Wi-SUN Module FAN1.0 compliant

BP35C5 Startup Manual

Version 1.0.2

Overview

This instruction manual describes the procedures on how to use each evaluation board of Wi-SUN Module BP35C5, and how to check an operation using a serial communication software (Tera Term).

BP35C5-T01

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2. Downloading related documents and software

The documents related to this manual are listed at the beginning of each chapter. Refer to them if necessary.

The documents for hardware are available for download on ROHM Wi-SUN support page.
ROHM Wi-SUN support page: https://www.rohm.co.jp/products/wireless-communication/specified-low-power-radio-modules/bp35c5-product/documents

The documents for software and firmware are available for download on Wi-SUN FAN support page of Nissin Systems Co., Ltd.
Nissin Systems homepage : https://e-support.co-nss.co.jp/

The terminal software Tera Term is used to check the operation, and it can be downloaded from the following URL.
Tera Term download : https://osdn.net/projects/ttssh2/

USB-UART conversion chip of FTDI Ltd. is used in evaluation boards. Download the FTDI driver from the URL below if necessary because Windows may not be able to automatically recognize it, and the driver may need to be installed.
FTDI Ltd. download : https://www.ftdichip.com/FTDrivers.htm

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3. What can you do with BP35C5

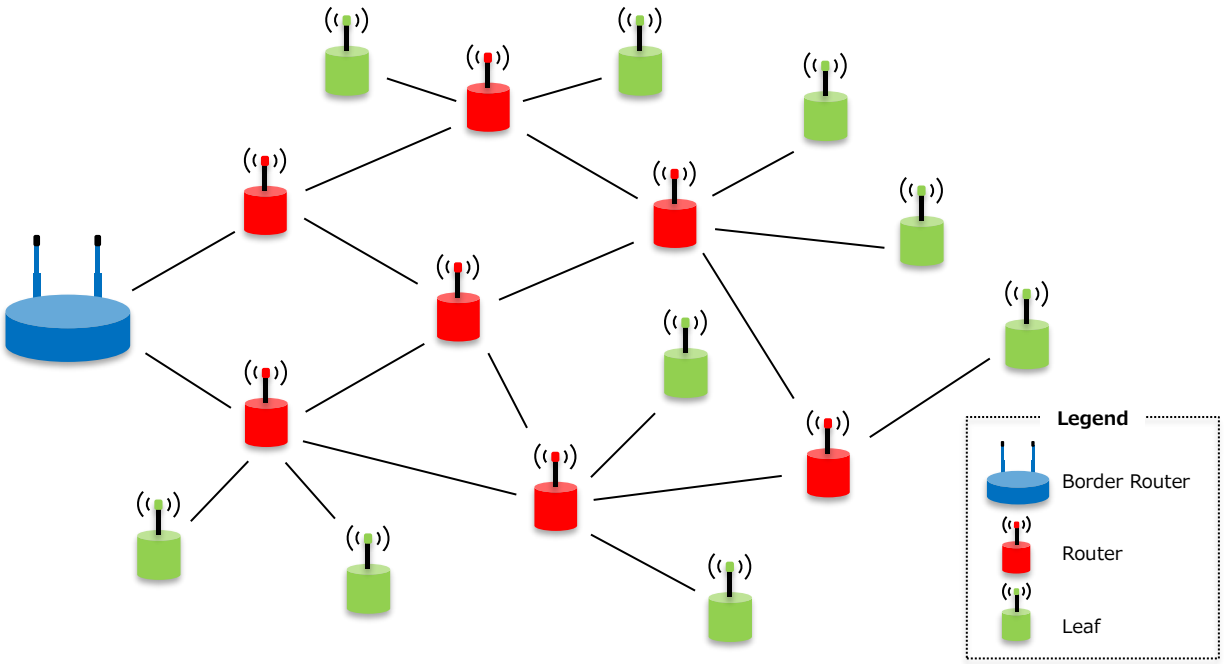
BP35C5 enables you to create a network such as the following and to communicate with UDP and/or TCP.

Name	Features
Mesh networking	A networking in which each station is connected in a mesh. Even if a station fails (network down or radio interference), it is possible to build another route to communicate.
Serial network	A networking in which all stations are connected in a straight line. Long-distance communication is possible by making the most of hopping.
Star network	A networking in which all child stations are directly connected to one parent station. Communication at high speed in a narrow range is possible.
Tree network	A networking in which each station branches like branch of a tree. It is a form in which the vertical relationship between stations is clear and easy to control.

3.1. Mesh Networking

This type of networking makes the most of FAN characteristics.

It covers a wide range because of hopping, and automatic routing can be used to avoid failures.



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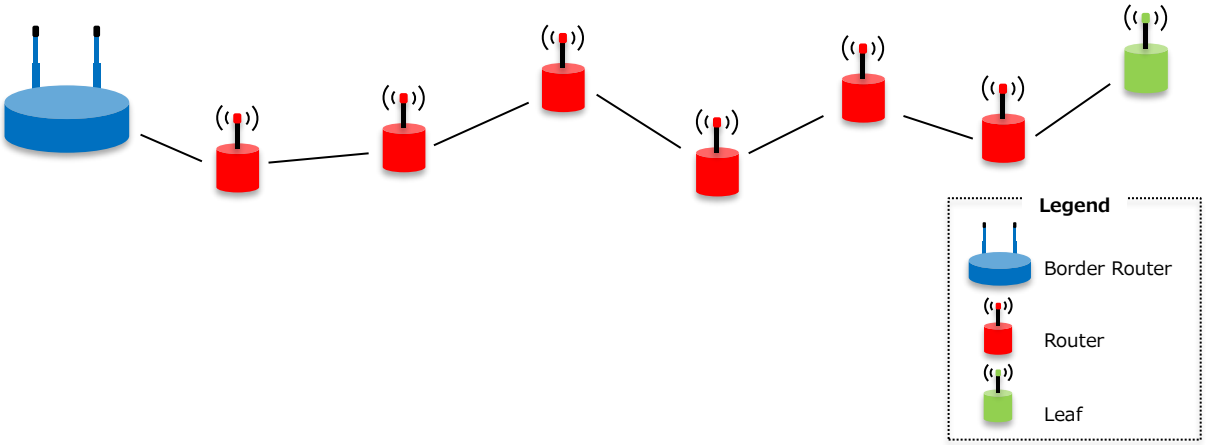
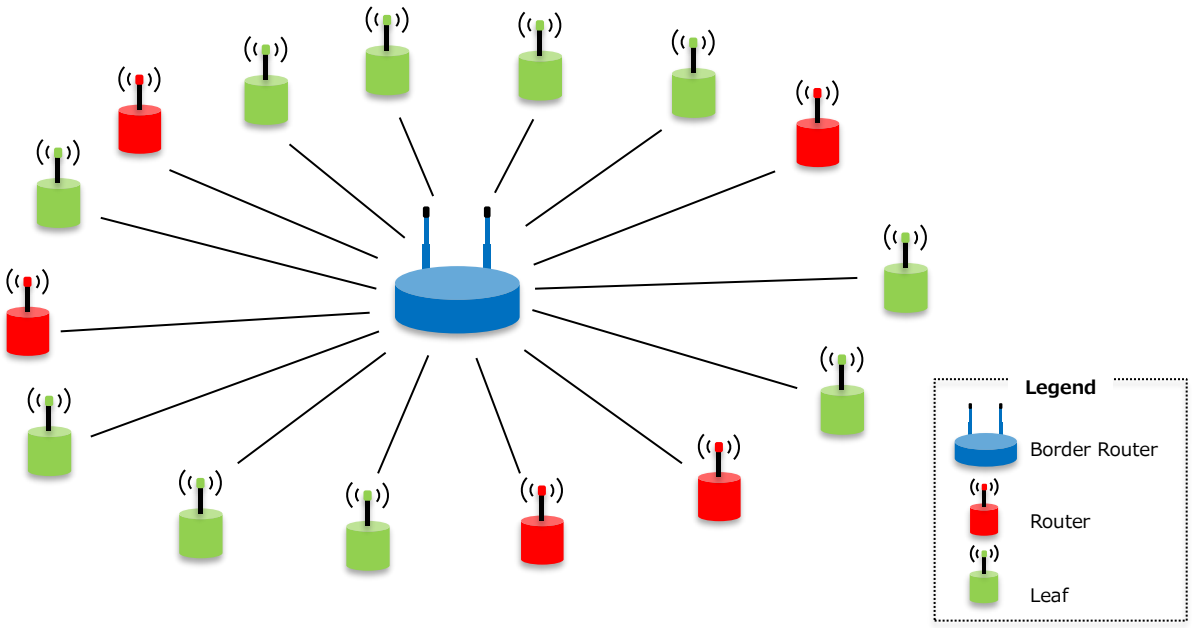
3.2. Serial Network

This type of networking that can realize communication distance by hopping, and suitable for infrastructure (street lights, etc.) installed in a straight line.



3.3. Star Network

This type of networking is applicable for communicating at high speed in a narrow range because it does not use hopping.



