Dalhousie University
Department of Electrical and Computer Engineering

ECED 3403 – Computer Architecture

Lab/Tutorial 1: The XM23 ISA, XM23p Assembler, and XM23 Emulator

1 Objectives

In this lab/tutorial you should gain experience with the XM23 ISA by writing, assembling (using the XM23p Assembler), and running XM23 programs (using the existing XM23 emulator).

2 Requirements

This lab requires you to design, implement, and test XM23p assembly language programs to:

1. Sum an array of 16-bit numbers, stopping when a program-specified limit is reached. The limit is supplied in the first word of the array.
2. Convert lower-case ASCII characters to upper-case characters in a NUL-terminated string.
3. Count the number of bits that are set in a register.

3 Submission and Marking

3.1 Submission

The assignment will be marked using the following marking scheme:

Design: A brief design is required, consisting of a flowchart and a data dictionary of the structures required.

Software: A fully commented assembly language that meets the requirements described above and follows the design description.

Testing: Sufficient test results must be supplied to demonstrate that your implementation meets the specifications.

You must give a demonstration of your solution during the lab

Your design, software, and tests must be submitted electronically to the course website.

3.2 Marking

Marking is as follows:

3: All requirements (design, implementation, and testing) met.

2: One missing requirement or coding problem.

1: Two missing requirements or coding problems.

0: Not demonstrated, not submitted, or more than two missing requirements or coding problems.

4 Important Dates

Available: 15 May 2024 at noon.

Submission due: 15 May 2024 at midnight, Atlantic.

5 Miscellaneous

This lab/tutorial is to be completed individually.

The existing XM23 emulator will read XM23p `S2` records and store them in the corresponding *instruction memory* locations. This means an S2 data record with address `#1000`, will be treated as an S1 instruction record with address `#1000`. This is only a problem with (feature of?) the existing emulator. In your two-memory (Instruction and Data) XM23p emulator, this should not be a problem.

In other words, put your code and data in separate memory locations.

If you are having *any* difficulty with this or any part of the course, *please* contact Dr. Hughes or Emad as soon as possible.