

# **Introduction to Electric Vehicles**

## **Monitor Program**

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The KAIST logo consists of the word "KAIST" in a bold, blue, sans-serif font. Below the text is a blue horizontal oval shape that tapers at both ends, serving as a base or shadow for the text.

# Goals

- Implement monitor program
- Functions have to be implemented
  - UART communication (by polling)
    - `putChar()`, `putString()`; //Already implemented
    - `unsigned char genChar()`;
    - `char* getString()`;
    - `myPrintf(const char *format,...)`
      - `va_start()`;
      - `va_end()`;
  - Memory modification
    - Read one byte from typed memory address
    - Read N bytes from typed memory address
    - Write one byte from typed memory address and one byte data
    - Write N bytes from typed memory address and N bytes data
  - Super loop approach
    - Handle user input
    - Support menu functions

# Monitor program example

```
stm32f10x_core - 하이퍼터미널
파일(F) 편집(E) 보기(V) 호출(C) 전송(T) 도움말(H)
Rabbit Development Board Ver 2.1
PLLCLK = 16MHz
BaudRate = 115200, Databit = 8bit, StopBits = 1, Parity = no,

[1] LED test
[2] KEY test
[3] TIMER test
[4] FND test
[5] UART2 test
[6] 485 test
[7] LCD12864 test
[8] LCD1602 test
[9] ADC test
[a] RTC(DS1302) test
[b] EEPROM(AT24C02) test
[c] BUZZER test
[d] TEMPERATURE(DS18B20) test
[e] SD test
[f] RF(nRF24L01) test
[g] 2.8 TFT LCD) test

Select menu ?

연결 0:00:34 ANSIW 115200 8-N-1 SCROLL CAPS NUM 캡 메코
```

# Memories

Read the data sheet pp. 18 - 36

Memory		Mnemonic	AT90CAN32	AT90CAN64	AT90CAN128
Flash	Size	Flash size	32 K bytes	64 K bytes	128 K bytes
	Start Address	-	0x00000		
	End Address	Flash end	0x07FFF <sup>(1)</sup> 0x3FFF <sup>(2)</sup>	0x0FFFF <sup>(1)</sup> 0x7FFF <sup>(2)</sup>	0x1FFFF <sup>(1)</sup> 0xFFFF <sup>(2)</sup>
32 Registers	Size	-	32 bytes		
	Start Address	-	0x0000		
	End Address	-	0x001F		
I/O Registers	Size	-	64 bytes		
	Start Address	-	0x0020		
	End Address	-	0x005F		
Ext I/O Registers	Size	-	160 bytes		
	Start Address	-	0x0060		
	End Address	-	0x00FF		
Internal SRAM	Size	ISRAM size	2 K bytes	4 K bytes	4 K bytes
	Start Address	ISRAM start	0x0100		
	End Address	ISRAM end	0x08FF	0x10FF	0x10FF
External Memory	Size	XMem size	0-64 K bytes		
	Start Address	XMem start	0x0900	0x1100	0x1100
	End Address	XMem end	0xFFFF		
EEPROM	Size	E2 size	1 K bytes	2 K bytes	4 K bytes
	Start Address	-	0x0000		
	End Address	E2 end	0x03FF	0x07FF	0x0FFF

# Memories

- Flash program memory
  - Write/erase the firmware to flash memory
  - Flash memory space is divided into two sections
    - Boot program section
    - Application program section
- SRAM data memory
  - Volatile memory
  - Fast operation
- EEPROM data memory
  - Non-volatile
  - Slow write/read operation

# Homework (project) #3

- Printed report is required
  - Until May 22nd, Friday class. (one week)
  - No delayed paper accepted
- Contents should include
  - Source code
  - Detailed explanation about the source code
  - Screenshot of the operation

