Manual

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1. Introduction

Welcome to the owner's manual for your [Your EV Cargo Vehicle Model]. This manual serves as your comprehensive guide to understanding and operating your electric cargo vehicle safely and efficiently.

As an electric vehicle (EV) owner, you are at the forefront of sustainable transportation technology, contributing to a cleaner and greener future. This manual is designed to provide you with all the necessary information to maximize the performance, longevity, and enjoyment of your EV cargo vehicle.

Throughout this manual, you will find detailed instructions on how to operate various features of your vehicle, interpret important metrics such as battery status and energy consumption, and maintain your vehicle to ensure optimal performance. Additionally, this manual contains information about warranty

coverage, troubleshooting tips, and contact details for assistance when needed.

We encourage you to read through this manual carefully and refer to it whenever you have questions or require guidance on using your EV cargo vehicle. By following the recommendations outlined in this manual, you can enhance your driving experience and make the most of your investment in electric mobility.

Thank you for choosing [Your EV Cargo Vehicle Model]. We are confident that you will enjoy the convenience, efficiency, and sustainability that your EV cargo vehicle provides.

2. Getting Started

Before you start operating your EV three-wheeled cargo vehicle, it's essential to familiarize yourself with the vehicle's unique features and ensure everything is set up correctly for a safe and efficient ride. Follow these steps to get started:

2.1 Pre-Drive Checklist

Review the Owner's Manual: Take the time to thoroughly read through the owner's manual provided with your EV three-wheeled cargo vehicle. This manual contains important information about operating procedures, maintenance, and safety precautions specific to your vehicle model.

Inspect the Vehicle: Conduct a visual inspection of the exterior and interior of the vehicle to check for any damages or abnormalities. Ensure that all components, including lights, mirrors, tires, and brakes, are in good working condition.

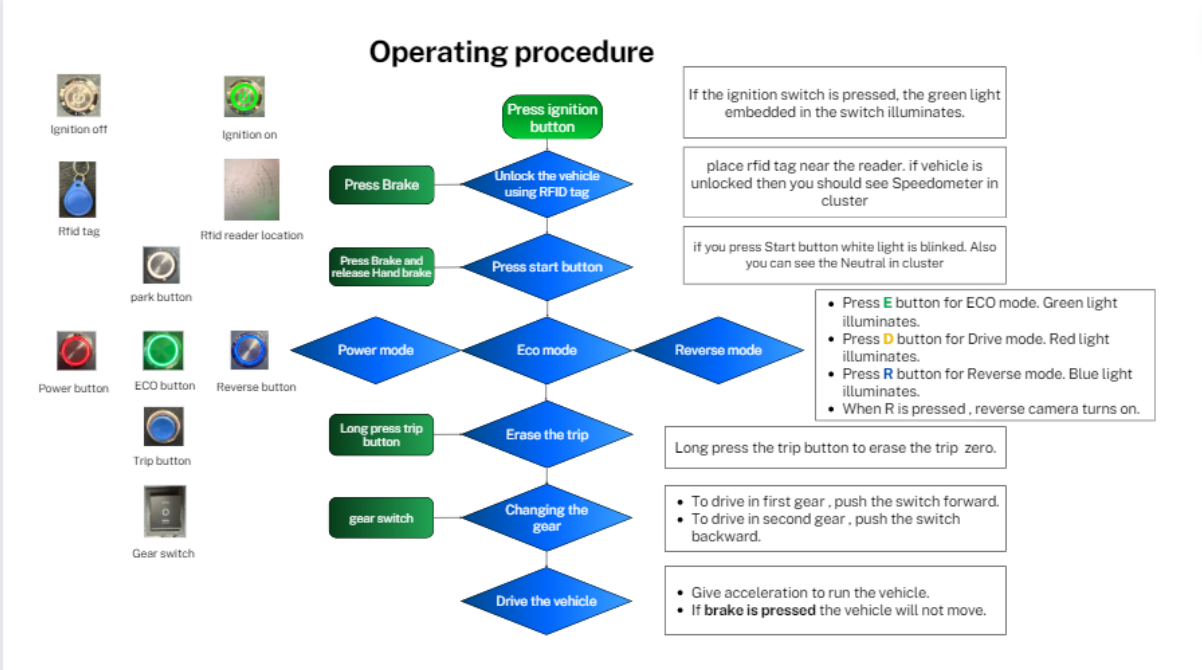
Check Battery Level: Verify the battery level of your EV cargo vehicle. If the battery needs charging, connect the vehicle to a compatible charging station using the provided charging cable.

Adjust Mirrors: Adjust the mirrors to ensure optimal comfort and visibility while driving. Proper mirror adjustments are essential for safe operation.

Cluster and telematics indication: Always check Cluster to show Company name and Logo before using RFID tag to start the vehicle. Check telematics indicator (blinking) to connect your vehicle to the Cloud to know its driving insights.

Check Trip Meter: Reset the trip meter on your vehicle's dashboard to monitor the distance traveled during your trip. This allows you to track your mileage and estimate the range remaining based on your driving habits.

2.2 Starting the Vehicle



Ignition: Start your EV three-wheeled cargo vehicle by pressing the Start button.

Ignition OFF

Ignition ON

RFID Tag Activation: Your EV three-wheeled cargo vehicle uses RFID (Radio Frequency Identification) technology for vehicle access. Hold the RFID tag near the designated reader on the vehicle to unlock it. Follow the instructions provided in the owner's manual for your specific vehicle model.

Dashboard Display: Once the vehicle is unlocked, the dashboard display will illuminate, providing essential information such as speed, battery status, and vehicle diagnostics. Familiarize yourself with the dashboard layout and the meaning of various indicators.

Battery and Control Health Checking in Cluster: The dashboard cluster provides vital information regarding the health and status of the vehicle's battery and control systems. Before driving, take a moment to check the cluster display for any alerts or warnings related to the battery and control systems. If any issues are detected, refer to the owner's manual for guidance on troubleshooting or seeking assistance.

Handbrake Release: Once the vehicle is unlocked and you have checked the dashboard cluster for any alerts, release the handbrake to allow the vehicle to move.

Parking Enabling: Before starting your journey, press parking switch to enable the controller to switch between driving modes. Now your vehicle is ready to move.

2.3 Driving Modes

Your EV cargo vehicle may have different driving modes available, such as Eco, Reverse or Power modes. Select the appropriate driving mode based on your driving conditions and preferences.

2.4 Safety Precautions

- When interacting with the LCD cluster display of your EV three-wheeled cargo vehicle, it's crucial to observe the following safety precautions:

Avoid Distractions:

- Refrain from interacting with the LCD cluster display while driving to prevent distractions that could compromise your attention on the road.
- Familiarize yourself with the layout and functions of the LCD cluster before driving to minimize the need for adjustments while on the move.
- Plan any necessary checks of the LCD cluster before starting your journey or during stops in a safe location.

Monitor Passively:

- Utilize the LCD cluster display as a passive information source while driving, periodically glancing at it to stay informed about critical vehicle metrics such as speed, battery status, and warnings.

- Avoid fixating on the display for extended periods. Instead, maintain focus primarily on the road ahead while using peripheral vision to monitor the cluster when necessary.

Follow Manufacturer Guidelines:

- Adhere to the manufacturer's recommendations and guidelines provided in the owner's manual regarding the operation and interaction with the LCD cluster display.
- Refer to the manual for instructions on interpreting various indicators, alerts, and warnings that may appear on the display.

- By adhering to these safety precautions, you can ensure responsible and safe interaction with the LCD cluster display of your EV cargo vehicle, minimizing distractions and maintaining focus on the road while driving.

3. EV Cluster

Features

The EV Cluster is a multifunctional display located on the dashboard of your EV cargo vehicle. It provides essential information about your vehicle's

performance, battery status, and other important metrics. Some of the key features of the EV Cluster include:

- **Speedometer:** Displays the current speed and motor RPM of the vehicle.
- **Odometer:** Displays the total distance travelled by the vehicle.
- **Tripmeter:** Displays the current distance of the vehicle.
- **Battery Level Indicator:** Indicates the remaining charge level of the battery.
- **Temperature Indicator:** Indicates the controller temperature.
- **Range Estimator:** Estimates the remaining driving range based on current battery charge and driving conditions.
- **Energy Consumption:** Displays real-time energy consumption data to help you monitor your driving efficiency.
- **Trip Information:** Tracks trip distance, energy consumption, and other trip-related data.
- **Various Indicators:** Like High beam, Low beam, left and right indicators, Parking brake, driving modes.

