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**RN4677 PICtail™/PICtail Plus Board
User's Guide**

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Object of Declaration: RN4677 PICtail™/PICtail Plus Board

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

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The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA


Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:



RN4677 PICtail™/PICtail PLUS BOARD USER'S GUIDE

Table of Contents

Preface	7
Chapter 1. Overview	
1.1 Introduction	11
1.2 RN4677 PICtail™ Board Description	11
1.3 Board Features	12
1.4 Interface Description	13
1.5 USB-UART Serial Interface	14
1.6 PICtail Plus and PICtail Interface	15
Chapter 2. Getting Started	
2.1 Introduction	17
2.2 Hardware Requirements	17
2.3 Software Requirements	17
2.4 Using RN4677 PICtail™ Board in USB-UART Serial Interface Mode	18
2.5 Using RN4677 PICtail™ Board in PICtail Interface Mode	41
Appendix A. RN4677 Module PIN Assignment	
A.1 RN4677 Module PIN Assignment	43
Appendix B. Schematics	
B.1 RN4677 PICtail™/PICtail Plus Board Schematics	45
Appendix C. Questions and Answers	
C.1 Questions and Answers	47
Worldwide Sales and Service	48

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXXXXXA”, where “XXXXXXXX” is the document number and “A” is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the RN4677 PICtail™/PICtail Plus Board. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [Recommended Reading](#)
- [The Microchip Web Site](#)
- [Development Systems Customer Change Notification Service](#)
- [Customer Support](#)
- [Revision History](#)

DOCUMENT LAYOUT

This document describes how to use the RN4677 PICtail/PICtail Plus Board as a development tool to emulate and debug firmware on a target board. The document is organized as follows:

- **Chapter 1. “Overview”** – Describes the operating modes of the RN4677 PICtail/PICtail Plus Board and presents how to establish Bluetooth connection.
- **Chapter 2. “Getting Started”** – Describes how to establish Bluetooth serial data connections using the RN4677 PICtail Board over the USB-UART MCP2200 interface.
- **Appendix A. “RN4677 Module PIN Assignment”** - Shows the pinout for RN4677 and describes the module’s pins.
- **Appendix B. “Schematics”**- Shows the RN4677 PICtail/PICtail Plus Board schematics.
- **Appendix C. “Questions and Answers”**- Lists the most common questions and answers for using the RN4677 module.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Italic characters	Referenced books	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	<u><i>File</i></u> > <u><i>Save</i></u>
Bold characters	A dialog button	Click OK
	A tab	Click the Power tab
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Plain Courier New	Sample source code	#define START
	Filenames	autoexec.bat
	File paths	c:\mcc18\h
	Keywords	_asm, _endasm, static
	Command-line options	-Opa+, -Opa-
	Bit values	0, 1
	Constants	0xFF, 'A'
<i>Italic Courier New</i>	A variable argument	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }
Notes	A Note presents information that we want to re-emphasize, either to help you avoid a common pitfall or to make you aware of operating differences between some device family members. A Note can be in a box, or when used in a table or figure, it is located at the bottom of the table or figure.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p>Note: This is a standard note box.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">CAUTION</p> <p>This is a caution note.</p> </div> <p>Note 1: This is a note used in a table.</p>

RECOMMENDED READING

This user's guide describes how to use RN4677 PICtail/PICtail Plus Board. Other useful documents are listed below. The following Microchip document(s) are recommended as supplemental reference resources:

RN4677 Bluetooth® 4.0 Dual Mode Module Data Sheet (DS50002370A)

This document provides the technical specifications for the RN4677 module and is available for download from the Microchip website (www.microchip.com)

RN4677 Bluetooth® 4.0 Dual Mode Module User's Guide (DS50002377A)

This command reference user's guide describes how to configure the RN4677 Bluetooth Dual Mode module.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

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To register, access the Microchip web site at www.microchip.com, click on Customer The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools
- **Emulators** – The latest information on the Microchip MPLAB® REAL ICE™ in-circuit emulator
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 3
- **MPLAB X IDE** – The latest information on Microchip MPLAB X IDE, the Windows® Integrated Development Environment for development systems tools
- **Programmers** – The latest information on Microchip programmers including the PICkit™ 3 development programmer

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:

<http://www.microchip.com/support>.

REVISION HISTORY

Revision A (July 2015)

This is the initial release of this document.

Chapter 1. Overview

1.1 INTRODUCTION

This document describes the hardware and software for the RN4677 PICtail™/PICtail Plus Board.

The RN4677 PICtail/PICtail Plus Board enables the designer to evaluate and demonstrate the capabilities of the RN4677 Dual Mode Bluetooth® RF Module. The evaluation board includes an integrated configuration and programming interface for plug-and-play capability. It also includes on-board connection and data-status LEDs enabling rapid prototyping and fast time to market.

In addition to RN4677 PICtail/PICtail Plus Board hardware, several software applications are provided to demonstrate Bluetooth data connections to the on-board RN4677 module and optionally configure the RN4677 module.

The demonstration software application consists of:

- Android™ Chat Application using Serial Port Profile (SPP)
- iOS Bluetooth Terminal (BLETR)
- BT Chat Tool

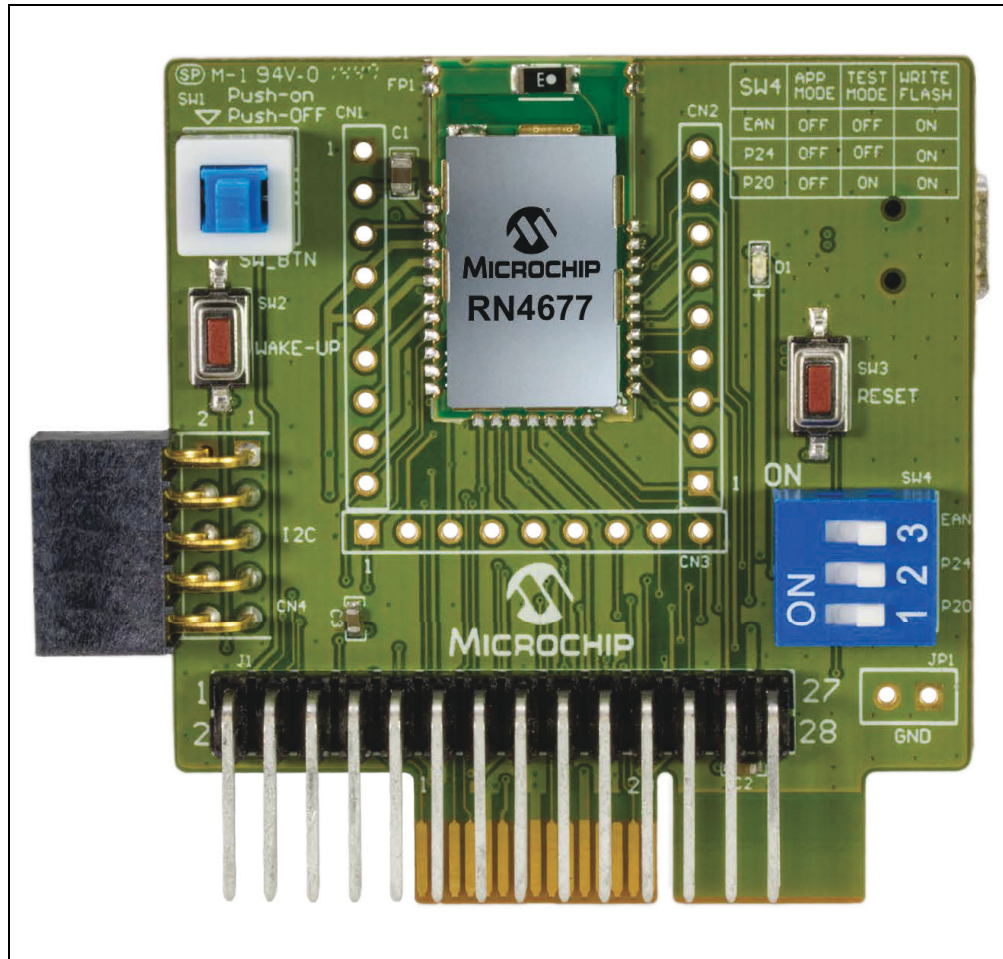
The configuration software consists of:

- IS1677 Configuration Library
- IS1677 Configuration User Interface (UI) Tool
- IS1677 EEPROM Table Utility

1.2 RN4677 PICtail™ BOARD DESCRIPTION

The RN4677 PICtail board provides rapid prototyping and developing for Bluetooth data applications for Classic SPP or Bluetooth Low Energy using the RN4677 module. It can be powered via USB host or through the Microchip PICtail Plus interface. The RN4677 PICtail board utilizes the RN4677 module, a fully certified Bluetooth 4.0 dual mode RF module supporting Bluetooth Classic SPP and Bluetooth Low Energy (BTLE), providing Bluetooth serial data connections. The RN4677 PICtail board provides a MCP2200 USB-UART converter for issuing ASCII commands to control or configure the RN4677 modules for any specific requirement based on the application. The USB-UART converter also provides the flexibility to interface to a host PC, a PC terminal utility to drive both classic SPP and BTLE data connections. The RN4677 PICtail board also provides Microchip PICtail Plus and PICtail interfaces to be able to interface with the Microchip PIC® microcontrollers (MCU) using standard Microchip development tools, see [Figure 1-1](#).

FIGURE 1-1: RN4677 PICtail™/PICtail PLUS BOARD



1.3 BOARD FEATURES

The RN4677 PICtail board has the following features:

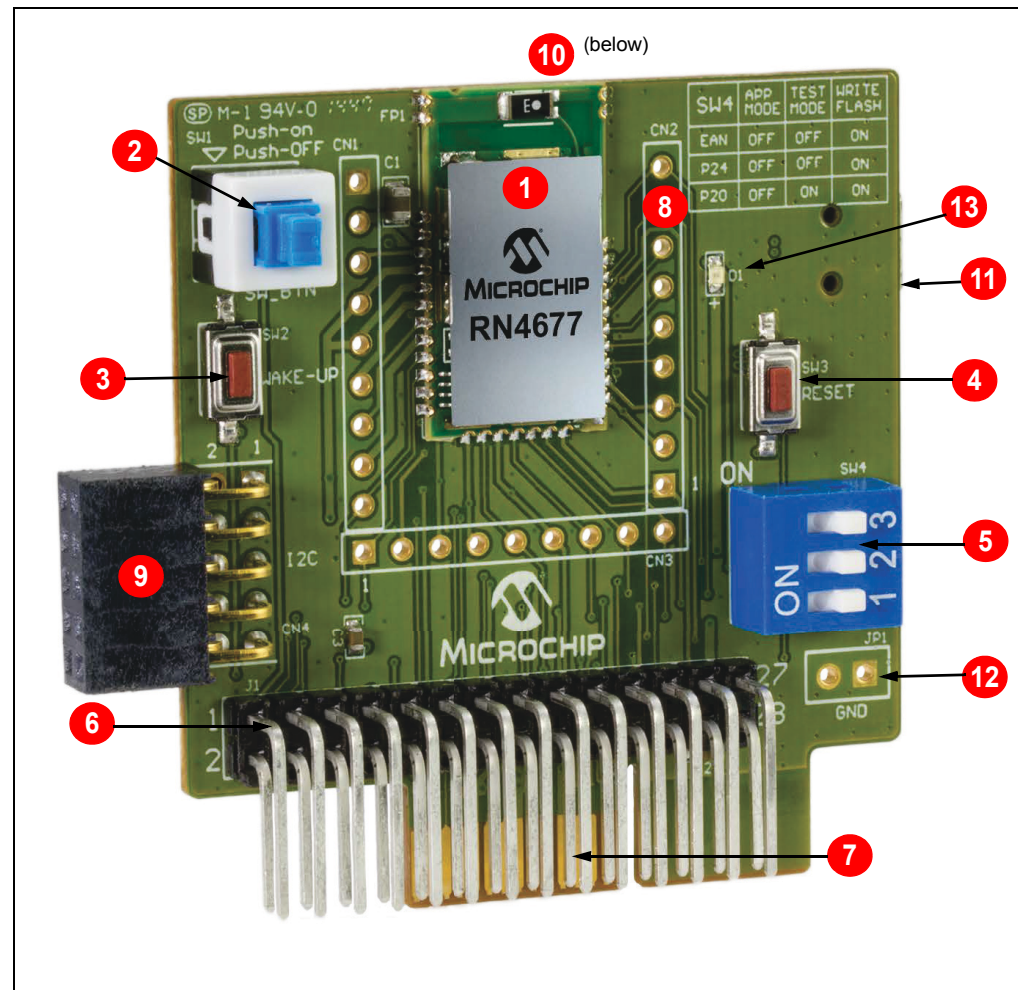
- Fully certified on-board Bluetooth 3.0 + EDR and Bluetooth 4.0 stack
- Class 2 transmitter, +2 dBm typical
- Transparent serial data connection over Bluetooth Classic SPP and Bluetooth Low Energy transparent serial data service
- Access to the ASCII command interface over UART available on the RN4677
- On-board Dual In-line Package (DIP) switch block to set operating modes
- PICtail Plus and PICtail interfaces to fully access RN4677 pins using PIC Explorer 8 and 16 development boards
- Embedded MCP2200 USB-UART converter to enable application mode and programming interface to update firmware and configuration settings

1.4 INTERFACE DESCRIPTION

The following are the description of the RN4677 PICtail board in its default configuration as represented in [Figure 1-2](#):

1. Bluetooth Module, RN4677 (FP1)
2. Button to SW_BTN pin (SW1); press the button down to turn ON RN4677
3. Wake up button to wake up the module from shutdown state (SW2)
4. Reset button for RN4677 Bluetooth module (SW3)
5. Mode Switch (SW4); see [Table 1-1](#), [Table 1-2](#)
6. PICtail interface (J1)
7. PICtail Plus interface (J2)
8. Header that brings out RN4677 pins (CN2)
9. I²C™ expansion port (CN4)
10. Microchip MCP2200 chip; USB/UART serial converter (U3)
11. Mini-B USB connector (P1)
12. Ground (GND) test points (JP1)
13. Status LED (D1)

FIGURE 1-2: RN4677 PICtail™ BOARD INTERFACES






1.4.1 Mode Definition

Table 1-1 and Table 1-2 show the mode definitions and the mode switch settings of the module.

