Real-Time Operating System (RTOS) Project Design Document

1. Introduction

This document outlines the design of the Real-Time Operating System (RTOS) project, which aims to control the seat heating system in a vehicle using an embedded system. The system employs FreeRTOS, a popular real-time operating system kernel for embedded devices.

2. System Overview

The system consists of several tasks designed to manage various aspects of the seat heating control system. These tasks include:

- CPU Load Measurement Task
- Tasks Time Measurement Task
- Display System State Task
- Seat 1 Adjust Heater Task
- Seat 2 Adjust Heater Task
- Get Seat 1 Current Temperature Task
- Get Seat 2 Current Temperature Task
- Check Seat 1 Heating Level Change Task
- Check Seat 2 Heating Level Change Task

These tasks operate concurrently and communicate with each other as necessary to ensure proper functioning of the system.

3. Task Descriptions

3.1 CPU Load Measurement Task

- **Description**: Measures the CPU load of the system.
- **Periodicity**: Executes every 1000 milliseconds.

3.2 Tasks Time Measurement Task

- **Description**: Measures the execution time of various tasks in the system.
- **Periodicity**: Executes every 1000 milliseconds.

3.3 Display System State Task

- **Description**: Displays the current state of the seat heating system, including temperature, heating levels, and heater intensity.
- **Periodicity**: Executes every 1000 milliseconds.

3.4 Seat 1 Adjust Heater Task

- **Description**: Adjusts the heater intensity for seat 1 based on the desired temperature and current temperature.
- **Periodicity**: Executes every 100 milliseconds.

3.5 Seat 2 Adjust Heater Task

- **Description**: Adjusts the heater intensity for seat 2 based on the desired temperature and current temperature.
- **Periodicity**: Executes every 100 milliseconds.

3.6 Get Seat 1 Current Temperature Task

- **Description**: Reads the current temperature of seat 1 using a sensor.
- **Periodicity**: Executes every 100 milliseconds.

3.7 Get Seat 2 Current Temperature Task

- **Description**: Reads the current temperature of seat 2 using a sensor.
- **Periodicity**: Executes every 100 milliseconds.

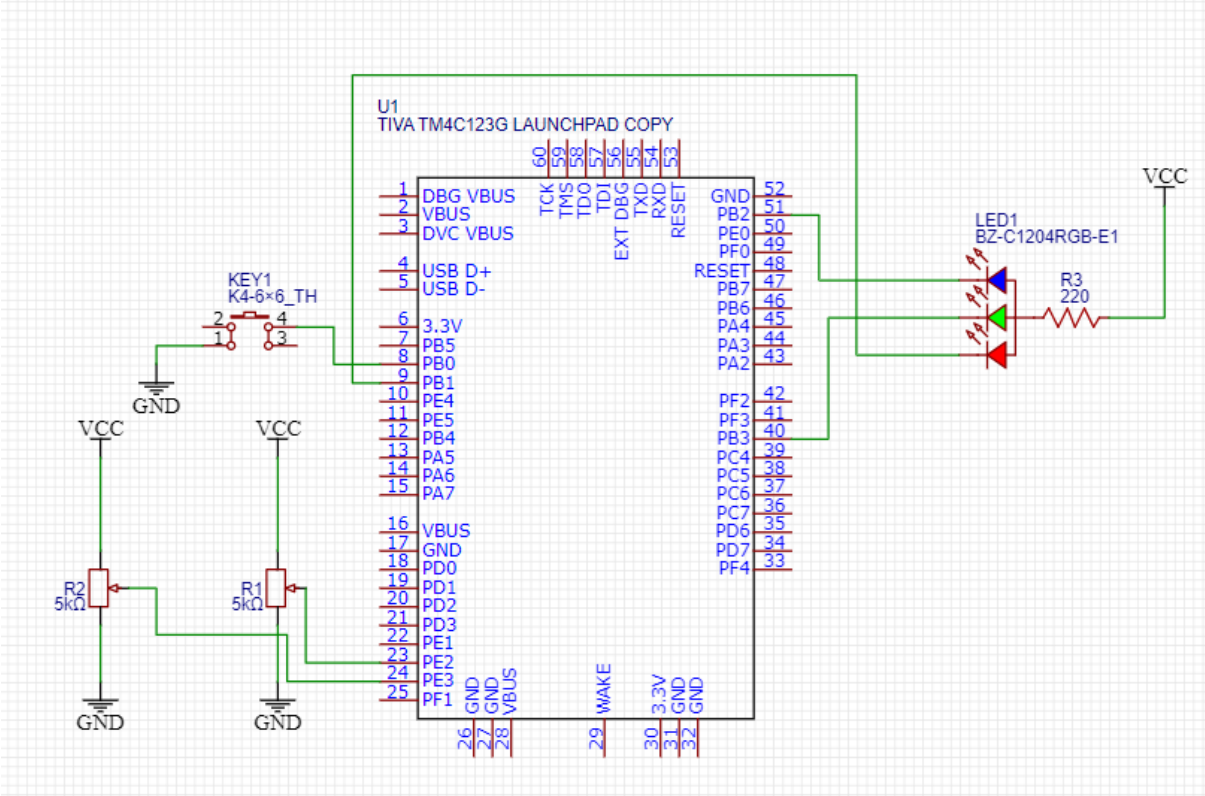
3.8 Check Seat 1 Heating Level Change Task