Driving Modes

Your EV cargo vehicle may feature different driving modes to adjust performance characteristics based on driving preferences and conditions. Common driving modes include:

Park enabling

ECO mode

Power mode

Reverse mode

- **Eco Mode:** Optimizes energy efficiency by reducing power output and maximizing range.
- **Reverse Mode:** Engages the vehicle for reverse motion, allowing you to maneuver in tight spaces or navigate parking lots.
- **Power Mode:** Enhances acceleration and responsiveness for a more dynamic driving experience.

Gear Shifting Switch (1 and 2 Gear)

Gear switch

The gear shifting switch allows you to select between different gears for controlling the vehicle's speed and power output. In an electric vehicle, this switch typically includes options for:

- **Forward (1st Gear):** Engages the vehicle for forward motion at lower speeds.
- **Forward (2nd Gear):** Engages the vehicle for forward motion at higher speeds.

Trip Button

The trip button enables you to access trip-related information on the EV Cluster, such as trip distance, energy consumption, and average efficiency. Pressing the trip button allows you to toggle between different trip modes and reset trip data as needed.

Hand Brake Sensing

The EV Cluster may include a hand brake sensing feature that alerts you if the hand brake is engaged while driving. This safety feature helps prevent unintentional operation with the hand brake engaged, reducing the risk of accidents or damage to the vehicle.

Charger Connection and Charging Sensing

When connecting your EV cargo vehicle to a charger, the EV Cluster provides feedback to indicate the charging status and battery state of charge (SOC). This feedback typically includes:

- **Charging Indicator:** Indicates when the vehicle is connected to a charger and actively charging.
- **SOC Display:** Displays the current state of charge as a percentage, allowing you to monitor the progress of the charging process.

Fault Code Indication

In the event of a malfunction or system error, the EV Cluster may display fault codes or warning messages to alert you to the issue. These fault codes provide diagnostic information that can help you identify and address the problem promptly. Refer to the owner's manual or seek assistance from a qualified technician to interpret fault codes and resolve any issues.

Trouble Shooting the Cluster and its Connections

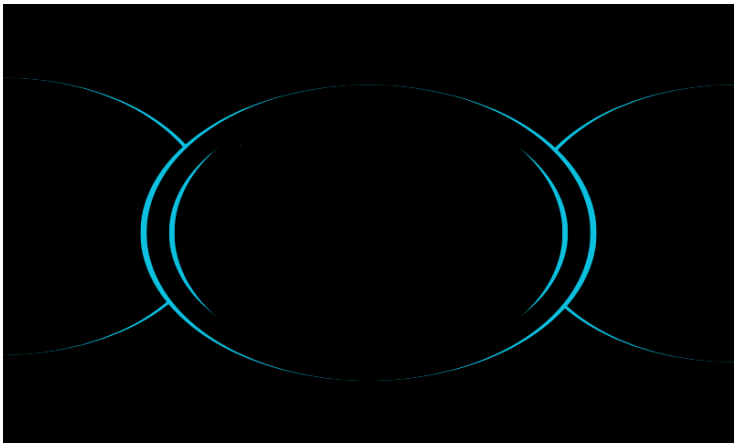
Sl	To do	observations	faults

no.			
1	press the ignition button	Button's light, HMI logo page	check the battery connections
2	Unlock the vehicle using RFID tag	HMI home page, should listen contactor sound.	Check that you are using right RFID tag. Check if the brakes are pressed properly, else check brake signals. Check 12v connection to Ignition Relay. Debug the firmware.
3	Check CAN data in HMI	SOC, drive mode, RPM, temperature	Check the Battery and Controller CAN wire connection. Check the CAN signal with CAN tester. Debug the firmware.
4	Put left and right indicator, high and low beam and hand brake	Should see the toggling arrows on screen	Check the Wiring connection using Multi-meter. Debug the firmware.

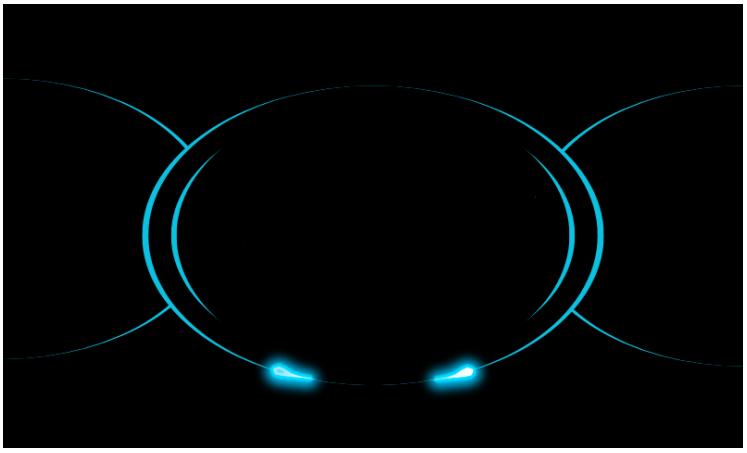
	signal in HMI		
5	Press the park button	white light should visible when pressed	FNER buttons should not ignite any light, if so it indicates noise. Check Hand brake and Brake signals using multimeter. Check the wiring connections. N should be present in HMI after pressing once. Check the Controller Connection. Debug the firmware.
6	Run the vehicle in Eco , Drive and Reverse mode	Should see the green or red or blue light on the buttons.	Check the Wiring connection using Multimeter. You should see the ECO, D or R wrt buttons pressed. Debug the firmware.
7	Observe the Speed, Odo, RPM, Trip in HMI	speed should be less than 45, odo and trip values.	Check the wiring connection of hall sensor. Debug the firmware.

While Charging

Charging Status Display



when charger is connected



while charging

State of Charge (SOC)

- When the charger is connected to your EV cargo vehicle, the EV Cluster primarily displays the State of Charge (SOC), indicating the current level of battery charge as a percentage. This allows you to monitor the battery's charging progress and estimate the remaining time until full capacity is reached.

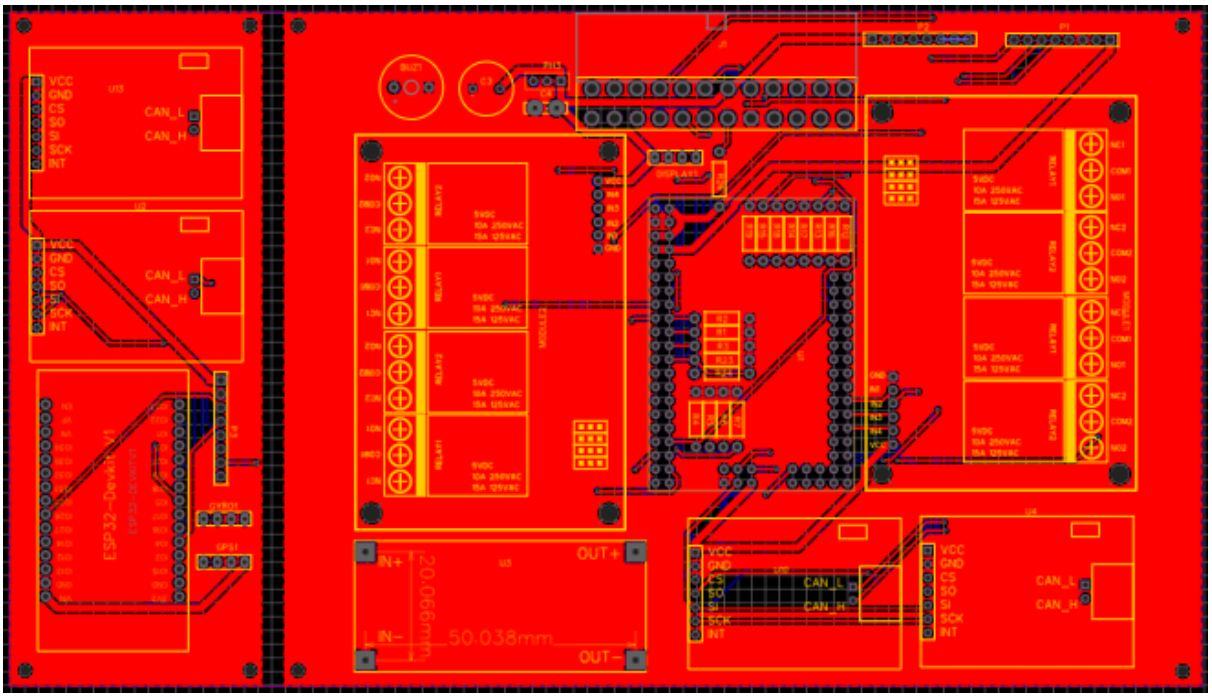
User Interface (UI) Indication During Charging

- While your vehicle is actively charging, the EV Cluster provides a user-friendly interface with additional indications beyond SOC. This includes graphical indicators and text displays that inform you of the charging status and various charging-related parameters.

