

M3H Group(1)
Application Note
I²C Interface
(I2C-B)

Outlines

This application note is a reference material for developing products using I2C interface (I2C) functions of M3H Group(1).

This document helps the user check operation of the product and develop its program.

Target sample program: I2C_EEPROM

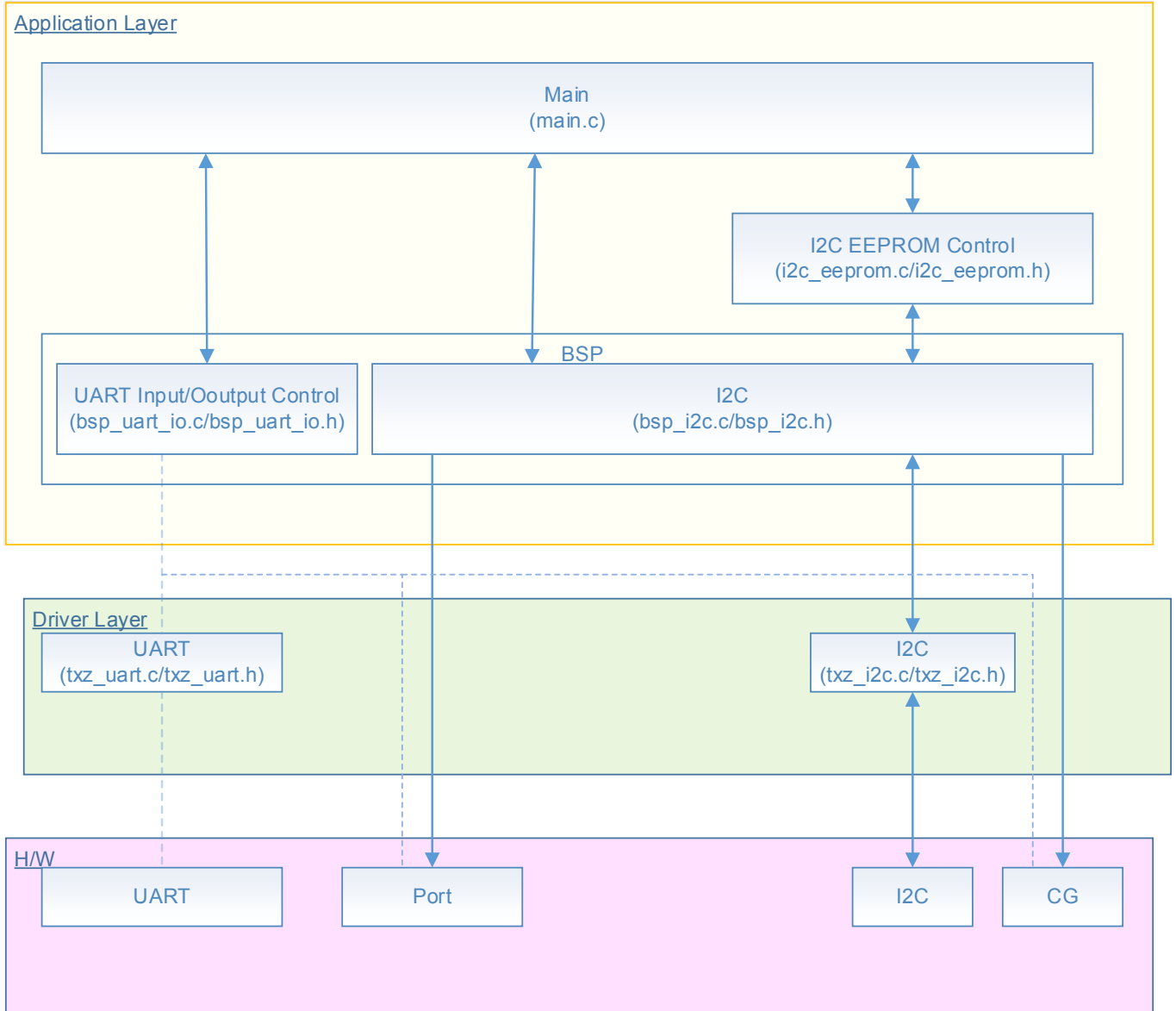
Table of Contents

| | |
|---|----|
| Outlines | 1 |
| Table of Contents | 2 |
| 1. Preface | 3 |
| 2. Reference Document | 4 |
| 3. Function to Use | 4 |
| 4. Target Device | 4 |
| 5. Conditions for Correct Operation | 5 |
| 6. Evaluation Board Setting | 6 |
| 7. Operation of Evaluation Board | 6 |
| 8. Outline of I ² C Interface function | 7 |
| 8.1. Clock Supply | 7 |
| 9. Sample Program | 8 |
| 9.1. Initialization | 8 |
| 9.2. Sample program main operation | 8 |
| 9.3. Output Example of Sample Program | 9 |
| 9.3.1. Setting Example of Terminal Software | 10 |
| 9.4. Operating Flow of Sample Program | 11 |
| 10. Precaution | 19 |
| 11. Revision History | 19 |
| RESTRICTIONS ON PRODUCT USE | 20 |

1. Preface

This sample program is used to check the operation of I2C communication function. TPM3H6 writes to I2C EEPROM and read from I2C EEPROM is executed by terminal software on the host PC via USB-UART.

Structure diagram of Sample program



2. Reference Document

- Datasheet
TMPM3H group (1) datasheet Rev2.0 (Japanese edition)
- Reference manual
I2C interface (I2C-B) Rev2.0 (Japanese edition)
- Other reference document
TMPM3H Group Peripheral Driver User Manual (Doxygen)

3. Function to Use

| IP | Channel | Port | Function / operation mode |
|----------------------------|---------|-------------------------------|---------------------------|
| I2C interface | ch0 | PC0 (SCL) PC1 (SDA) | I2C mode |
| Asynchronous communication | ch0 | PA1 (UT0TXDA) PA2 (UT0RXD) | UART mode |

4. Target Device

The target devices of application note are as follows.

| | | |
|--------------|--------------|--------------|
| TMPM3H6FWFG | TMPM3H6FUFG | TMPM3H6FSFG |
| TMPM3H6FWDFG | TMPM3H6FUDFG | TMPM3H6FSDFG |
| TMPM3H5FWFG | TMPM3H5FUFG | TMPM3H5FSFG |
| TMPM3H5FWDFG | TMPM3H5FUDFG | TMPM3H5FSDFG |
| TMPM3H4FWUG | TMPM3H4FUUG | TMPM3H4FSUG |
| TMPM3H4FWFG | TMPM3H4FUFG | TMPM3H4FSFG |
| TMPM3H3FWUG | TMPM3H3FUUG | TMPM3H3FSUG |
| TMPM3H2FWDUG | TMPM3H2FUDUG | TMPM3H2FSDUG |
| TMPM3H2FWQG | TMPM3H2FUQG | TMPM3H2FSQG |
| TMPM3H1FWUG | TMPM3H1FUUG | TMPM3H1FSUG |
| TMPM3H1FPUG | TMPM3H0FSDUG | TMPM3H0FMDUG |

* This sample program operates on the evaluation board of TMPM3H6FWFG.