TABLE 1-1: MODE DEFINITIONS

Mode	Switch Number	1	2	3
	Pin Name	P20	P24	EAN
	ON	Low	Low	High
	Function	EEPROM/Test mode High = Disable/Application Low = Enable/Test mode	Flash Write High = Disable Low = Enable	Boot to Flash or ROM Application High = ROM Low = Flash

TABLE 1-2: MODE SWITCH SETTINGS

Mode	Switch	PIN Definition
Write Flash		1 = P20: Low 2 = P24: Low 3 = EAN: High
EEPROM/Test		1 = P20: Low 2 = P24: High 3 = EAN: Low
Application (default)		1 = P20: High 2 = P24: High 3 = EAN: Low

1.5 USB-UART SERIAL INTERFACE

The RN4677 PICtail board consists of an USB-UART converter enabling flexible interface to the host PC, a PC terminal utility and SmartPhone APPs to drive both classic SPP and BTLE data connections. The UART port on the RN4677 is exposed through an MCP2200 USB-UART serial converter for interfacing easily with a host PC.

Connecting the mini-B USB receptacle (P1) on the RN4677 PICtail board to the USB port on a PC enumerates the RN4677 PICtail board as a Composite Device Class (CDC) USB device for serial communication. After the MCP2200 enumerates, a dedicated COM port is assigned on the host PC for serial communication with the RN4677 on the RN4677 PICtail board. A PC terminal utility or application opens then the assigned COM port and connects to the UART port on RN4677 for serial data transfer or to configure and control RN4677. If the MCP2200 does *not* enumerate, ensure that the MCP2200 drivers are downloaded and manually installed from www.microchip.com/MCP2200.

1.6 PICtail PLUS AND PICtail INTERFACE

The PICtail Plus and PICtail interface on the RN4677 PICtail board is used to configure and transfer data to the RN4677 module over the UART using an external PIC MCU and to send and receive raw data over UART. The PICtail interface can also be used to access the UART and the GPIOs on the RN4677 module.

[Section 2.5 “Using RN4677 PICtail™ Board in PICtail Interface Mode”](#) provides more information on the PICtail Plus and PICtail interfaces.

NOTES:

Chapter 2. Getting Started

2.1 INTRODUCTION

This chapter describes how to establish Bluetooth® serial data connections using the RN4677 PICtail Board over the USB-UART MCP2200 interface (P1). The purpose of the exercise is to demonstrate the basic data capabilities of the RN4677, and interoperability with other Bluetooth devices. Note that in all these demonstrations, the RN4677 is a Bluetooth slave waiting for a connection initiated by the Bluetooth master device.

This chapter discusses the following topics:

- [Hardware Requirements](#)
- [Software Requirements](#)
- [Using RN4677 PICtail™ Board in USB-UART Serial Interface Mode](#)
- [Using RN4677 PICtail™ Board in PICtail Interface Mode](#)

2.2 HARDWARE REQUIREMENTS

The following hardware applications are required to demonstrate the RN4677 PICtail:

- RN4677 PICtail Board, (Part# RN4677-PICTail), available for purchase on www.microchipdirect.com
- Bluetooth-enabled Smartphone or Tablet
 - Android™ device running Android 4.3 or later
 - iOS: iPhone® 4S or later, iPad®3 or later, must support Bluetooth Low Energy
- Windows® Host PC with USB port
- Bluetooth adapter supporting 2.0+EDR or later

2.3 SOFTWARE REQUIREMENTS

The following software applications are required to demonstrate the RN4677 PICtail:

- RN4677-PICTAIL webpage: www.microchip.com/rn-4677-pictail
- Bluetooth (BT) Chat Tool, BT Chat v004.exe available for download at www.microchip.com/rn-4677-pictail
- Android BtChat APP, BtChat_V1.0.3.apk available at www.microchip.com/rn-4677-pictail
- iOS Terminal "BLETR", available on Apple® AppStore (iOS)
- MCP2200 driver for Windows, available at www.microchip.com/MCP2200
- PC terminal emulator such TeraTerm or CoolTerm

2.4 USING RN4677 PICtail™ BOARD IN USB-UART SERIAL INTERFACE MODE

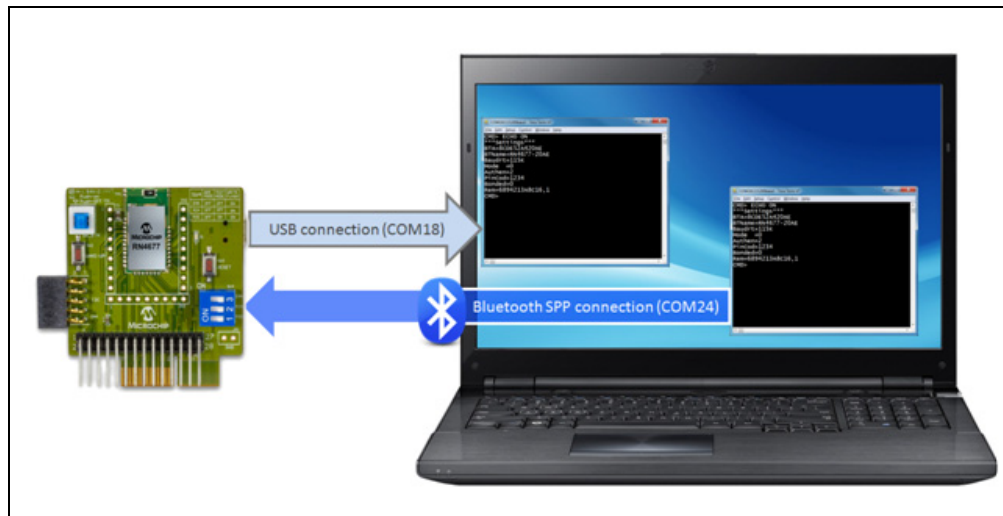
This section discusses the following topics:

- how to exercise the RN4677 module using the USB-UART serial interface on the RN4677 PICtail Board,
- scanning for the devices and connecting to the selected device with the ASCII command over the UART interface of the RN4677 using the USB-UART serial converter on the board,
- establishing the Bluetooth Classic and Bluetooth Low Energy data connections
- transferring data on the RN4677 module through the USB-UART serial interface, which is demonstrated via PC utility and Smartphone applications.

2.4.1 Bluetooth Classic® (SPP) Connection to Host PC

In this demonstration, a Bluetooth (SPP) data connection is established between the RN4677 PICtail Board connected to PC via USB and local Bluetooth HOST. A terminal emulator, such as TeraTerm, is used to communicate with the RN4677 PICtail, and on the Host PC Bluetooth adapter to initiate connection to RN4677 PICtail, as illustrated in [Figure 2-1](#).

FIGURE 2-1: COM PORT CONNECTIONS



Use the Host PC Bluetooth adapter to add the RN4677 PICtail device to its list of managed Bluetooth devices. In this demo, an SPP connection is made to RN4677 PICtail using the HOST PC's internal Bluetooth adapter.

To connect the RN4677 PICtail to Host PC and initiate communication with the RN4677 module, use the following steps :

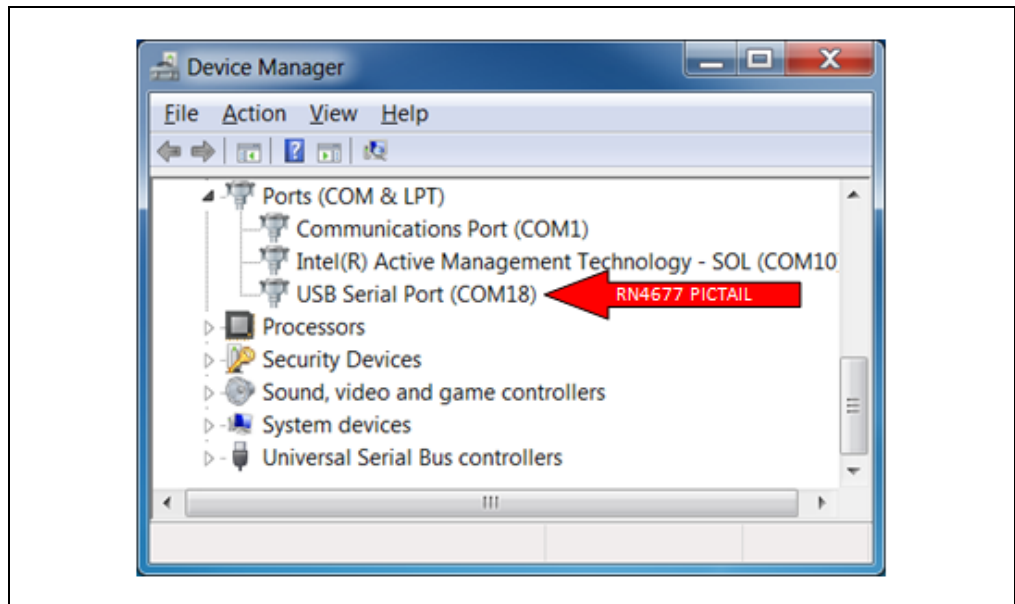
1. Ensure that the RN4677 PICtail Board is unplugged from the PICtail interface of a Microchip Explorer 16 development board.
2. Verify that SW4 switches are set to application mode (1: OFF, 2: OFF, 3: OFF).
3. Ensure that SW1 button is set in the ON position (pushed down).
4. Use a mini-B USB cable and connect the RN4677 PICtail Board mini-B USB receptacle (P1) to a host PC USB port to power up the RN4677 PICtail Board. See [Figure 2-2](#). The blue connection LED1 (D1) indicates the connection state as follows:
 - **Stand-by** State: the LED1 on RN4677 PICtail Board blinks once at a time.
 - **Pairing, Connected** State: the LED1 blinks twice at a time.

FIGURE 2-2: CONNECT THE RN4677 PICtail™ BOARD TO A HOST PC USB PORT



5. Ensure that the virtual COM port, COM18 in this example, is enumerated as shown in [Figure 2-3](#).

FIGURE 2-3: VIRTUAL COM PORT ENUMERATED



Note: A virtual COM port must be created when the RN4677 PICtail Board is connected to a PC. If a virtual COM port is undetected in the Device Manager port list, install the Microchip MCP2200 driver. (www.microchip.com/MCP2200)

6. Open the virtual COM port created in [Step 5](#), COM18 in this example, using a terminal emulator such as TeraTerm shown in [Figure 2-4](#), with the serial port settings illustrated in [Table 2-1](#).

FIGURE 2-4: TERMINAL EMULATOR - TERATERM

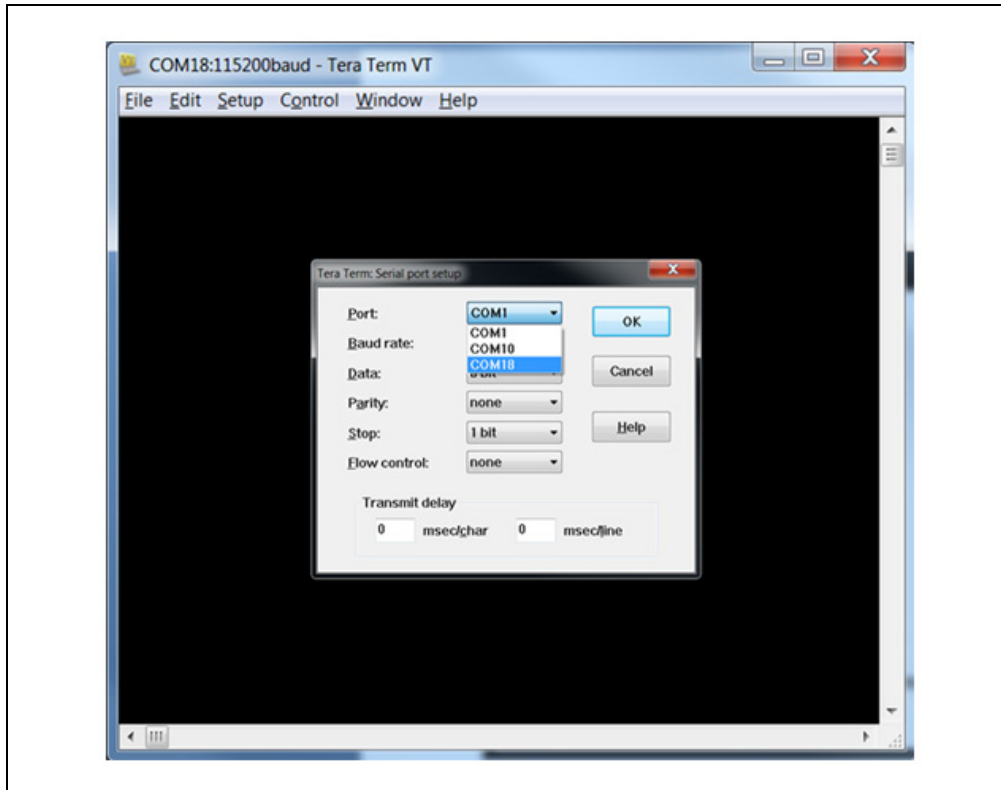
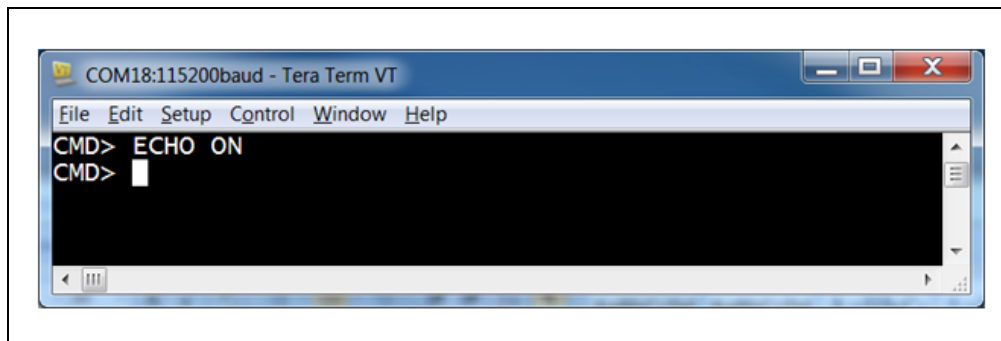


