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Large Scrolling Text Display

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Abstract: *The Large Scrolling Text Display is an innovative solution designed to present dynamic information in public spaces, educational institutions, transportation hubs, and Commercial environments. Utilizing LED matrix technology, the system displays real-time scrolling messages with high visibility and low power consumption. The project integrates a microcontroller (such as Arduino or Raspberry Pi)to manage text input, speed, and display patterns. It supports both wired and wireless communication interfaces, allowing for Remote updates via Bluetooth, Wi-Fi, or mobile applications. The design emphasizes modularity, scalability, and user-friendliness, making it suitable for a wide range of applications, from advertisement boards to digital notice systems. The display offers enhanced read ability, especially in low-light or outdoor conditions, ensuring effective communication in various environments.*

Keywords: Large Scrolling Text Display

I. INTRODUCTION

In today's fast- paced world, effective communication of information is crucial, especially in public and commercial environments. Traditional static displays often fail to capture attention or convey real-time updates efficiently. To overcome this limitation, scrolling text displays have emerged as a popular and practical solution. A Large Scrolling Text Display is an electronic board that showcases continuously moving messages, making it ideal for announcements, advertisements, traffic updates, and alerts.

This project aims to design and implement a cost- effective, programmable, and user- friendly large scrolling text display using LED matrix panels and a microcontroller. The system is capable of displaying alpha numeric characters and symbols in a scrolling Format, ensuring high visibility even from a distance. It can be updated in real- time through various interfaces such as Bluetooth, Wi-Fi, or GSM, depending on the application.

By combining hardware efficiency with flexible software control, the display can serve

Multiple purposes in schools, railway stations, offices, and markets. Its modular structure also allows for easy scaling, making it suitable for both indoor and outdoor applications. The goal of this project is to enhance information dissemination while maintaining simplicity, energy efficiency, and reliability.

Sr. no.	Component	Quantity
1	ATMega 328 PU Micro Controll	1
2	28 Pin IC Base	1
3	Arduino Uno	1
4	HC – 05 Bluetooth Module	1

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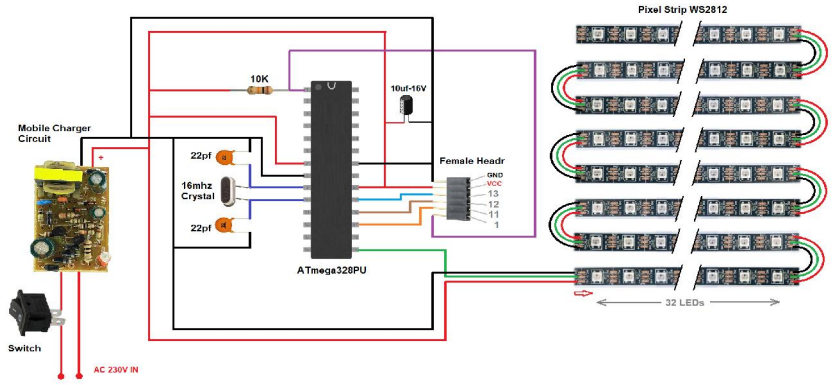
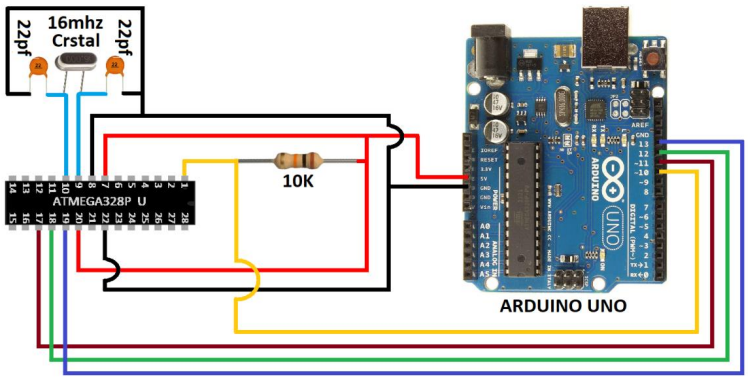
5	Pixel Strip	1
6	22 micro Farad	2
7	10micro farad- 16V Capacitor	1
8	10k Ohm Resistor	2
9	16Mhz Crystal	1
10	Mobile Charger Circuit	1
11	Dot Board	1
12	Switch	1
13	Female Header Pin	1
14	3/3 PVC Box	1
15	2 Inch Pipe	1