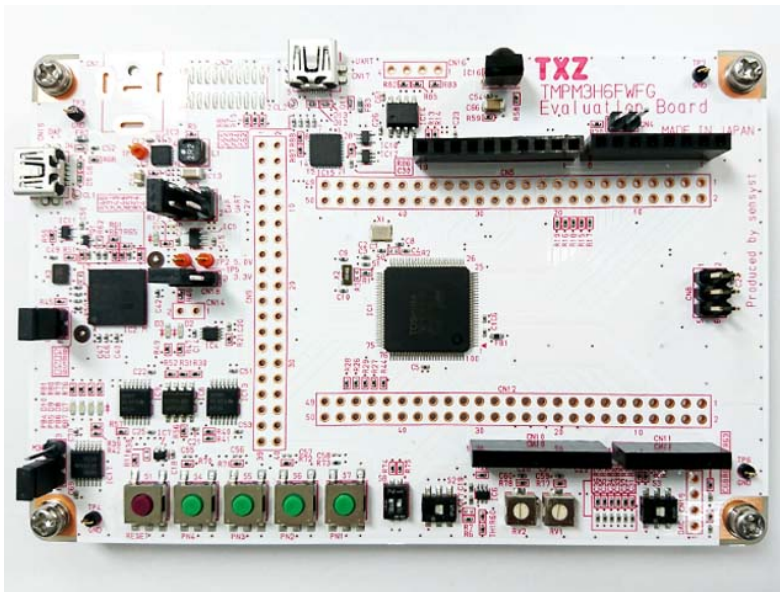
If other function than the TMPM3H6 one is checked, it is necessary that CMSIS Core related files (C startup file and IO header file) should be changed properly.

The BSP related file is dedicated to the evaluation board (TMPM3H6). If other function than the TMPM3H6 one is checked, the BSP related file should be changed properly.

5. Conditions for Correct Operation

| | |
|---------------------------------|--|
| Used microcontroller | TMPM3H6FWFG |
| Used board | TMPM3H6FWFG Evaluation Board (Product of Sensysst) |
| Unified development environment | IAR Embedded Workbench for ARM 8.11.2.13606 |
| Unified development environment | µVision MDK Version 5.24.2.0 |
| Terminal software | Tera Term V4.96 |
| Sample program | V1100 |

Evaluation board (TMPM3H6FWFG Evaluation Board) (Top view)



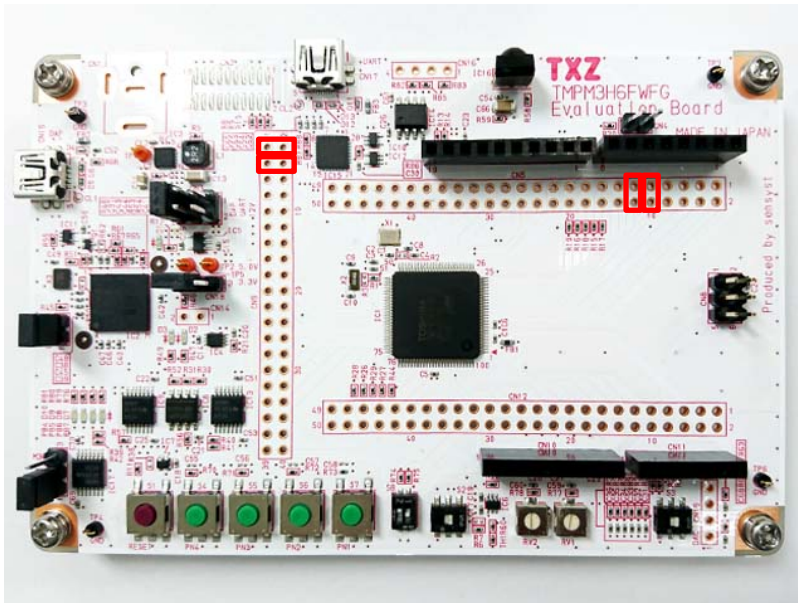
For purchasing the board, refer to the following homepage. (<http://www.chip1stop.com/>)

6. Evaluation Board Setting

The following pin connections should be done on the evaluation board.

| CN5 | | |
|------------|------------------|------------|
| Use | Through-hole No. | Setting |
| UART (RXD) | 9-10 | Connection |
| UART (TXD) | 11-12 | Connection |

| CN9 | | |
|-----------|------------------|------------|
| Use | Through-hole No. | Setting |
| I2C (SCL) | 1-2 | Connection |
| I2C (SDA) | 3-4 | Connection |



7. Operation of Evaluation Board

Connect the PC with the USB_UART terminal of the evaluation board with a USB cable.
 After start-up the terminal software (Tera Term), performs communication setting on the terminal software.
 Press the reset button on the evaluation board.
 Communication starts according to command input.
 For details of command input operation, refer to the sample program main operation.

8. Outline of I²C Interface function

The I2C can operate as a transceiver circuit of 1ch (SCL, SDA) in 1 unit circuit.

8.1. Clock Supply

When using I2C, please set a clock enabling bit corresponding with the fsys supply on/off register A (**[CGFSYSENA]**) or B (**[CGFSYSENB]**) and fc supply on/off register (**[CGFCEN]**) as "1" (clock supply). Please refer to "Clock Control and Operation Mode" of the reference manual for the details.

9. Sample Program

Enter the command (write or read) on the terminal software.

In the case of the write command, the input character is saved in the I2C EEPROM.

In the case of the read command, it reads the data saved in the I2C EEPROM and displays it in the terminal software.

9.1. Initialization

The following initialization is done after power is supplied.

The port setting is executed after the initialization of each clock setting, the watchdog timer setting and the clock setting.

9.2. Sample program main operation

After the initialization operation, shift to the main function and perform the following initialization.