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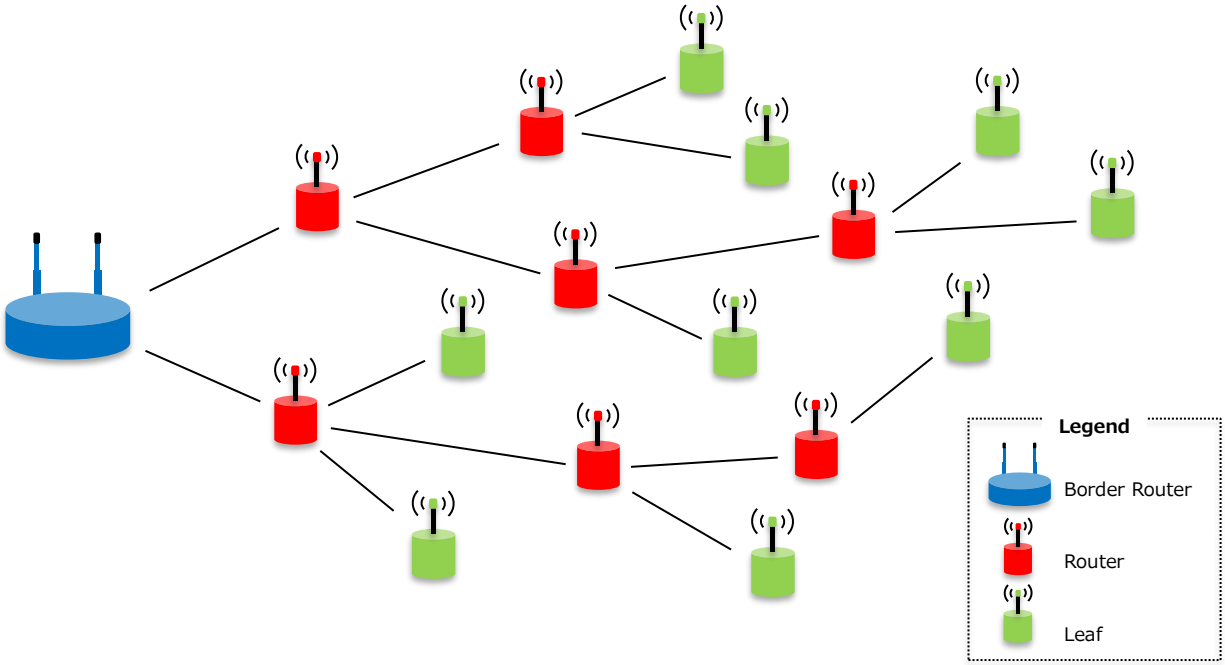
3.4. Tree Network

This is a type of networking in which each station branches off like branch of a tree. With a slight change in settings, it can also be a mesh networking.



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4. Setup of hardware and software

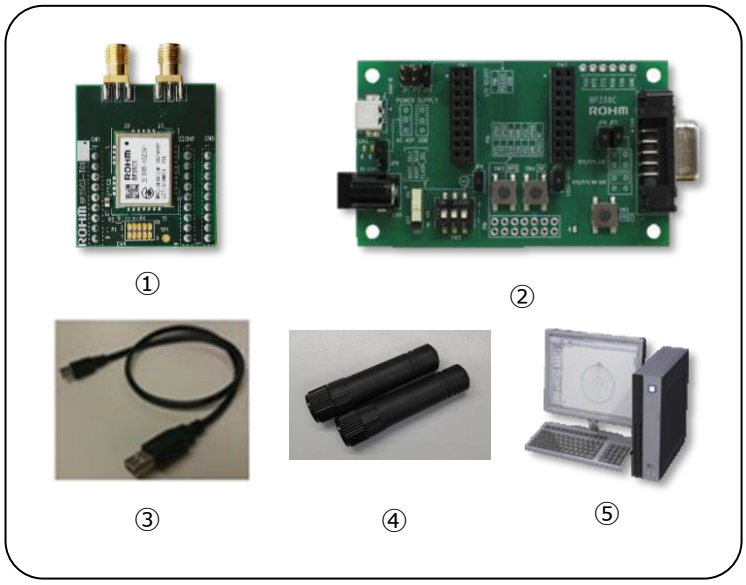
This chapter explains the setup of hardware and software in order to check the operation of BP35C5.
The flow of setup is as follows.

- STEP 1: Preparing the hardware and software
- STEP 2: Connecting the hardware to PC
- STEP 3: Setting up the serial communication software

4.1. STEP1: Preparing the hardware and software

The hardware and software to be used will be described.

4.1.1. Regarding the hardware



No.	Name
①	BP35C5-T01
②	BP359C
③	USB cable (Mini-B)
④	Antenna
⑤	Windows PC

*① and ② can be purchased from ROHM, distributors, or online.
*③, ④ and ⑤ must be purchased by the customer.

*Reference info: ROHM is actually using the cable below as USB cable.
・ELECOM Co. Ltd. Product "U2C-M05BK" (mini-B type)

The following are related documents for hardware. Refer to it as needed.
Download URL : https://www.rohm.co.jp/products/wireless-communication/specified-low-power-radio-modules/bp35c5-product/documents

Filename	Details
BP35C5 Datasheet (bp35c5_datasheet_v***e.pdf)	This document describes the hardware specifications for BP35C5.
BP35C5-T01 Evaluation Board (bp35c5-t01_evaluationboard_v***e.pdf)	This document describes the hardware specifications for BP35C5-T01.
BP359C Evaluation Board (bp359c_evaluationboard_v***e.pdf)	This document describes the hardware specifications of UART interface evaluation board (BP359C).
List of external antenna (bp35c5_antennalist_v***e.pdf)	This is a list of external antennas that have been certified for radio law compatible with BP35C5.

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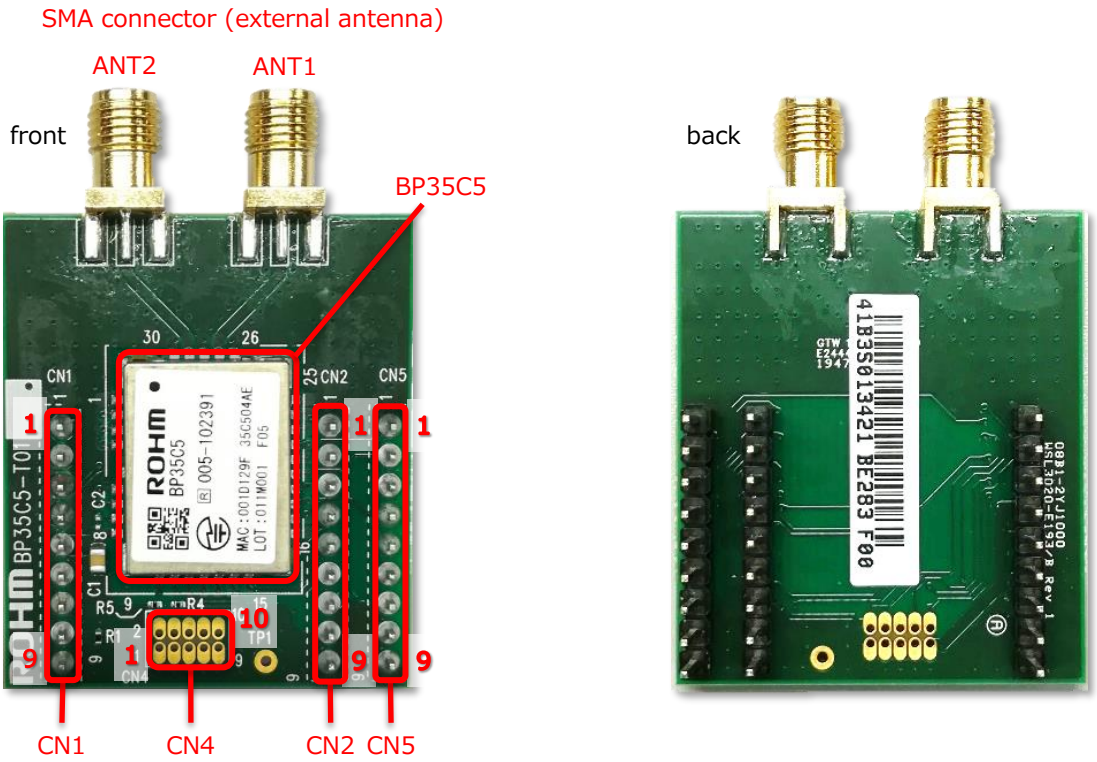
- Adapter board BP35C5-T01

In this chapter, BP35C5 adapter board (BP35C5-T01) is used in order to use BP35C5 on the evaluation board (BP359C).

This is an evaluation board that can be connected to the BP359C with built-in BP35C5.



The pin configuration of BP35C5-T01 is shown below.

Refer to BP35C5 Datasheet for the information of each pin of BP35C5.

CN1	
Pin No.	Pin Name
1	GND
2	GPIOB1/FTM
3	ADC2
4	VDD
5	VDD
6	NC
7	NC
8	MODE0
9	GND

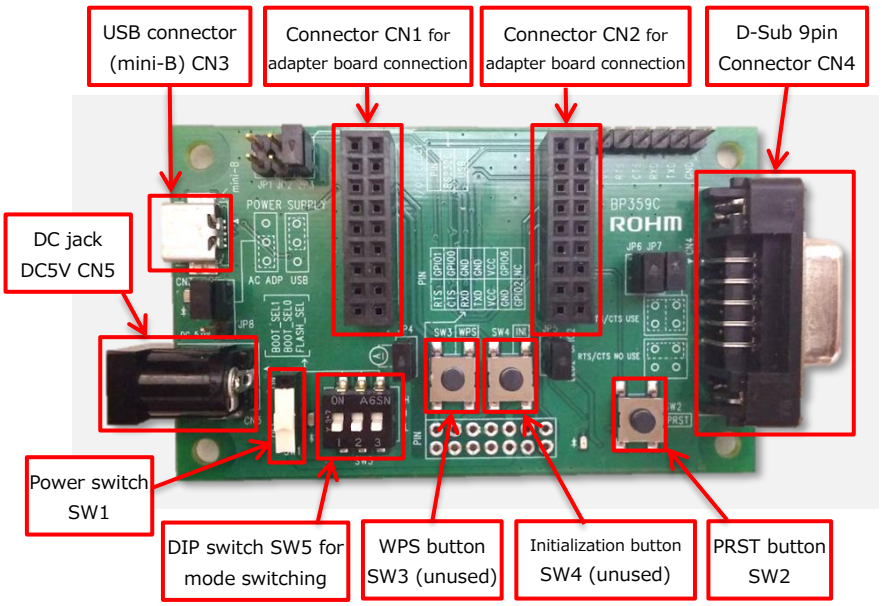
CN2	
Pin No.	Pin Name
1	GND
2	RTS
3	CTS
4	RXD
5	TXD
6	GPIOA1/SCL
7	RESETN
8	GPIOA0/SDA
9	GND