Circuit Diagram





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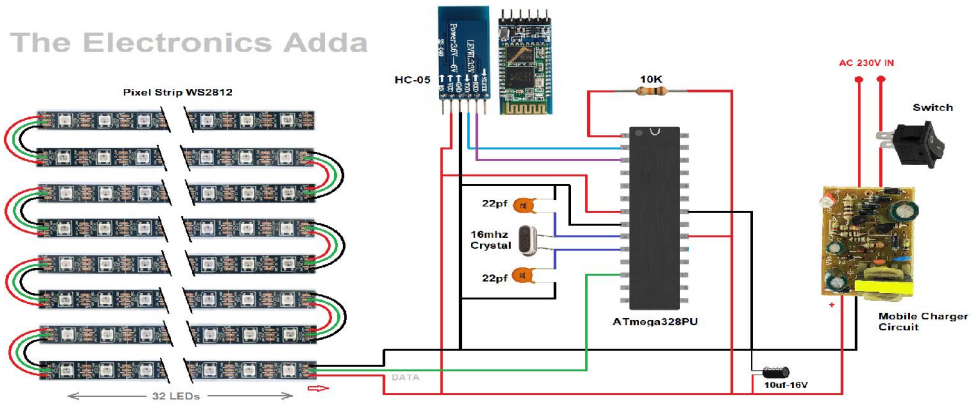
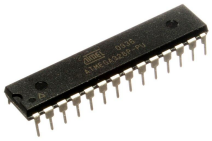


II. COMPONENTS

ATmega328P

The ATmega328P microcontroller (often found in Arduino Uno boards) serves as the central processing unit in many embedded systems and electronics projects. Here are its key functions



Function of ATmega 328P Microcontroller:

Control Unit:

It acts as the brain of the system, controlling and coordinating the operation of all connected components like displays, sensors, and input devices.

Digital I/O Handling:

It provides digital input/output pins (14digital I/O pins) to read signals from sensors or to control devices like LEDs, relays, and motors.

Analog Input Reading:

With 6 analog input channels (10-bit ADC), it can read analog signals from sensors (e.g., temperature, light sensors).

Program Execution:

It runs the user- defined program stored in its flash memory (32KB), enabling it to perform logical decisions, calculations, and control outputs based on inputs.

Timing and Delay Functions:

It includes internal timers/counters that help generate precise delays, PWM signals, and manage time- dependent operations.

Serial Communication:

It supports communication protocols like UART, SPI, and I2C to interface with other microcontrollers, modules (Bluetooth, Wi-Fi), or computers.

Power Efficiency:

It supports different power- saving modes for low-power applications, which makes it suitable for battery- operated devices.

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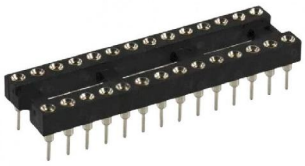
In a Large Scrolling Text Display, the ATmega328P receives the input text (via Bluetooth, serial, or manually), processes the data, and controls the LED matrix to display the scrolling text according to the program logic

28 - Pin IC Base

The 28-pin IC base serves an important role in electronic circuits, especially when working with integrated circuits (ICs) like the ATmega328P. Here's its function:



Function of 28-Pin IC Base:

Socket for IC Placement:

It provides safe and convenient slot to insert a 28- pin IC(like ATmega 328P) without soldering the IC directly on to the PCB or breadboard.

