ÇANKAYA UNIVERSITY
COMPUTER ENGINEERING DEPARTMENT

Microprocessors Course (CENG329) Laboratory Manual

Experiment 6-B
Data Directives and Address Spaces

OBJECTIVE

Learn how to use data directives and access different address spaces available on eZ8 CPU.

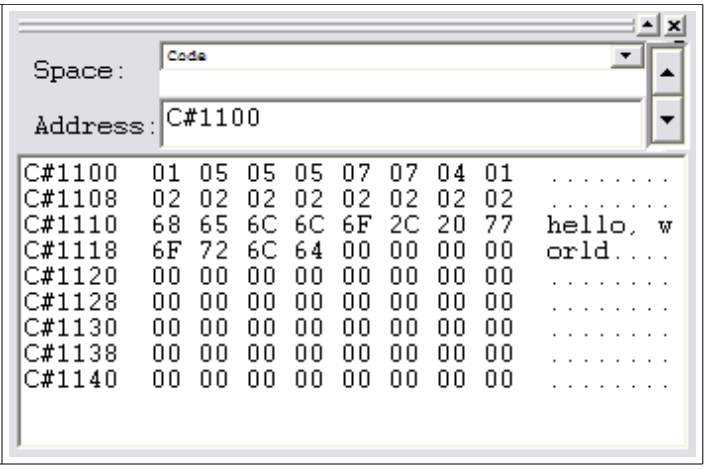
1. Data Directives

With data directives, memory locations can be reserved and initialized for later use. The table below shows a list of available data directives and their definitions:

Directive	**Definition**
BFRACT	Signed fractional (8 bits)
BLKB	Byte
BLKL	Long
BLKW	Word
DB	Byte data (8 bits)
DD	Double signed floating point (32 bits)
DF	Signed floating point (32 bits)
DL	Long (32 bits)
DW	Word data (16 bits)
DW24	Word data (24 bits)
FRACT	Signed fractional (16 bits)
UBFRACT	Unsigned fractional (8 bits)
UFRACT	Unsigned fractional (16 bits)

Inspect the sample codes below and compare the differences between different data directives:

```
vector reset=startup
org %1100
A0 db 1
A1 db [3] 5
A2 db [2] 7, 4, 1, [8] 2
A3 db "hello, world"
```

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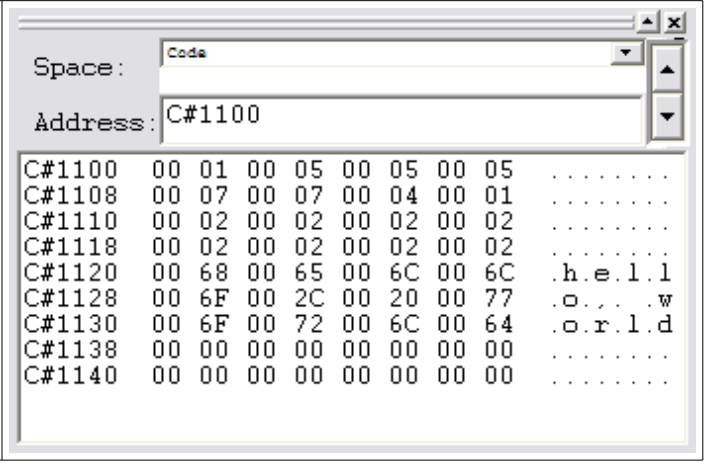

2. Address Spaces

Different address spaces can be specified when using data directives, so that they can be initialized in different sections of memory:

ROM	The ROM space is used for code storage and can also be used for the storage of constant data. The ROM memory is located at program addresses `0000H` – `xxxxH`, where `xxxxH` is the highest location in program memory.
RData (Register Data)	The RData memory is located in `00H` - `FFH` and is used for a small memory model.
EData (Extended Data)	EData is used for default data storage in the large memory model. The EData memory begins at data address `100H` and extends to a maximum of `EFFH`.

Below is a demonstration of how to access each address space:

```
vector reset=startup
define sample1, org=20H, space=RData
define sample2, org=100H, space=ROM
define sample3, org=100H, space=EData

segment sample1
S1 db 18, 11, 16, 44

segment sample2
S2 db "Hello World"

segment sample3
S3 db [4] 1, [3] 2

segment code
org %1000

startup:
srp #00
ld r0, #S1      ; Access to RData can be achieved
ld r1, @r0      ; using LD.

ld r2, #01h     ; Access to ROM can be achieved using
ld r3, #00h     ; LDC. LDC takes a register pair as
ldc r4, @rr2    ; 2nd operand. RR should contain the
                ; address of the desired data.

ld r6, #01h     ; Access to EData can be achieved using
ld r7, #00h     ; LDE. LDE takes a register pair as 2nd
lde r8, @rr6    ; operand. RR should contain the address
                ; of the desired data.
```

EXPERIMENTAL WORK

Using the methods explained above, modify the last week's code to make use of data directives and address spaces.

Hint: You may use http://academic.cankaya.edu.tr/~efeciftci/ceng329/lab06b.php for obtaining random numbers.