

UPPARA BHARATH KUMAR - Jr. Embedded Firmware Engineer

Kurnool, Andhra Pradesh | +91 6304196506 | upparabharathkumar04@gmail.com | [LinkedIn](#)

PROFESSIONAL SUMMARY

Embedded Firmware Engineer with 1.4 years of experience in embedded software design, implementation, and real-time embedded systems modernization. Backed by a strong technical foundation in firmware development for real-time applications, with solid expertise in RTOS, wireless communication protocols, and embedded C programming. Possesses strong understanding of microcontroller architectures, peripherals, memory management, hardware-software interfacing, and low-level driver development. Skilled in debugging, performance optimization, and system-level troubleshooting, with the ability to work effectively both independently and within collaborative engineering teams.

EXPERIENCE

Jr. Embedded Firmware Engineer, R&D Department | Kali MedTech Pvt. Ltd. - Ahmedabad, Gujarat *April 2025 – Present*

- Engineered production-grade firmware for 12-lead resting and 7-channel wearable ECG medical devices using NXP RW612 and TI(CC2652R), FreeRTOS, achieving clinical-level signal accuracy.
- Deployed a Bluetooth Low Energy communication stack for real-time ECG data streaming to companion mobile applications.
- Reduced power consumption through low-power firmware optimization, extending battery life on wearable devices.
- Incorporated NAND Flash offline data logging with synchronization to maintain uninterrupted data recording.
- Collaborated with QA teams to perform ECG signal validation, noise filtering, and calibration to meet clinical standards

SKILLS

Embedded Programming Languages: Advanced C, C++, Data Structures, Embedded C, Python (Basic)

Embedded Hardware: Soldering, Circuit Debugging, Testing, Component Schematic and Datasheet Analysis.

OS and RTOS: Linux Commands, Multithreading, IPC (Pipes, FIFO, Shared Memory), FreeRTOS.

Microcontrollers: NXP (RW612), Texas Instruments (CC2652R), STM32 Nucleo-64, ESP32 (CAM, H2, S3, WROOM), Arduino (Nano, Mega, Nano 33 IoT), PIC (18F4580), NRF Power Profiler.

Debug Probes: NXP LinkServer, SEGGER J-Link (JTAG and SWD), CP2102 USB-to-TTL Converter.

Development Tools: MCUXpresso IDE (NXP), Code Composer Studio (TI), Arduino IDE, MPLAB, Vim editor, Git.

Communication Protocols: Bluetooth, Wi-Fi (Wireless), SPI, I2C, UART, CAN, TCP, UDP and IP, GPIO.

Embedded Modules: **Memory:** NAND Flash, NOR Flash, EEPROM. **ADC:** ADS1298, ADS1293, AD8232, MCP4725, Max32664. **Sensors:** TMP117, Ultrasonic Distance, Motion, Gas. **Displays:** CLCD, 0.97-inch, E-Paper, OLED 0.91 and 2.42 inch. Timers, Interrupts, Digital Filtering, Logic Analyzer.

PROJECTS

12-Channel Resting ECG Device | Kali MedTech | *2026*

Designed firmware for a 12-channel resting ECG system using NXP Semiconductors RW612 with ADS1298 interfaced over SPI for continuous ECG acquisition across 12 leads. Fused ADC settings including sampling rate, gain control, and channel selection for accurate waveform capture. Implemented Bluetooth Low Energy (BLE) communication using GAP for device advertising and connection management, and GATT services with custom characteristics for real-time ECG data streaming. Linked SPI NOR Flash memory for temporary ECG data buffering and retransmission, along with MAX17048 over I2C for battery monitoring. Utilized FreeRTOS-based task scheduling and applied notch, bandpass, and baseline wander filtering techniques to achieve stable clinical-quality ECG waveforms.

Components: NXP RW612, ADS1298, SPI, I2C, BLE, Nor Flash, FreeRTOS, MCUXpresso IDE.