- ① Initialization of BSP (Board Support Package)
- ② Initialization of variables
- ③ Initialize the application
- ④ Initialization of I2C for EEPROM
- ⑤ Main control of sample program

After the above processing, perform the following operations on PC terminal software (Tera Term).

"Command>" is displayed on Tera Term. Enter write or read command according to the following format.

"write" command: The input character should be stored to I2C EEPROM (0x0 address).

"read" command: I2C EEPROM (0x0 address) is read and displayed on the Tera Term.

Command format:

write_ command

write_ X

X: Any character

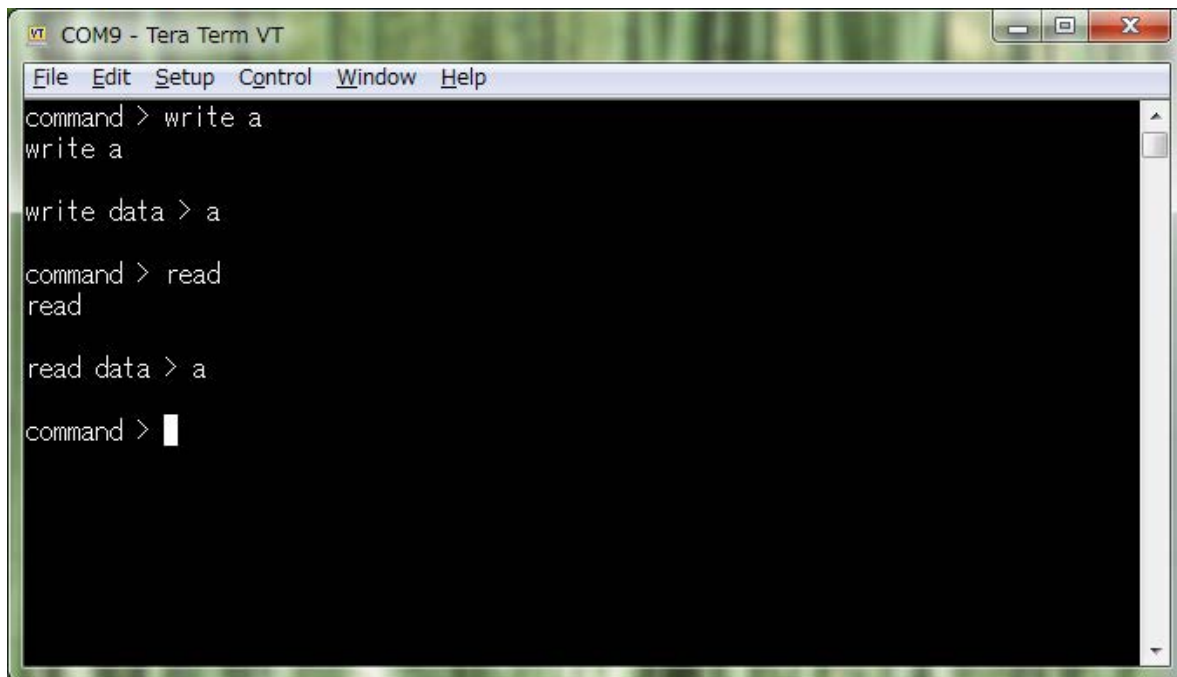
read_ command

read

| | |
|-------------|--------------------------|
| Used memory | I2C EEPROM: 24FC256-I/SN |
| Used port | SCL: PC0 and SDA: PC1 |

9.3. Output Example of Sample Program

When the sample program operates, the command results are shown as follows;



The image shows a screenshot of a terminal window titled "COM9 - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal content shows a sequence of commands and their outputs:

```
command > write a
write a

write data > a

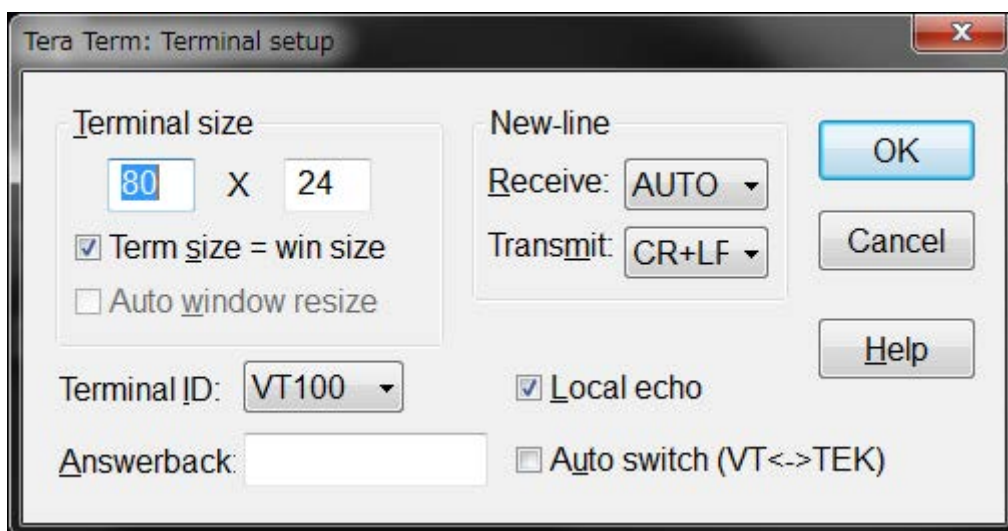
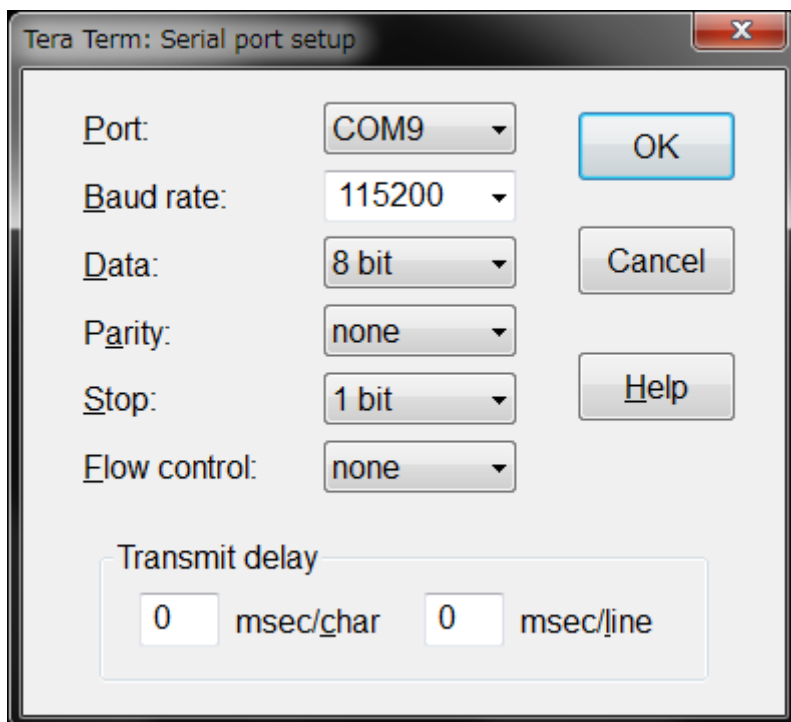
command > read
read

read data > a

command > █
```