CN5	
Pin No.	Pin Name
1	GND
2	SPI_MISO
3	SPI_SSN
4	GPIOC0/RXD2
5	GPIOB7/TXD2
6	SPI_SCK
7	RESETN
8	SPI_MOSI
9	GND

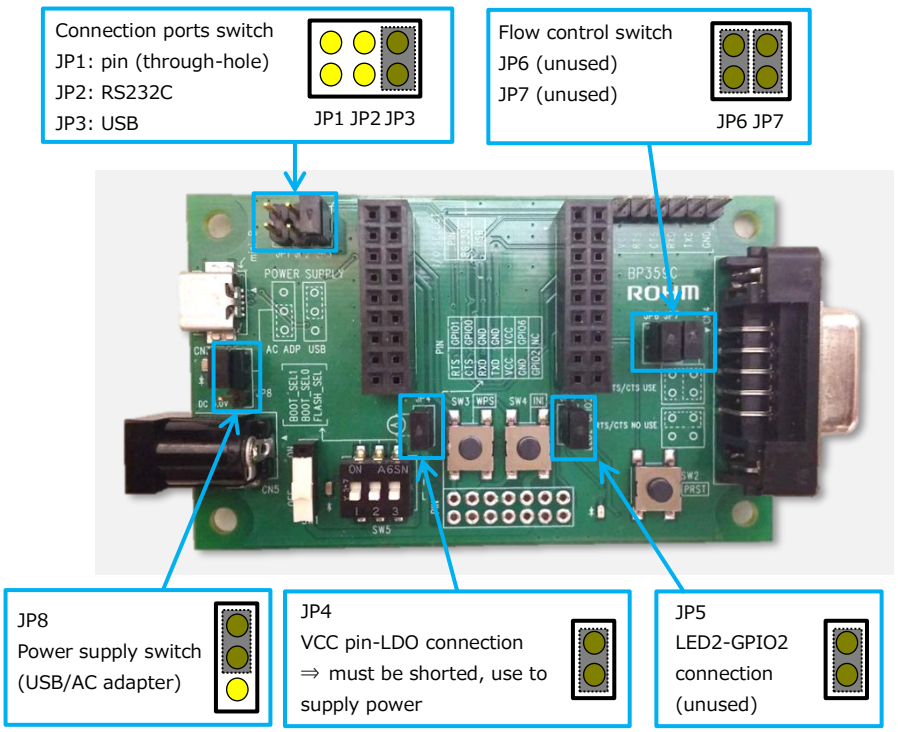
CN4	
Pin No.	Pin Name
1	VDD
2	SWD
3	GND
4	SWCK
5	GND
6	NC
7	NC
8	NC
9	GND
10	RESETN

- Evaluation board BP359C

The BP359C evaluation board is a board to evaluate various radio modules.
Refer to the manual of BP359C evaluation board for internal schematics and pin configuration.
The names of each part are listed below.



For various jumper pins, the role and settings when using USB connector (CN3) are described below. The settings for using the D-Sub connector are described in "7.1. Connecting via D-Sub connector". Take note that JP5, JP6, and JP7 are not used in this manual.



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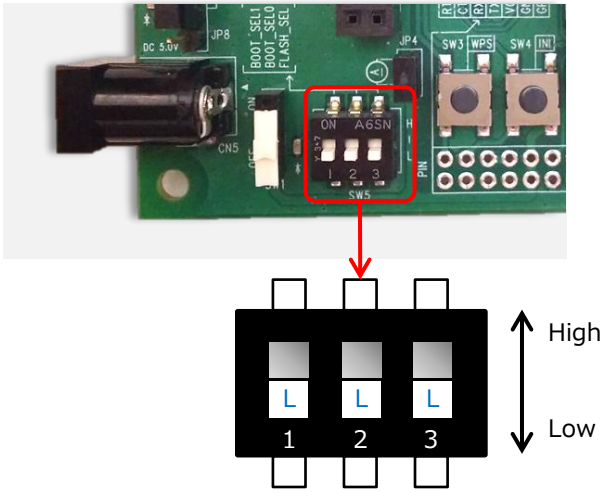
Set the DIP switch (SW5) to low when checking the normal operation as follows.



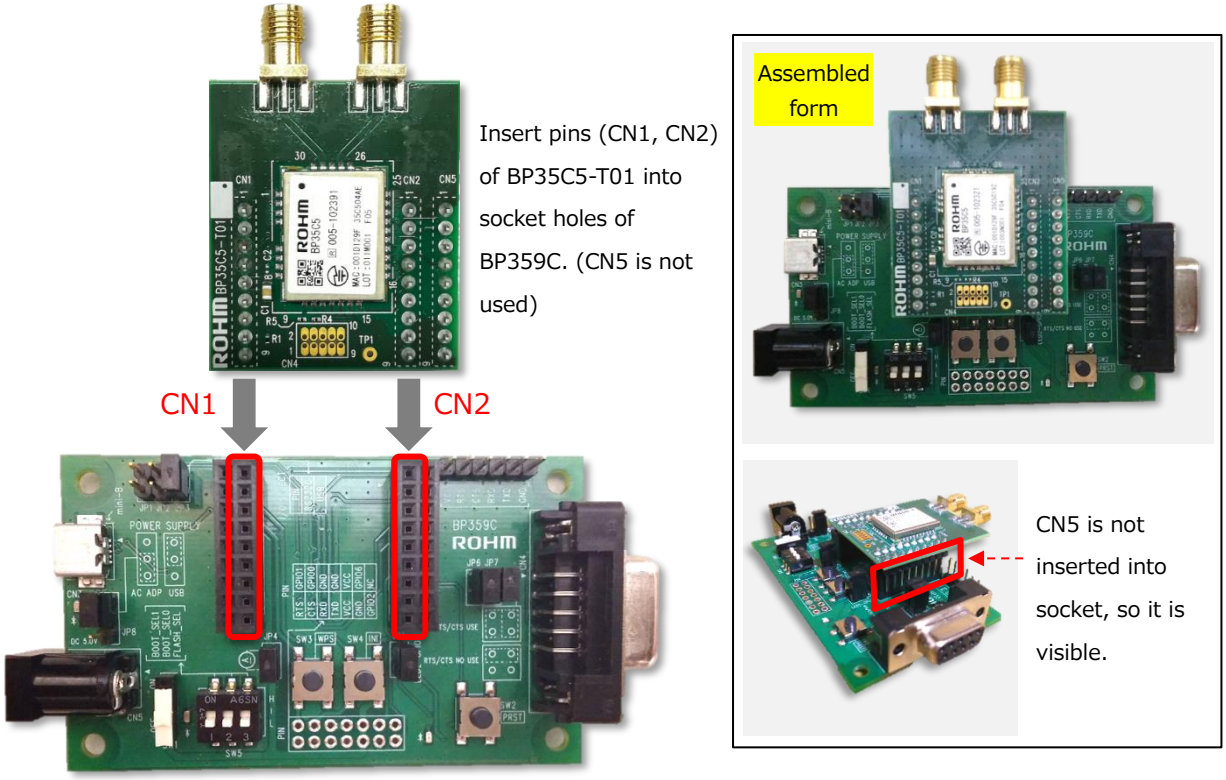
4.1.2. Regarding the software

No.	Filename	Details
①	Terminal Software (Tera Term)	This is a software that can serially communicate and send binary files. Tera Term, a Windows free software is used in this manual.
②	Firmware	This is a BP35C5 Wi-SUN FAN1.0 compliant firmware, which is provided by Nissin Systems Co., Ltd.
③	EW-WSN-FAN Command Application Users Manual (EW-WSN-FAN UsersManual.pdf)	This manual describes the command specifications for controlling BP35C5, which is provided by Nissin Systems Co., Ltd.
④	Sample Script Manual (bp35c5_samplescript_v***j.pdf)	This is the instruction manual of BP35C5 Sample Script.

Tera Term in No.① can be downloaded from the site below.
URL: https://osdn.net/projects/ttssh2/

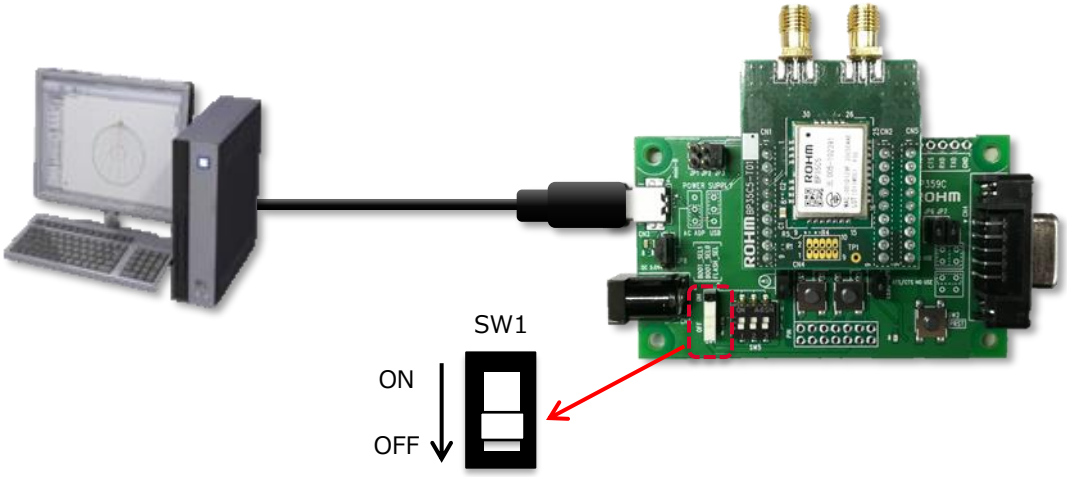
4.2. STEP2: Connecting the hardware to PC

Insert BP35C5-T01 into BP359C from the top as shown in the images below.



After connecting the adapter board to BP359C, connect it to PC.

