**Testing Plan**

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# Introduction

This document describes the manner, expected output, and result of each test conducted on the assembler. The assembler will be tested to see that the expected errors are produced and also test that the assembler produces the correct and expected object file output for various object file inputs.

# Object File Assembly

## Test Explanation

The tests following are assembly language files written to produce either correct and expected object file output or appropriate assembler errors describing said error. The assembly files will be written with various lengths and complexity to test the various commands allowed in our assembly language architecture.

## Test Results

### File IO

Call: >java Assembler.Main doesnotexist.asm result.txt

Result: Failed to assemble program due to an IO error.

### Prompt Given Example – Absolute Program

|  |  |
| --- | --- |
| Assembly | Object File |
| Lab2EG .ORIG x30B0  count .FILL #4  Begin LD ACC,count ;R1 <- 4  LEA R0,msg  loop TRAP x22 ;print "hi! "  ADD ACC,ACC,#-1 ;R1--  BRP loop  JMP Next  msg .STRZ "hi! "  Next AND R0,R0,x0 ;R0 <- 0  NOT R0,R0 ;R0 <- xFFFF  ST R0,Array ;M[Array] <-xFFFF  LEA R5,Array  LD R6,=#100 ;R6 <= #100  STR R0,R5,#1  TRAP x25  ACC .EQU #1  ; ----- Scratch Space -----  Array .BLKW #3  .FILL x10  .END Begin | HLab2EG30B00018  T30B00004  T30B122B0  T30B2E0B7  T30B3F022  T30B4127F  T30B502B3  T30B640BC  T30B70068  T30B80069  T30B90021  T30BA0020  T30BB0000  T30BC5020  T30BD903F  T30BE30C3  T30BFEAC3  T30C02CC7  T30C17141  T30C2F025  T30C60010  T30C70064  E30B1 |
| **Result:** | Matches Expected Output |

### Relative Program

|  |  |
| --- | --- |
| Assembly | Object File |
| Test5 .ORIG  count .FILL #4  Begin LD ACC,count ;R1 <- 4  LEA R0,msg  loop TRAP x22 ;print "hi! "  ADD ACC,ACC,#-1 ;R1--  BRP loop  JMP Next  msg .STRZ "hi! "  Next AND R0,R0,x0 ;R0 <- 0  NOT R0,R0 ;R0 <- x####  ST R0,Array ;M[Array] <-x####  LEA R5,Array  LD R6,=#100 ;R6 <= #100  STR R0,R5,#1  TRAP x25  ACC .EQU #1  ; ----- Scratch Space -----  Array .BLKW #3  .FILL x10  .END Begin | HTest500000018  T00000004  T00012200M0  T0002e007M0  T0003f022  T0004127f  T00050203M0  T0006480cM0  T00070068  T00080069  T00090021  T000a0020  T000b0000  T000c5020  T000d9000  T000e3013M0  T000fea13M0  T00102c17M0  T00117141  T0012f025  T00160010  T00170064  E0001 |
| **Result:** | Matches Expected Output |

### Program with Maximum Symbols, Literals, and Source Records

|  |  |
| --- | --- |
| Assembly | Object File |
|  |  |
| **Result:** |  |

### Program Using Forward Referencing

|  |  |
| --- | --- |
| Assembly | Object File |
|  |  |
| **Result:** |  |

### Program Beginning Execution at Last Memory Address

|  |  |
| --- | --- |
| Assembly | Object File |
| LasMem .ORIG xFFFF  count .FILL #4  Begin LD ACC,count ;R1 <- 4  LEA R0,msg  loop TRAP x22 ;print "hi! "  ADD ACC,ACC,#-1 ;R1--  BRP loop  JMP Next  msg .STRZ "hi! "  Next AND R0,R0,x0 ;R0 <- 0  NOT R0,R0 ;R0 <- xFFFF  ST R0,Array ;M[Array] <-xFFFF  LEA R5,Array  LD R6,=#100 ;R6 <= #100  STR R0,R5,#1  TRAP x25  ACC .EQU #1  ; ----- Scratch Space -----  Array .BLKW #3  .FILL x10  .END Begin |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 20 - Operand value "Begin" (65536) is out of bounds.  Assemble error: Program spans multiple memory pages. Relocate or shrink the program to fit inside one memory page.  Assemble error: Program loads into memory outside the addressable range. |

### Program Spanning Page Boundary

|  |  |
| --- | --- |
| Assembly | Object File |
| Test6 .ORIG x0E00  count .FILL #4  Begin LD ACC,count ;R1 <- 4  LEA R0,msg  loop TRAP x22 ;print "hi! "  ADD ACC,ACC,#-1 ;R1--  BRP loop  JMP Next  msg .STRZ "hi! "  Next AND R0,R0,x0 ;R0 <- 0  NOT R0,R0 ;R0 <- x0E00  ST R0,Array ;M[Array] <-x0E00  LEA R5,Array  LD R6,=#100 ;R6 <= #100  STR R0,R5,#1  TRAP x25  ACC .EQU #1  ; ----- Scratch Space -----  Array .BLKW #3  .FILL x10  .END Begin |  |
| **Expected:** | Fail |
| **Result:** | Passes Test When it Should Not |