# Functions for undetermined number of input

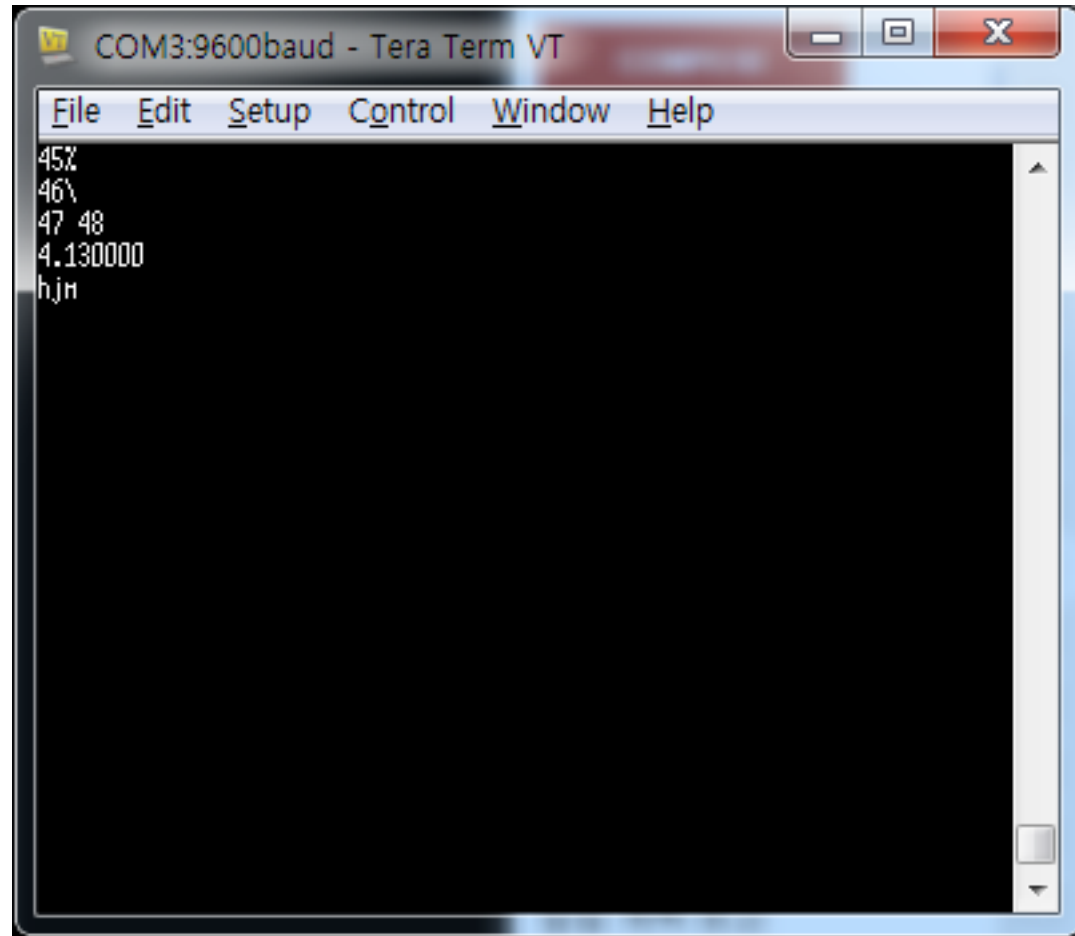
- #include <stdarg.h>
  - va\_list()
  - va\_start()
  - va\_arg()
- #include <stdlib.h>
  - itoa()
  - atoi()
  - dtostrf()
- #include <string.h>
  - strtok()
- #include "avr/eeprom.h"
  - eeprom\_read\_byte()
  - eeprom\_write\_byte()

# Result\_Joonki (1)

## Result 1

### myPrintf

```
myPrintf("%d%%\n\r", 45);  
myPrintf("%d\\\n\r", 46);  
myPrintf("%d %d\n\r", 47, 48);  
myPrintf("%f\n\r", 4.13);  
  
myPrintf("%c", c);  
myPrintf("%s\n\r\n", "jm");  
c = 'h';  
putString(getString());
```



