

Typical Questions for Experiment 4

Checkpoint 1

- What does the `bic` instruction do? How is it different from `and`?
- What does the instruction “`ldr r1,=portA`” do? What is the real instruction used?
- How long, on average, does it take the ARM processor to execute one instruction?
- What would be the frequency of the flashing LEDs if you added the `nop` instruction to the loop in Figure 3?
- Would it make any difference *where* that `nop` instruction was added?

Checkpoint 2

- What is the stack pointer initialised to? Why is this necessary in the first place?
- What is the difference between `flash-v2.s` and `flash-v3.s`? Which is better, and why?
- Where is the stack located in memory? How many bytes are reserved for the stack?
- What value of `waitval` will give you a frequency of 1 Hz for the flashing LEDs?
- What would be the frequency of the LEDs if you set `waitval` to zero?

Checkpoint 3

- What is the address of the free-running timer? What is its period (ie, time it takes to count a complete cycle, from zero to zero)?
- From your answer to Checkpoint 1, how many instructions are executed by the ARM processor during one timer tick (ie, the time it takes the timer to increment the value by one)?
- What is the implication of this when checking whether the timer has reached zero?

Checkpoint 4

- How many timer pulses add up to one second? Is the free-running timer able to count this high?
- How frequently does the timer port value *change*? How can you use this to write the delay function?

Checkpoint 5

- How many states do you need to keep track of all of the traffic light combinations?
- Where have you stored the LED settings for each state?
- How can you generate a delay of either one second or 2½ seconds using the *same* function?
- What does the requirement “Conform to the ATPCS” mean? How have you met it?