TABLE 2-1: SERIAL PORT SETTINGS FOR VIRTUAL COM PORT

Definition	Value
Port	Virtual COM Port
Baud Rate	115200
Data Bits	8 bits
Parity	None
Stop Bits	1
Flow Control	None

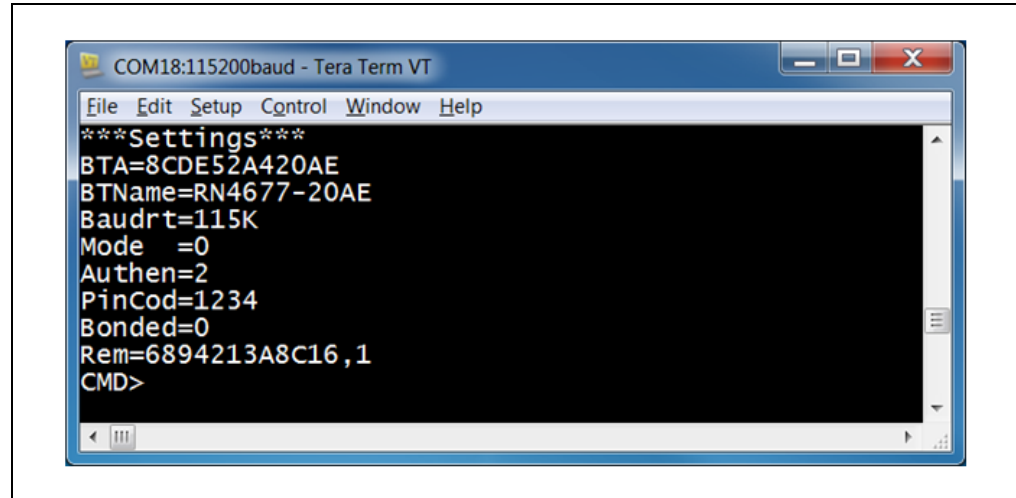
7. Type \$\$\$ in terminal emulator to enter command mode. As shown in [Figure 2-5](#), a CMD> prompt is returned when in command. In Command mode, any data received on the RN4677 UART is interpreted as a command to access features or functions of the module.

FIGURE 2-5: ENTER COMMAND MODE



- [Recommended] Enable local echo by pressing + followed by the <Enter> key when interacting with RN4677 Command mode using a terminal emulator. The ECHO ON status message displays and any commands sent to UART echoes back to sender.
- Type D and press <Enter>/Return key into the terminal emulator application window to get the summary of the current settings of the module as illustrated in Figure 2-6.

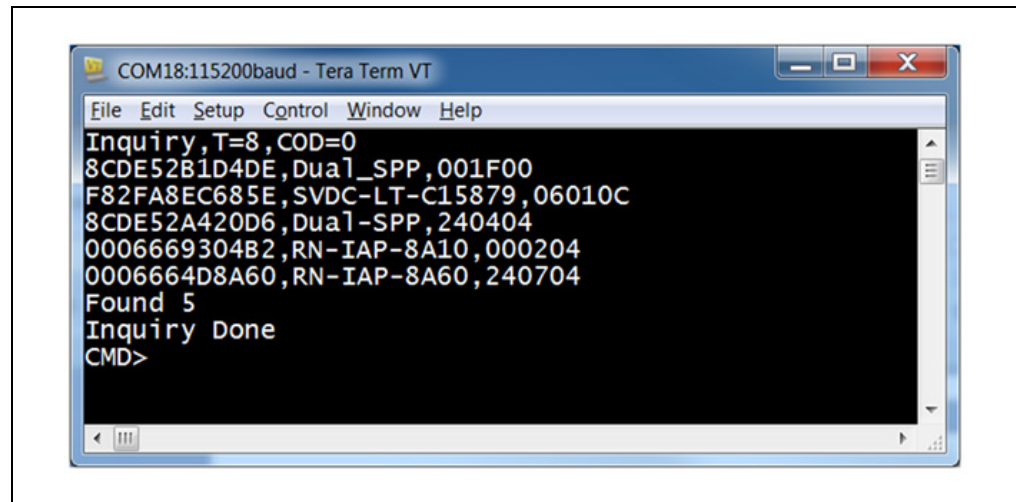
FIGURE 2-6: RN4677 CURRENT SETTINGS



```
COM18:115200baud - Tera Term VT
File Edit Setup Control Window Help
***Settings***
BTA=8CDE52A420AE
BTName=RN4677-20AE
Baudrt=115K
Mode =0
Authen=2
PinCod=1234
Bonded=0
Rem=6894213A8C16,1
CMD>
```

- Type I and press <Enter>/Return key into the terminal emulator application to initiate an active scan for all the Bluetooth Classic devices in Discovery mode nearby. Figure 2-7 displays the scan results.

FIGURE 2-7: SCAN FOR BLUETOOTH® CLASSIC DEVICES

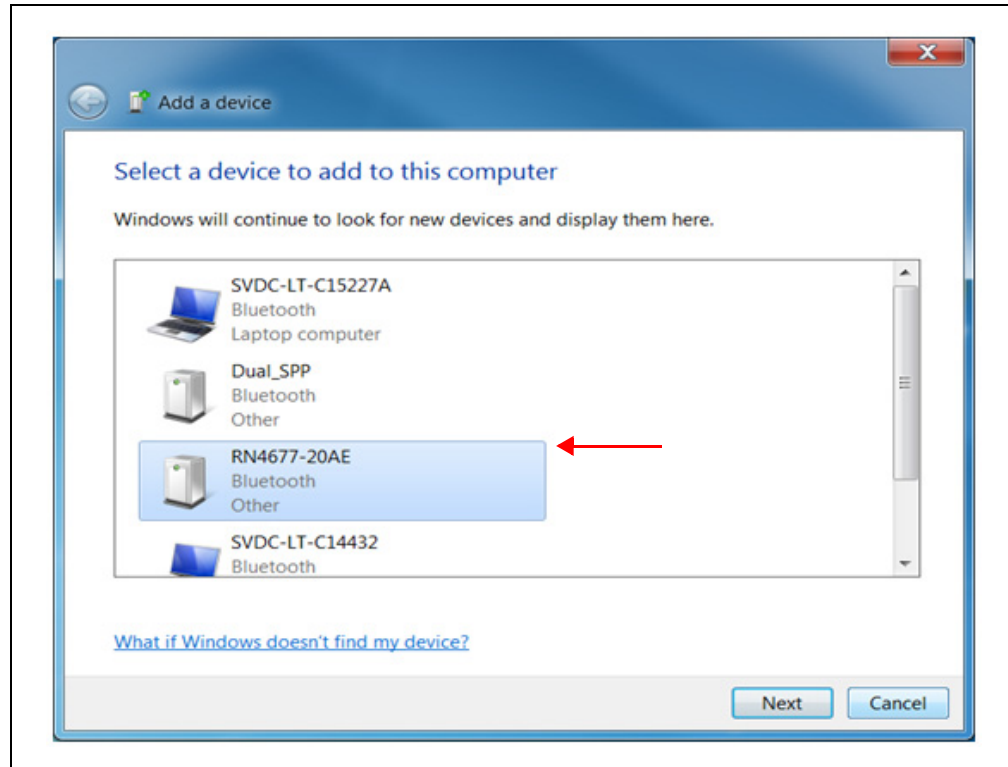


```
COM18:115200baud - Tera Term VT
File Edit Setup Control Window Help
Inquiry,T=8,COD=0
8CDE52B1D4DE,Dual_SPP,001F00
F82FA8EC685E,SVDC-LT-C15879,06010C
8CDE52A420D6,Dual-SPP,240404
0006669304B2,RN-IAP-8A10,000204
0006664D8A60,RN-IAP-8A60,240704
Found 5
Inquiry Done
CMD>
```

In the following steps the RN4677 PICtail device is added to the HOST PC's Bluetooth Device Manager. This step enables the HOST to initiate an SPP connection from HOST PC to RN4677 PICtail just by opening a virtual COM port using a terminal emulator. In this example, the PICtail name "RN4677-20AE" is used. The Bluetooth device name may be different for the provided RN4677 PICtail.

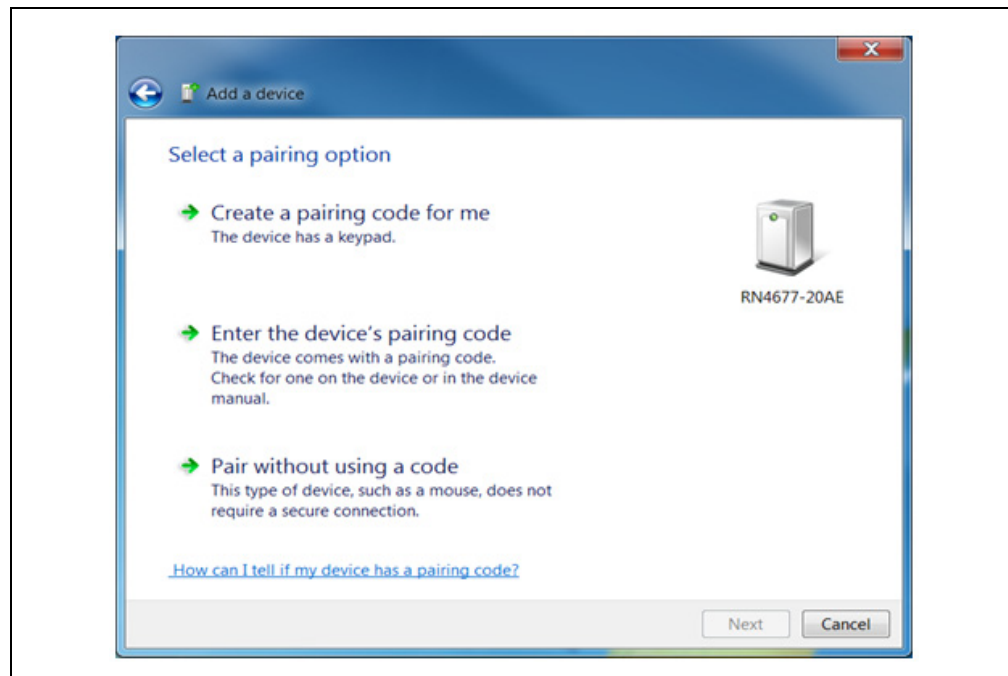
- In the Control Panel, click on <Add a device> from Hardware and Sound category. If the HOST PC has a working Bluetooth Adapter, a device scan is initiated. Figure 2-8 shows that the "RN4677-20AE" PICtail is discovered.