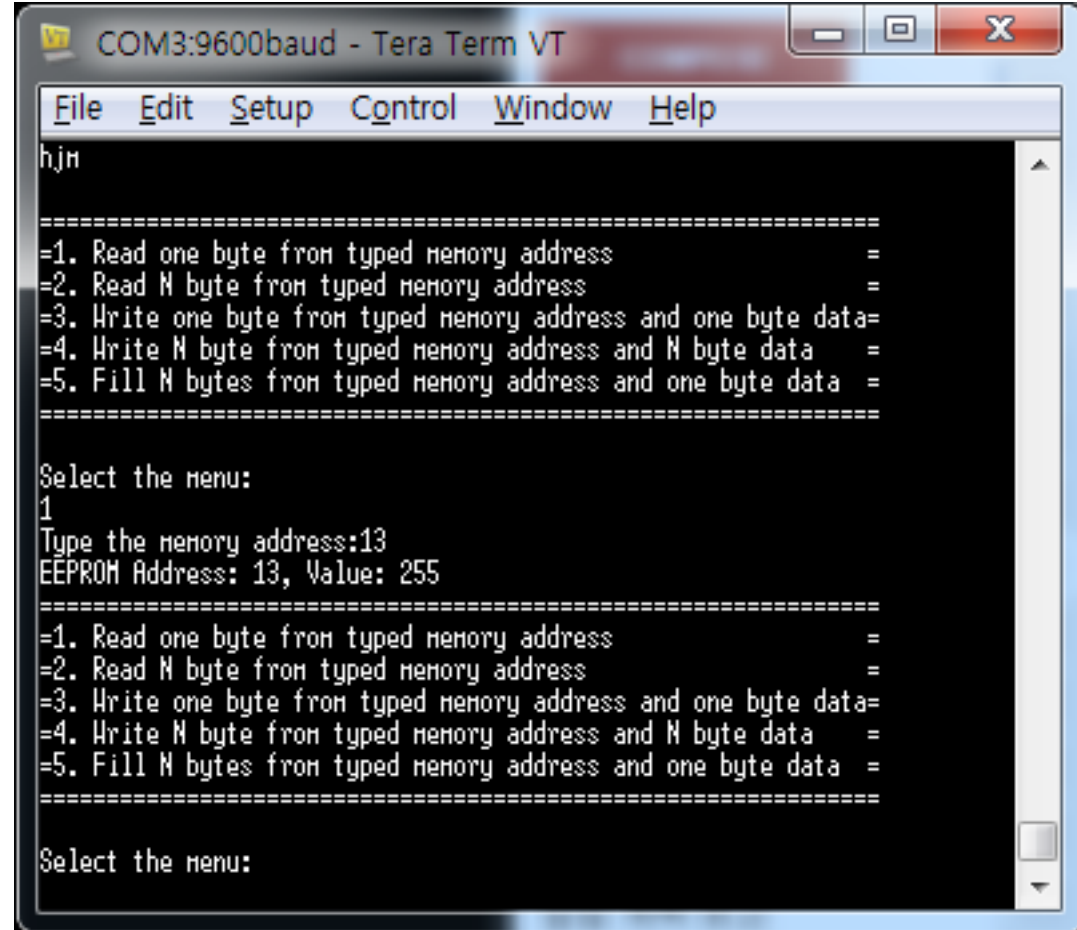
The screenshot shows a terminal window titled "COM3:9600baud - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal output is as follows:

```
45%  
46\  
47 48  
4.130000  
hjn
```



# Result\_Joonki (2)

- Function 1
  - Read the data from the data address (13)