Prevents IC Damage:

It protects the IC from heat damage during soldering, as the base is soldered instead of the actual chip.

Easy Replacement:

Makes it easy to remove and replace the IC for programming, testing, or troubleshooting without damaging the pins.

Secure Connection:

Ensures as table and reliable electrical connection between the IC and the rest of the circuit.

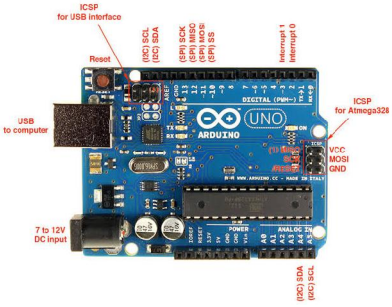
Protection of IC Pins:

Reduces wear and tear on the IC pins caused by repeated insertions and removals.

In a project like a large scrolling text display, the 28- pin IC base is commonly used to mount the ATmega328P microcontroller safely and securely on a PCB

Arduino Uno:

The Arduino Uno is a widely used microcontroller development board based on the ATmega328P. Its main function is to control and automate elec tronic systems by reading inputs and controlling outputs based on programmed logic.



Functions of Arduino Uno :

Microcontroller Platform:

It hosts the ATmega328P chip, which executes code written by the user to perform specific tasks.

Input Reading:

It reads digital and analog signals from sensors, buttons, and other input devices.

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Output Control:
It controls output devices like LEDs, motors, relays, and displays based on programmed logic.

Programming Interface:
Allows users to write and upload code using the Arduino IDE via a USB connection.

Communication:
Supports communication via USB, UART(Serial), SPI, and I2C, allowing it to interface with other devices, modules (like Bluetooth, Wi-Fi), and computers.

Power Supply Regulation:
Can be powered via USB or an external power supply, and includes on board voltage regulation for stable operation.

Prototyping - Friendly:
Its pin headers and compatibility with breadboards and shields make it ideal for proto typing and learning electronics.
In a Large Scrolling Text Display project, the Arduino Uno reads text input, processes it, and controls the LED matrix to scroll the message across the screen

HC-05 Bluetooth Module :
The HC-05 Bluetooth module is used to enable wireless serial communication between devices. It allows a microcontroller (like Arduino) to communicate with smart phones, laptops, or other Bluetooth- enabled devices.

Function of HC-05 Bluetooth Module:

Wireless Data Transmission:
Transmits and receives data over Bluetooth, replacing wired serial communication (UART).

Serial Communication Interface:
Communicates with microcontrollers using UART (TX and RXpins) at configureable baud rates.

Bluetooth SPP (Serial Port Profile) :
Supports the SPP protocol, making it suitable for sending and receiving serial data like text or commands.

Master/Slave Mode:
Can be configured as either a Master (initiates connection) or Slave (waits for connection) device.

Real- Time Communication:
Enables real- time wireless control- ideal for sending messages, commands, or data to systems like scrolling displays.
In a Scrolling Text Display The HC-05 allows the user to send text messages from a mobile phone or computer to the Arduino, which then scrolls the message on an LED display—making the system wirelessly programmable and user-friendly

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WS2812 Pixel Strip :

The WS2812 pixel strip (also known as Neo Pixel strip) is a flexible LED strip where each Individual LED can be controlled independently in terms of color and brightness. It's widely used in colorful visual displays, effects, and lighting systems.

Function of WS2812 Pixel Strip :

Individually Addressable LEDs :

Each LED has a built- in controller, allowing individual control fred, green, and blue (RGB) color channels.

Full- Color Control (24-bit RGB) :

Allows over 16 million color combinations per LED by varying intensity of red, green, and blue.

Single Data Line Control :

Uses only one data pin from a micro controller (like Arduino) to control the entire strip, simplifying wiring.

Cascadable Design:

Multiple LEDs are chained together, passing data down the line while keeping their own color info.