Charging Progress

- In addition to the SOC, the EV Cluster may show a charging progress indicator during active charging sessions. This visual representation, such as a progress bar or animation, illustrates the current status of the charging process, allowing you to track the charging progress at a glance.

PCB Layout



PCB layout

Trouble Shooting

Troubleshooting the EV cluster, which serves as the dashboard display providing essential vehicle information, involves diagnosing and resolving issues related to its hardware, software, and connectivity. Here's a guide to troubleshooting common problems with the EV cluster:

Hardware Issues:

Display Malfunction:

- **Symptoms:** Blank screen, flickering display, distorted graphics.

- **Troubleshooting Steps:** Check the power supply to the cluster, inspect wiring connections, and ensure the display module is securely connected. If necessary, replace faulty display components.

Button or Switch Failure:

- **Symptoms:** Inoperative buttons or switches, unresponsive controls.
- **Troubleshooting Steps:** Inspect buttons and switches for physical damage or debris. Clean contacts if necessary. Replace damaged components as needed.

Software Issues:

System Freeze or Crashes:

- **Symptoms:** Cluster freezes, becomes unresponsive, or restarts unexpectedly.
- **Troubleshooting Steps:** Check for software updates or patches provided by the manufacturer. If applicable, reset the cluster to factory defaults. Ensure compatibility between software components.

Data Inaccuracies or Incorrect Readings:

- **Symptoms:** Incorrect speed readings, inaccurate battery level, or other data discrepancies.
- **Troubleshooting Steps:** Verify sensor inputs and connections. Calibrate sensors if necessary. Check for software bugs or glitches affecting data processing.

Connectivity Issues:

Communication Errors:

- **Symptoms:** Loss of connection with vehicle systems, failure to receive data updates.
- **Troubleshooting Steps:** Check wiring connections between the cluster and vehicle systems. Verify the integrity of communication protocols

(e.g., CAN bus). Inspect connectors and terminals for damage or corrosion.

Network Connectivity Problems:

- **Symptoms:** Inability to connect to external servers or cloud platforms.
- **Troubleshooting Steps:** Check network settings and configurations. Verify internet connectivity using diagnostic tools. Test alternate network connections (e.g., Wi-Fi, cellular).

General Troubleshooting Steps:

Power Cycle:

- Turn off the vehicle and disconnect the battery for a few minutes. Reconnect the battery and restart the vehicle to reset the cluster.

Check for Error Codes:

- If the cluster displays error codes or warning messages, consult the owner's manual or service documentation for guidance on interpreting and addressing the issue.

Consult Technical Support:

- If troubleshooting steps do not resolve the problem, contact the manufacturer's technical support team or consult a qualified technician for assistance.

Update Firmware or Software:

- Ensure that the cluster's firmware or software is up to date. Check for available updates and install them according to the manufacturer's instructions.

Replace Faulty Components:

- If hardware components are found to be defective or damaged beyond repair, replace them with compatible parts recommended by the manufacturer.

Perform System Diagnostics:

- Use diagnostic tools or software utilities to perform comprehensive system tests and identify underlying issues affecting cluster performance.

4. Telematics

Overall Features:

1. Battery State of Charge (SoC)

- · Provides the current state of charge of the EV's battery.
- · Essential for understanding the available energy for driving and estimating remaining range.

2. Voltage and Current

- · Displays real-time voltage and current measurements of the battery pack.
- · Helps in monitoring charging and discharging operations.

3. MOS Temperature

- · Monitors the temperature of MOSFETs (Metal-Oxide-Semiconductor Field-Effect Transistors) in the battery management system.
- · Ensures safe operating temperatures for critical components.

4. Battery Cell Balance Temperature

- · Monitors and displays temperatures across individual battery cells.
- · Helps in identifying potential overheating issues or imbalances.

5. Power, Ampere-hours (Ah), Kilowatt-hours (kWh), Watt-hours per kilometer (Whr/km)

- · Tracks instantaneous power, total ampere-hours consumed, total energy consumed in kWh, and energy efficiency in Whr/km.
- · Provides insights into energy consumption and efficiency.

6. High and Low Cell Voltage

- · Monitors the highest and lowest voltage levels among battery cells.
- · Helps in identifying cells that might be overcharged or discharged.

7. Individual Cell Voltages

- · Displays voltages of each individual cell within the battery pack.
- · Helps in identifying any imbalances or faulty cells.

8. Speedometer, Odometer (ODO), Trip Meter

- · Records and displays vehicle speed, total distance traveled, and distance traveled for specific trips.
- · Essential for tracking driving patterns and distances covered.

9. RPM (Revolutions Per Minute)

- · Monitors motor revolutions per minute.
- · Provides insights into motor performance and efficiency.

10. Ambient, Controller, Motor Temperature

- · Monitors and displays ambient temperature, controller temperature, and motor temperature.
- · Ensures components operate within safe temperature limits.

11. Gradient

- · Measures the slope or gradient of the terrain.
- · Provides information affecting energy consumption on inclines or declines.

12. Location

- · Uses GPS to track the vehicle's current location.
- · Enables tracking and mapping functionality.

13. Battery and Controller Health

- · Provides diagnostics and health status of the battery and motor controller.
- · Alerts about potential issues or degradation.

14. Device Access Token

- · Authentication token for secure access to the telematics system.
- · Ensures authorized access to the system.

15. Range and Efficiency

- · Estimates remaining range based on current battery status and driving efficiency.
- · Helps in planning routes and charging stops.

16. Vehicle Condition and Diagnostics

- · Monitors various vehicle systems and provides diagnostic information.
- · Alerts users about faults, errors, or maintenance requirements.

Hardware Components:

ESP32 Microcontroller:

ESP32

- Construction: The ESP32 is a powerful microcontroller with built-in Wi-Fi and Bluetooth capabilities. It features a dual-core processor and ample memory for running complex applications.
- Working: The ESP32 serves as the main control unit of the telematics system. It interfaces with other hardware components, collects data

from sensors, communicates with external servers, and controls peripheral devices.

- Operation: The ESP32 runs firmware that manages the overall operation of the telematics system. It handles tasks such as data acquisition, processing, and transmission, as well as device management and communication protocols.
- Troubleshooting: Common issues with the ESP32 may include firmware bugs, connectivity problems, or hardware malfunctions. Troubleshooting steps may involve firmware updates, checking connections, and testing individual components for faults.

MCP2515 CAN Bus Module:

MCp2515 CAN Module

- Construction: The MCP2515 is a standalone controller area network (CAN) bus module. It interfaces with the ESP32 via SPI (Serial Peripheral Interface) communication.
- Working: The MCP2515 facilitates communication with the vehicle's CAN bus system, allowing the telematics system to retrieve vehicle data such as speed, RPM, battery status, and more.
- Operation: The MCP2515 module is configured to listen to specific CAN bus messages and extract relevant data for transmission to the server. It handles message filtering, buffering, and error detection.

- Troubleshooting: Issues with the MCP2515 module may include communication errors, bus conflicts, or incorrect message interpretation. Troubleshooting involves verifying wiring connections, checking bus termination, and debugging communication protocols.