- **Description**: Monitors for user input to change the heating level for seat 1.
- **Periodicity**: Executes every 100 milliseconds.

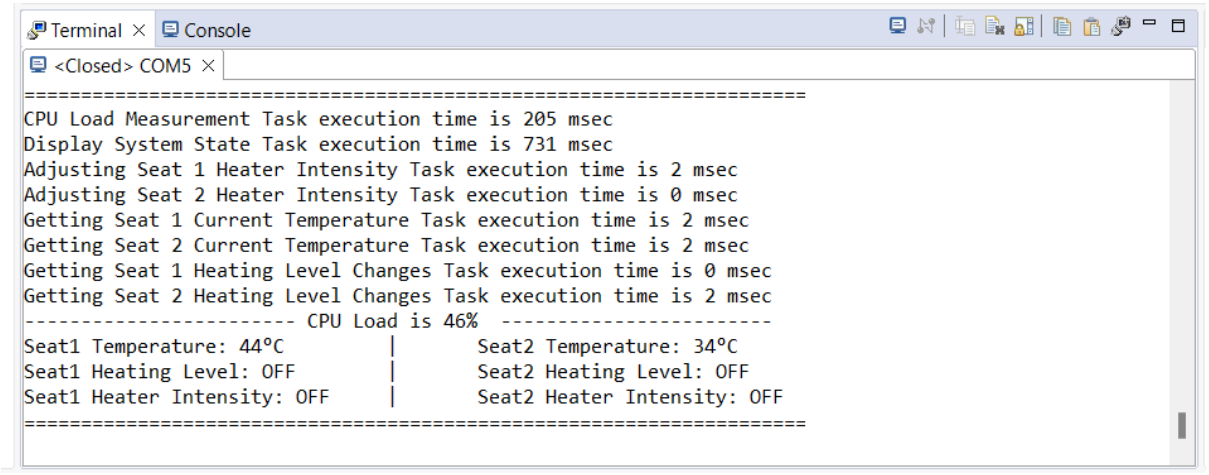
3.9 Check Seat 2 Heating Level Change Task

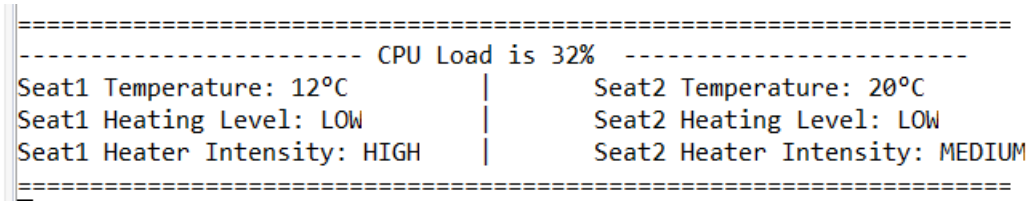
- **Description**: Monitors for user input to change the heating level for seat 2.
- **Periodicity**: Executes every 100 milliseconds.