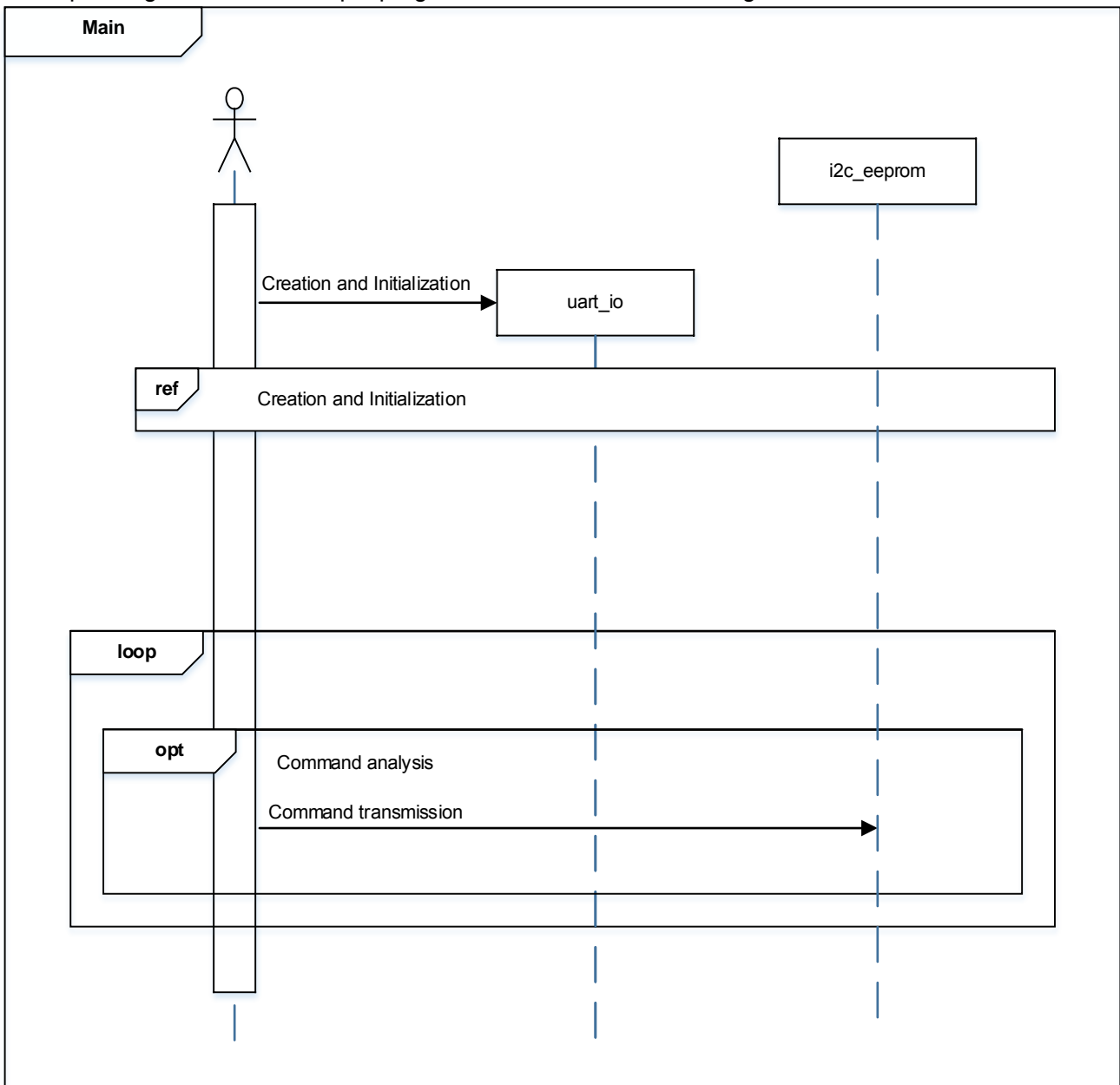
9.3.1. Setting Example of Terminal Software

