In Application Programming
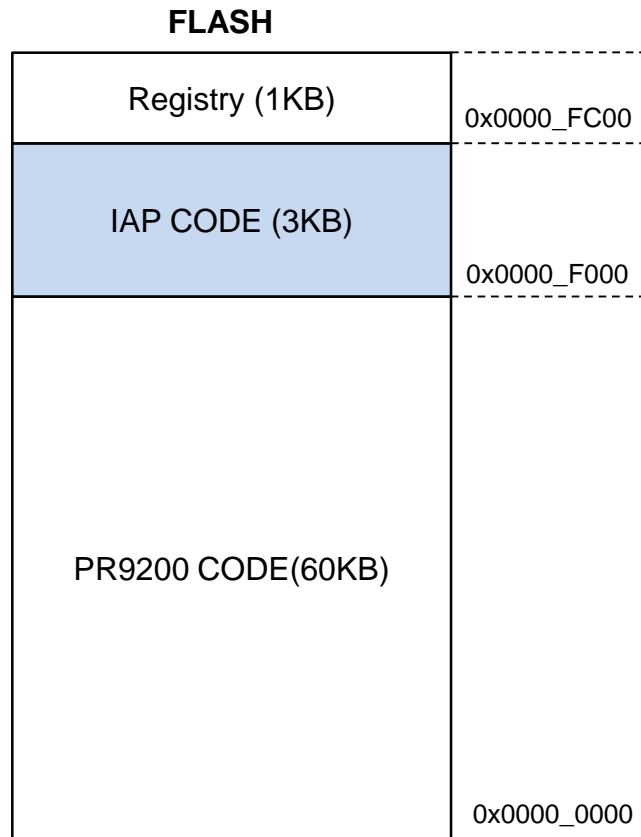
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Revision History

Version	Date	Description
01	2014-08-13	Initial release
02	2015-06-29	Added RCP Command & Response

Document Summary

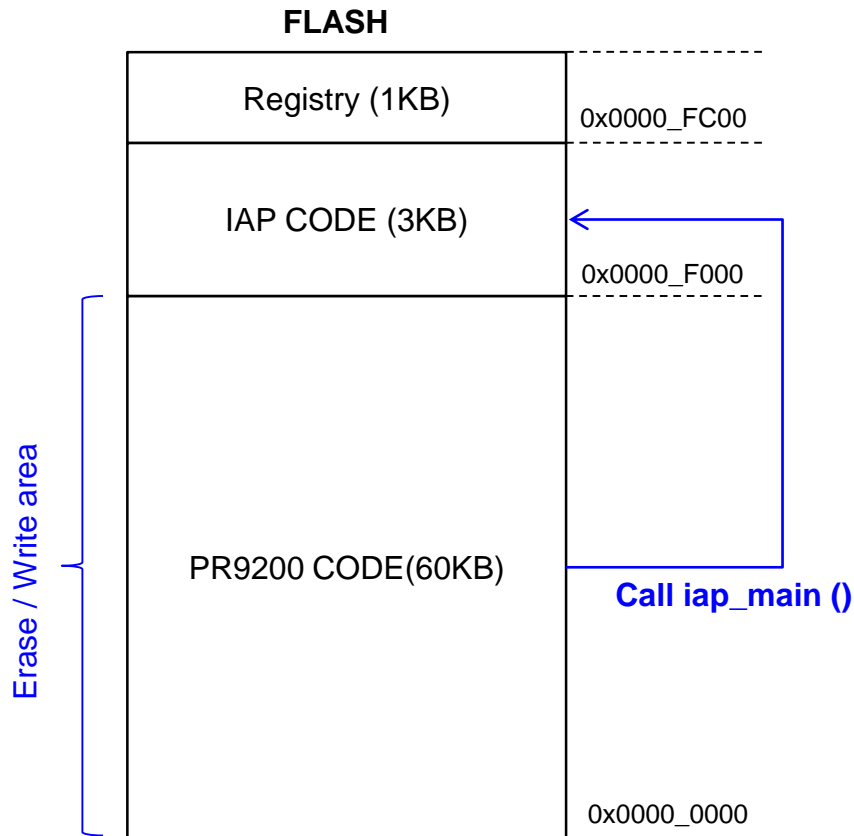- This document contains the description and usage of In-Application Programming.

