

# Tiva TM4C1294NCPT Traffic Light Controller

## Software Requirements

### Functional Requirements

**RE1: The software should produce 10 binary(on-off) outputs:**

- 1-3: Main road: 1 Green, 2 Yellow, 3 Red;
- 4-6: Side road: 4 Green, 5 Yellow, 6 Red;
- 7-8: Main Pedestrian 7 Green, 8 Red;
- 9-10: Side Pedestrian 9 Green, 10 Red)

**RE2: The software should take 4 binary inputs:**

1. Main Pedestrian Button;
2. Side Pedestrian Button;
3. Side Road Sensor;
4. Mode Switch;

**RE3: By pushing Mode Switch, it should be possible to loop through operation modes:** -> Standard(Default) -> Rush -> Night ->

3 Operation modes have to be implemented:

**Standard mode:**

**RE4: During standard mode, there are 4 combinations of single road lights, which loop in a cycle:**

1. Green - Green lights up
2. Green to Red - Yellow lights up
3. Red - Red lights up
4. Red to Green - Yellow and Red lights up

**RE5: During Standard mode, there are 8 states (combinations taken from RE4):**

1. 0 Main 3, Side 3 (1 sec)
2. 1 Main 4, Side 3 (1 sec)
3. 2 Main 1, Side 3 (5 sec)
4. 3 Main 2, Side 3 (1 sec)
5. 4 Main 3, Side 3 (1 sec)
6. 5 Main 3, Side 4 (1 sec)
7. 6 Main 3, Side 1 (3 sec)
8. 7 Main 3, Side 2 (1 sec)

\*Note: 0.25 sec tick should be the basis for checking for polling-based interrupts

**RE6: During Standard mode, Pedestrian light modes depends on the mode of the road they cross (Main Pedestrian - Main Road):**

1. Red - RE4 modes 2, 3
2. Green - RE4 modes 1, 4

**RE7: During all modes pedestrian button should only work when the corresponding light is red.**

**RE8: Pressing the button will do the following:** *For Main Road: Go to RE5 Phase 1, continue normal*

*For Side Road: Go to RE5 Phase 5, continue normal*

**Rush Hour mode:**

**RE9: During Rush mode, lights are always in RE5 phase 3, unless interrupted.**

**RE10: During Rush mode, Main pedestrian button is disabled.**

**RE11: During Rush mode, button press by Side Road Sensor or Side Pedestrian will loop through RE5 phases 1 time and return to RE5 phase 3.**

**Night mode:**

**RE12: During Night mode, there are 3 light combinations:**

1. All road lights light up yellow
2. All road lights off
3. All road lights red

**RE13: During Night mode, there are 2 passive states:**

1. RE12 1 for 1 sec.
2. RE12 2 for 1 sec.

**RE14: Pressing any pedestrian button will do the following:**

1. Turn to RE12 3 for 6 seconds.
2. Return to RE13 behavior.

**Developer Requirement:**

**DRE1: Operational mode “STOP” has to be introduced.** The Software would start in this mode, then switch to regular function, as described in

RE3. This is needed, as once the software is loaded onto the microcontroller, it immediately starts running.