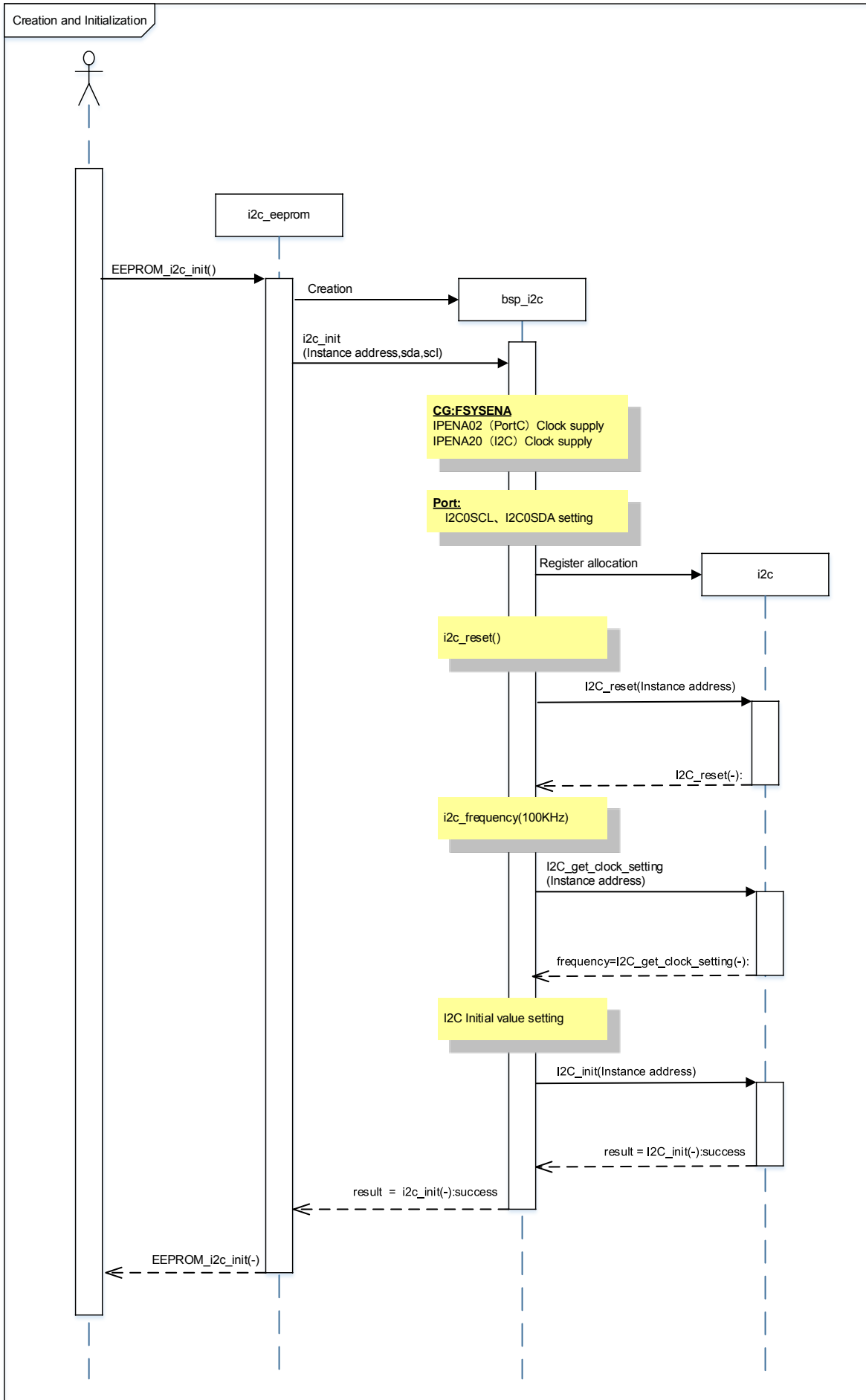
The operation of the terminal software (Tera Term) has been checked with the following settings.



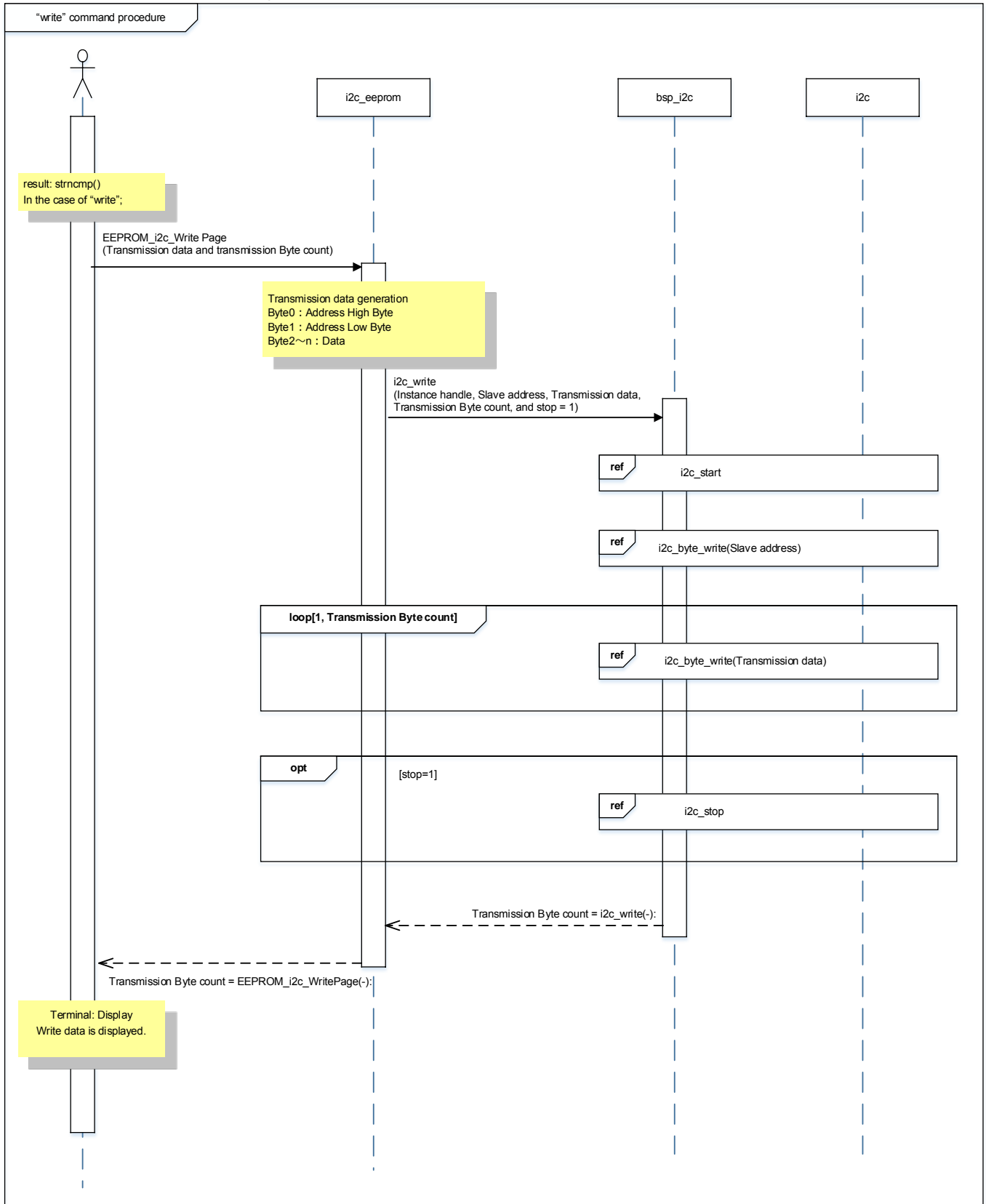
9.4. Operating Flow of Sample Program

The operating flows of the sample program are shown in the following;