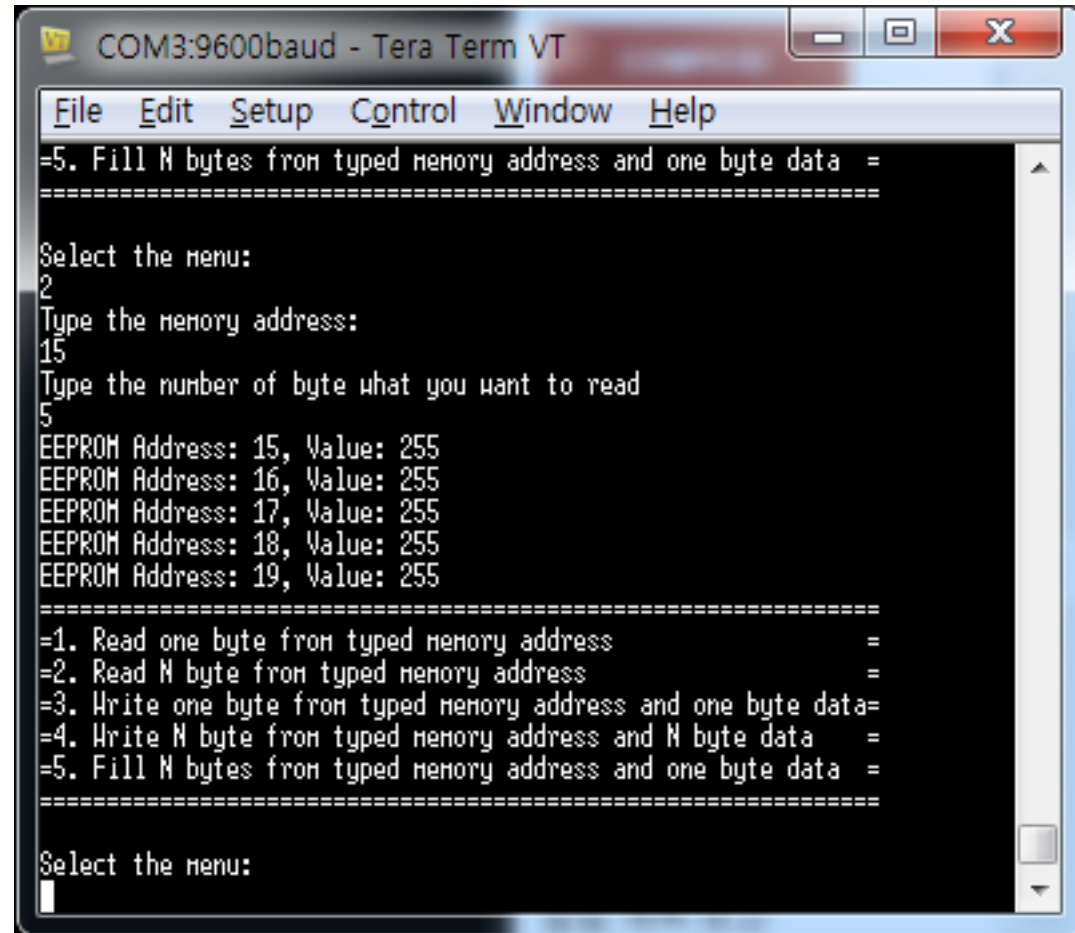
```
COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help
hjn
=====
=1. Read one byte from typed memory address           =
=2. Read N byte from typed memory address            =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data  =
=5. Fill N bytes from typed memory address and one byte data =
=====

Select the menu:
1
Type the memory address:13
EEPROM Address: 13, Value: 255
=====
=1. Read one byte from typed memory address           =
=2. Read N byte from typed memory address            =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data  =
=5. Fill N bytes from typed memory address and one byte data =
=====

Select the menu:
```