FIGURE 2-8: ADD A NEW DEVICE



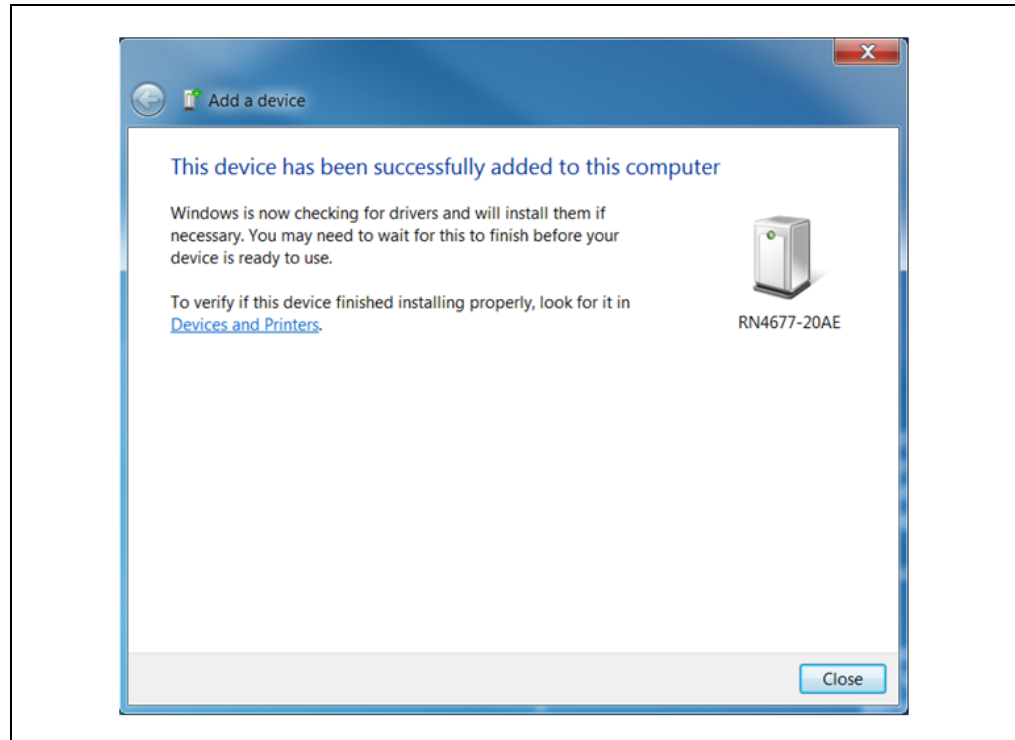
12. Select the "RN4677-20AE" device and click **Next** button.
13. The HOST PC's Bluetooth device manager attempts to pair with the PICtail Device "RN4677-20AE". [Figure 2-9](#) shows the list of pairing options. If the HOST PC supports Bluetooth 2.1+EDR or later, select "Pair without using a code". Otherwise, select "Enter the device's pairing code", and then enter "1234" when prompted for a code.

FIGURE 2-9: SELECT PAIRING METHOD



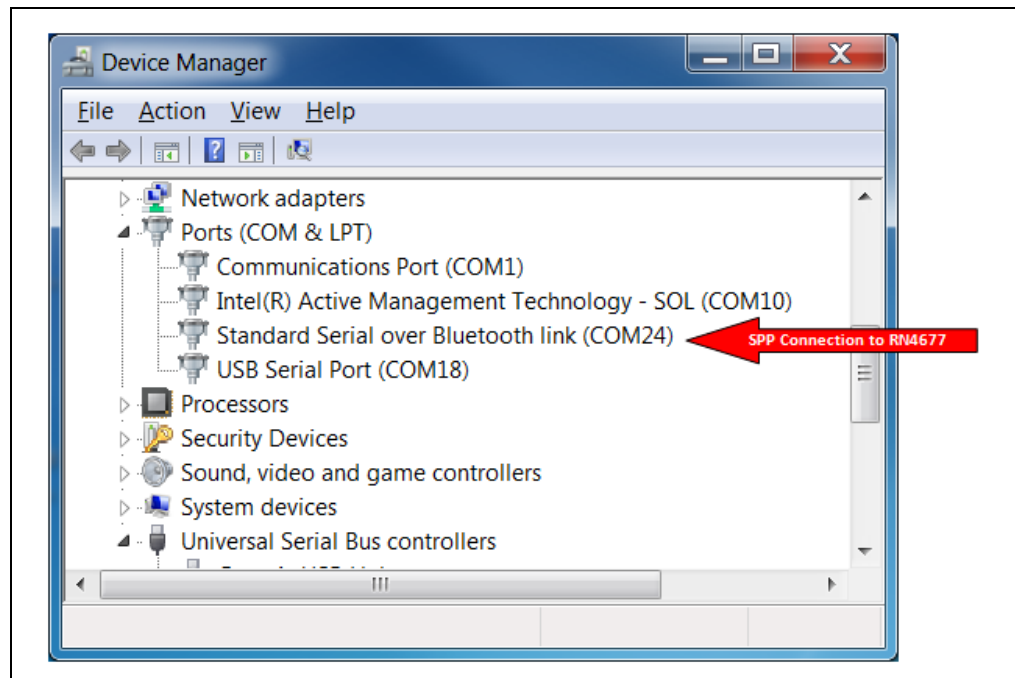
- When the "RN4677-20AE" device is successfully added to the Host's Bluetooth Device Manager, a confirmation message displays. See [Figure 2-10](#).

FIGURE 2-10: NEW DEVICE CONFIRMATION



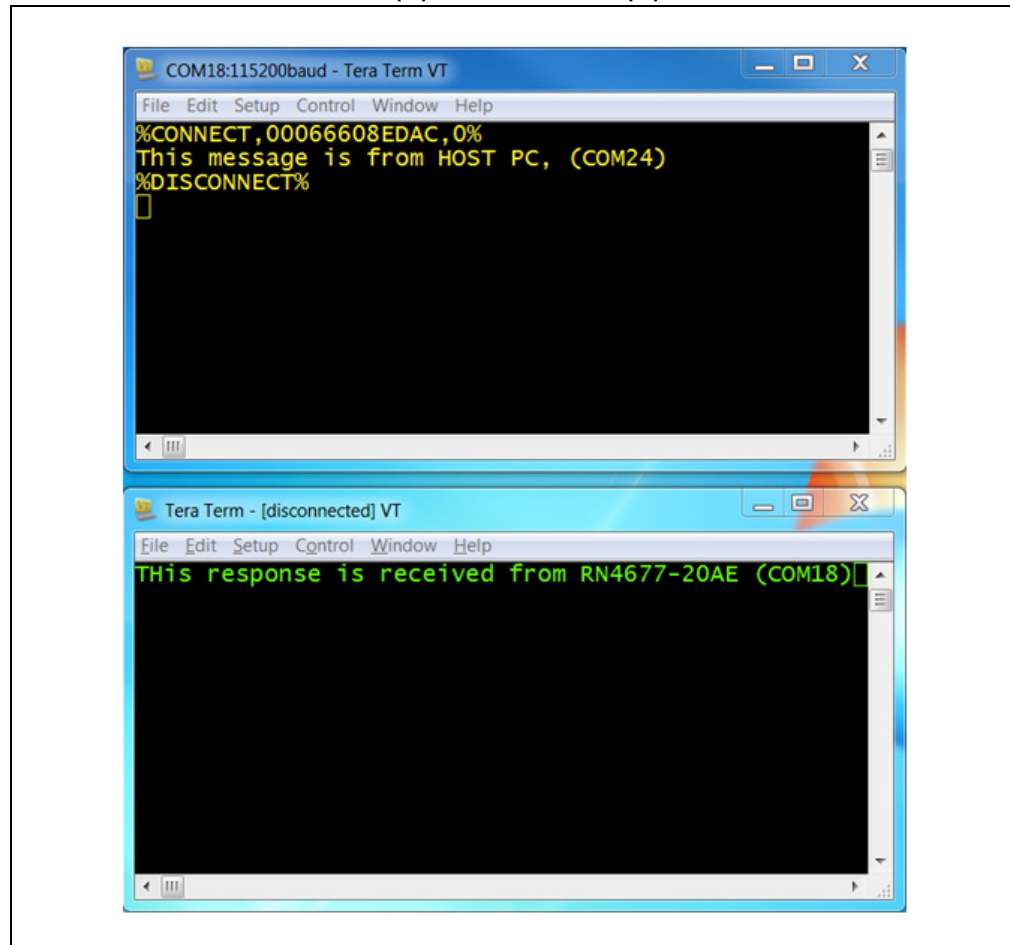
- Note that adding "RN4677-20AE" to the Host PC results in creating another virtual COM port, which is illustrated in the device manager as COM24, see [Figure 2-11](#). Any application, such as TeraTerm, that opens COM24 initiates a Bluetooth SPP connection from HOST PC to "RN4677-20AE" device.

FIGURE 2-11: OUTGOING PORT



16. Use TeraTerm to initiate a Bluetooth SPP data connection from host PC. See [Figure 2-1](#) for the illustration of test setup.
17. Open a TeraTerm connection as described in [Step 7](#).
18. From the File Menu, select *New Connection > Bluetooth COM port* (COM24 in this example). Click **OK** to start RN4677 connection.
19. Verify that `%CONNECT,xxxxxxxxxxxx,0%` are received on TeraTerm session connected to RN4677. The "xxxxxxxxxxxx" is the Media Access Control (MAC) address of the Bluetooth adapter on HOST PC.
20. Type any text characters in the terminal session connected to RN4677 PICtail (COM18). The characters are sent to the RN4677 on COM18, and then over Bluetooth SPP connection to the Bluetooth adapter in the HOST PC. [Figure 2-1](#) shows the data path.
21. Verify that the text characters entered into the RN4677 (COM18) display in the other TeraTerm session connected to Bluetooth COM port (COM24 in this example).
22. From the TeraTerm session connected to the Bluetooth COM port (COM24 in this example), enter any text. Verify that the text is received in other TeraTerm session (COM18 in this example).
23. Use `<ALT-I>` key sequence to close COM port.
24. Wait until `%DISCONNECT%` message is received from the remote TeraTerm session to indicate that the Bluetooth SPP data connection is terminated. See [Figure 2-12](#).

FIGURE 2-12: TERMINAL (A) TO TERMINAL (B) OVER BT SPP



2.4.2 Bluetooth® SPP Connection to Android Smartphone/Tablet

In this demonstration, a Bluetooth SPP data connection is established between the BT Chat Tool and the Smartphone application via RN4677 PICtail Board. For the SPP demonstration, an Android 4.3 or later Smartphone or tablet is required.

As illustrated in [Figure 2-13](#), the host PC runs a BT Chat Tool application, transferring serial data over a COM port (USB virtual COM port) to the RN4677 PICtail Board. The serial data is then transmitted over a Bluetooth connection to the remote Bluetooth device, which is the Android BtChat APP.

FIGURE 2-13: BLUETOOTH® SPP CONNECTION TO SMARTPHONE

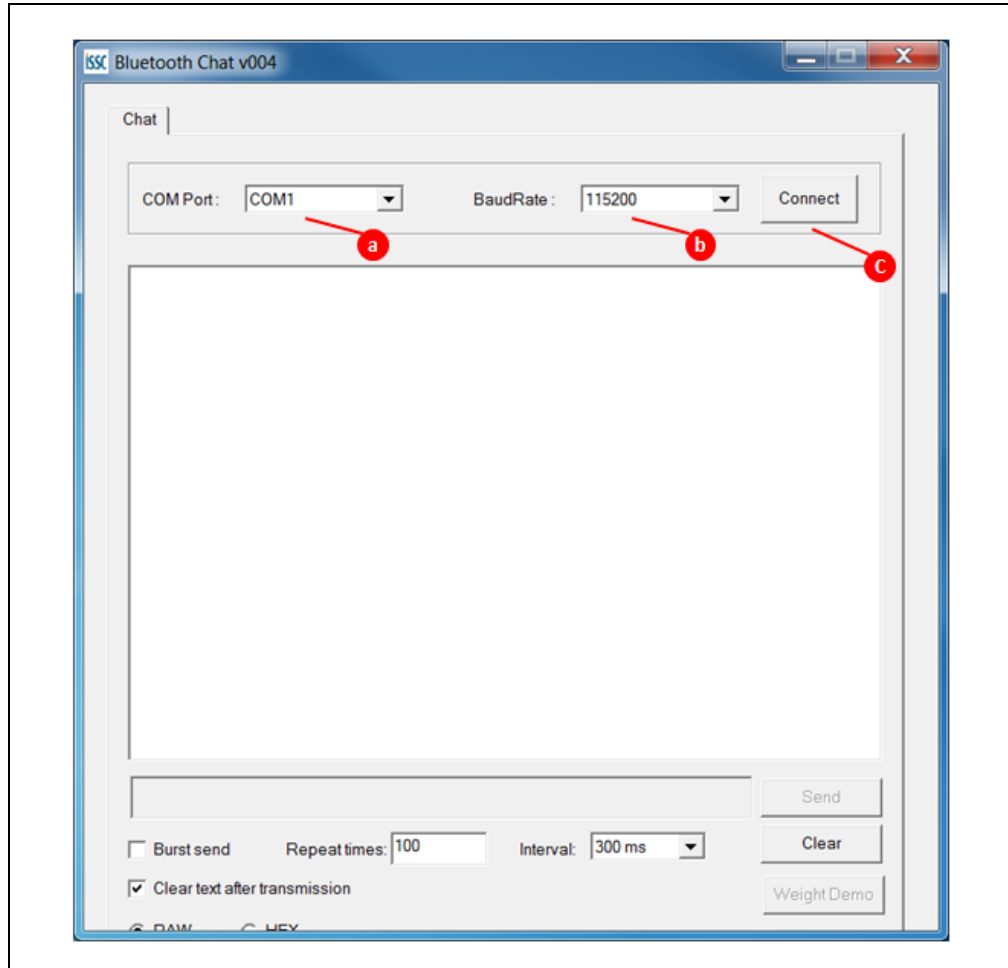


To establish a connection, perform the following steps:

1. Ensure that the RN4677 PICtail Board is unplugged from the PICtail interface of a Microchip Explorer 16 development board.
2. Verify that SW4 switches are set to application mode (1: OFF, 2: OFF, 3: OFF).
3. Ensure that SW1 button is set in the ON position (pushed down).
4. Use a mini-B USB cable and connect the RN4677 PICtail Board mini-B USB receptacle (P1) to a host PC USB port to power up the RN4677 PICtail Board. See [Figure 2-2](#). The blue connection LED1 (D1) indicates the connection state as follows:
 - **Stand-by State:** the LED1 on RN4677 PICtail Board blinks once at a time.
 - **Pairing, Connected State:** the LED1 blinks twice at a time.
5. Ensure that the virtual COM port (COM18 in this example) is enumerated as shown in [Figure 2-3](#).