In-Application Programming

FLASH

Registry (1KB)
IAP CODE (3KB)
PR9200 CODE(60KB)

0x0000_FC00

0x0000_F000

0x0000_0000

Flash memory area in normal mode

- IAP(In-Application Programming) use same method to ISP for downloading firmware

- IAP can download firmware in normal mode without hardware control by function iap_main( ) in iap.c

- Available Interface to download firmware
  - UART, SPI, I^{2}C

- The function code downloading firmware is loaded at 0xF000~0xFBFF(3KB)
  - RCP
  - UART/SPI/I^{2}C
  - Flash
  - Timer

- Flash download range area (CODE area) is 0x0000_0000 ~ 0x0000_EFFF(60KB)
  - Keep IAP Code/Registry region

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IAP Download Procedure

FLASH

Registry (1KB)	0x0000_FC00
IAP CODE (3KB)	0x0000_F000
PR9200 CODE(60KB)	0x0000_0000

Erase / Write area
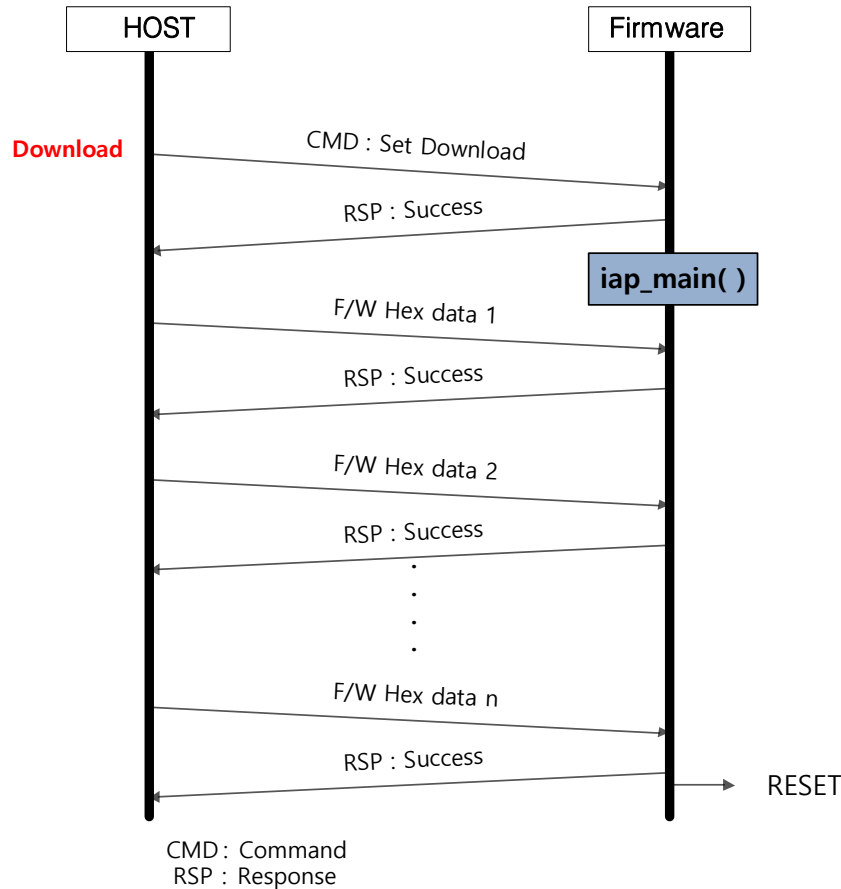
Call iap_main ()