When connecting to PC, keep the power switch (SW1) on BP359C off. The evaluation board will be automatically recognized by Windows after connecting.*



*In BP359C, FTDI is used to convert USB to UART. Depending on PC environment, installation of a driver may be necessary. Therefore, download the driver from the following URL if necessary.
https://www.ftdichip.com/FTDrivers.htm

4.3. STEP3: Setting up the serial communication software

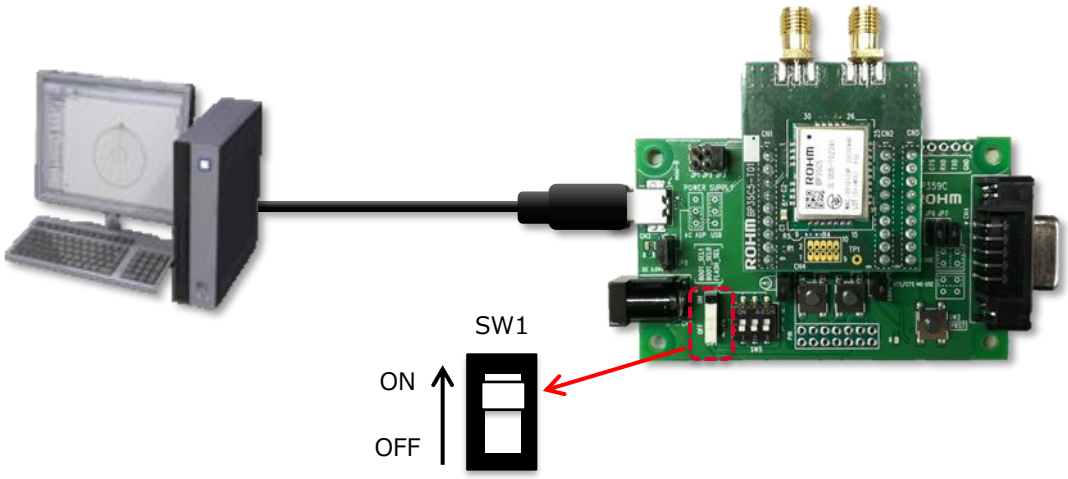
In this manual, the following software is used.

Program Name	Details
Terminal software (Tera Term)	This is a free software that can serially communicate on Windows. Tera Term is available for download from: https://osdn.net/projects/ttssh2/

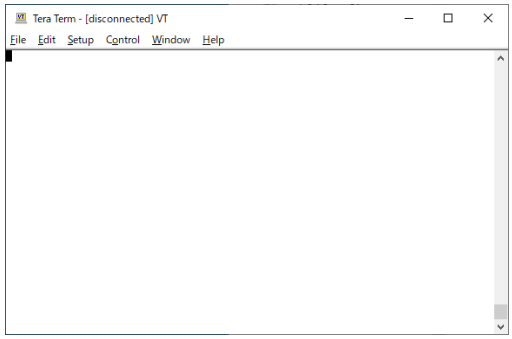
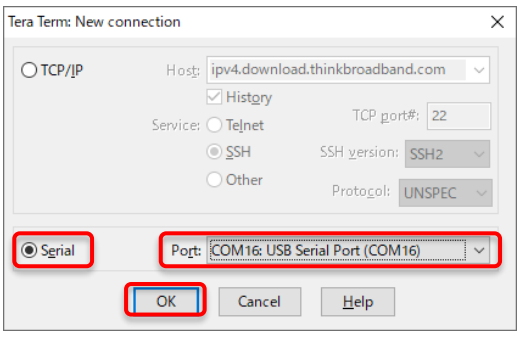
4.3.1. Setup of terminal software

In this manual, a Windows free software Tera Term is used for serial communication.

First, turn on the power supply in BP359C power switch (SW1). The LED near SW1 will turn green once the power switch is on.



After installing Tera Term, follow these steps:

No.	Screen	Operating details
1		Tera Term starts up.
2		Select "File" → "New connection...". Check "Serial" in the displayed window, select COM Port (USB Serial Port) to use, and then click OK. The COM Port is the number assigned when USB is inserted in PC. If unknown, follow these steps:

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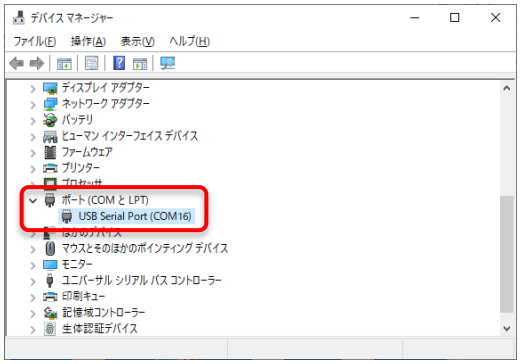
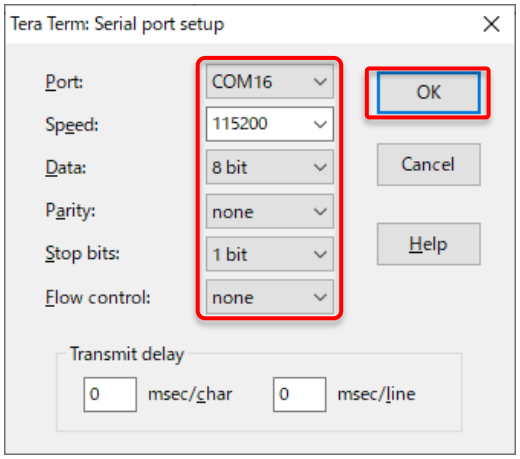
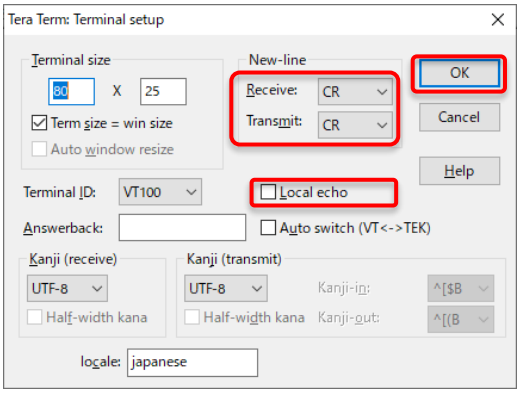
3		(In case COM Port is unknown) The left screen opens in "Device Manager" (search in Windows Start Menu). Refer to the COM Port that appears in the Port (COM and LPT) field.
4		Select "Setup" → "Serial port...". Select "115200" from the baud rate drop-down in the displayed window. Set the data to "8bit", parity to "none", stop bit to "1bit", and flow control to "none". Then, click OK after selecting.
5		Select "Settup" → "Terminal...". Under the Newline Code in the displayed window, set both receiving and sending to "CR", and uncheck the Local echo. Then, click OK after selecting.
		That's all to prepare the Tera Term.

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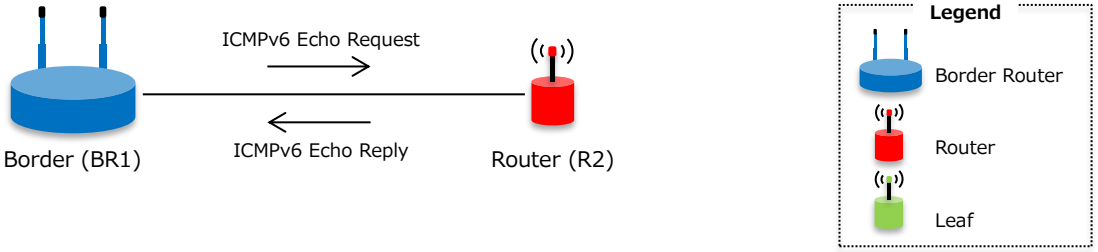
5. Verifying the communication

In this chapter, the networking with 2 parts namely; Border and Router will be configured, and communication will be verified using ping.



5.1. Preparation

Prepare two evaluation sets (with antenna) of BP35C5 with initial settings.

If the setting is not in the initial state, use "clrst" command to reset the setting to its initial state as follows.

```
> clrst                                  ← Reset back to its initial state
clrst parameter is cleared and reset delay 0sec
```

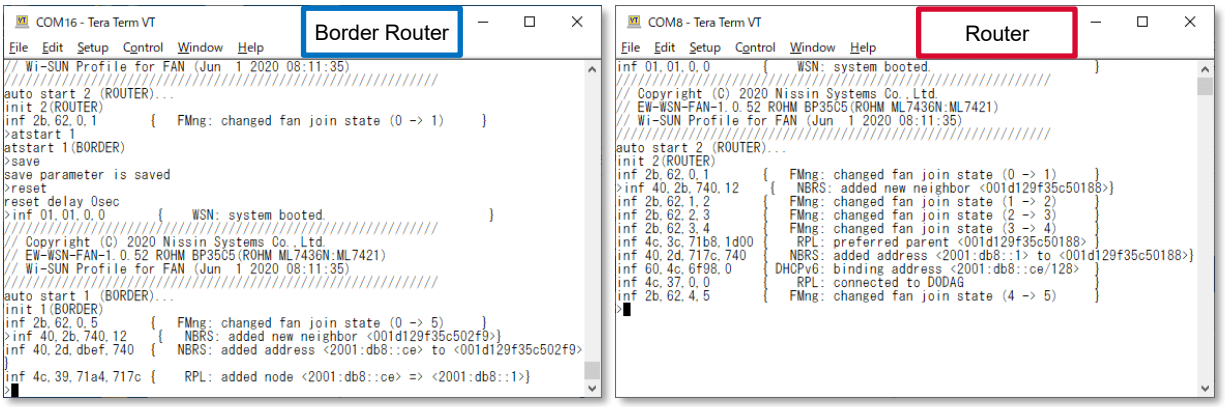
The initial BP35C5 state starts as Router. However, it will require a Border unit to configure the network. Thus, set one unit to be a Border.

```
BR1> atstart 1                           ← Set to Border
atstart 1(BORDER)

BR1> save                                ← Save the settings
save parameter is saved

BR1> reset                               ← Reset to reflect the settings
reset delay 0sec
```

A few moments after setting, the network will be connected as shown below, and an IP address will be automatically assigned to the Router.



Use the "fstat" command to check if the Router is connected to the Border. If "5(OPERATIONAL)" is displayed, then the connection is successful.

```
R2> fstat
fstat 5(OPERATIONAL)                    ← 5(OPERATIONAL) means connected
```

5.2. Verification of communication

Next, run ping from the Border to the Router to verify the communication.

Check the IP address of the Router by sending the "leased" command in the Border.

```
BR1> leased                             ← Show the list of leased IP address
leased <2001:db8::ce>,<001d129f35c502f9>
```

In this example, "2001:db8::ce" is assigned to the Router.

Run ping from the Border.

If the Router responds, it should look like the example below.

```
BR1> ping 2001:db8::ce
ping <2001:db8::ce> (seq=1 sz=32bytes time=0.070sec) 1/1
1 transmitted, 1 received, 0.0% loss (min=0.070/max=0.070/avr=0.070 sec)
```

Also, the following is shown in the Router.

```
inf 44,32,1,20      { icmpEch: rcvd echo request (seq=1 len=32)   }
```

With the above, the communication is verified.