NEO-6M GPS Module:

GPS Module

- Construction: The NEO-6M is a compact GPS module that receives signals from GPS satellites to determine the vehicle's location.
- Working: The NEO-6M module communicates with the ESP32 via UART (Universal Asynchronous Receiver-Transmitter) to provide accurate GPS coordinates, velocity, and time information.
- Operation: The GPS module continuously updates the vehicle's position, allowing the telematics system to track its location in real-time. It may also provide additional data such as altitude, heading, and satellite status.
- Troubleshooting: GPS-related issues may include poor satellite reception, signal interference, or antenna placement. Troubleshooting involves checking antenna connections, ensuring clear line-of-sight to satellites, and adjusting configuration settings.

MPU6050 Gyroscope:

Gyroscope

- Construction: The MPU6050 is a gyroscope and accelerometer sensor module.
- Working: The MPU6050 measures the vehicle's orientation, acceleration, and rotation rates in three dimensions.
- Operation: The gyroscope provides data on the vehicle's tilt, pitch, and roll angles, which can be used for motion detection, stability control, and driver behavior analysis.
- Troubleshooting: Gyroscope issues may include calibration errors, noise interference, or sensor drift. Troubleshooting involves calibrating the sensor, filtering out noise, and verifying sensor integrity.

4G Dongle for Cellular Connectivity:

Dongle

- Construction: The 4G dongle is a USB-based cellular modem that provides internet connectivity to the telematics system.
- Working: The dongle connects to a cellular network provider's infrastructure to enable data transmission over the internet.

- Operation: Cellular connectivity allows the telematics system to transmit real-time data, receive commands, and communicate with remote servers or cloud platforms.
- Troubleshooting: Issues with the 4G dongle may include network coverage problems, SIM card issues, or configuration errors. Troubleshooting involves checking signal strength, verifying APN settings, and troubleshooting network connectivity.

Overall Construction and Operation:

- The hardware components are interconnected to the ESP32 microcontroller, which serves as the central processing unit.
- Data from sensors (GPS, gyroscope) and vehicle systems (CAN bus) are collected and processed by the ESP32.
- The ESP32 communicates with external servers or cloud platforms via the 4G dongle for real-time monitoring, data logging, and remote control.
- The telematics system continuously operates, collecting data, updating vehicle status, and transmitting information as required.
- Regular maintenance, such as checking wiring connections, updating firmware, and calibrating sensors, helps ensure optimal performance and reliability.

Trouble shooting :

Troubleshooting telematics systems involves identifying and resolving issues related to hardware, software, network connectivity, and data transmission. Here's a comprehensive guide to troubleshooting common telematics system problems:

1. Hardware Issues:

- **Check Power Supply:** Ensure that all hardware components are receiving adequate power. Verify connections to power sources and check for any loose connections or damaged cables.
- **Inspect Wiring Connections:** Verify wiring connections between components (e.g., sensors, microcontroller, modules) to ensure they are properly connected and securely fastened. Look for any signs of damage or corrosion.
- **Test Sensor Functionality:** Use diagnostic tools or test procedures to verify the functionality of sensors (e.g., GPS module, gyroscope). Ensure that sensors are calibrated correctly and providing accurate data.
- **Verify Hardware Integrity:** Check for any signs of physical damage, such as broken components, loose connectors, or burnt circuitry. Replace any damaged hardware components as necessary.

2. Software Issues:

- **Update Firmware:** Ensure that firmware for all hardware components (e.g., microcontroller, modules) is up to date. Install any available updates or patches to address known issues or bugs.
- **Check Configuration Settings:** Review configuration settings for the telematics system, including communication protocols, data formats, and sensor calibration parameters. Verify that settings are configured correctly for the intended operation.
- **Debug Code:** Use debugging tools and techniques to identify and resolve software bugs or errors in the system code. Monitor system logs and diagnostic messages for any indications of software-related issues.
- **Perform Software Resets:** If encountering unexpected behavior or system crashes, perform a software reset or reboot to restart the system and clear any temporary issues.

3. Network Connectivity:

- **Check Cellular Signal Strength:** Verify that the 4G dongle is receiving adequate cellular signal strength. Ensure that the device is connected to a compatible network and is within coverage range.
- **Review APN Settings:** Check Access Point Name (APN) settings for the cellular network provider. Ensure that APN settings are configured correctly for the network being used.
- **Test Network Connection:** Use diagnostic tools or network testing utilities to verify network connectivity. Ping remote servers or perform traceroute tests to identify any network connectivity issues.

4. Data Transmission:

- **Monitor Data Traffic:** Monitor data traffic between the telematics system and remote servers or cloud platforms. Use network monitoring tools to track data transmission rates and identify any abnormalities or bottlenecks.
- **Check Data Integrity:** Verify that data transmitted by the telematics system is complete, accurate, and consistent. Implement data validation techniques to detect and correct any errors or inconsistencies in the transmitted data.
- **Troubleshoot Server-side Issues:** If data is not being received or processed correctly on the server side, investigate potential issues with server configuration, data processing algorithms, or database connectivity.

5. Telematics Website

Introduction

The EV Analytics Web Application is designed to provide comprehensive analysis and insights into electric vehicle data. Whether you're a fleet

manager, service provider, or an individual user, this application offers powerful tools to monitor vehicle performance, energy consumption, and driver behavior. This detailed user manual will walk you through each feature and function of the application.

Getting Started

To get started with the EV Analytics Web Application, ensure you have a compatible web browser and a stable internet connection. Navigate to the application's URL and you'll be greeted with the login page. Here, you'll need to enter your email address and password to access your account. Once logged in successfully, you'll be directed to the dashboard where you can access various features through the top navigation bar.

Architecture and Technologies

The Telematics WebApp is designed using the MERN stack, which includes:

- **MongoDB:** A NoSQL database used for storing vehicle data, user information, and other relevant data.
- **Express.js:** A web application framework for Node.js used for building APIs and handling server-side logic.
- **React.js:** A JavaScript library for building user interfaces, used for the frontend of the Telematics WebApp.
- **Node.js:** A JavaScript runtime environment used for server-side scripting and running the backend server.

The frontend of the Telematics WebApp, built using React.js, is hosted on Netlify, while the backend server, implemented in Node.js with Express.js, is hosted on Vercel. This setup provides scalability, reliability, and seamless

integration between the frontend and backend components of the application.

Functionality

The Telematics WebApp offers various functionalities to enhance the user experience and provide valuable insights into vehicle performance and analytics. These functionalities include:

Login Page: Allows users to securely log in to the Telematics WebApp using their credentials.

Create User Page: Enables new users to register and create an account for accessing the web application.

Register Vehicle Page: Allows users to register their vehicles by providing relevant information such as vehicle identification number (VIN), make, model, and year.

Graph Analytics Page: Provides interactive graphs and visualizations of vehicle data, including metrics such as energy consumption, battery status, and driving patterns.

Past Data Analytics Page: Allows users to view historical data and analytics for their vehicles, facilitating trend analysis and performance evaluation over time.

Live Data and Map Page: Displays real-time data and live tracking of vehicles on a map interface, showing their current location, speed, and other relevant information.

Node Server APIs

The backend server implemented in Node.js with Express.js provides APIs for performing CRUD (Create, Read, Update, Delete) operations on the database. These APIs enable seamless interaction between the frontend React

application and the MongoDB database, facilitating data retrieval, storage, and manipulation. Some of the key APIs provided by the Node server include:

- **User Management APIs:** Allow for user authentication, registration, and profile management.
- **Vehicle Registration APIs:** Handle vehicle registration requests, validation, and storage of vehicle information in the database.
- **Data Retrieval APIs:** Retrieve vehicle data, analytics, and historical records from the database for display on the frontend.
- **Live Tracking APIs:** Provide real-time location tracking and map data to the frontend application for live monitoring of vehicles.

