketGulhane Vishal Srivastava, Tejasvi Gupta, Sourabh Kumar, Vinay Kumar, Javed Rafiq, Satish Kumar Dwivedi, “Automatic Side Stand”, International Journal Of Engineering and Advanced Technology (IJEAT), ISSN: 2249-8958, Volume- 3, Issue-4, April 2014.

2. Prashant Khadatkar, B.E. Mechanical (Student), Priyaradshini Bhagwati College of Engineering, Nagpur University, Maharashtra (India).

3. Vishal Srivastava, Tejasvi Gupta, Sourabh Kumar, Vinay Kumar, Javed Rafiq, Satish , Javed Rafiq, Satish Kumar Dwivedi, “Automatic Side Stand”, International Journal Of Engineering and Advanced Technology (IJEAT), ISSN: 2249-8958, Volume- 3, Issue-4, April 2014..

4. Pratik Das, B.E. Mechanical (Student), Priyaradshini Bhagwati College of Engineering, Nagpur University, Maharashtra (India).

5. Saurabh Dangore, B.E. Mechanical (Student), Priyaradshini Bhagwati College of Engineering, Nagpur University, Maharashtra (India).

6. Ms.Shweta AmbadasNaik, “Design and Shape Optimisation of Connecting Rod Using FEA:

8. A Riview”, International Journal of Engineering and Technical Research (IJETR),

   ISSN: 23210869, Volume- 2, Issue- 8, August 2014.

9. B. Anusha, C. Vijaya Bhaskar Reddy, “Modeling and Analysis of Two Wheeler Connecting Rod by Using Ansys”, IOSR Journal of Mechanical and Civil Engineering(IOSR-JMCE), e ISSN: 2278-1684, p-ISSN: 2320-334x, Volume- 6, Issue 5, May-June 2013.

10. B. Anusha, Dr. C. Vijaya Bhaskar Reddy, “Comparision of

Materials For Two- Wheeler

11. Connecting Rod Using Ansys, International Journal of Engineering Trends and Technology (IJETT), ISSN: 2231-5381, Volume- 4, Issue- 9, September 2013.

12. 12. 10). Sharma P.C., 2010-2011, "Machine Design", Study For Design Purpose