7-Channel Wearable ECG Device | Kali MedTech | *2025*

Established wearable ECG firmware on Texas Instruments CC2652R with ADS1293 for multi-channel ECG monitoring and posture-based activity detection. Established BLE communication using GAP for advertising and connection handling, and GATT services with custom characteristics for ECG packet transmission and mobile application connectivity. Worked with BLE packet handling, MTU optimization, and PHY configuration for stable real-time wireless streaming. Developed an offline-first system where ECG data is stored in NAND Flash during BLE disconnection and synchronized automatically after reconnection. Assimilated MAX17048 for battery monitoring and applied calibration and digital filtering techniques for reliable ECG waveform acquisition.

Components: TI - CC2652R, ADS1293, NAND Flash, MAX17048, BLE, FreeRTOS, Code Composer Studio (CCS), Position Sensor, SPI, I2C.

Smart Vital Signs Card (ECG and SpO2) | Kali MedTech |

2025

Programmed a compact card-form-factor vital monitoring system on ESP32-H2 using Arduino IDE integrating ADS1293 for ECG acquisition and MAX32664 with TMP117 for SpO2 and heart rate monitoring. Implemented FreeRTOS-based multitasking for concurrent ECG, PPG acquisition, OLED display handling, and BLE communication. Generated BLE architecture using GAP/GATT services with custom characteristics, MTU optimization, and PHY configuration for stable real-time waveform streaming to a mobile application. Attached a 2.42-inch OLED display for live ECG and PPG visualization and validated signal quality, BLE reliability, and sensor accuracy through hardware and QA testing.

Components: ESP32-H2, ADS1293, Max32664, TMP117, 2.42-inch OLED Display, BLE, FreeRTOS, Arduino IDE.

Car Black Box Data Logger | Emertxe Institute |

2024

Created a vehicle black box data logging system on PIC18F4580 for continuous monitoring of vehicle speed, engine status, and driving events. Utilized ADC for real-time sensor signal acquisition and configured CLCD display interfacing to show speed, event status, gear position, and logged system information. Formed event detection logic for sudden braking, acceleration changes, and engine fault recording with timestamp-based storage for post-event analysis. Integrated EEPROM circular buffer management with checksum validation for reliable non-volatile data storage during continuous operation and unexpected power loss conditions. Worked with UART communication, timers, interrupts, and Embedded C programming for real-time embedded control and debugging.

Components: PIC18F4580, EEPROM, SPI, I2C, UART, Timers, CLCD Display, MPLAB IDE, Embedded C.

Mining Safety Helmet Monitoring System | Academic Project |

2023

Enhanced a smart safety helmet system for mining and industrial environments to monitor worker safety and environmental conditions in real time. Integrated temperature, gas, motion, and accident detection sensors for continuous health and hazard monitoring. Constructed real-time sensor acquisition, threshold-based alert generation, and wireless communication for continuous data transmission to a central monitoring station. Designed the system to trigger emergency alerts during abnormal gas levels, high temperature, unsafe movement, or accident conditions while ensuring reliable operation in harsh industrial environments. Worked on embedded firmware Reconstruction, sensor interfacing, real-time monitoring logic, and stable communication handling for continuous safety supervision.

Components: ESP32, GPS, RFID, Gas Sensors, Wi-Fi, Bluetooth, Embedded C.

EDUCATION		
Bachelor of Engineering in Electronics and Communication Engineering (ECE)		2019 - 2023
- Sri Krishnadevaraya University, Anantapur, Andhra Pradesh 63 %		
Board of Intermediate Education (Class - XII)		2017 - 2019
- Master Junior College of Arts and Science, Kurnool, Andhra Pradesh 75%		
Board of Secondary Education (Class - X)		2016 - 2017
- ZP High School, Ternekal 77%		

CERTIFICATIONS		
- Advanced Embedded Systems, Emertxe Information Technologies, Bengaluru.		2024
- Internet of Things (IoT) Internship Certification, Skill Dzire, online		2022