[STEP1] Set download command at HOST

[STEP2] Call function iap_main ( ) in order to move pointer to IAP code area
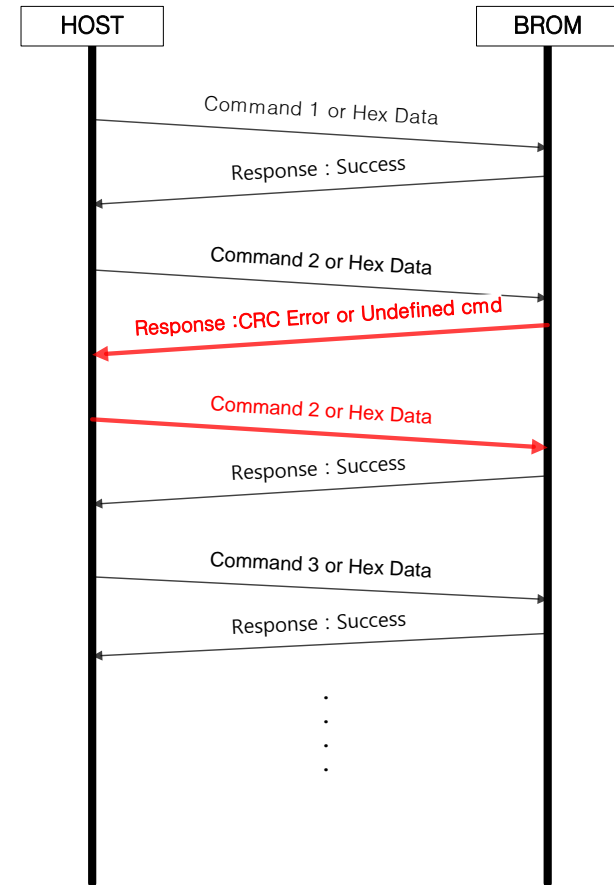
[STEP3] Flash erase and write data according to the defined procedure (same as ISP)
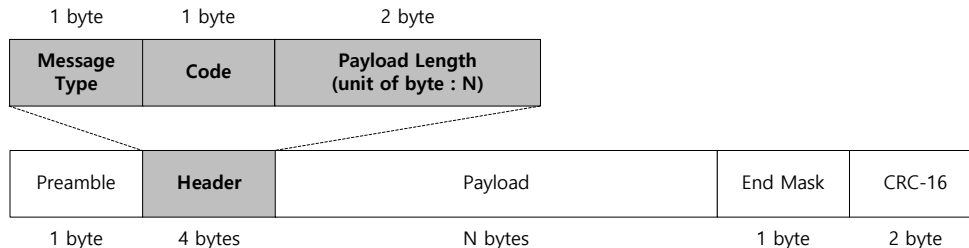
[STEP4] Hardware reset to start new firmware

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IAP Flow Chart

Normal Operation Flow

Abnormal Operation Flow

Protocol Structure

1 byte	1 byte	2 byte
Message Type	Code	Payload Length (unit of byte : N)

Preamble	Header	Payload	End Mask	CRC-16
1 byte	4 bytes	N bytes	1 byte	2 byte

- **Preamble(0xBB)**

A preamble includes information for indicating the start of a protocol message. The preamble has a value of 0xBB

- **Header**

The header includes three fields describing the message type, code and payload length.

  ✓ **Message Type**

  The message type field includes information about which one of a command and a response in a protocol format. The message type can b

Message Type	Value(Hexadecimal)
Command	0x00
Response	0x01

  ✓ **Code**

  A code field is used to discern the type of a command and a response.

  ✓ **Payload Length**

  A payload length field indicates the length of a payload field located after a header field. The payload length field may be composed of 16

- **End Mark**

An end mark includes information for indicating the end of protocol message. The end mark has a value of 0x7E.

- **CRC-16**

The 16-bit CRC is calculated on all the massage bits from the message type field to the end mark field. CRC-16 = $X16 + X12 + X5 + 1$ (initial Value: 0xFFF

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Commnad & Response Structure (1/2)

▪ **Download Flash (0xB1)**

A download flash command is used to indicate the start of flash hex data transmission after successfully completing the transmission, the host transmits the frames of flash fata type to reader.