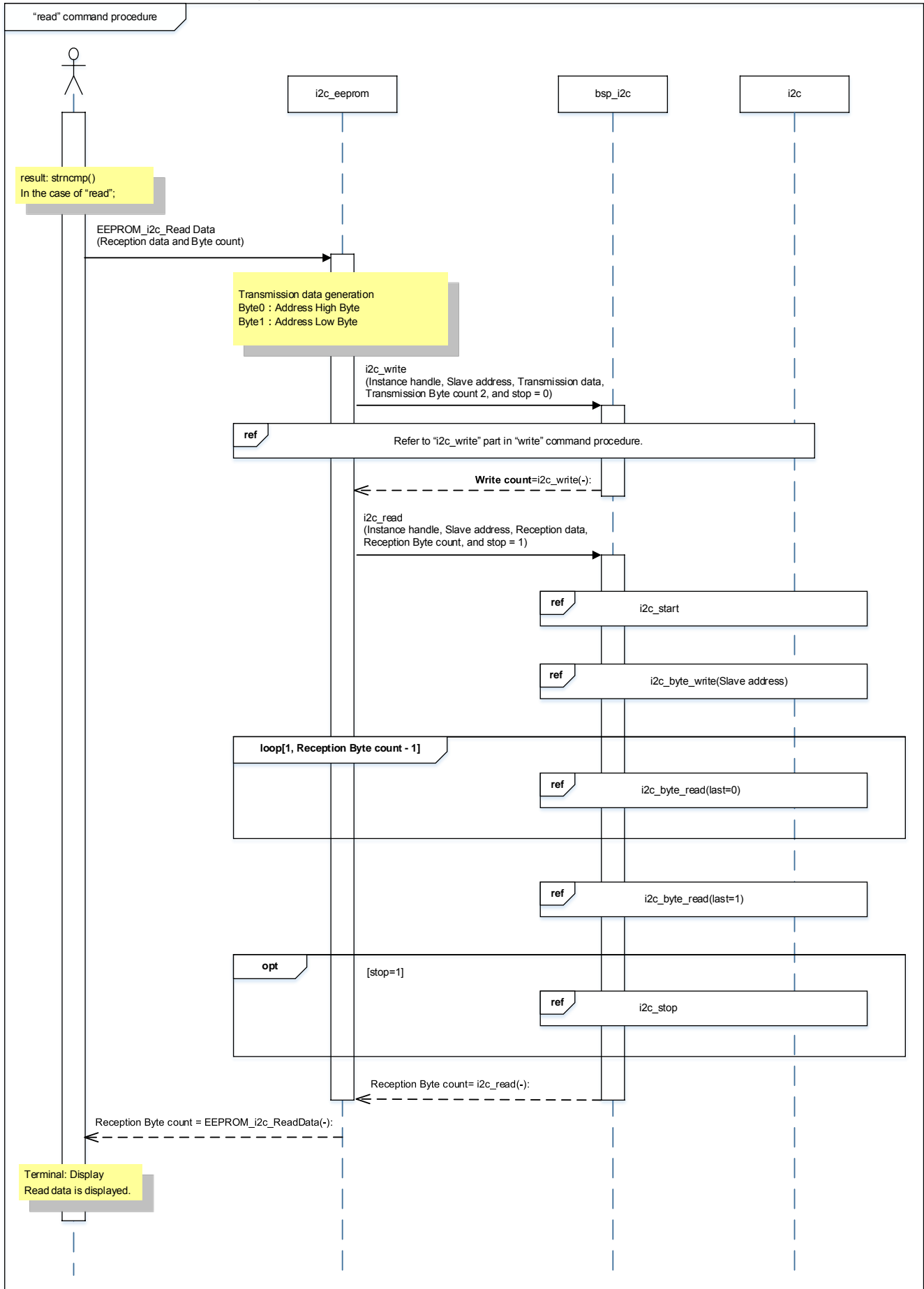




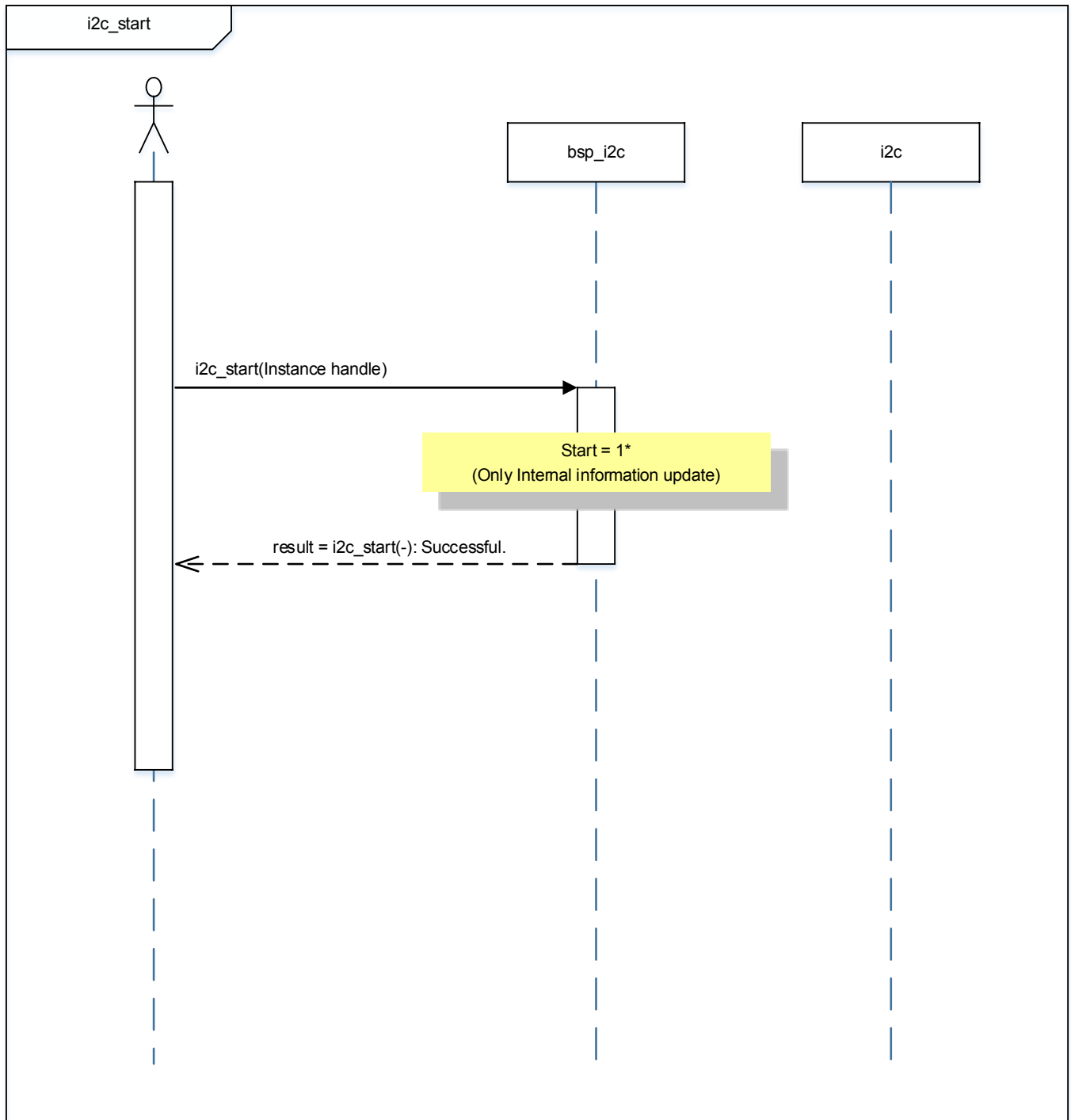
"write" command processing



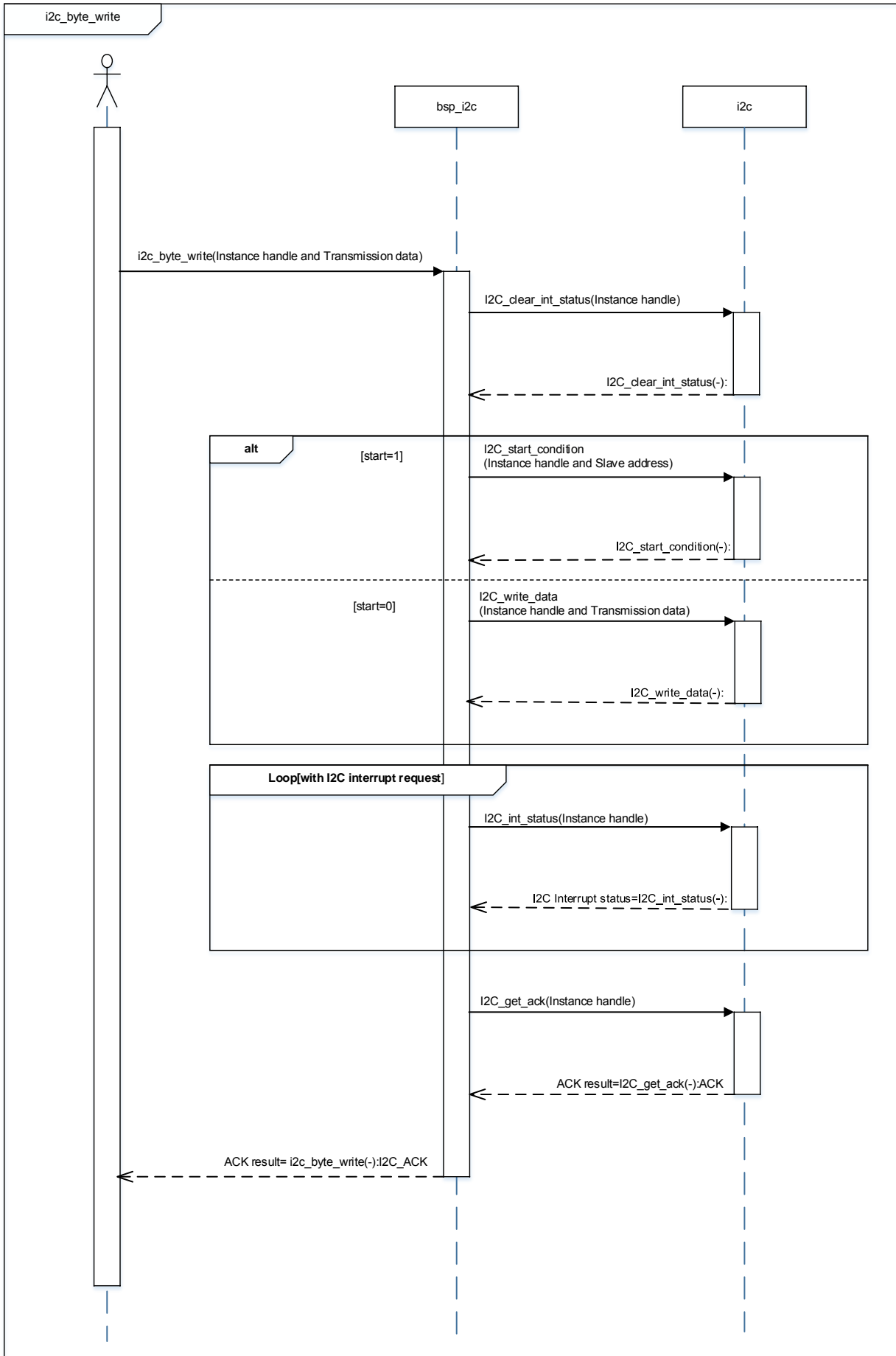
"read" command processing



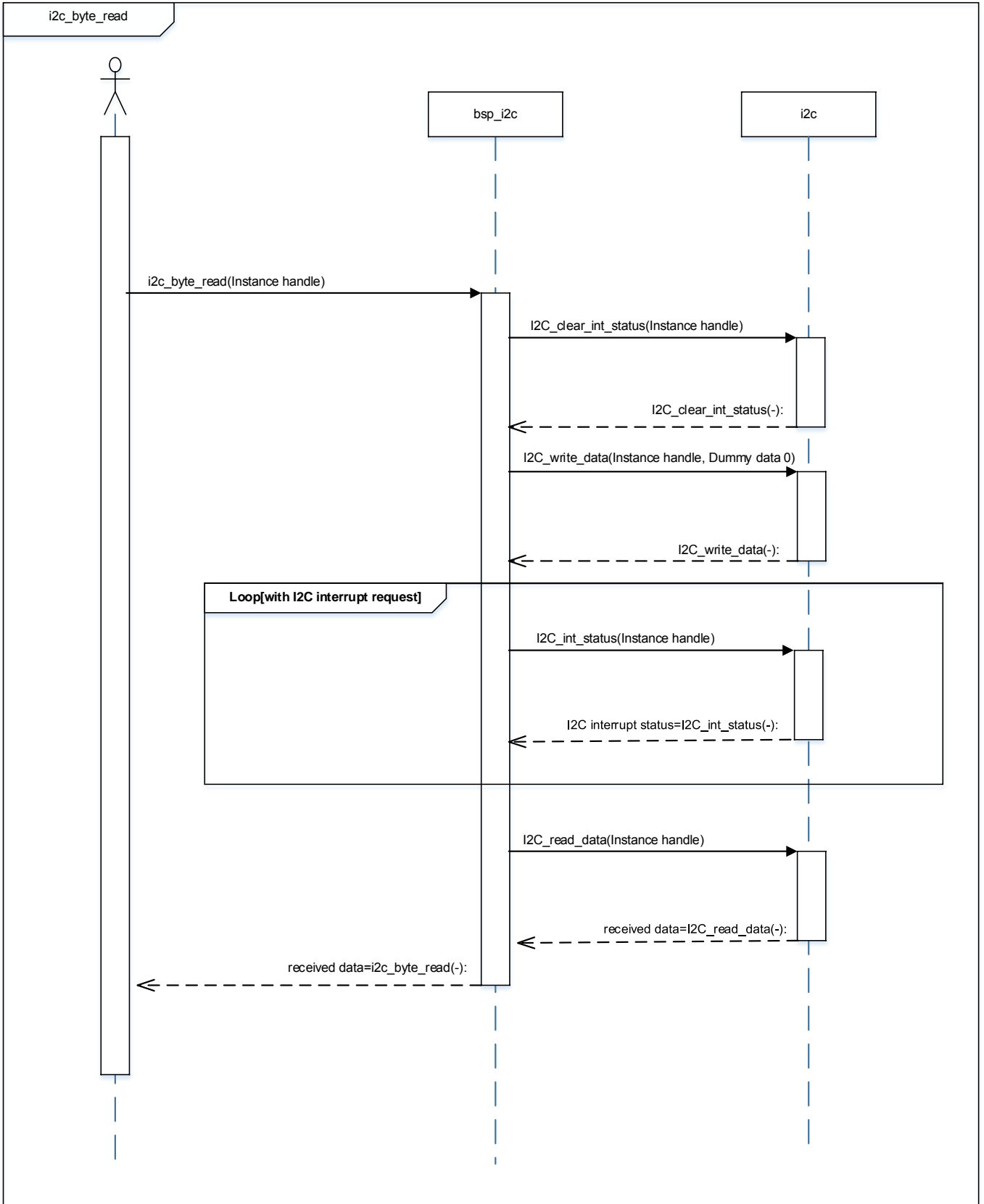