Features Access for Different User Roles:

1. Admin:

- **Complete Access:**
  - Login Page
  - Vehicle Registration Page
  - Driver Details Page
  - Vehicle List Page
  - Live Dashboard Template
  - Graph Analytics Page
  - Data Analytics Page

2. Service Provider:

- **Access Excluding Vehicle Registration and Driver Details:**
  - Login Page
  - Vehicle List Page
  - Live Dashboard Template
  - Graph Analytics Page
  - Data Analytics Page

3. Fleet:

- **Access to Live Dashboard, Data Analytics, Graph Analytics, and Geofence:**
  - Live Dashboard Template:
    - Live Location
    - Battery and Controller Health
    - Speed
    - Odometer Reading
    - State of Charge (SOC)
    - Range
    - Trip Details
    - Fault Codes
    - Efficiency
    - Energy Consumption
    - Drive and Charging Cycle
    - Battery, Controller, and Motor Temperature
    - Vehicle Lists
    - Geofence Alerts
  - Data Analytics Page:
    - Speed
    - Odometer Reading
    - State of Charge (SOC)
    - Range
    - Trip Details
    - Fault Codes
    - Efficiency
    - Energy Consumption
    - Drive and Charging Cycle
    - Load Carrying

        - Battery, Controller, and Motor Temperature

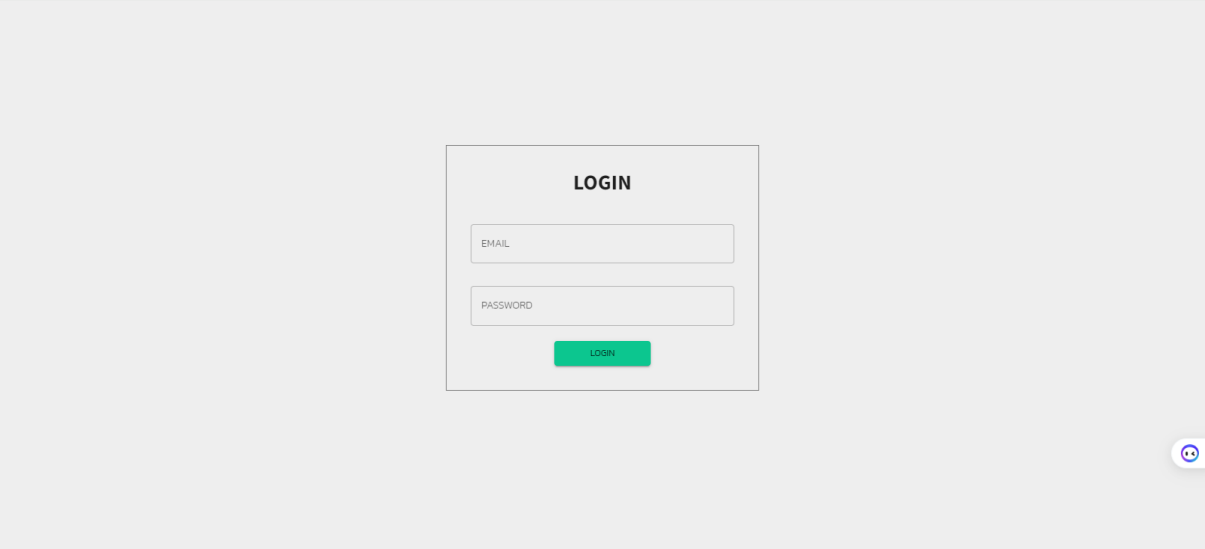
4. Individual:

- **Access to Live Dashboard and Data Analytics with Minimal Features:**
    - Live Dashboard Template:
        - Live Location
        - Battery and Controller Health
        - Speed
        - Odometer Reading
        - State of Charge (SOC)
        - Range
        - Trip Details
        - Fault Codes
        - Efficiency
        - Energy Consumption
        - Drive and Charging Cycle
        - Battery, Controller, and Motor Temperature
    - Data Analytics Page:
        - Speed
        - Odometer Reading
        - State of Charge (SOC)
        - Range
        - Trip Details
        - Fault Codes
        - Efficiency
        - Energy Consumption
        - Drive and Charging Cycle
        - Battery, Controller, and Motor Temperature

Page Designs

1. Login Page

The login page serves as the entry point to the EV Analytics Web Application. Enter your registered email address and password to authenticate your identity. Upon successful login, you'll gain access to the application's features and functionalities. If you're a new user, you'll need to sign up for an account before accessing the application.



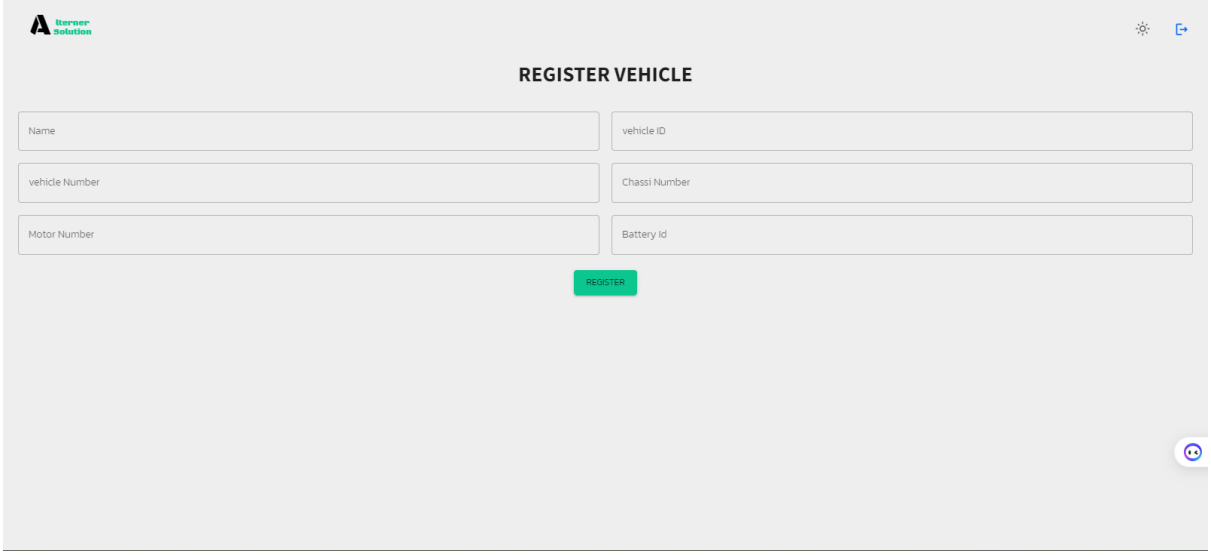
Login Page

2. Vehicle Registration Page

The vehicle registration page allows users to register new vehicles into the system. To register a vehicle, you'll need to provide the following information:

- Vehicle Model Name
- Vehicle Registration Certificate (RC) Number
- Chassis Number
- Motor Number
- Battery Number
- Authentication Key
- Vehicle ID

Once the necessary information is provided, click on the "Register" button, and the details will be stored in the backend database for future reference.



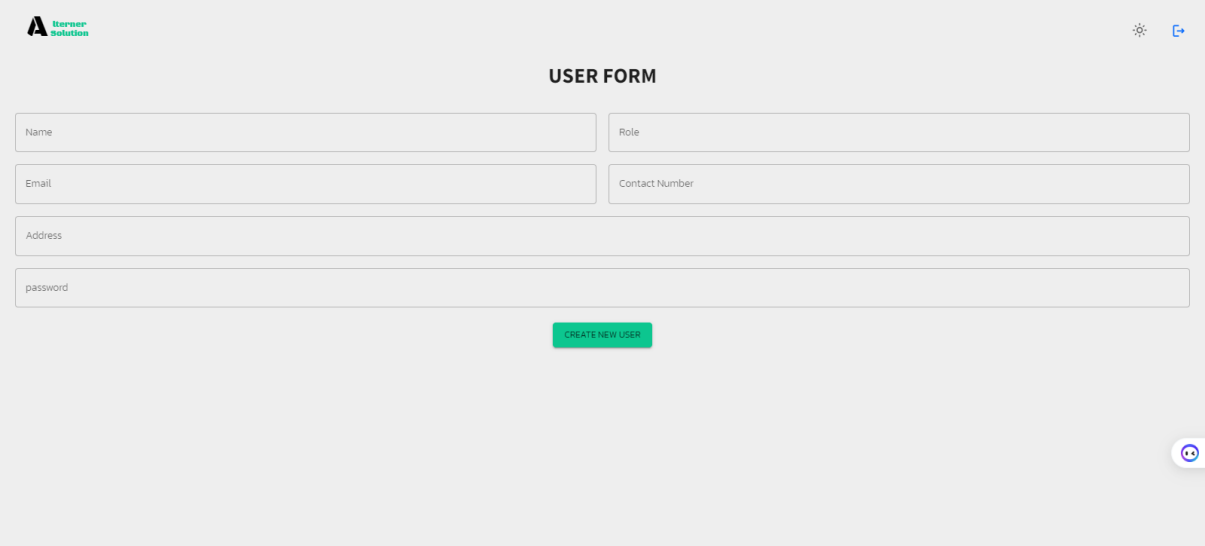
Vehicle Register Form

3. Driver Details Page

The driver details page enables users to manage user credentials and roles associated with the application. Here, you can input details such as:

- Username
- Email Address
- Password
- Role (Admin, Service Provider, Fleet Manager, Individual)
- Authentication Key

After entering the required information, click on the "Save" button to update the user credentials. The authentication key serves as an additional layer of security for user authentication.