With the ping result or if "100% loss" is outputted, it means that the communication failed.

If this is the case, check the following situations:

- Is the destination IP address correct? → Check the entered IP address whether correct or not.
- Is the Router connected? → It may reconnected after a while.
- Is the antenna installed? → It may be not connected due to weak radio waves.
- Are the settings correct? → Check the settings for each node used in this chapter on the following page.

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Border (BR1) parameter settings

```
BR1> param
    mac address : <001d129f35c50188>(*)
         pan id  : <NONE>
   profile mode : 1(FAN)
      auth mode : 1
    UART hwflow : 0
   IPv6 address : ULA<NONE/64>,GBL<NONE/64>
   RPL DODAG ID : <NONE>
RPL instance ID : 0
UDP listen port :  3610 20171
   DHCPv6 range : 1000
     mac-filter : default( allow )
  joiner-filter : default( allow )
  CCA threshold : -83
        chrate   : 150Kbps
        channel  : low(33)<->high(59),num=14
   network name : Wi-SUN-FAN
    TCP options : auto_connect send_port=3610
                : listen_port=3610
                : idle_minutes=3 rto_sec=10 maxrtx=3 syn_maxrtx=5 mss=536
    UDP options : send_port=3610 send_port_text=20171
                : listen_port=3610
                : listen_port_text=20171
 RMTCTL options :
auto start role : 1(BORDER)
```

Router (R2) parameter settings

```
R2> param
    mac address : <001d129f35c502f9>(*)
         pan id  : <cafe>(*)
   profile mode : 1(FAN)(*)
      auth mode : 1(*)
    UART hwflow : 0(*)
   IPv6 address : ULA<NONE/64>,GBL<2001:db8::ce/128>(*)
   RPL DODAG ID : <NONE>(*)
RPL instance ID : 0(*)
UDP listen port : (*)
   DHCPv6 range : 1000(*)
DHCPv6 fixed IP : (*)
  CCA threshold : -83(*)
        chrate   : 150Kbps(*)
        channel  : low(33)<->high(59),num=14(*)
   network name : Wi-SUN-FAN(*)
    TCP options : send_port=3610(*)
                : listen_port=3610(*)
                : idle_minutes=3 rto_sec=10 maxrtx=3 syn_maxrtx=5 mss=536(*)
    UDP options : send_port=3610 send_port_text=20171(*)
                : listen_port=3610(*)
                : listen_port_text=20171(*)
 RMTCTL options : send_done (*)
auto start role    : 2(ROUTER)(*)
```

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6. Updating the firmware

There are two ways to update the firmware as follows.

1. Use FlashWriterForSubG
2. Use Tera Term

The firmware file structure is shown below.

bootloader
- bootloader.bin
- bootloader.ttl

ew-wsn-cmd
- ew-wsn-cmd.bin
- ew-wsn-cmd.ttl

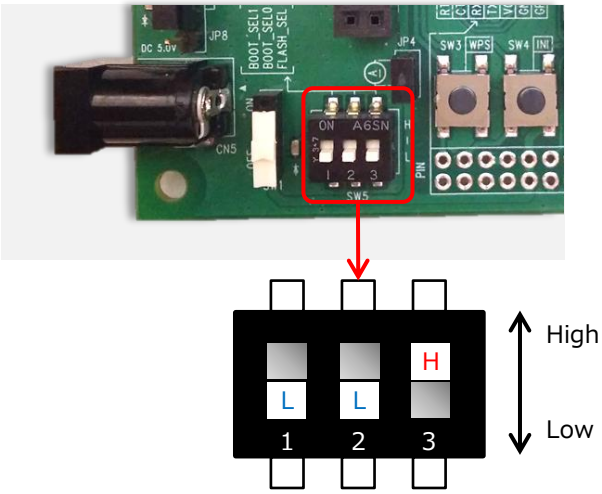
} The files for the method of use Tera Term

rohm-bp35c5.hex ← The file for the method of use FlashWriterForSubG

Each method is explained below.

6.1. Use FlashWriterForSubG

1. Set the DIP-SW(SW5) of BP359C as follows and reset.



2. Start FlashWriterForSubG.

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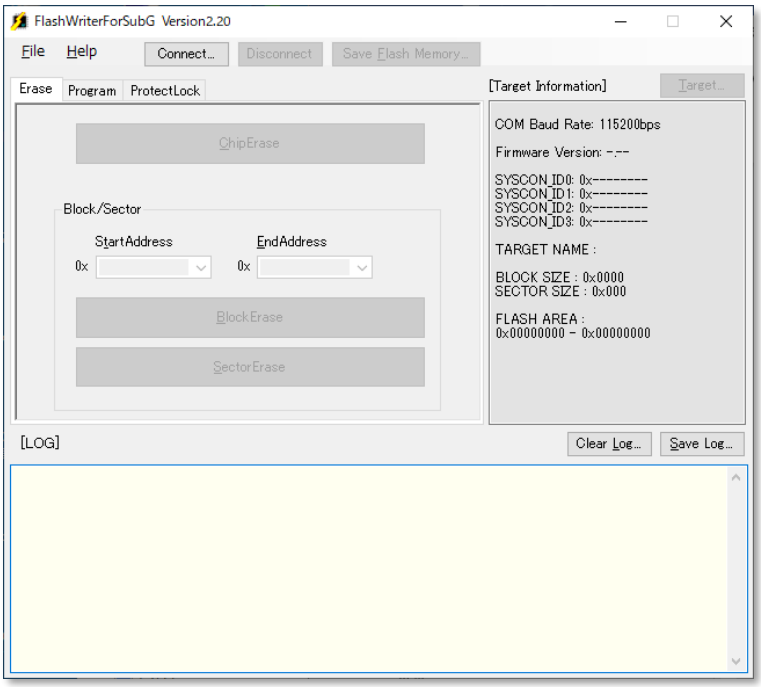

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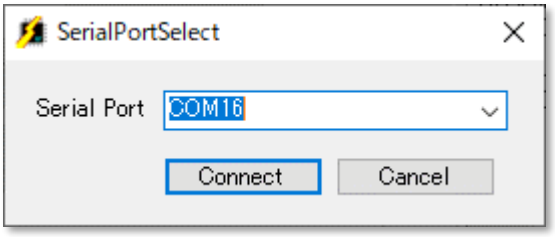
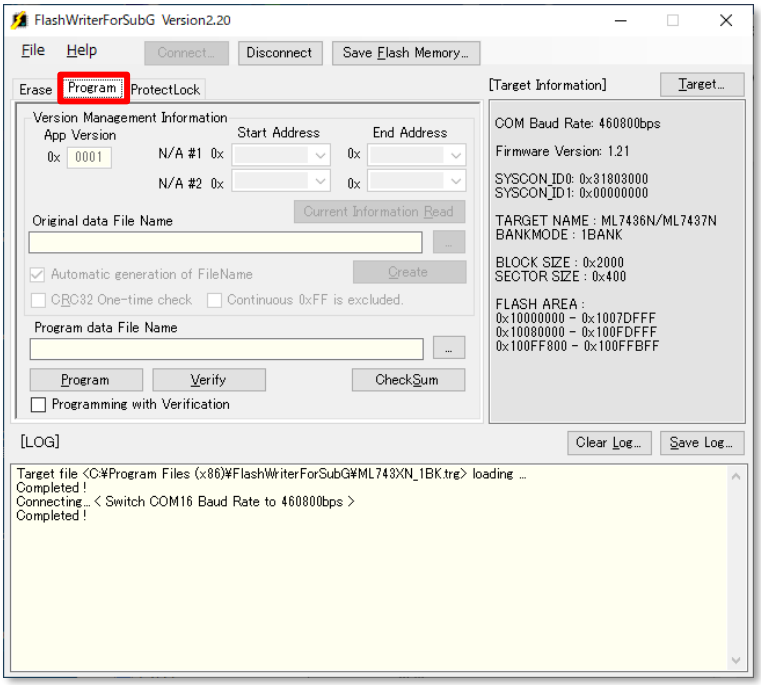
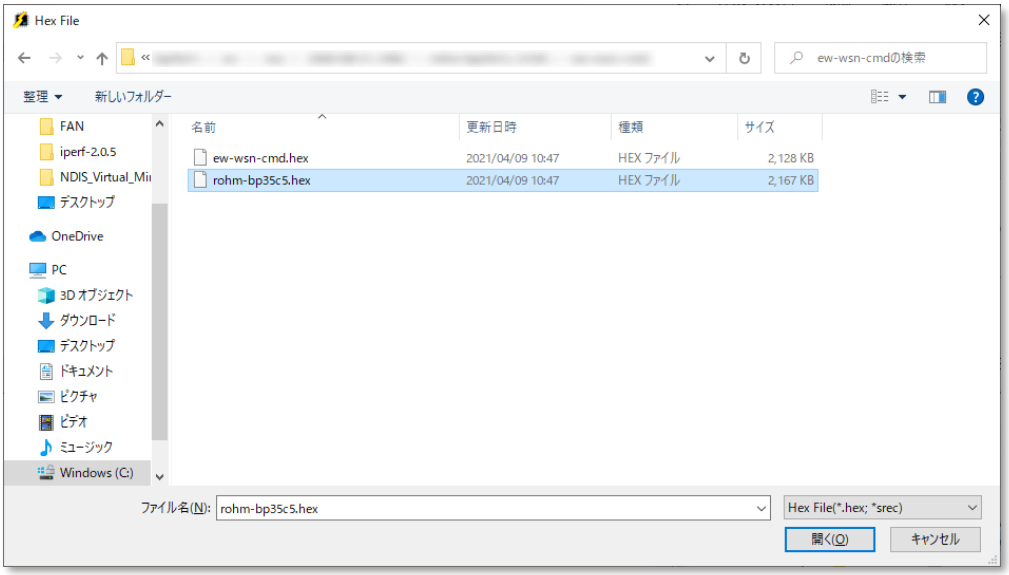
3. Select [File]-[Connect ...] from the menu, select the appropriate port, and press the [Connect] button.



