EE4390 Microprocessors

Lesson 5

Addressing Modes

Addressing Modes

- Inherent
- Immediate
- Direct
- Extended
- Index
- Indexed-indirect
- Relative

Inherent Addressing Mode

- The op-code of the instruction contains all the information necessary to execute the instruction

Label	**Op-Code**	**Operand(s)**	**Comment**
	INCA		; increment A
	ABA		; A + B -> A

Immediate Addressing Mode

- Actual data required to complete an instruction follows immediately after the op-code in memory -- # sign
- Hexadecimal values indicated with “$”

Label	**Op-Code**	**Operand(s)**	**Comment**
	LDAA	#$5F	; $5F -> A
	ADDA	#$12	;A+$12->A
	LDD	#$1234	;$1234 -> D

Direct Addressing Mode

- Use data whose address is specified by a single byte. Higher byte assumed to be $00.
  - Limits addresses to $0000 to $00FF
  - Less memory, faster execution

Label	**Op-Code**	**Operand(s)**	**Comment**
	LDAA	$5F	;[$005F]->A
	ADAA	$12	;A+[$0012]->A

Extended Addressing Mode

- Uses 16-bit address to specify location of data

```
Label       Op-Code     Operand(s)   Comment
            LDAA        $5F43        ; [$5F43]->A
            ADDA        $1234        ;[$1234]+A->A
```

Index Addressing Mode

- Effective address of data is found by adding the contents of an index register, SP, or PC with an offset
  - offsets are signed numbers
  - offsets may be 5, 9, or 16 bits

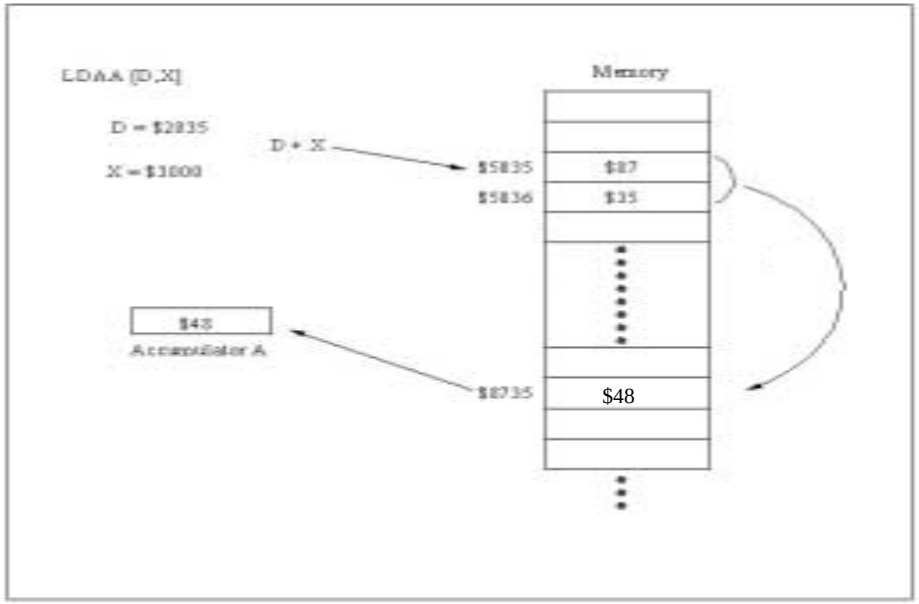
```
Label   Op-Code     Operand(s)    Comment
        LDAA      $53,X         ;[$53+X]->A
        ADDA      $12,X         ;A + [$12+X]->A
```

Indexed-Indirect Addressing Mode

- New for the 68HC12
- Instruction finds a pointer (address) to its desired data at a location designated by a 16-bit offset (specified by D or 16-bit number) and one of the following registers: X, Y, SP, or PC.

Indexed-Indirect Addressing Mode (cont)

Label	Op-Code	Operand(s)	Comment
	LDAA	[D,X]	



Relative Addressing Mode

- Used for branch instructions - Bxx
- Computes effective address by adding the signed relative offset to the contents of the program counter
- Normally use label instead of actual number

Label	**Op-Code**	**Operand(s)**	**Comment**
	BNE	$10	;Branch if Z=0

;will branch to PC + $10 and continue processing