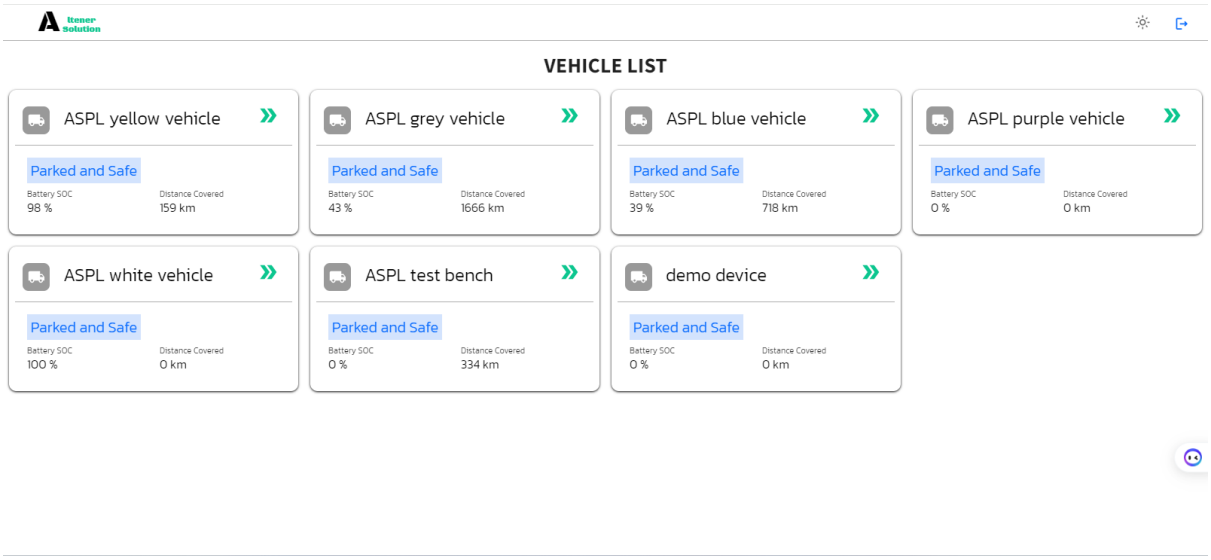
User Registration Form

4. Vehicle List Page

The vehicle list page displays all registered vehicles along with basic information such as:

- State of Charge (SOC)
- Odometer Reading
- Vehicle Condition
- Model Name
- Online Status

Additionally, there's a button available for each vehicle that allows users to navigate to the dashboard of a specific vehicle to access live maps and insights.



Vehicle List

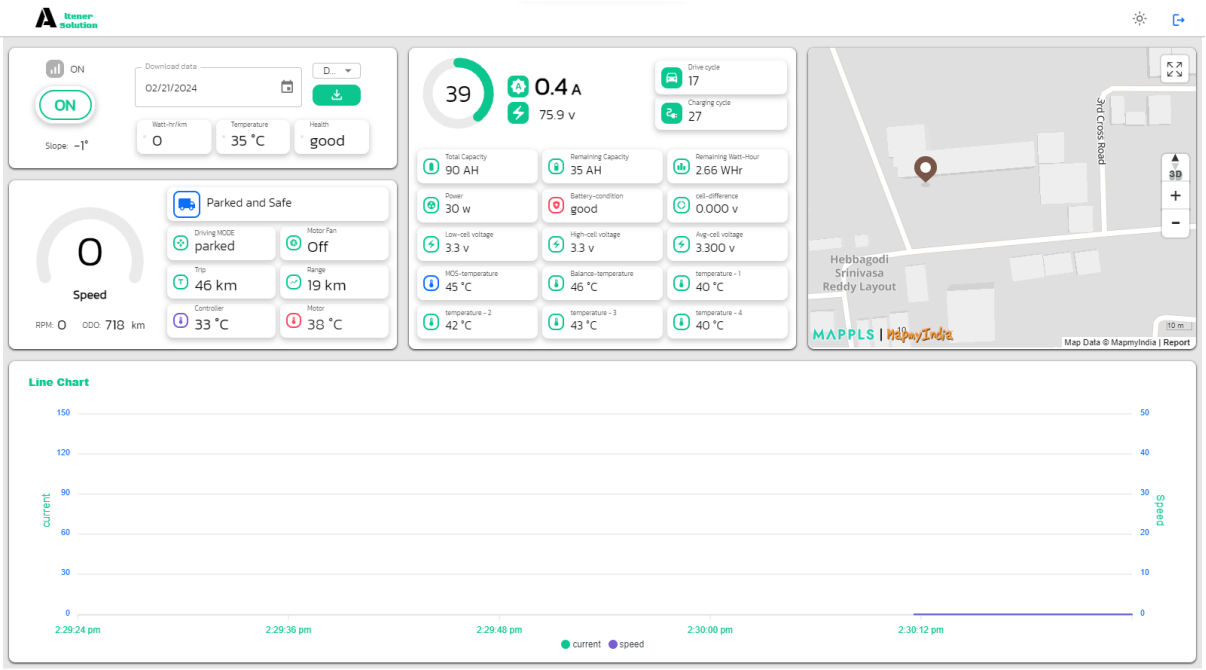
5. Live Dashboard Template

The live dashboard template provides real-time data insights for a selected vehicle. It offers a comprehensive view of various parameters including:

- Live Location and Map
- Battery and Controller Health
- Energy Consumption Metrics (e.g., Whr/km)
- Ambient Conditions
- Speed
- RPM
- Driving Mode
- Odometer Reading
- Trip Meter
- Range
- Vehicle Condition
- Online Status
- Temperature Readings (Controller, Motor, Battery)
- Slope
- Battery SOC

- Current
- Voltage
- Power
- Watt Hour remaining
- AH total and remaining
- Cell voltages

Users can also control the ignition switch to remotely turn the vehicle on or off for added convenience and security.