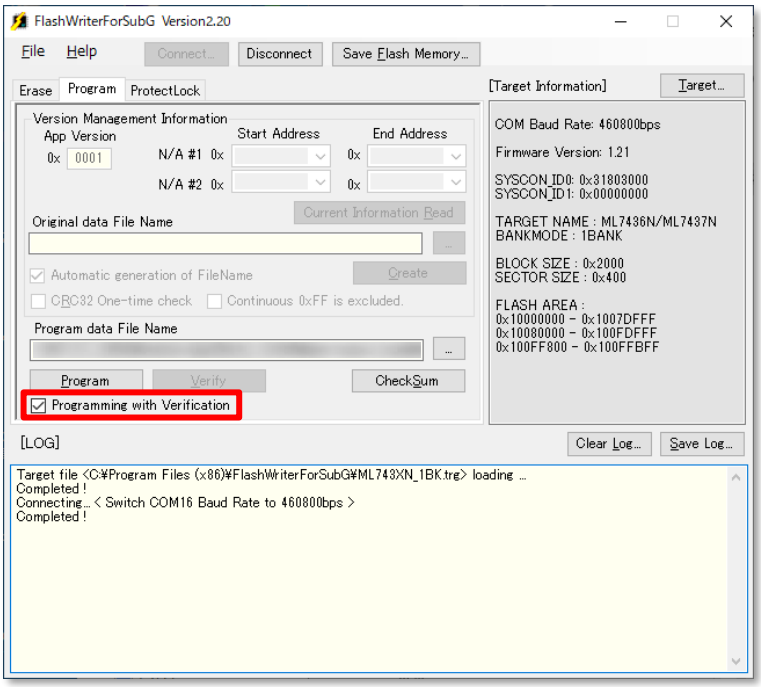
4. Select the Program tab.



5. Press the [...] button to the right of the "Program data File Name" to select the "rohm-bp35c5.hex" file and press the [Open] button.



6. Enable Programming with Verification.



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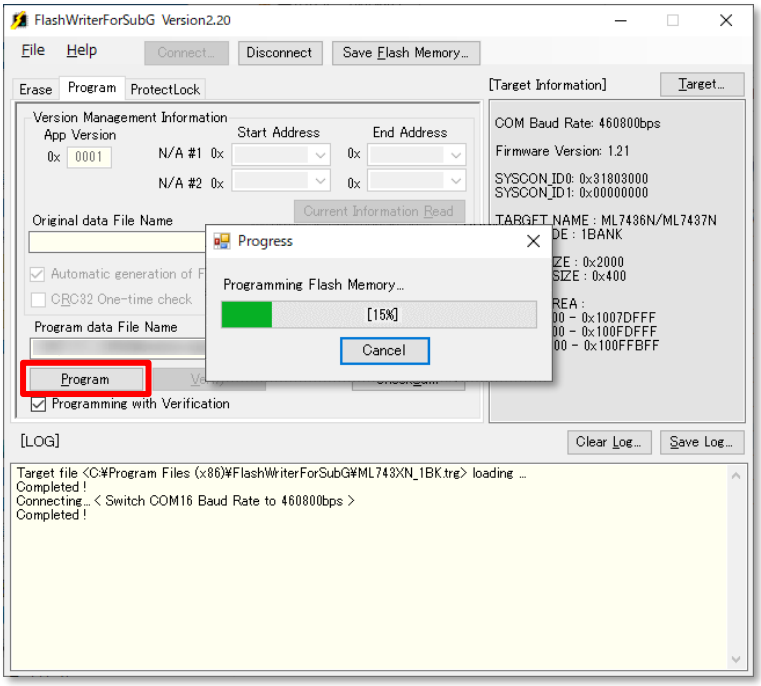
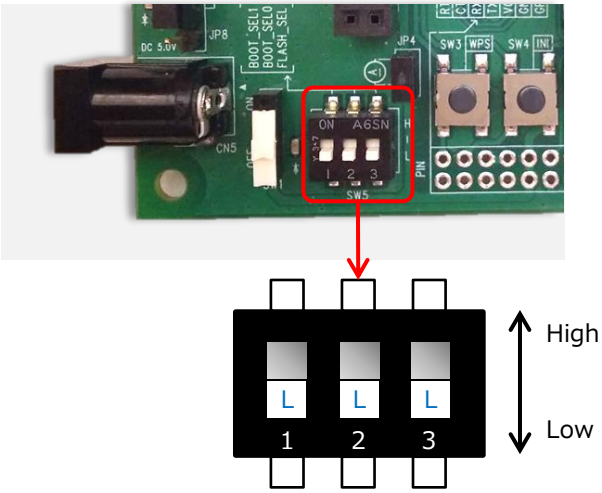
7. Press the [Program] button to erase, write and verify.



8. Select [File]-[Disconnect] from the menu to disconnect the port.

9. Set the DIP-SW(SW5) of BP359C as follows and reset.



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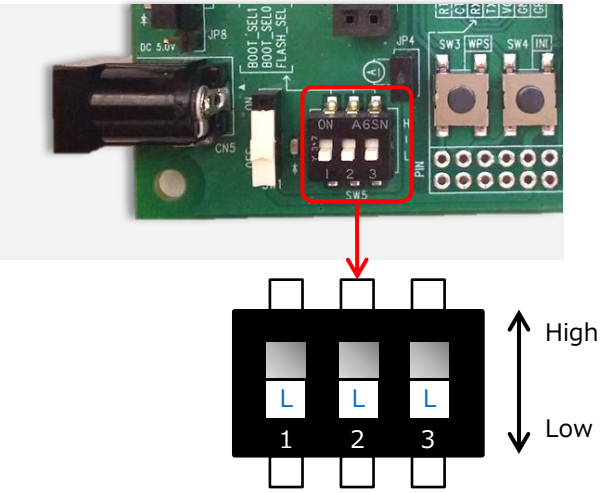
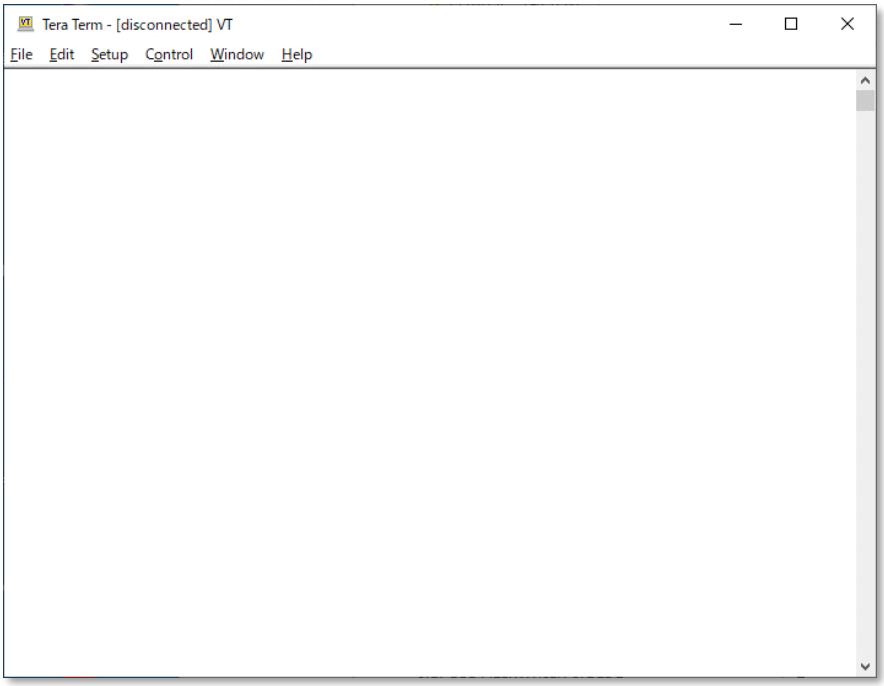
6.2. Use Tera Term

Use the macros of Tera Term to update the firmware.

1. Set the DIP-SW(SW5) of BP359C as follows and reset.



2. Start the Tera Term.



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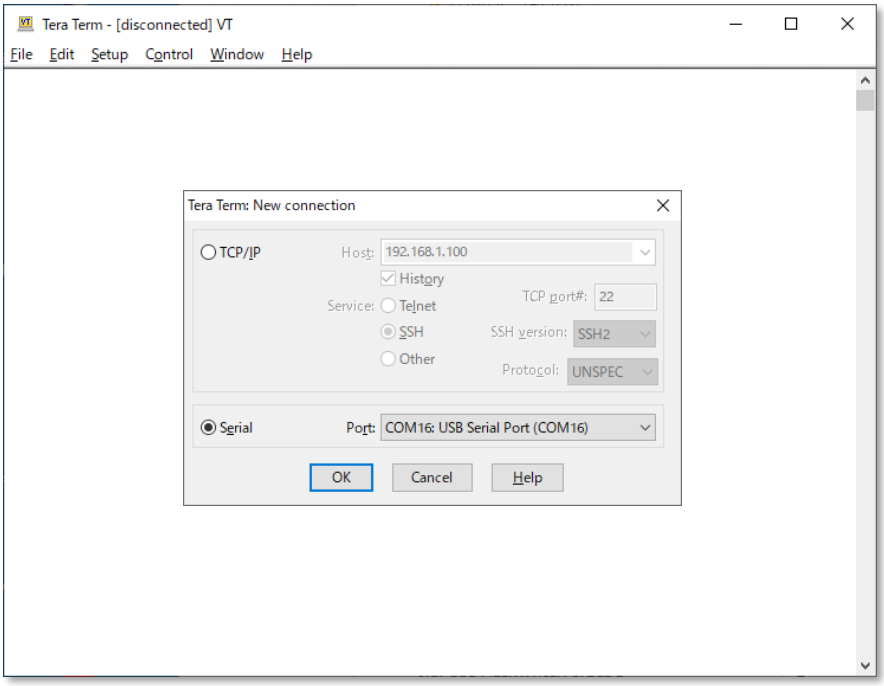
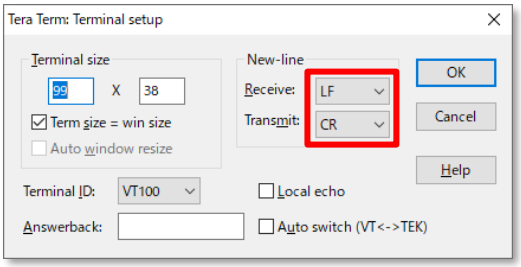
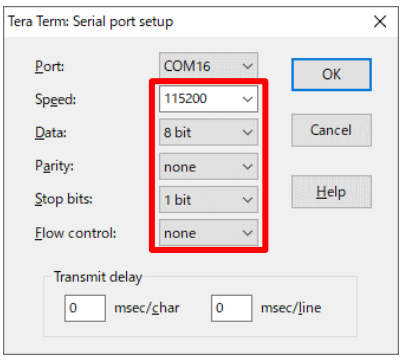
3. Select [File]-[New connection...] to connect to the BP35C5.