Customizable Animations :

Enables complex animations, such as color fades, rainbow effects, chasing lights, and scrolling patterns.

In a Scrolling Text Display a WS2812 strip can be used to display colorful, animated text or graphics, making the Display more attractive and dynamic compared to single-color LED matrices. It's especially useful in projects where vivid visual appeal is important

16 MHz Crystal Oscillator:

The 16 MHz crystal oscillator is a key timing component used with microcontrollers like the ATmega328P to provide a precise and stable clock signal for their operation.

Function of 16 MHz Crystal Oscillator:

Clock Source for Microcontroller:

Provides a 16 0million cycles per second (16MHz) timing signal to drive the internal operations of the microcontroller.

Ensures Accurate Timing:

Allows the microcontroller to execute instructions, manage communication protocols (UART, SPI, etc.), and generate precise delays and PWM signals.

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Stable Operation:
Offers much more accurate and stable timing than the internal RC oscillator, which can vary with temperature or voltage
.

Required for Serial Communication:
A stable clock is essential for accurate baud rate generation, especially in UART-based communication(e.g., with HC-05 Bluetooth module).
In a Scrolling Text Display Project the 16 MHz crystal ensures that the ATmega328P runs at a consistent and correct speed, enabling smooth text scrolling, timed animations, and reliable communication with other devices

22pF Capacitors :
The 22pF capacitors are typically used in microcontroller circuits as load capacitors for a crystal oscillator (like the16MHz crystal with the ATmega 328P).

Function of 22pF Capacitors :
Stabilize Oscillation :
They work with the crystal to form a stable oscillator circuit, helping maintain a consistent clock frequency.

Noise Filtering:
Help filter out high- frequency noise, ensuring clean and reliable clock pulses for the microcontroller.

Set Load Capacitance:
The value (22pF) helps achieve the crystal's required load capacitance for proper operation. It's part of the formula used to calculate the load seen by the crystal.

Support Crystal Startup:
Assist in the initial startup of the crystal by enabling the proper phase shift and feedback loop.
In a Scrolling Text Display (with ATmega 328P) the 22pF capacitors are connected on each leg of the 16MHz crystal to ground, ensuring the microcontroller has as table and precise clock for controlling the timing of scrolling, communication, and animations

10µF, 16V Capacitor :
A 10µF, 16V capacitor (usually an electrolytic capacitor) is used in electronic circuits for filtering, decoupling, and energy storage purposes.

10uf/16V
Electrolytic Capacitor

Function of 10µF, 16V Capacitor :
Power Supply Filtering :
Smooths out voltage fluctuations by filtering noise and ripple from the power supply, providing a more stable DC voltage to components.

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Decoupling (Bypass) Capacitor:
Placed near microcontrollers or ICs to absorb sudden changes in current demand, preventing voltage dips and stabilizing performance.

Energy Storage:
Stores charge and supplies it when the circuit experiences brief drops in power, helping prevent resets or glitches.

Voltage Regulation Support:
Often used with voltage regulators (e.g.,7805) on the input or output side to stabilize voltage and improve regulation.
In a Scrolling Text Display Circuit a 10µF capacitor is commonly used to :
Filter the power supply to the microcontroller and LED modules.
Work with other smaller capacitors (like 0.1µF) to maintain clean and stable power.
Prevent noise that could affect scrolling behavior or communication (e.g., Bluetooth).

10kΩ Resistor:
A 10k ohm resistor is a commonly used resistor value in electronics. Its specific function depends on where it's used in a circuit, but here are the typical roles.

Function of 10kΩ Resistor:
Pull - up or Pull - down Resistor:
Pull-up : Connects a microcontroller input pin to Vcc to ensure a default HIGH state.
Pull-down : Connects to GND to ensure a default LOW state.
Prevents floating inputs and ensures stable logic levels.

Current Limiting:
Limits the current flowing into LEDs, transistors, or microcontroller pins to protect components.