# Result\_Joonki (3)

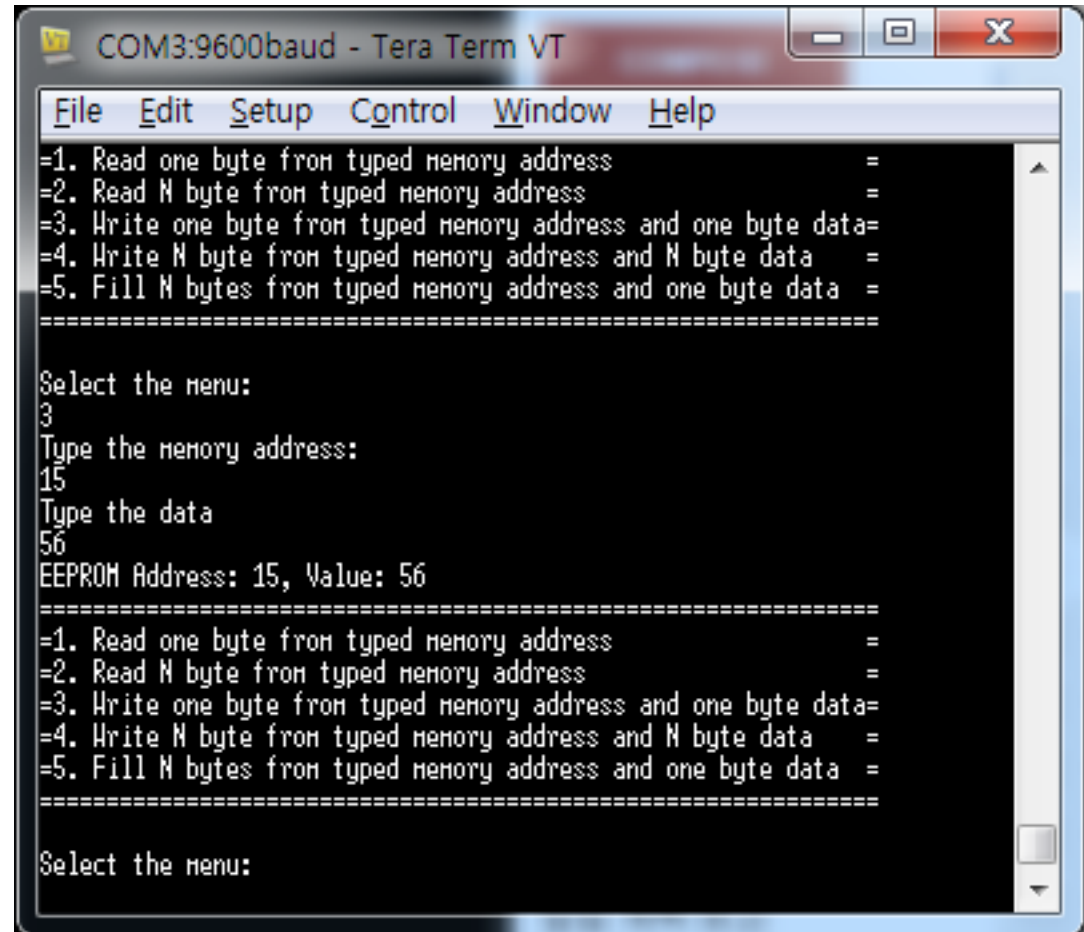
- Function 2
  - Read the data from the data address (15 ~ 19)



```
COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help
=5. Fill N bytes from typed memory address and one byte data =
=====
Select the menu:
2
Type the memory address:
15
Type the number of byte what you want to read
5
EEPROM Address: 15, Value: 255
EEPROM Address: 16, Value: 255
EEPROM Address: 17, Value: 255
EEPROM Address: 18, Value: 255
EEPROM Address: 19, Value: 255
=====
=1. Read one byte from typed memory address =
=2. Read N byte from typed memory address =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data =
=5. Fill N bytes from typed memory address and one byte data =
=====
Select the menu:
|
```