4. Select [Setup]-[Terminal...] and set as below.



5. Select [Setup]-[Serial port...] and set as below.



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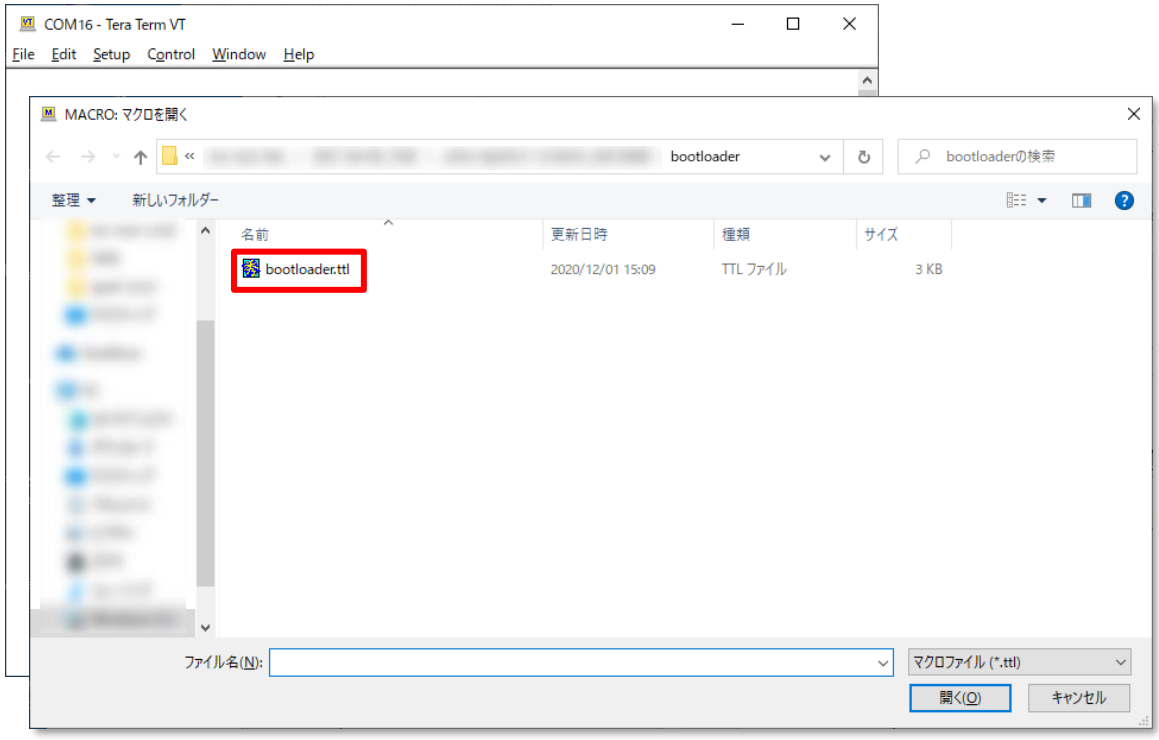
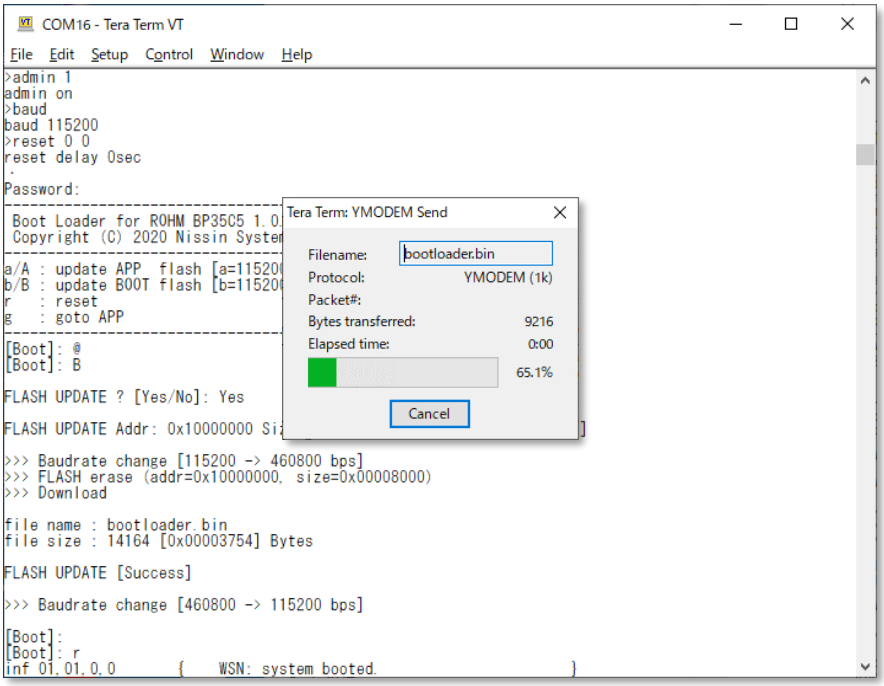
6. To update the boot loader, select [Control]-[Macro] and select file "bootloader\bootloader.ttl".



7. The boot loader will be updated.



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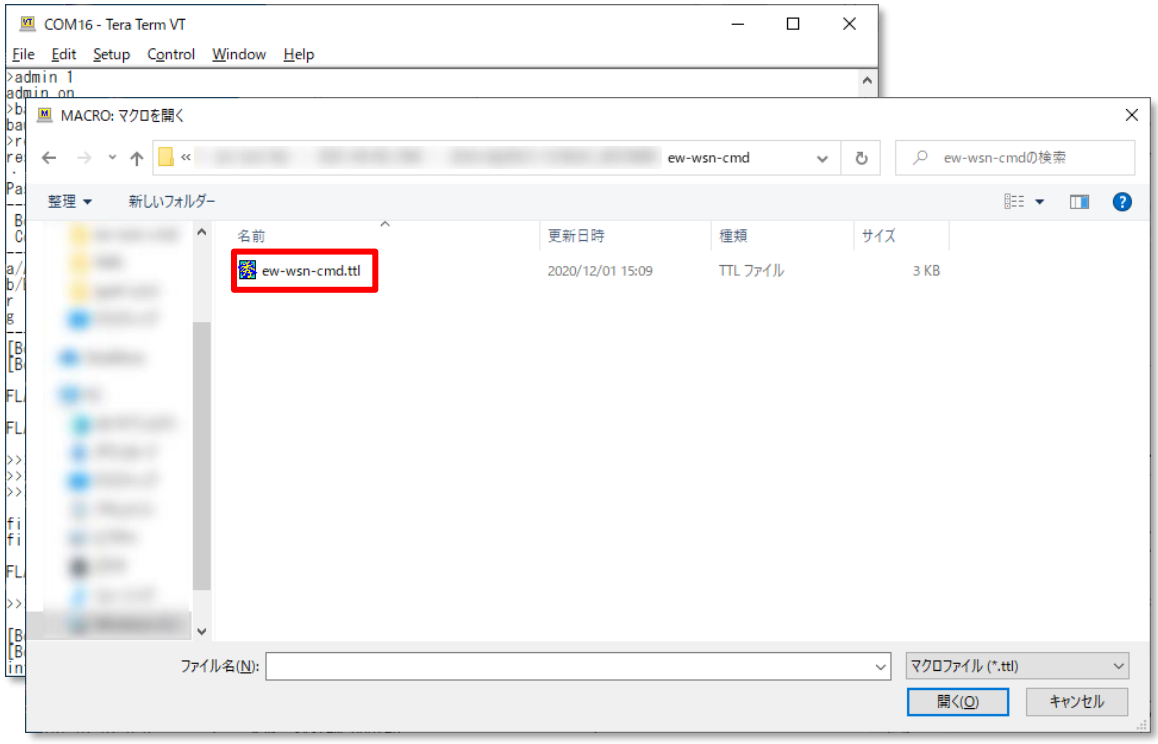
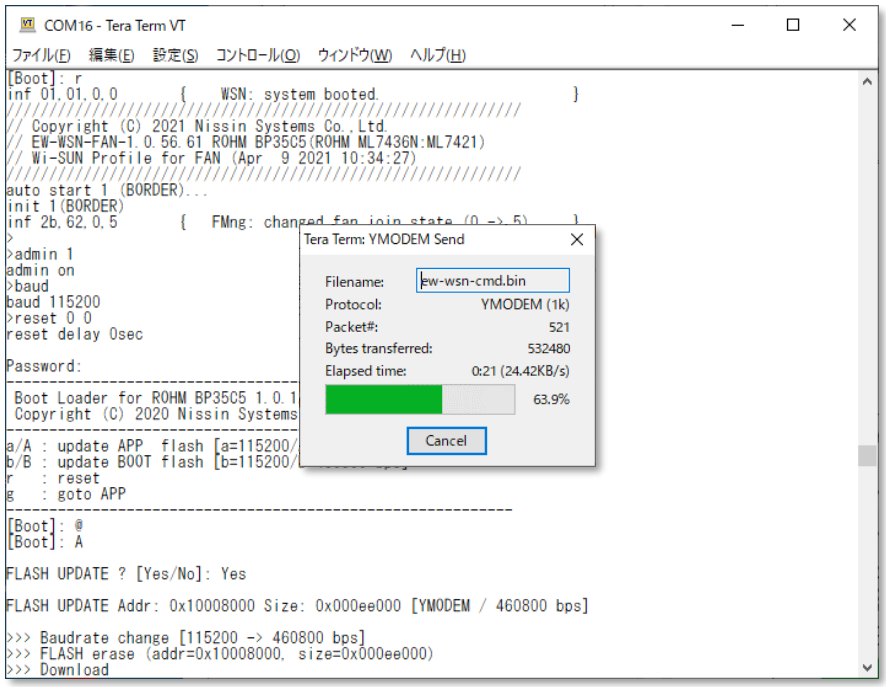
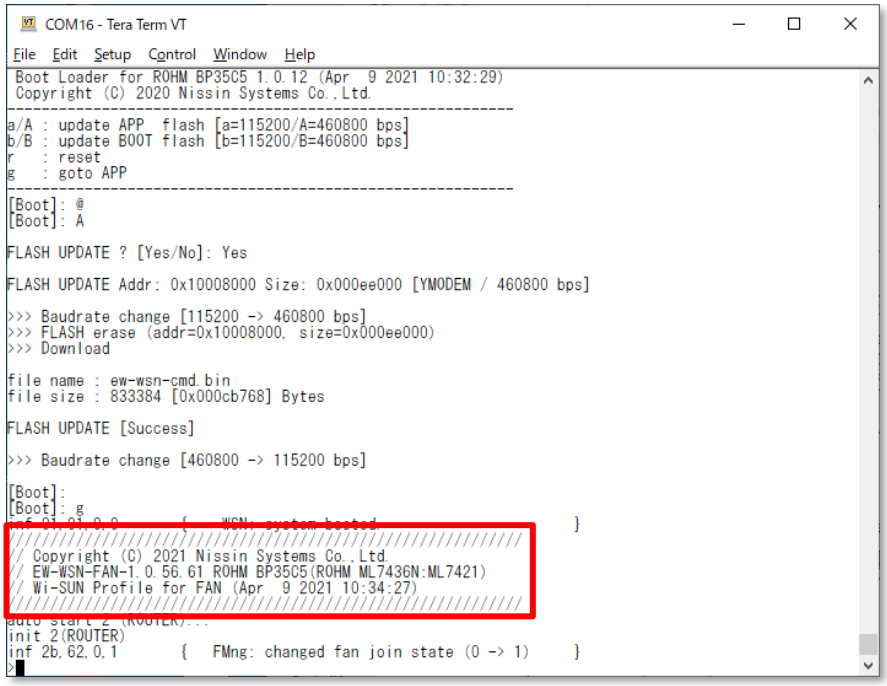
8. To update the firmware, select [Control]-[Macro] and select file "ew-wsn-cmd\ew-wsn-cmd.ttl".