4. Schematic Diagram

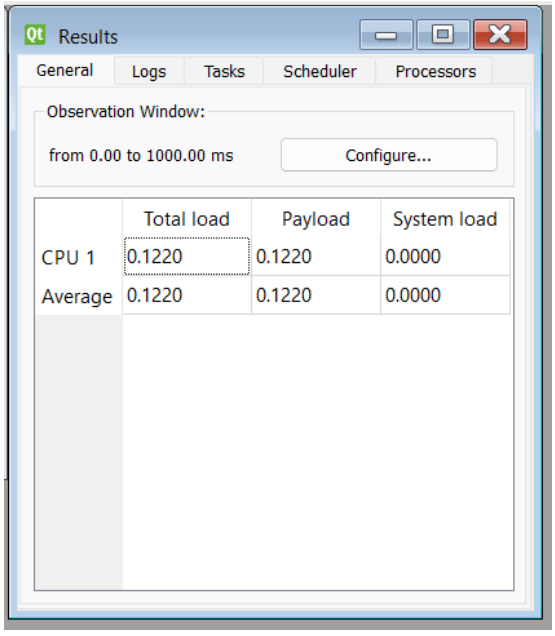


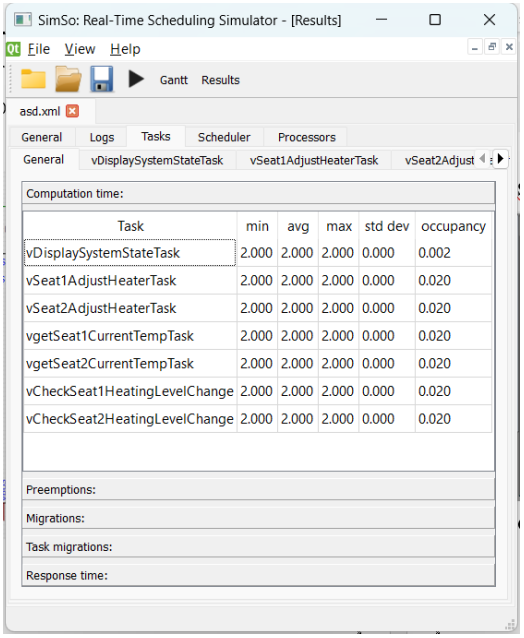
5. UART messages

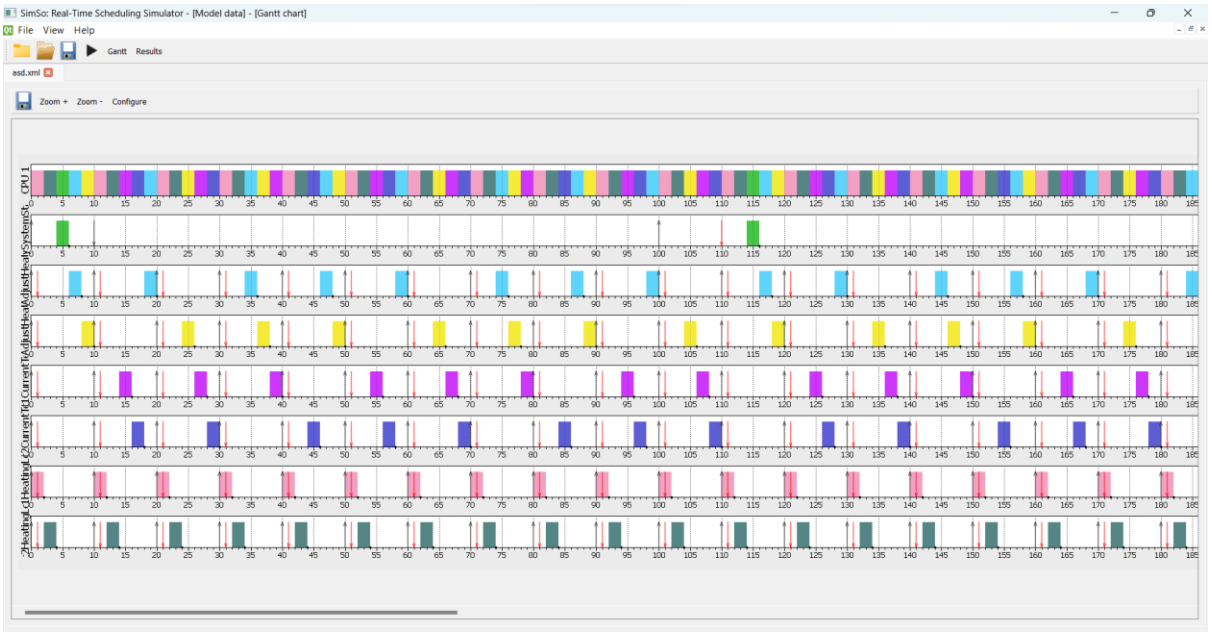




6. Simso Simulation







7. Connections