# Result\_Joonki (4)

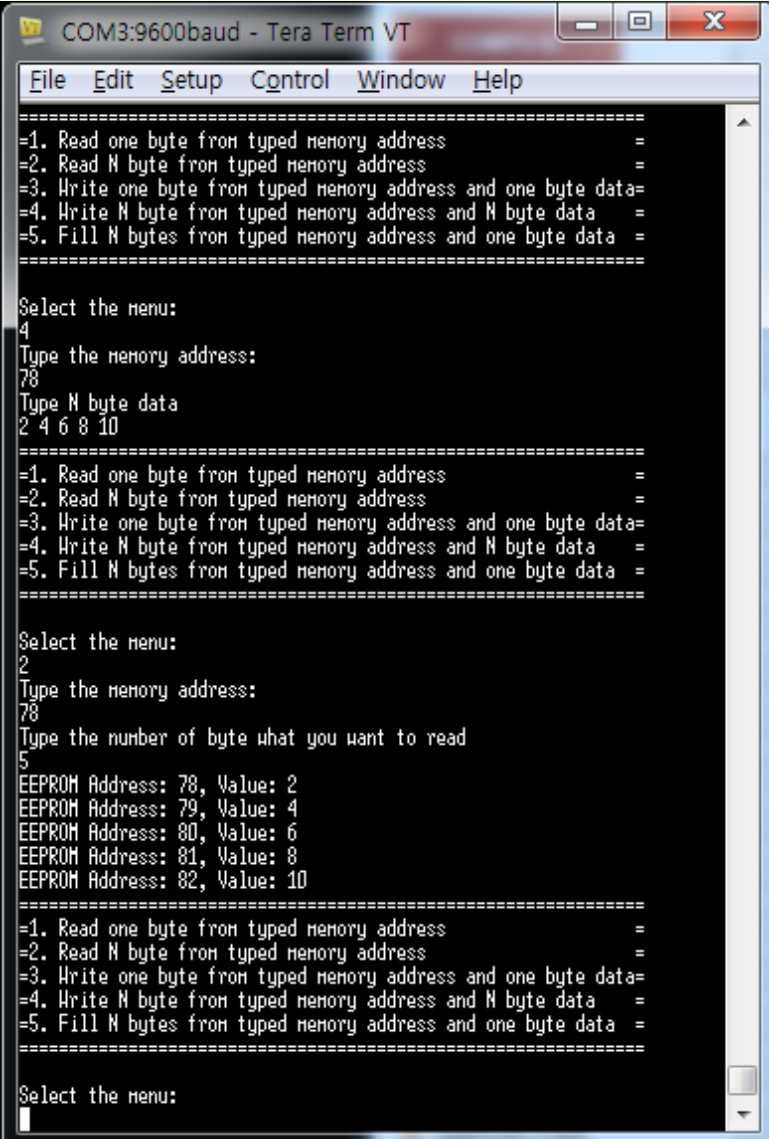
- Function 3
  - Write the value '56' to the data address (15)



```
COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help
-1. Read one byte from typed memory address =
-2. Read N byte from typed memory address =
-3. Write one byte from typed memory address and one byte data=
-4. Write N byte from typed memory address and N byte data =
-5. Fill N bytes from typed memory address and one byte data =
=====
Select the menu:
3
Type the memory address:
15
Type the data
56
EEPROM Address: 15, Value: 56
=====
-1. Read one byte from typed memory address =
-2. Read N byte from typed memory address =
-3. Write one byte from typed memory address and one byte data=
-4. Write N byte from typed memory address and N byte data =
-5. Fill N bytes from typed memory address and one byte data =
=====
Select the menu:
```