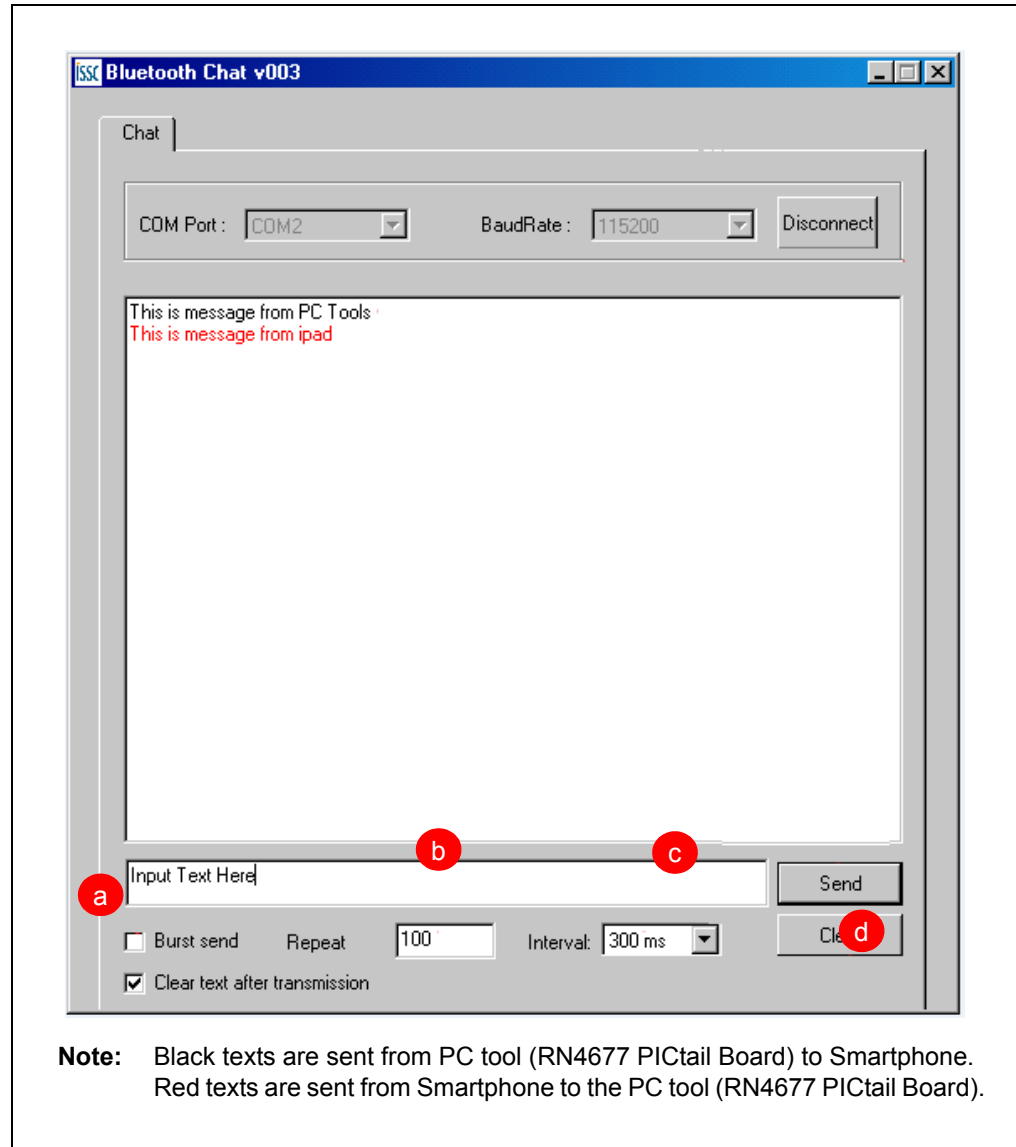
6. Run the `BT Chat v004.exe` file from your PC and ensure that the COM Port is connected. See [Figure 2-14](#).
 - a. Select the COM Port assigned to the RN4677 PICtail Board
 - b. Ensure that the default Baud Rate is 115200
 - c. Click **Connect** button.

FIGURE 2-14: CONNECT TO COM PORT



7. The **Connect** button changes into a **Disconnect** button once [Step 6](#) is completed. Use the "Input" field to enter characters to transmit. Click **Send** to transmit text to Smartphone over the RN4677 PICtail Board Bluetooth connection as shown in [Figure 2-15](#).
 - a. Check the Burst send box to enable sending the text repeatedly from this tool.
 - b. Input a value into the "Repeat" field to set the number of times of resending the text.
 - c. Select the desired value from the Interval drop-down list to set the time interval between two successive sent attempts.
 - d. Press the **Clear** button to delete the text on the screen, if required.

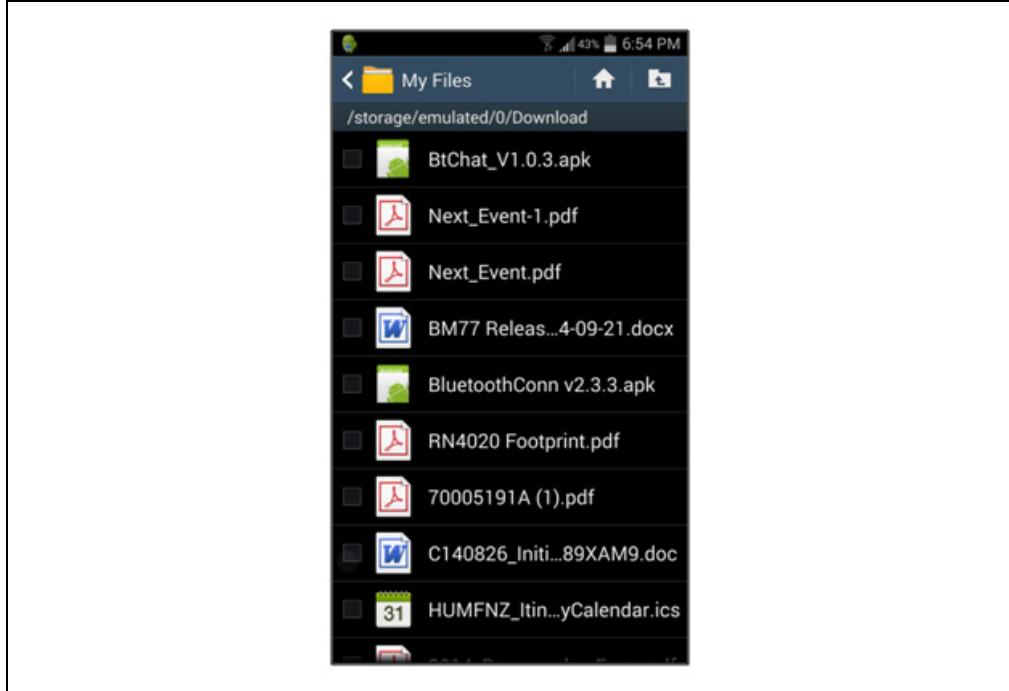
FIGURE 2-15: BT CHAT TOOL SETTING



Note: Black texts are sent from PC tool (RN4677 PICtail Board) to Smartphone.
Red texts are sent from Smartphone to the PC tool (RN4677 PICtail Board).

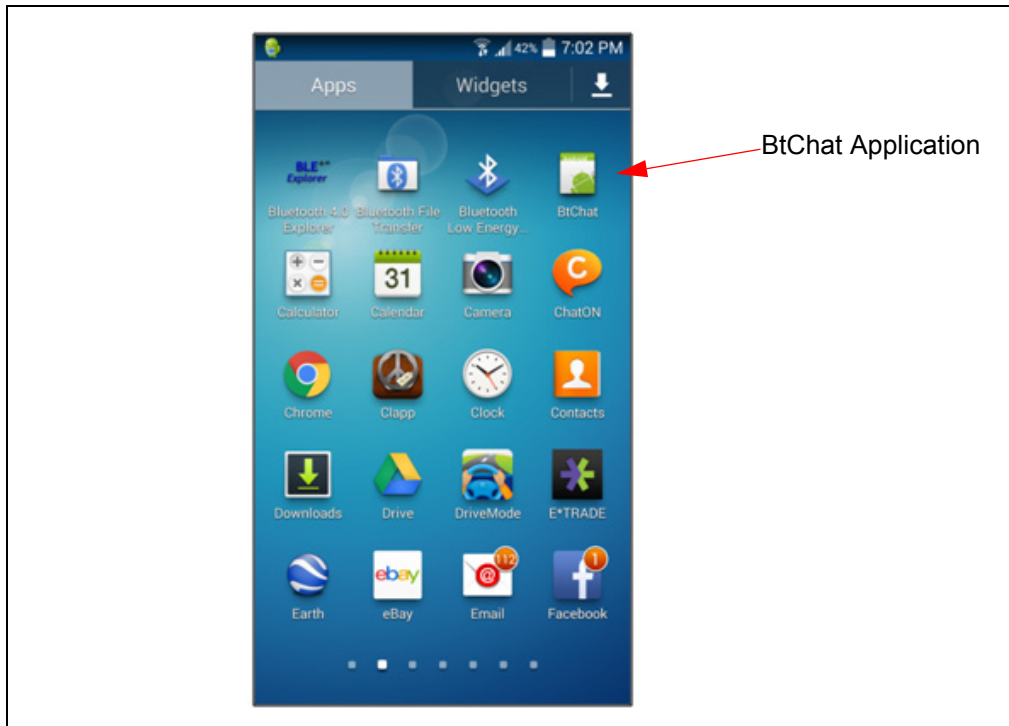
8. Install the Android Bluetooth Chat application into the Android device by copying or downloading the `BTChat_v1.0.3.apk` file. The `.apk` file can be copied into the Android device by using an SD Card to transfer the file, or by plugging Android device into the host PC, where the Android device mounts as an external USB drive. Note that Android Media Transfer Protocol (MTP) is required on host. Once the file is copied into the Android device, follow the instructions below:
 - a. Go to the downloaded file. Click the file to install from the Android File Manager "My Files" App. If necessary, enable the "Unknown Sources" from the Device Security settings of the phone to allow the installation. See [Figure 2-16](#).

FIGURE 2-16: INSTALL THE ANDROID BLUETOOTH® CHAT APPLICATION



- b. The BtChat APP displays in the Application view after successful installation, see [Figure 2-17](#).

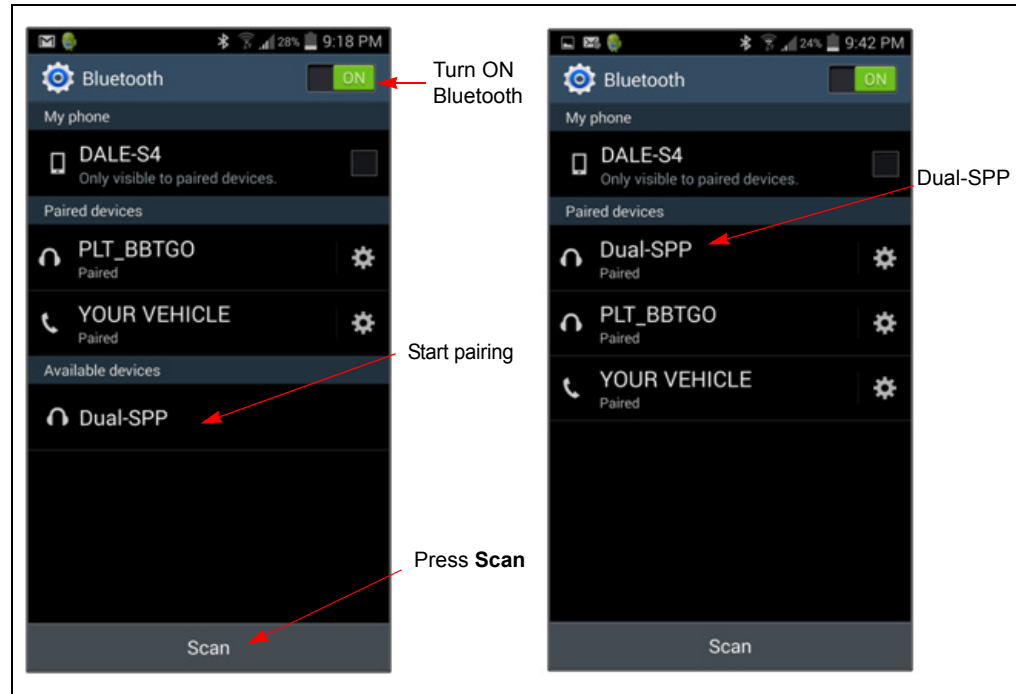
FIGURE 2-17: BTCHAT APP ON ANDROID



- 9. To pair the RN4677 PICtail Board with the Android Device, open *Settings > Bluetooth* page on the Android device and then set to **ON** to turn ON Bluetooth, see left image in [Figure 2-18](#). Press **Scan** to initiate the Bluetooth Device scan, find the RN4677 PICtail Board device named Dual-SPP, and then select to start the pairing process.