Voltage Divider:
Used with an other resistor to scaled own voltage, often for analog - to –digital conversion or reference voltage creation.

Reset Circuit:
Often used as a pull-up resistor on the RESET pin of micro controllers like ATmega328P to keep it HIGH during normal operation.

Biasing Components:
Helps set the operating point for transistors or other analog components.
In a Scrolling Text Display a 10kΩ resistor is commonly used as a pull-up on the RESET pin of the microcontroller or in the Bluetooth module interface to ensure proper signal levels and reliable operation

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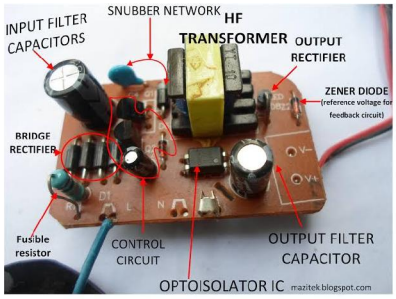
Mobile Charger Circuit:

A mobile charger circuit is designed to convert AC power to regulated DC power suitable for charging mobile devices or powering small electronics.



Function of a Mobile Charger Circuit:

AC to DC Conversion (Rectification):

Converts 220V/110V AC (from the wall) into DC voltage using a bridge rectifier or switching regulator.

Voltage Regulation:

Regulates the output voltage (usually 5V DC) using a voltage regulator IC (e.g.,7805 or buck converter), ensuring safe charging levels for the device.

Current Limiting Protection:

Includes safety components like fuses, resistors, or thermal cut offs to protect against over current, short circuits, or overheating.

Filtering:

Uses capacitors to smooth out the DC output, removing any ripples or voltage spikes.

USB Output Interface :

Often includes a USB port for connecting a charging cable, which carries 5V to the mobile device.

In a Scrolling Text Display Project a mobile charger circuit can be used as a convenient 5V power supply for the Arduino, LED matrix, or Bluetooth module, making the project easily powered from household AC mains

Switch:

A switch is a simple electrical component that is used to control the flow of current in a circuit by opening (breaking) or closing (completing) the electrical path.

Function of a Switch:

Manual Control:

Allows the user to turn a device or circuit ON or OFF manually.

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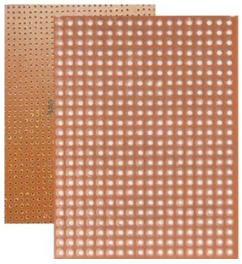
Circuit Activation / Deactivation:
Opens the circuit to stop the current flow or closes it to start the current flow.

Input to Microcontroller:
Acts as a digital input device (e.g. ,a pushbutton) to send HIGH or LOW signals to a micro controller like Arduino for triggering actions.

Mode Selection:
Used to toggle between different modes or functions in a circuit (e.g. ,reset, configuration mode, etc.).

Safety and Isolation:
Used to isolate power during maintenance or emergencies to prevent damage or shock.
In a Scrolling Text Display Project a switch can be used to:
Turn the system on/off
Reset the microcontroller
Trigger text updates or animations
Switch between different messages or scrolling modes

Dot Board (Perf board/Vero Board):
A dot board- also known as a perf board, strip board, or vero board—is used for building and proto typing electronic circuits in a semi-permanent way without designing a full PCB.



Function of Dot Board (Perf board/Vero Board):
Circuit Assembly Platform:
Provides a base for soldering components and creating electrical connections using copper pads or strips.

Custom Layouts:
Allows you to custom design the circuit layout by manually connecting components with wires or solder bridges.

Durability:
Offers a more stable and long-lasting solution compared to breadboards for projects you want to keep running.

Component Mounting:
Supports a wide variety of through-hole components like resistors, ICs, capacitors, LEDs, and connectors.

No Etching Needed:
Eliminates the need for chemical PCB etching- suitable for quick, small- scale or DIY projects.
In a Scrolling Text Display Project a dot board is used to:
Assemble the microcontroller, Bluetooth module, power components, and other elements.