# Result\_Joonki (5)

- Function 4
  - Write 2, 4, 6, 8, 10 to the data address (78 ~ 82) and read the data address



```
COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help
=====
=1. Read one byte from typed memory address =
=2. Read N byte from typed memory address =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data =
=5. Fill N bytes from typed memory address and one byte data =
=====

Select the menu:
4
Type the memory address:
78
Type N byte data
2 4 6 8 10

=====
=1. Read one byte from typed memory address =
=2. Read N byte from typed memory address =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data =
=5. Fill N bytes from typed memory address and one byte data =
=====

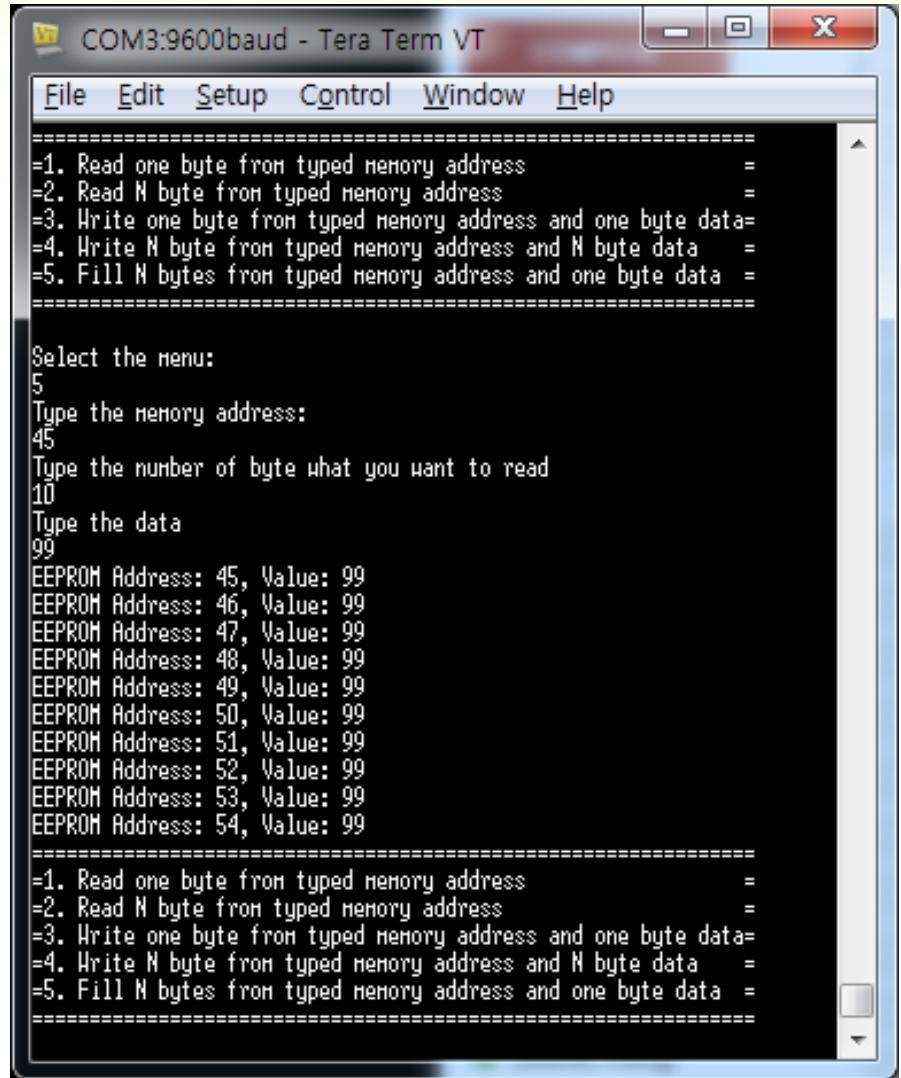
Select the menu:
2
Type the memory address:
78
Type the number of byte what you want to read
5
EEPROM Address: 78, Value: 2
EEPROM Address: 79, Value: 4
EEPROM Address: 80, Value: 6
EEPROM Address: 81, Value: 8
EEPROM Address: 82, Value: 10

=====
=1. Read one byte from typed memory address =
=2. Read N byte from typed memory address =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data =
=5. Fill N bytes from typed memory address and one byte data =
=====

Select the menu:
```

# Result\_Joonki (6)

- Function 5
  - Write the value '99' to the data address 45 ~ 54



```
COM3:9600baud - Tera Term VT
File Edit Setup Control Window Help
=====
=1. Read one byte from typed memory address      =
=2. Read N byte from typed memory address      =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data   =
=5. Fill N bytes from typed memory address and one byte data =
=====
Select the menu:
5
Type the memory address:
45
Type the number of byte what you want to read
10
Type the data
99
EEPROM Address: 45, Value: 99
EEPROM Address: 46, Value: 99
EEPROM Address: 47, Value: 99
EEPROM Address: 48, Value: 99
EEPROM Address: 49, Value: 99
EEPROM Address: 50, Value: 99
EEPROM Address: 51, Value: 99
EEPROM Address: 52, Value: 99
EEPROM Address: 53, Value: 99
EEPROM Address: 54, Value: 99
=====
=1. Read one byte from typed memory address      =
=2. Read N byte from typed memory address      =
=3. Write one byte from typed memory address and one byte data=
=4. Write N byte from typed memory address and N byte data   =
=5. Fill N bytes from typed memory address and one byte data =
=====
```