9. The firmware will be updated.



10. Finally, check for updated version.



Note:

When updating the firmware, all the parameters set and saved will be disabled. Therefore, set and save the parameters again after updating. If there are concerns or trouble with the settings when they're disabled, make sure to record all settings before updating.

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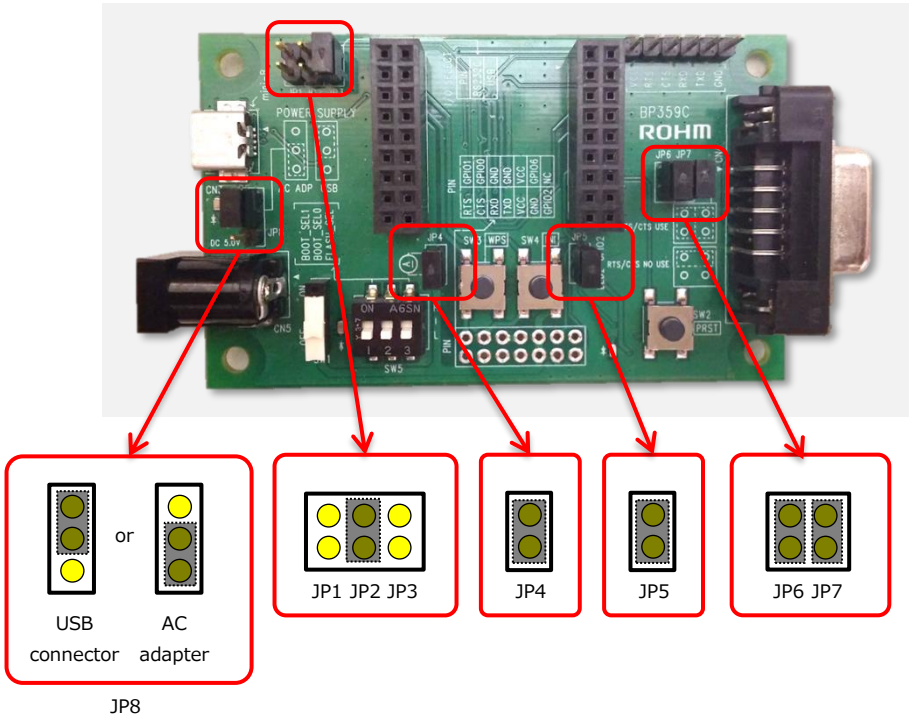
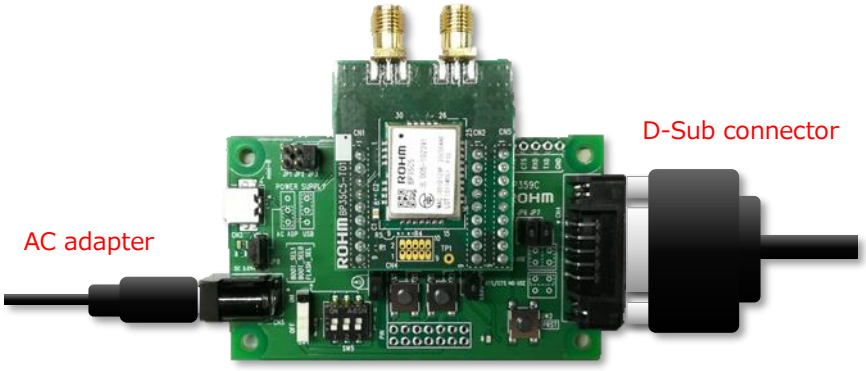
7. Appendix

7.1. Connecting via D-Sub connector

When connecting BP359C to PC via D-Sub connector, set the jumper pin as follows.

Switch JP8 depending on the power supply method (via USB connector or AC adapter).





* For the AC adapter, use a plug with Φ5.5mm outer diameter, Φ2.1 mm inner diameter, and 9.5 mm or more length.
  Also, use a product with 5V output voltage.

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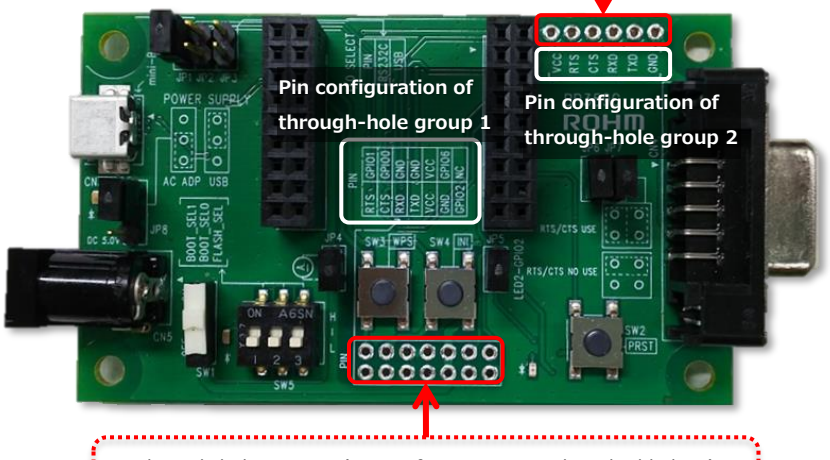
7.2. Connecting UART directly from through-hole

In BP359C, through-holes are prepared as follows.

PIN	LP18	LP14	LP15	LP16	LP17	LP19
Pin Name	VCC	RTS	CTS	RXD	TXD	GND

Through-hole group 2 (Pin configuration is as described above.)



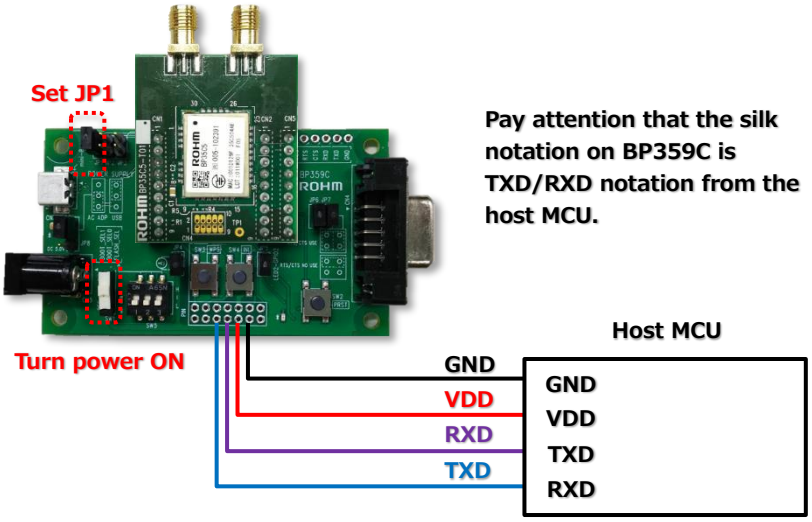
Through-hole group 1 (Pin configuration is as described below.)

PIN	LP2	LP1	LP6	LP7	LP5	LP4	LP20
Pin Name	ADC1	ADC0	GND	GND	VCC	NC	NC
PIN	LP9	LP11	LP10	LP8	LP12	LP13	LP3
Pin Name	RTS	CTS	RXD	TXD	VCC	GND	SDA

As described in silk on BP359C board, it is possible to take out the necessary pins (TXD, RXD, etc.) in UART of BP35C5 from Through-hole group 1 and Through-hole group 2.

Take note that when using the UART pin of Through-hole group 1, it is necessary to connect JP1 to enable the pin. Regarding Through-hole 2, it is possible to take out the UART pin from BP35C5 without switching JP1.

BP35C5 can be connected by wiring from the host MCU and through holes as shown below. Try this during evaluation using MCU without using Tera Term, etc.



*In the image above, it is assumed that the host MCU is powered by BP359C.

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8. Revision History

Ver.	Date	Author
1.0.0	2020/06/11	Initial version
1.0.1	2020/11/04	Updated the "Updating the firmware". (Added update method with FlashWriterForSubG) Updated the link to each home page.
1.0.2	2021/04/26	Updated the "Updating the firmware".

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