### Incorrect Use of Literal

|  |  |
| --- | --- |
| Assembly | Object File |
| Test3 .ORIG  Begin ADD R0, R1, =#100  .END Begin |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 2 - Could not find definition for operation "ADD" with matching operands. |

### Relative Program Containing Unclosed String

|  |  |
| --- | --- |
| Assembly | Object File |
| Test8 .ORIG  Symbol .EQU x3  Begin .STRZ "unclosed string  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 3 - Detected string operand with unclosed quotation mark. |

### Relative Program Testing .EQU Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test9 .ORIG  Symbol .EQU x3  Begin ADD R0, R1, Symbol  .END x0 | HTest9 00000001  T00001063  E0000 |
| **Expected:** | Pass |
| **Result:** | Matched Expected Output |

### Relative Program Testing Incorrect Use of .EQU Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test11 .ORIG  Symbol .EQU x3, #10  Begin ADD R0, R1, Symbol  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 2 - Incorrect usage of .EQU. Requires a label and one operand. |

### Absolute Program Testing Incorrect Use of .ORIG Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test10 .ORIG R0  Symbol .EQU x3  Begin ADD R0, R1, Symbol  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 1 - Operand of .ORIG must be an immediate value. |

### Relative Program Containing Improper Whitespace Use

|  |  |
| --- | --- |
| Assembly | Object File |
| Test12 .ORIG  Begin ADD R0, R1, #1 ;  ADD R0, R2, #2 ;  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 2 - Incorrect spacing.  Assemble error: Line 3 - Incorrect spacing. |

### Relative Program Using Undefined Symbol

|  |  |
| --- | --- |
| Assembly | Object File |
| Test24 .ORIG  Begin ADD R0, R1, #1  Test .EQU Bear  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 3 - null |

### Relative Program Attempting Symbol Aliasing

|  |  |
| --- | --- |
| Assembly | Object File |
| Test13 .ORIG  Begin ADD R0, R1, #1  Test .EQU Test  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 3 - Cannot alias a symbol to itself. |

### Relative Program Testing Incorrect Use of .FILL Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test14 .ORIG  Begin ADD R0, R1, #1  Test .FILL R2  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 3 - Incorrect operands for .FILL operation. |

### Relative Program Testing Incorrect Use of .STRZ Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test15 .ORIG  Begin ADD R0, R1, #1  Test .STRZ R2  Test2 .STRZ x3  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 3 - Incorrect operand type for .STRZ operation.  Assemble error: Line 4 - Incorrect operand type for .STRZ operation. |

### Relative Program Testing Symbol Redefinition

|  |  |
| --- | --- |
| Assembly | Object File |
| Test17 .ORIG  Begin ADD R0, R1, #1  Test .FILL x2  Test .FILL x2  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 4 - Symbol redefinition is not allowed. |

### Relative Program Testing Literal Use

|  |  |
| --- | --- |
| Assembly | Object File |
| Test18 .ORIG  Begin ADD R0, R1, #1  Test .FILL #-1  .END x0 | HTest1800000002  T00001061  T0001ffff  E0000 |
| **Expected:** | Pass |
| **Result:** | Matches Expected Output |

### Relative Program Testing Incorrect Hex Usage

|  |  |
| --- | --- |
| Assembly | Object File |
| Test19 .ORIG  Begin ADD R0, R1, #1  Test .FILL x0  .END x-3 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 4 - Cannot parse "-3" as a hex value. |

### Relative Program Testing Incorrect Operands

|  |  |
| --- | --- |
| Assembly | Object File |
| Test20 .ORIG  Begin ADD R-3, R1, #1  Test .FILL x0  .END x0 |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Operand value "R-3" (-3) is out of bounds. |

### Relative Program Testing .BLKW Pseudo-op

|  |  |
| --- | --- |
| Assembly | Object File |
| Test21 .ORIG  .FILL x0  .FILL x0  Test .BLKW #2  ADD R3, R1, #1  .END x0 | HTest2100000005  T00000000  T00010000  T00041661  E0000 |
| **Expected:** | Pass |
| **Result:** | Matches Expected Output |

### Relative Program Testing Incorrect Immediate Usage

|  |  |
| --- | --- |
| Assembly | Object File |
| Test22 .ORIG  Begin ADD R0, R1, #-17  .END Begin |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Line 2 - Operand value "-17" is out of bounds. |

### Relative Program Testing Incorrect Immediate Usage

|  |  |
| --- | --- |
| Assembly | Object File |
| Test23 .ORIG  Test .EQU #-17  Begin ADD R0, R1, Test  .END Begin |  |
| **Expected:** | Fail |
| **Result:** | Assemble error: Operand value "Test" (-17) is out of bounds. |