I²C start procedure



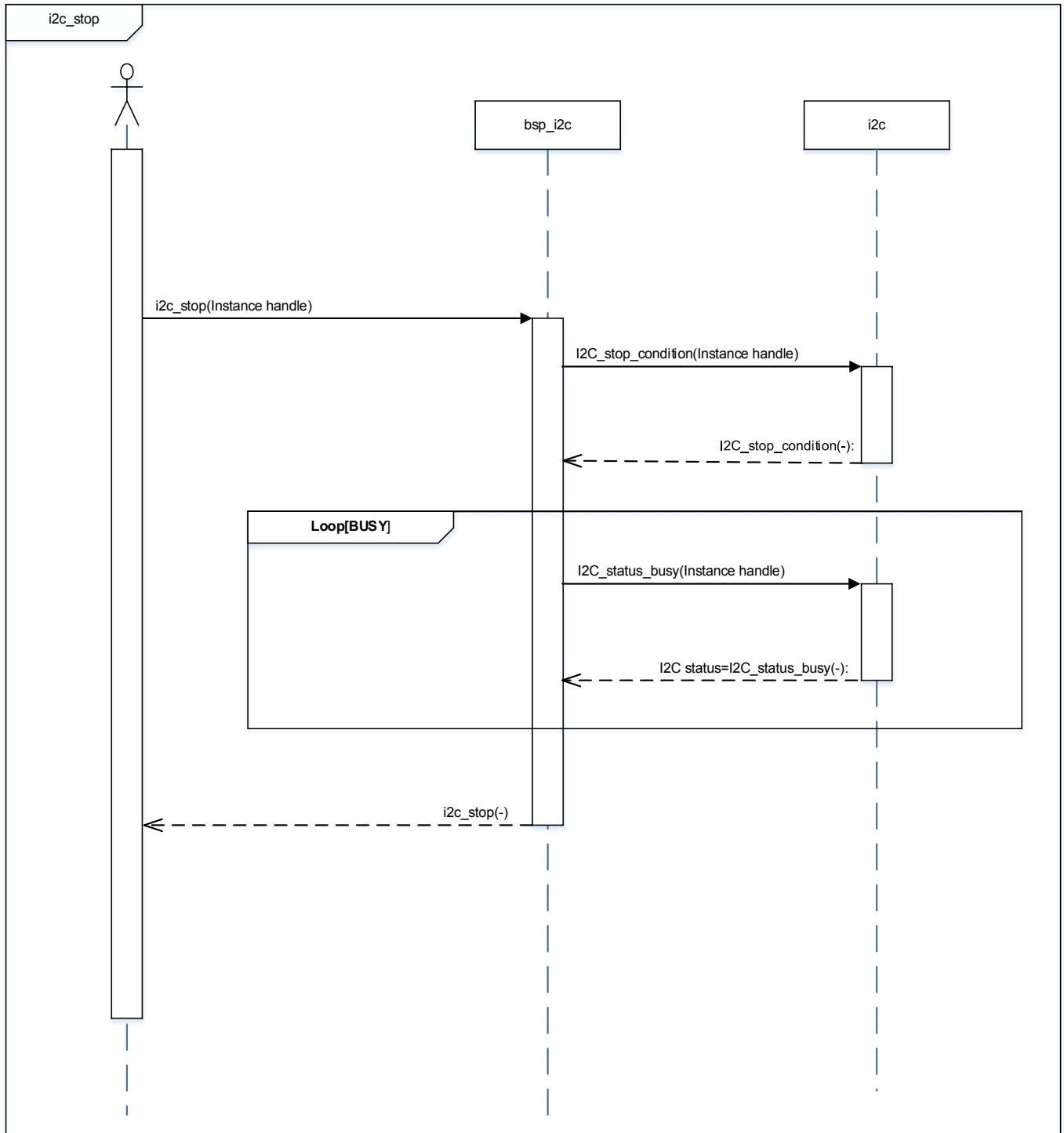
I²C write procedure



I²C read procedure



I²C stop procedure



10. Precaution

When using the sample program with CPU other than TMPM3H6, please check operation sufficiently.

11. Revision History

| Rev | Date | Page | Description |
|-----|------------|------|---------------|
| 1.0 | 2018-03-08 | - | First release |

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