**CSCI 360 Halfword Instructions**

Up to this point, we have been working with instructions (ST, L, A, etc...) that work with 32-bit signed integers that are stored as fullwords. We're now going to look at a set of instructions that work with 16-bit signed integers that are stored as halfwords.

Halfword storage areas and constants are generated by using DS and DC statements with a storage class of H. Using the H will force halfword alignment.

**Load Halfword**

Format: label LH R,D(X,B)

Copies into R the 32-bit representation of the number at the absolute address represented by D(X,B). The 2 leftmost bytes are set to X'0000' if the number is positive or X'FFFF' if the number is negative.

Execution of:

LH R4,=H'-12'

will change the contents of register 4 to X'FFFFFFF4'

**Store Halfword**

Format: label STH R,D(X,B)

Places a copy of the rightmost 2 bytes of R at the absolute address represented by D(X,B).

Assuming that register 4 contains X'FFFFFFF4', execution of:

STH R4,HALF

HALF DS H

will change the contents of HALF to X'FFF4'

**Compare Halfword**

Format: label CH R,D(X,B)

Compares the rightmost 2 bytes of R to the halfword at the absolute address represented by D(X,B) and sets the condition code.

Code Meaning

0 Equality

1 Halfword in R is low

2 Halfword at D(X,B) is low

Assuming that register 4 contains X'FFFFFFF4', execution of:

CH R4,HALF

HALF DC H'5'

will set the condition code to 1 because the contents

of register 4 (-12) is less than the contents of HALF (5)  
  
**Add Halfword**

Format: label AH R,D(X,B)

The halfword at D(X,B) is added to the rightmost 2 bytes of R. The sum is stored in R. The condition code is set.

Code Meaning

0 Sum is 0

1 Sum is less than 0

2 Sum is greater than 0

3 Overflow - sum cannot be stored as a halfword

Assuming that register 4 contains X'FFFFFFF4', execution of:

AH R4,HALF

HALF DC H'13'

will change the contents of register 4 to X'00000001'

**Subtract Halfword**

Format: label SH R,D(X,B)

The halfword at D(X,B) is subtracted from the rightmost 2 bytes of R. The difference is stored in R. The condition code is set.

Code Meaning

0 Difference is 0

1 Difference is less than 0

2 Difference is greater than 0

3 Overflow - difference cannot be stored as a halfword

Assuming that register 4 contains X'FFFFFFF4', execution of:

SH R4,HALF

HALF DC H'2'

will change the contents of register 4 to X'FFFFFFF2'

**Multiply Halfword**

Multiplying with halfwords is slightly different from multiplying with fullwords. A single register will be used rather than using an even-odd pair.

Format: label MH R,D(X,B)

The halfword at D(X,B) and the rightmost 2 bytes of R are multiplied together. The result is stored as a 32-bit number in R.

Assuming that register 5 contains X'FFFFFFF4', execution of:

MH R5,HALF

HALF DC H'-2'

will change the contents of register 5 to X'00000018'