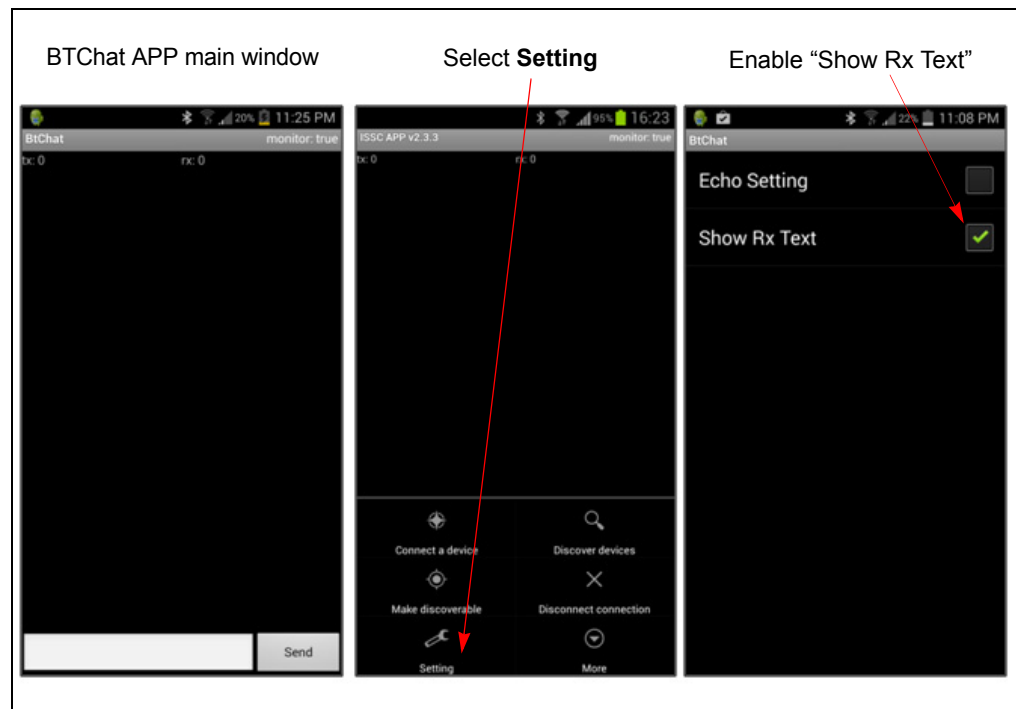
Once paired, the Dual-SPP (RN4677 PICtail Board) device is listed in the paired device list, see right image of [Figure 2-18](#).

FIGURE 2-18: PAIR RN4677 PICtail™ BOARD WITH THE ANDROID DEVICE



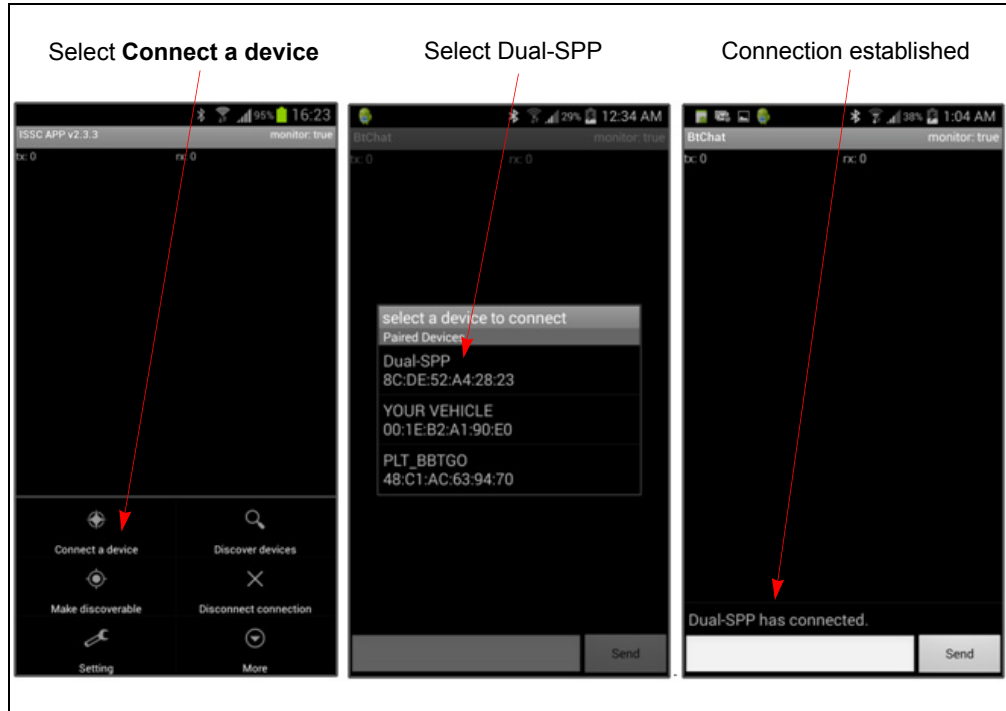
10. Launch the BtChat APP on the Android Device to display the BTChat APP main window. See [Figure 2-19](#). To open BtChat menu options, use the menu button of the phone. Select the **Setting** button to open the APP setting view. To show the received text in the APP, select the Show Rx Text option. Press the **Back** button of the phone to return to the main window.

FIGURE 2-19: SET BTCHAT APP



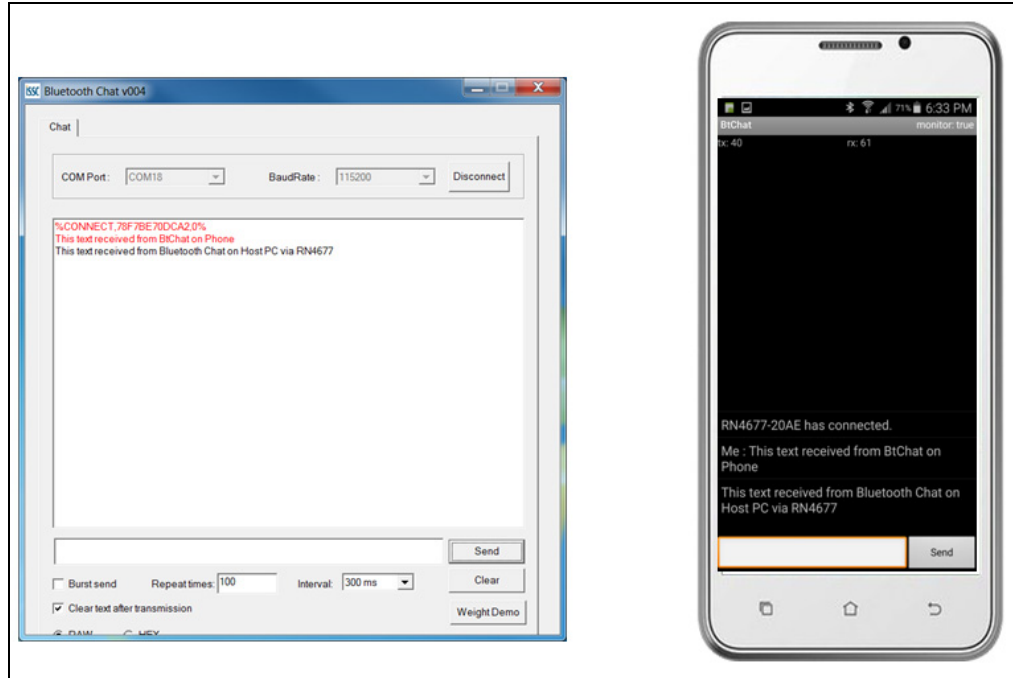
11. To set up a Bluetooth SPP connection to the RN4677 PICtail device, go to the BtChat APP main window. See [Figure 2-20](#). Press the menu button of the phone to open the BtChat menu options and then select the **Connect a device** button to open the paired device list. Select the Dual-SPP device to open an SPP connection to the RN4677 PICtail Board. A status message displays in the main window when a connection is established.

FIGURE 2-20: SET UP THE BLUETOOTH® SPP CONNECTION



12. To transfer data from the RN4677 to the Android Device via Bluetooth SPP connection, launch the BT Chat Tool on the host PC and set the correct COM port corresponding to the RN4677 PICtail Board as described in [Figure 2-14](#).
 - a. Enter text into the Android BtChat APP to send it to the BT Chat Tool on the PC. Click **Send** to transmit the text entered to RN4677 that is connected to the BT Chat Tool. Text received on the BT Chat Tool window displays in red.
 - b. Enter text into the BT Chat Tool to send it to the RN4677 PICtail Board. Click **Send** to transmit text into the Android BtChat APP. Text is received in Android BtChat APP. See [Figure 2-21](#).

FIGURE 2-21: DATA TRANSFER FROM RN4677 TO ANDROID DEVICE

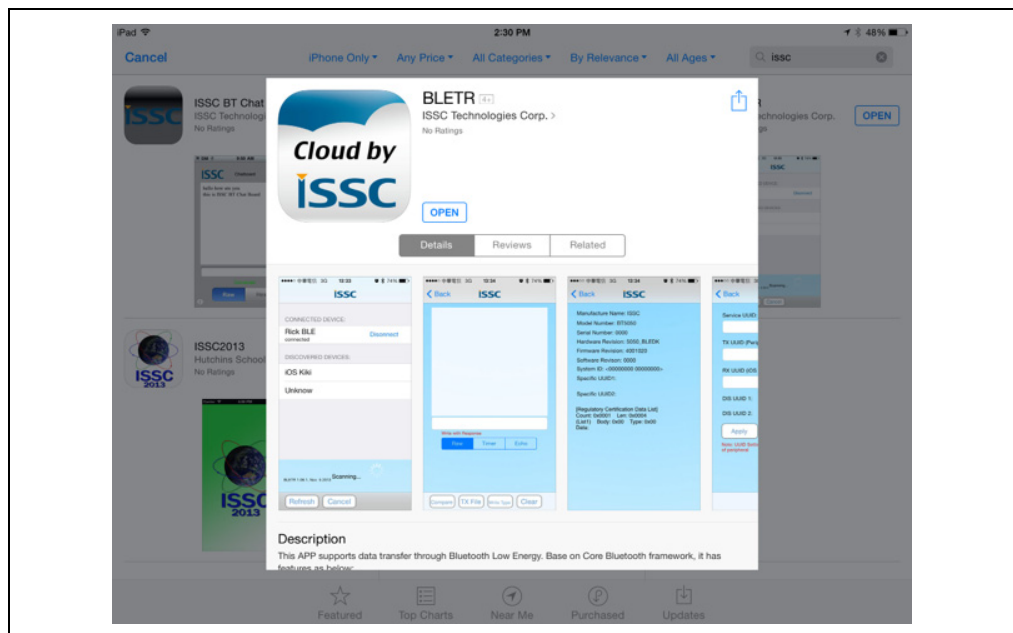


2.4.3 Bluetooth® Low Energy Data Connection to iOS Device

This demonstration shows how serial data is transmitted from RN4677 PICtail Board (via PC Chat) to an iOS device using Bluetooth Low Energy (BLE) connection. This demonstration uses the ISSC BLETR APP to establish connection with the RN4677 PICtail Board. BLETR can be downloaded from APP Store and ensure to disable the “iPad only” filter as this is an iPhone APP. A key feature of the RN4677 module is the transparent serial data connection from RN4677 UART to an iOS device over Bluetooth Low Energy connection.

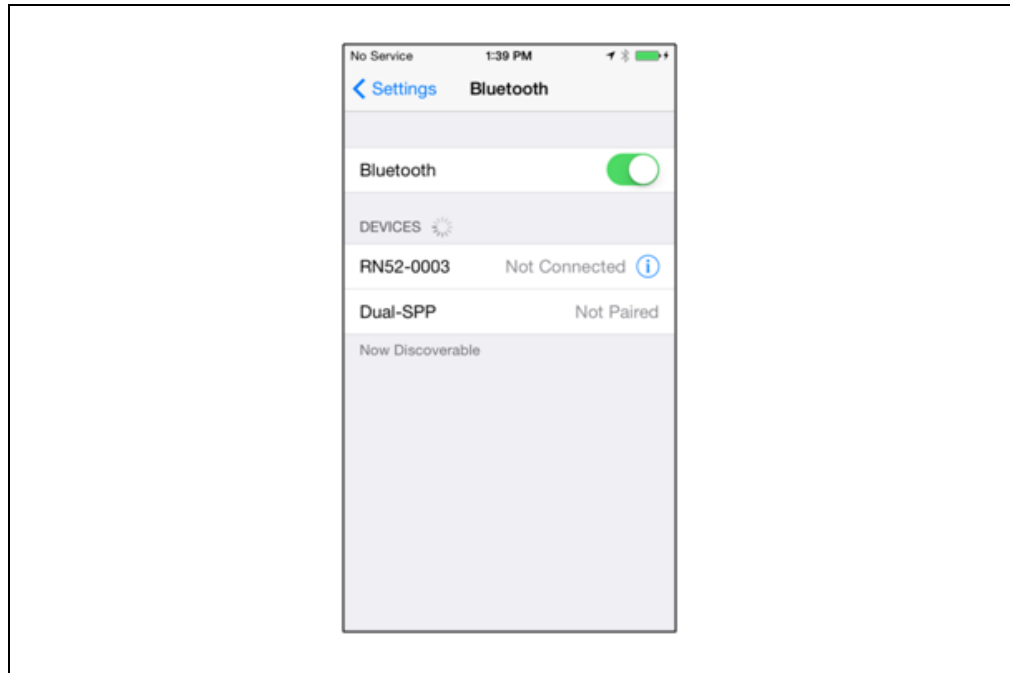
1. Download and install "ISSC BLETR" APP from Apple AppStore (iOS) using an iPhone 4S or later, iPad3 or later devices. See [Figure 2-22](#).

