Experiment 4-A
ADDRESSING MODES

OBJECTIVE

Learn about different types of addressing modes on eZ8 CPU and experiment on each method.

1. Addressing Modes

The eZ8 CPU provides six addressing modes:
- Register (R)
- Indirect Register (IR)
- Indexed (X)
- Direct (DA)
- Relative (RA)
- Immediate Data (IM)

NOTATION	DESCRIPTION	OPERAND	RANGE
R	Register	Reg	Reg. represents a number in the range of 00H to FFH
IR	Indirect Register	@Reg	Reg. represents a number in the range of 00H to FFH
X	Indexed	#Index	The register or register pair to be indexed is offset by the signed Index value (#Index) in a +127 to -128 range.
DA	Direct Address	Addrs	Addrs. represents a number in the range of 0000H to FFFFH
RA	Relative Address	X	X represents an index in the range of +127 to –128 which is an offset relative to the address of the next instruction
IM	Immediate Data	#Data	Data is a number between 00H to FFH

Create a new project in Z8 Encore! IDE and add a new empty asm file to the project. Then write and study the following code:

```
vector reset = startup
org $1000

startup:
srp #00

; A little housekeeping
ld r0, #$0f
loop:
    ld @r0, #$0
    dec r0
    jr nz, loop

; Register Addressing
ld 00h, #$01
ld 05h, #$ef

; Indirect Register Addressing
ld @00h, #$08
ld @01h, #$10

; Indexed Addressing
ld 03h+3, #$dd
ld 07h-4, #$ee

; Direct Addressing
ld 0000h, #$02
ld 0004h, #$0f

; Relative Addressing
ld 0001h+4, #$04
ld 000fh-13, #$01
```

Build the project by clicking the **Rebuild All** icon ( ) on toolbar. Wait for the building process to be completed. Then click the Reset icon ( ) to connect and download the code to the development board. When the debugging toolbar appears, click Memory icon ( ) to view the device memory. In the memory window, set Memory Space to **Rdata** and Address to **R#000**. Keep clicking on the Step Into icon ( ) and watch and understand how the memory window changes with each assembly instruction.

EXPERIMENTAL WORK
Using all the methods explained above, create your own complete assembly code which will display your own name and surname in the memory window.

As an example;

```
ld 00h,      #$45  ; E
ld 00h+1,    #$46  ; F (using indexed addressing)
ld 02h,      00h   ; E
```

TIP: Hexadecimal values of English alphabet letters start at 41 (A) and end at 5A (Z). Space character's hexadecimal value is 20. You may find the complete set below:

A 41	E 45	I 49	M 4D	Q 51	U 55	Y 59
B 42	F 46	J 4A	N 4E	R 52	V 56	Z 5A
C 43	G 47	K 4B	O 4F	S 53	W 57	space 20
D 44	H 48	L 4C	P 50	T 54	X 58	

NOTES:

If you are having problems compiling your code, make sure:

    1) Your project is created in a directory that you have write access

    2) Go to Project Properties → Linker and uncheck if the boxes are checked. This will allow the project to be built with warnings.

- If you are unable to debug your code and see C codes instead, make sure you include the startup code shown above.