Dashboard template

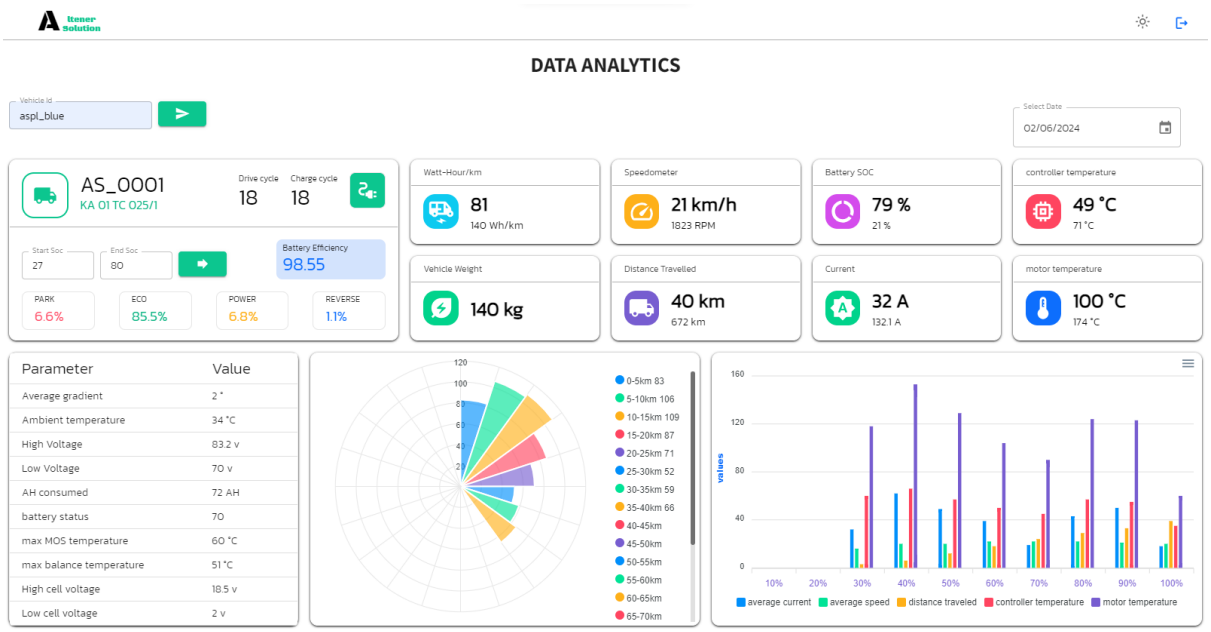
6. Data Analytics Page

The data analytics page offers detailed analysis and reports based on collected data. Users can input a vehicle ID and select a date range to generate comprehensive reports on:

- Energy Consumption
- Driver Behavior
- Efficiency

- Load Carrying Capacity
- Trip Details
- Charging Information
- Drive and Charging Cycles
- Temperatures
- Driving modes, vehicle health

The reports provide valuable insights for optimizing vehicle performance, identifying areas for improvement, and making informed decisions regarding vehicle usage and maintenance.



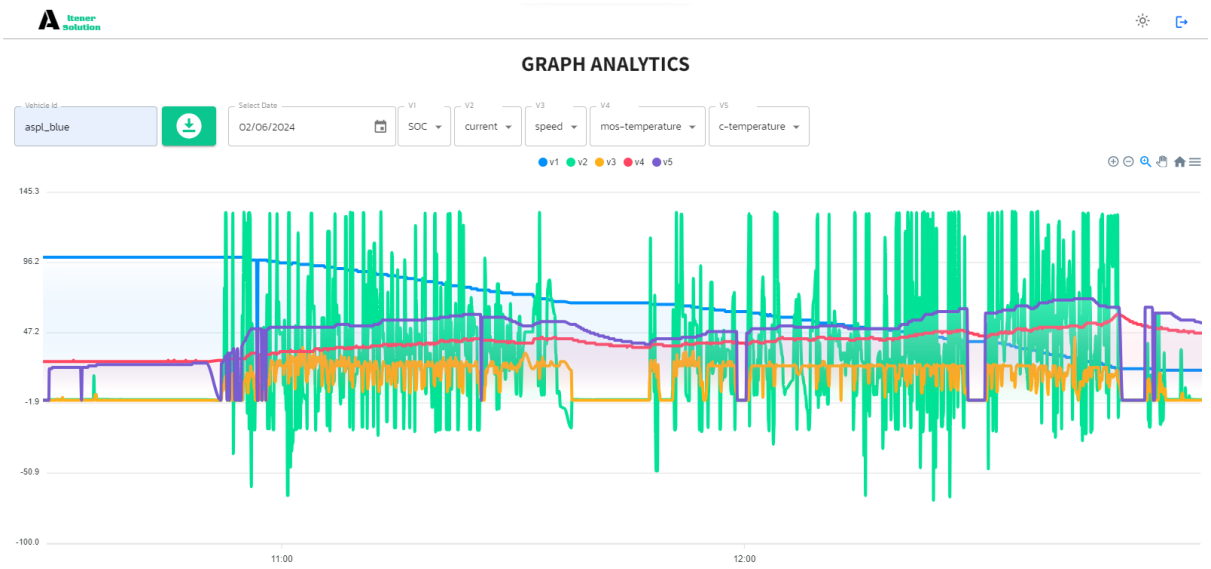
Analytics Template

6. Graph Analytics Page

The graph analytics page allows users to analyze historical data for a specific vehicle. To generate graphs, users need to input the vehicle ID and select a date. The page provides graphical representations of various parameters over the selected time period, including:

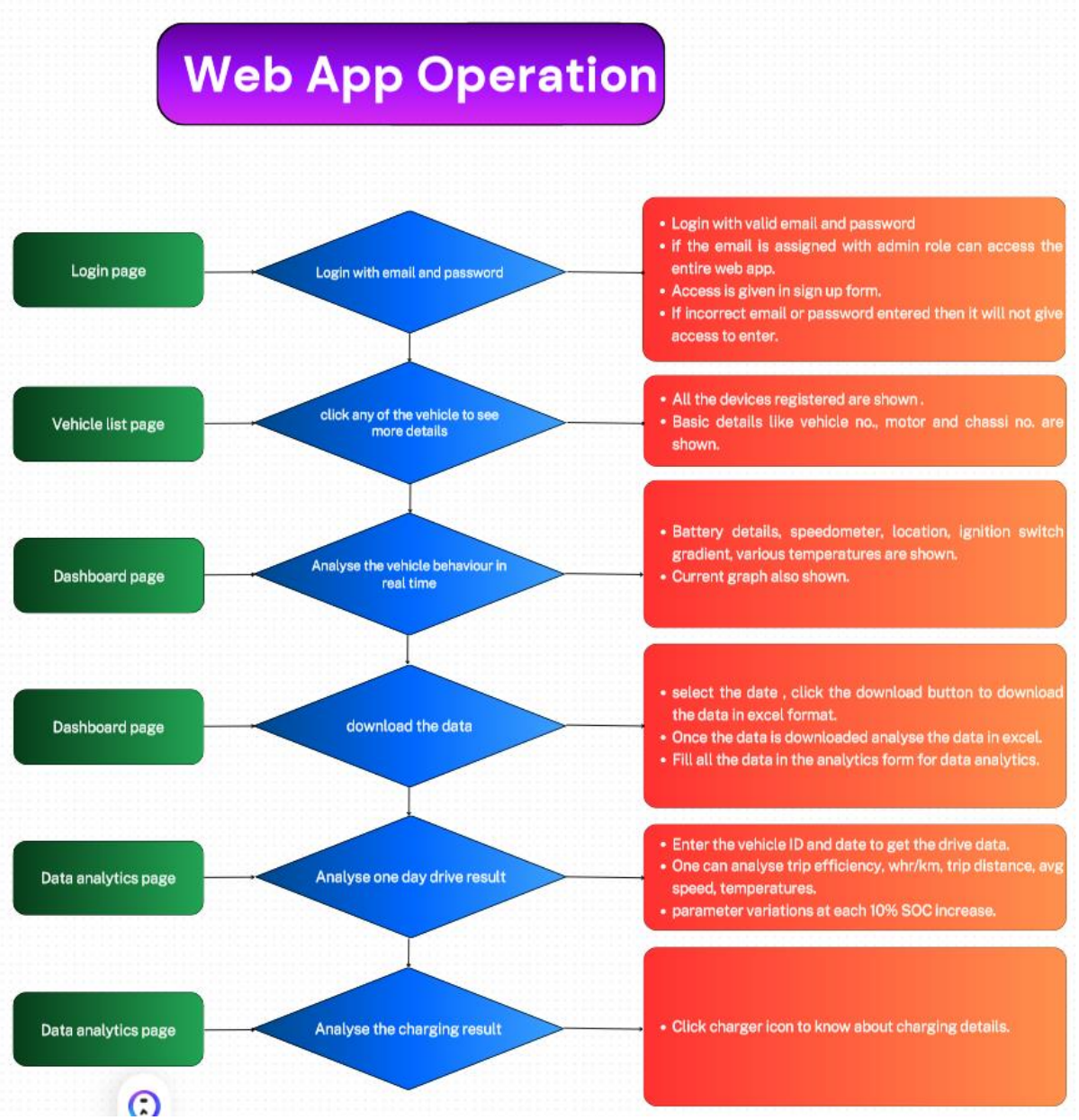
- Battery SOC

- Voltage
- Current
- Energy Consumption Metrics (e.g., Whr/km)
- Temperatures
- RPM
- Speed
- Odometer Readings