FIGURE 2-22: ISSC BLETR APP



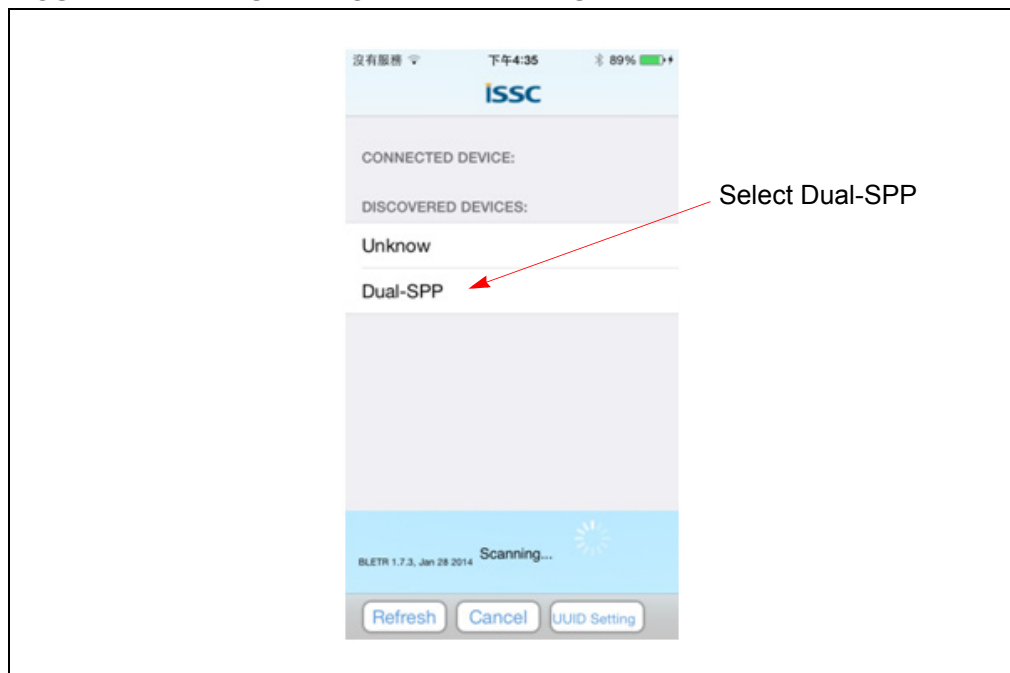
2. Go to *Settings > General > Bluetooth* Page. Turn ON the **Bluetooth**. See [Figure 2-23](#).

FIGURE 2-23: TURN ON BLUETOOTH



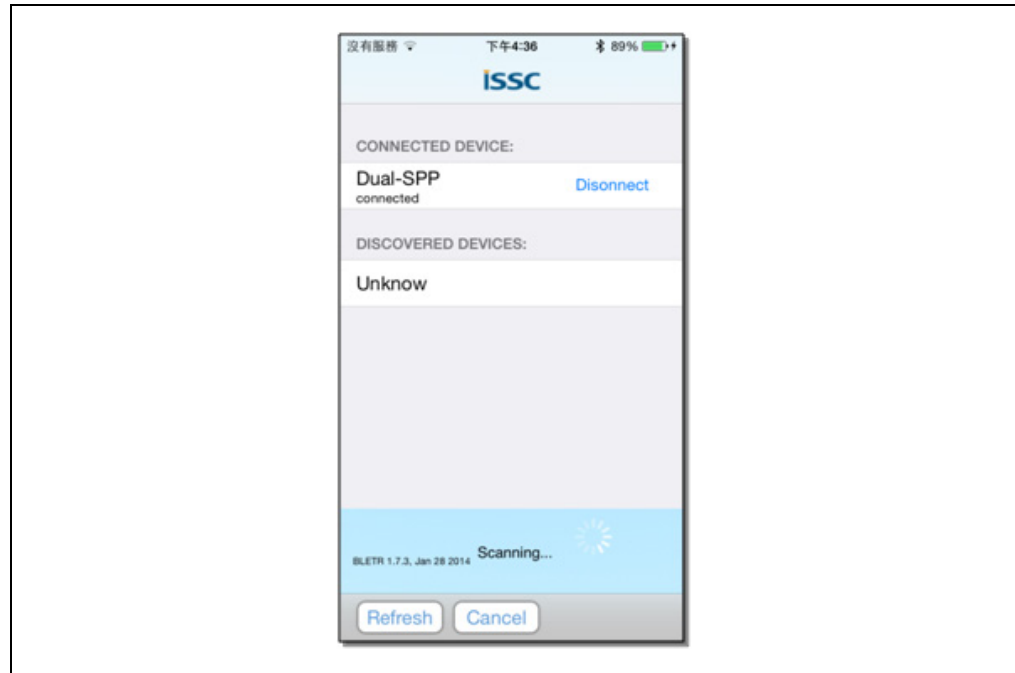
3. Launch the ISSC BLETR APP to scan for the Bluetooth Low Energy (BTLE) peripheral devices. If the device is not displaying on the list, press the **Refresh** or **Scan** button to restart the BTLE peripheral scan. Find the Dual-SPP device and then select to start a connection to the RN4677 PICtail Board. See [Figure 2-24](#).

FIGURE 2-24: SCAN FOR BTLE DEVICES



- BLETR displays the Dual-SPP device status as connected after a successful connection. See [Figure 2-25](#).

FIGURE 2-25: DUAL-SPP CONNECTED



- Select the connected Dual-SPP device to display the top level view, see [Figure 2-26](#). This view displays the following three options when connected to a RN4677 PICtail Board as shown in [Figure 2-27](#):

Transparent: Select this view to display received data, send data, and enable features.

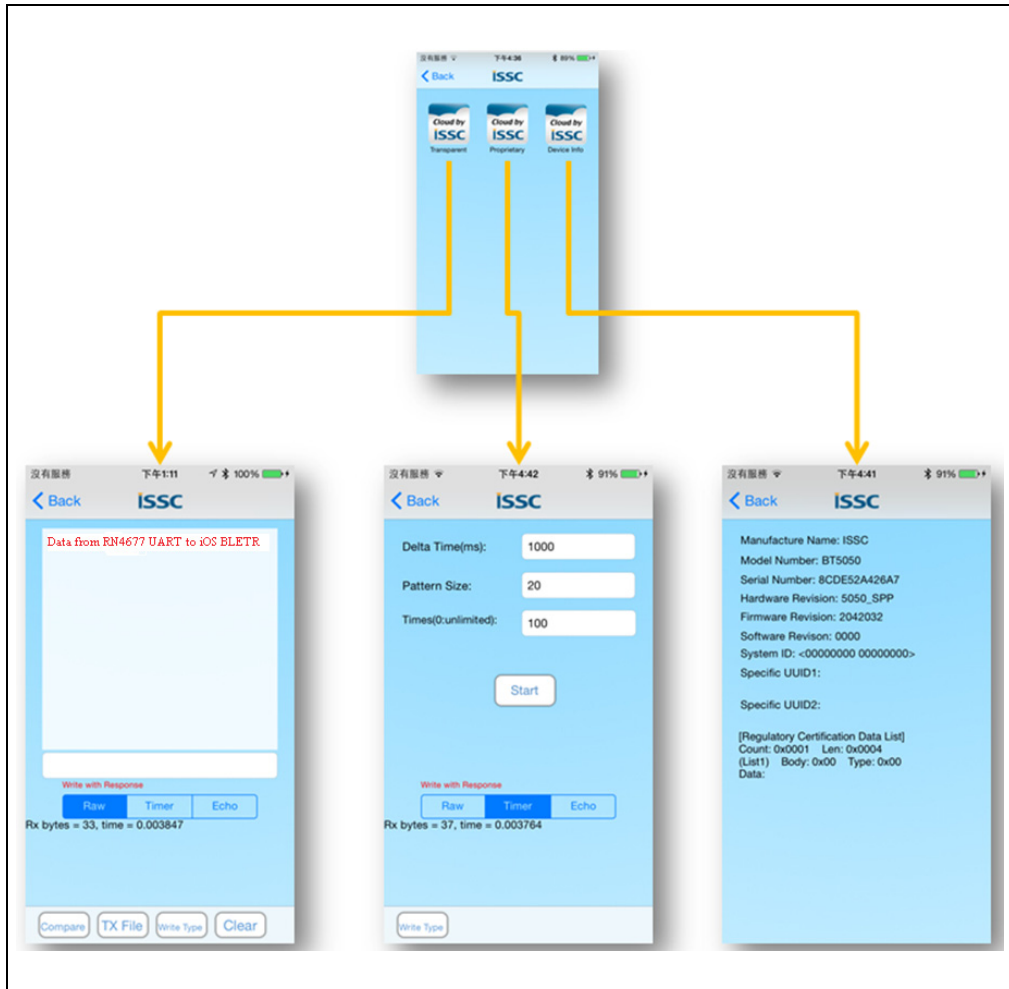
Proprietary: Select this view to set the Bluetooth Low Energy connection parameters.

Device Info: Select this view to display the settings for Bluetooth Low Energy Device Information Service.

FIGURE 2-26: ISSC BLETR APP TOP LEVEL VIEW



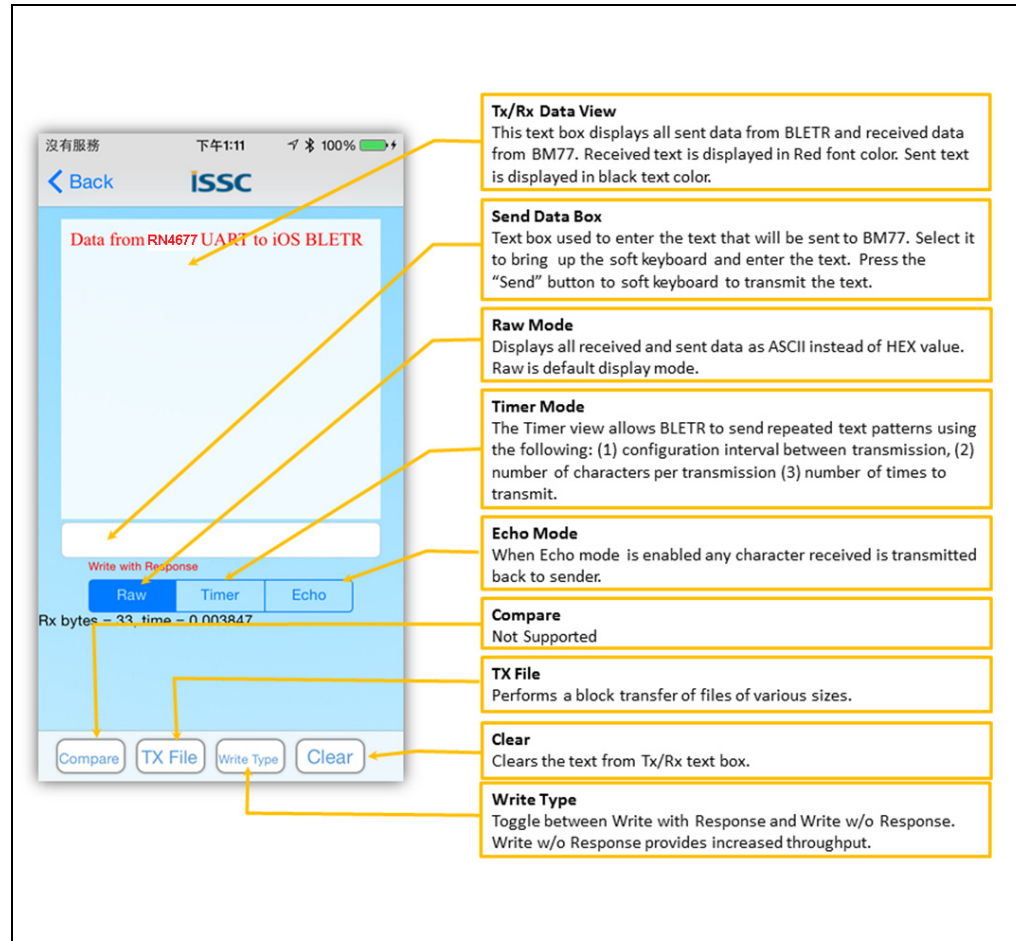
FIGURE 2-27: ISSC BLETR APP OPTIONS



2.4.3.1 TRANSPARENT DATA VIEW

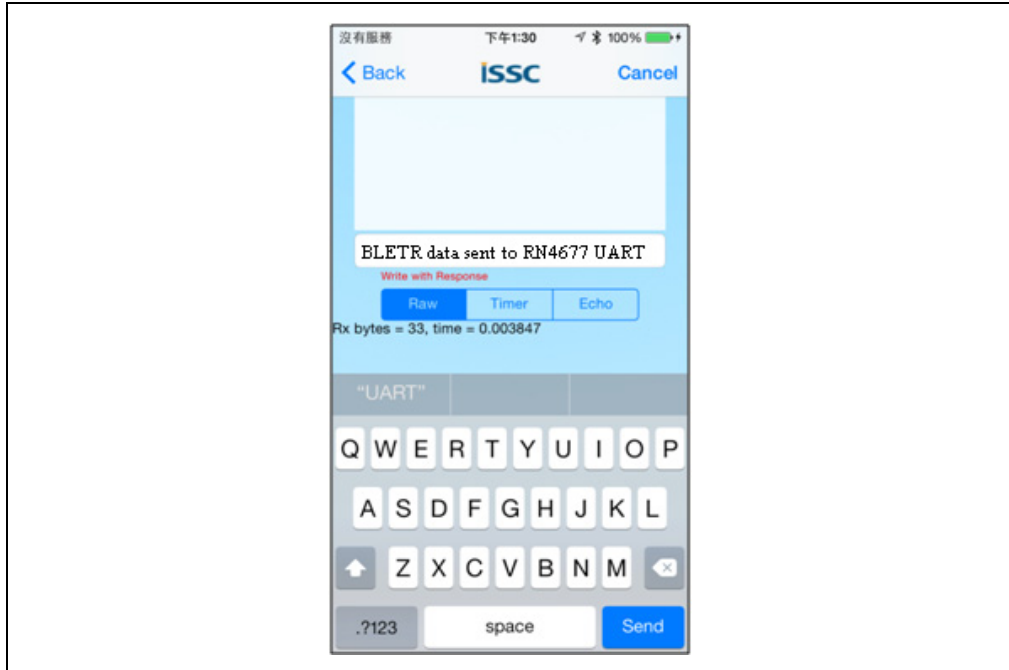
The Transparent data view enables to display received data, send data, and enable features. Selecting the **Transparent** button opens the transparent serial data view as shown in Figure 2-28. The default mode is Raw mode (ASCII), where the received data characters are displayed in red font in the large text box.