Download Hex command : from host to MCU

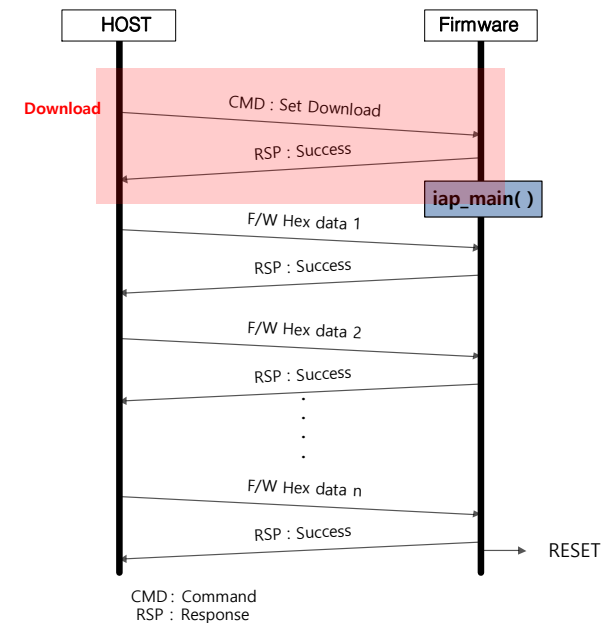| Preamble	Message Type	Code	Payload Length (unit of byte : N)		End Mask	CRC-16 (2bytes)
0xBB	0x00	0xB1	0x00	0x00	0x7E	0xNNNN

command response : from MCU to host

Preamble	Message Type	Code	Payload Length (unit of byte : N)		Payload	End Mask	CRC-16 (2bytes)
0xBB	0x01	0xB1	0x00	0x01	0x00	0x7E	0xNNNN

For example,

HOST REQ: BB 00 B1 00 00 7E 09 30
MCU REP: BB 01 B1 00 01 00 7E 67 86

HOST — Firmware

Download
CMD : Set Download
RSP : Success

iap_main( )

F/W Hex data 1
RSP : Success

F/W Hex data 2
RSP : Success

F/W Hex data n
RSP : Success
RESET

CMD : Command
RSP : Response

Commnad & Response Structure (2/2)

- **Data (0x57)**

Data Message : from host to MCU

Preamble	Message Type	Hex Address (2 bytes)		Hex Data (16 bytes)					End Mask	CRC-16 (2bytes)
0xBB	0x57	Addr0	Addr1	Data0	Data1	...	DataE	DataF	0x7E	0xNNNN

Data response : from MCU to host

Preamble	Message Type	Code	Payload Length (unit of byte : N)		Payload	End Mask	CRC-16 (2bytes)
0xBB	0x01	0xB1	0x00	0x01	0x00	0x7E	0xNNNN

✓ **Preamble & End Mark**
A preamble and end mark have a value of 0xBB and 0x7E.

✓ **Message Type**
A message type has a value 0x57.

✓ **Hex Address**
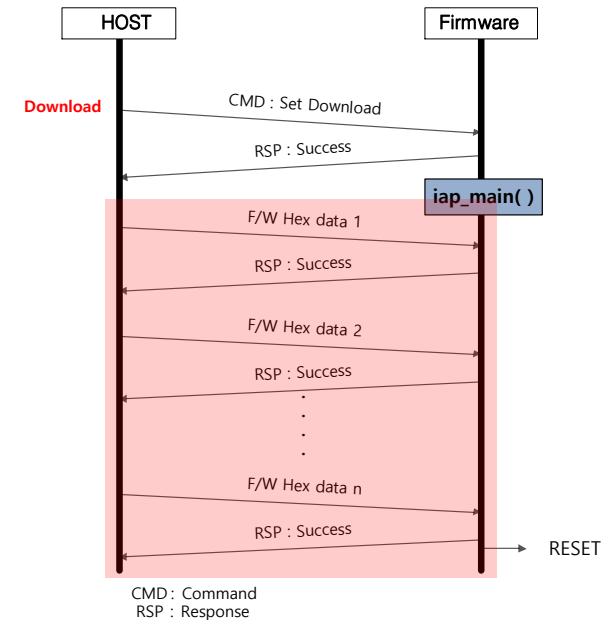A hex address indicates the flash memory address. The hex address field may be composed of 16 bits. (Addr0 * 256 + Addr1)

✓ **Hex Data**
The hex data indicates 16 byte hex data.

✓ **CRC-16**
The 16-bit CRC is calculated on all the massage bits from the message type field to the end mark field.

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