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Build the circuit in a compact and organized way.
Provide a reliable structure for wiring and soldering connections between components

PVC Box:
A PVC box (Polyvinyl Chloride enclosure) is used in electronics to safely house and protect circuit components and systems.

Function of PVC Box:
Physical Protection:
Shields the internal electronic components from dust, moisture, accidental impacts, and handling damage.

Electrical Insulation:
Provides non-conductive housing, preventing short circuits or electrical shock hazards.

Organized Mounting:
Offers a clean and structured way to mount PCBs, modules, switches, and connectors inside a project.

Aesthetic Appeal:
Gives the project a neat, finished, and professional look, especially for presentations or installations.

Safety Compliance:
Helps in meeting basic safety standards, particularly in school, lab, or public display setups.
In a Scrolling Text Display Project the PVC box is used to:
Enclose the micro controller, power supply, Bluetooth module, and support electronics.
Mount the LED display securely on the front or top.
Protect everything for long- term use and transportation

PVC Pipe :
While PVC pipes are traditionally used for plumbing, they are also very useful in DIY electronics and display projects for structural and support purposes.

Function of PVC Pipe in Electronics Projects:
Frame/Stand Construction:
Used to build frames or stands for mounting LED displays, panels, or circuit boards in a strong, light weight, and customizable way.
Wire Management:
Can serve as conduits for routing and protecting wires, helping organize and hide wiring for a cleaner look.
Enclosure Extension:
Acts as amounting pole or extension arm when used with a PVC box or housing.

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Portable Light weight Support:
Provides a durable yet light weight structure that is easy to carry or reposition.
Cost- effective Easy to Work With:
PVC pipes are cheap, widely available, and easy to cut and join, making them ideal for school or project use.
In a Scrolling Text Display Project PVC pipes are often used to:
Mount or elevate the LED display for better visibility.
Hold the entire unit upright like a sign board or poster stand.
Route power cables or Bluetooth antenna wires neatly inside the pipe.

Working of Large Scrolling Text Display:
The large scrolling text display works by using a microcontroller (like ATmega328P or
Arduino Uno) to control a series of LEDs arranged in a matrix or strip (such as WS2812). It scrolls text messages across the display using programmed logic and timing.

Step-by-Step Working:
Power Supply:
A mobile charger circuit or adapter provides a regulated 5V supply to the entire system including the micro controller, LED display, and Bluetooth module.

Text Input (Optional):
A Bluetooth module (HC-05) can receive text input wirelessly from a mobile phone using apps like Bluetooth Terminal.

Micro controller Operation:
The ATmega 328P or Arduino Uno receives the text and processes it to convert each character into a pixel pattern.

Display Control:
The micro controller sends data signals to the LED matrix or pixel strip (WS2812), lighting up specific LEDs in sequence to form characters.

Scrolling Logic:
Characters are displayed one column or row at a time, with as light delay to create the effect of smooth scrolling from right to left (or any direction).

Timing and Sync:
A 16MHz crystal and 22pF capacitors help maintain accurate timing for animations and communication.

User Control(Optional):
A switch may be added to change messages, reset the display, or toggle scrolling modes.

Enclosure and Mounting:
All components are securely mounted on a dot board, placed inside a PVC box, and supported by a PVC pipe frame for easy visibility and protection

III. CONCLUSION

The large scrolling text display is an effective and visually appealing way to convey dynamic messages in real-time. By integrating components like the ATmega328P microcontroller, WS2812 LED strip, HC-05 Bluetooth module, and a mobile power supply, the system offers both flexibility and convenience.

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This project not only demonstrates key concepts in embedded systems, wireless communication, and LED control, but also serves as a practical tool for displaying
Announcements, advertisements, or important notices in various environments such as schools, shops, and public spaces. Overall, the project successfully combines hardware and software to create a user-friendly, interactive, and energy- efficient digital signage solution.

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