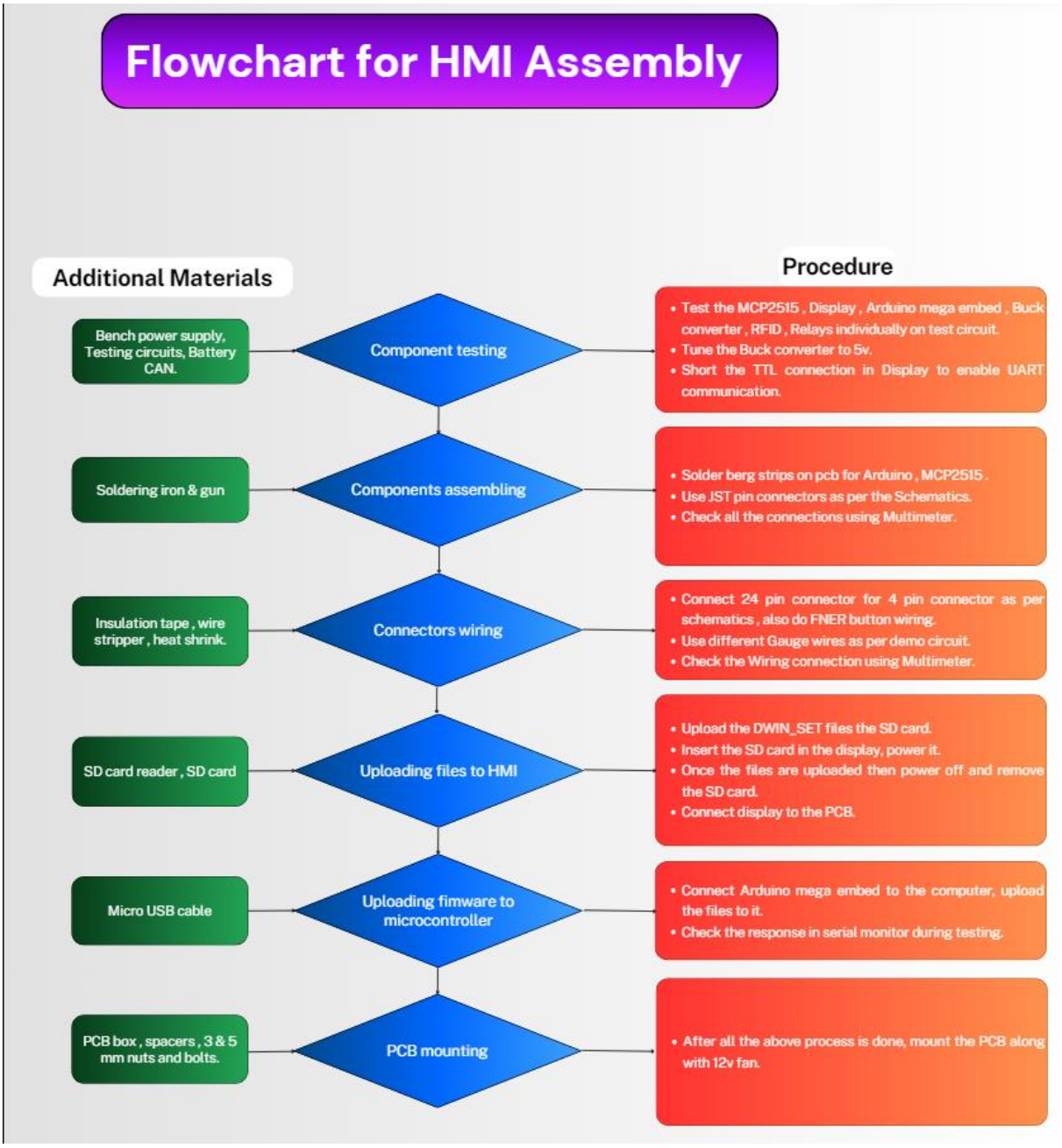


Graph template

Operational Flow Chart



6. Installation of Cluster and Telematics



Preparation Steps:

1. Soldering Components to the PCB:

· Referencing the circuit and block diagrams, solder all components onto the designed PCB (Printed Circuit Board) according to their designated positions.

· Follow proper soldering techniques, ensuring clean and secure connections to prevent short circuits or loose connections.

2. Wiring Connections to Relay Modules:

· Connect wires to the relay modules based on the specifications and instructions provided in the block diagram.

· Verify correct connections for relay control and power lines to ensure proper operation when activated.

3. Shielded Wiring for Sensitive Components:

· Use shielded wires for connections to sensitive components such as GPS, gyroscopes (gyro), instrument cluster, and Hall-effect sensors.

· Shielding helps prevent electromagnetic interference (EMI) and ensures accurate data transmission.

4. Software Integration:

· **Programming:** Develop or install the necessary software or firmware to drive the instrument cluster. This involves programming the microcontroller (e.g., Arduino) to handle display, button inputs, sensor data, and communication protocols.

· **Testing:** Conduct thorough testing to ensure proper functionality, including speedometer accuracy, data display, button responsiveness, and indicator operation.

5. Testing on the Bench:

· Before mounting the assembled PCB into the vehicle, conduct tests on a test bench setup.

· Power up the circuit and verify the functionality of individual components, sensors, and modules.

· Check for proper communication between components, accurate sensor readings, and relay operations.

6. Functional Testing:

· Test all operations as per the intended functions outlined in the system design.

· Ensure that each component responds correctly and communicates effectively within the system.

· Verify that the PCB assembly is performing the desired operations accurately.

7. Final Checks and Operation Verification:

· Confirm that all operations, including relay switching, sensor readings, GPS positioning, and cluster communication, are functioning correctly.

· Double-check connections and solder joints for any potential issues or loose connections.

· Confirm that the PCB is fully operational and ready for installation in the vehicle.

8. Mounting to the Vehicle:

· Once the PCB has passed all functional tests, mount it securely within the vehicle in the designated location, ensuring proper insulation and protection from environmental factors.

· Connect the shielded wires to their respective components, ensuring a clean and secure connection.

Hardware Installation Steps:

1. Mounting in the Box:

· Place the tested PCB board in the designated box or enclosure, ensuring it fits securely.

· Use spacers to mount the PCB securely within the box, providing appropriate clearance and support to prevent movement or damage during vehicle operation.

· Ensure the box provides adequate protection from environmental factors like moisture, dust, and vibrations.

2. Wiring Connections:

· Connect the 24-pin connector from the vehicle's electrical system to the corresponding connector on the PCB board. Ensure correct alignment and secure connection.

· Wire the ignition switch to the designated connector on the PCB, allowing the system to receive power when the vehicle is turned on.

3. Cluster, Gyroscope (Gyro), GPS Connections:

· Connect the cluster (instrument cluster) to its designated connector on the PCB. Ensure the connection is secure and aligned properly.

· Connect the gyro (gyroscope) using the designated connector to the PCB, ensuring a secure connection.

· Connect the GPS module via its JST connector to the corresponding connector on the PCB. Ensure the connection is firmly seated to prevent disconnection during vehicle operation.

4. Double-checking Connections:

· Verify all connections made during wiring to ensure correct alignment and firm attachment.

· Double-check the connections for the 24-pin connector, ignition switch, cluster, gyro, and GPS to avoid any loose or faulty connections.

5. Securing Wires and Cables:

· Use cable ties or clamps to organize and secure the wires, preventing them from moving excessively or interfering with other vehicle components.

· Ensure that wires are routed safely and do not obstruct any moving parts or pose a safety hazard.

6. Insulation and Protection:

· Insulate exposed wires or connections with appropriate coverings or insulating materials to prevent short circuits or electrical hazards.

· Close and seal the box or enclosure properly to protect the PCB and connected components from environmental elements.

7. Testing After Installation:

· After completing the installation, conduct a final check to ensure all connections are secure.

· Power on the vehicle and verify that the instrument cluster, gyro, and GPS modules are operational and communicating effectively with the installed PCB.

8. Functional Testing:

· Test the telematics and instrument cluster functions to ensure accurate data readings, GPS positioning, and proper display on the cluster.

· Verify that all components integrated with the PCB are functioning as intended.