FIGURE 2-28: DATA MODE TRANSFER



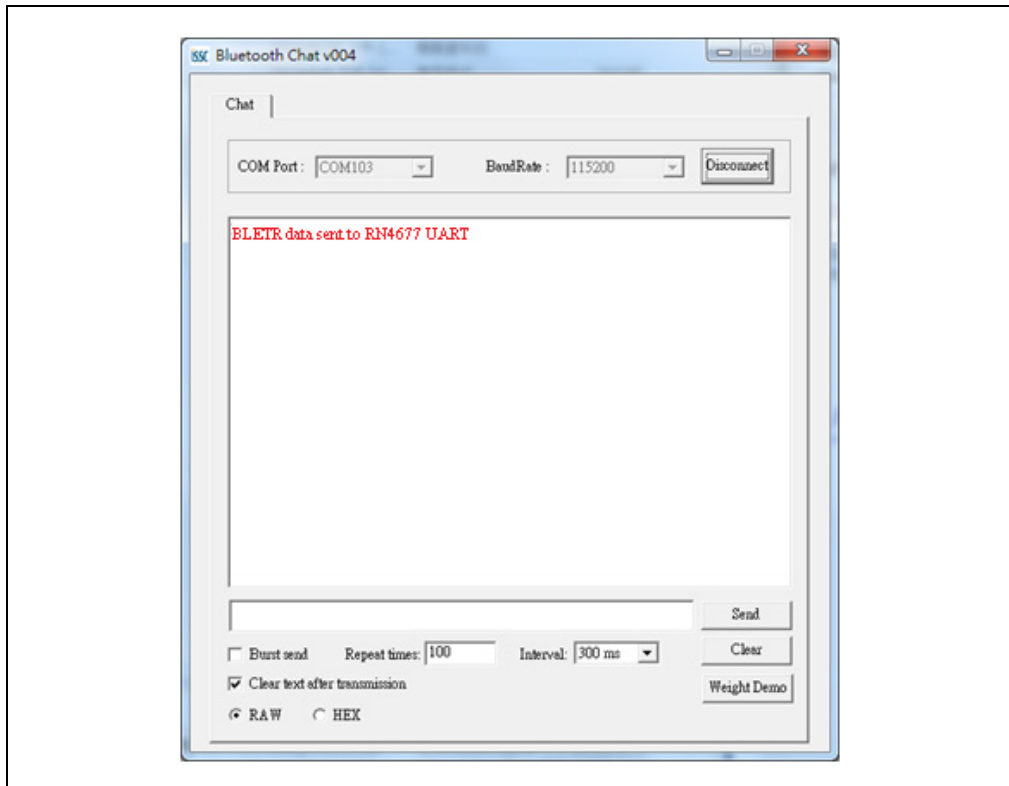
Select the input text box to send data from BLETR iOS device to the RN4677. The soft keyboard displays as shown in [Figure 2-29](#). Enter text in the input text box and click **Send** to transmit text to the RN4677 over BLE connection.

FIGURE 2-29: SOFT KEYBOARD



The text is received via the RN4677 UART after clicking **Send** and displayed in the BT Chat Tool window on the PC as shown in [Figure 2-30](#).

FIGURE 2-30: TEXT RECEIVED VIA THE RN4677 UART

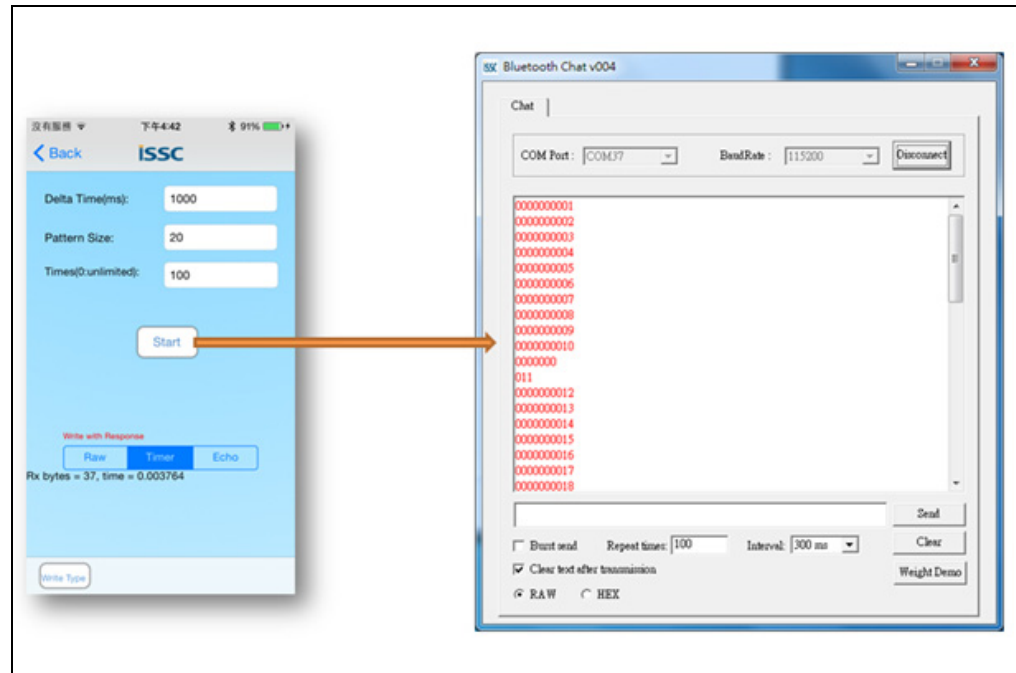


Timer Feature

In addition to the Raw mode (ASCII), the Transparent data view includes a Timer and Echo features, see [Figure 2-28](#). The Timer feature enables the BLETR to send a repeated test pattern to BT Chat Tool for throughput and data transfer test. [Figure 2-31](#) shows an example of the Timer test feature.

BLETR is configured to transmit a 100 test blocks of 20 characters in every 1000 ms. BT Chat Tool on PC receives the test pattern data and displays it in red text. The line break indicates a Bluetooth Low Energy packet break, which means that a transmitted test block is fragmented into multiple BLE packets. Clicking the **Start** button initiates the data transfer.

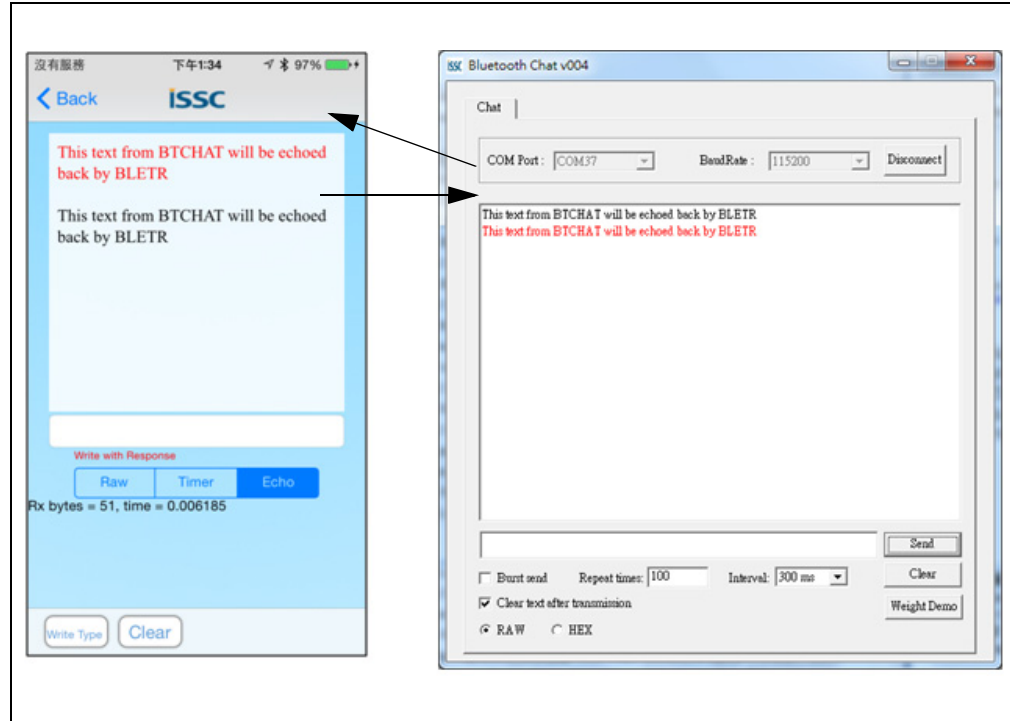
FIGURE 2-31: TIMER TEST FEATURE



Echo Feature

The Echo feature is an optional function for the Transparent data view. If Echo is enabled, any data received by BLETR is echoed back to the sender. [Figure 2-32](#) shows text sent from BT Chat Tool (PC) being echoed to BLETR when the Echo mode is enabled.

FIGURE 2-32: ECHO FEATURE

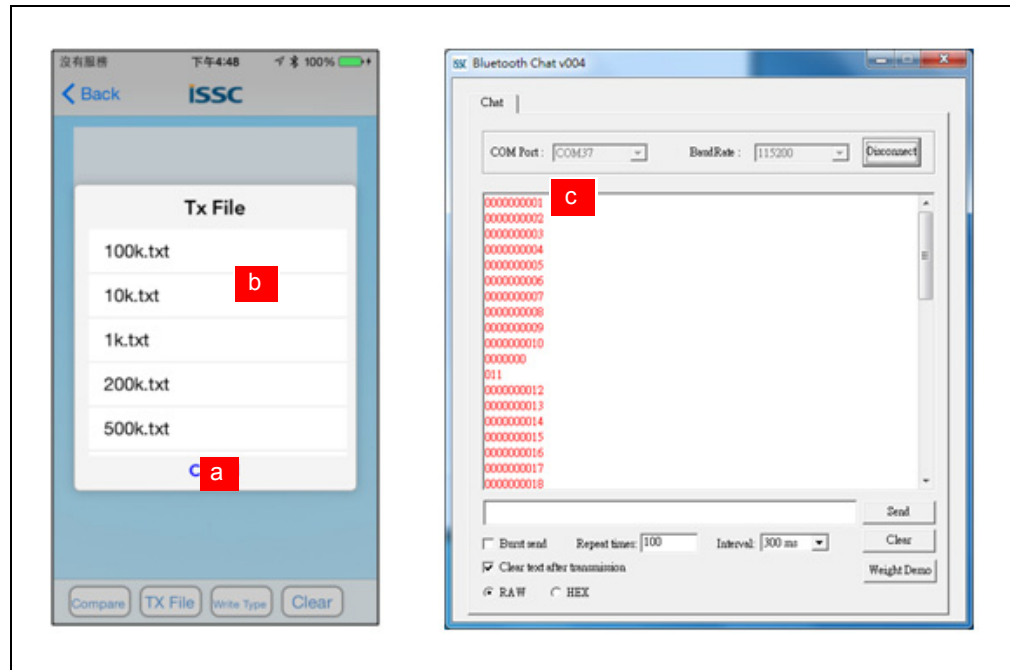


TX File Feature

Another test feature similar to the Timer feature is the TX File transfer. The TX File function transfers files, which is embedded in the BLETR APP, to the RN4677. The steps to use this feature is represented in [Figure 2-33](#):

- a. Click the **TX File** button to open a dialog box with the list of file sizes to transmit.
- b. Select the file size to send.
- c. Observe the file received on BT Chat Tool.

FIGURE 2-33: TX FILE FEATURE



2.4.3.2 PROPRIETARY DATA VIEW

The Proprietary data view demonstrates the capability to remotely change Bluetooth Low Energy connection parameters via BLETR application. These parameters only affect Bluetooth Low Energy connections.

- **Max Interval:** communication time interval (ms) between RN4677 and BLE Central device.
- **Connection Timeout:** determines the timeout (ms) between data exchanges before a connection is considered lost.
- **Latency:** number of peripheral (RN4677) connection events allowed to be skipped without risking disconnection.
- BLE name used to advertise Peripheral name to scan Central devices. To change device name, type new name in the text box and click **Change Name** to apply the change. See [Figure 2-34](#).

FIGURE 2-34: CHANGE DEVICE NAME



2.4.3.3 DEVICE INFORMATION VIEW

The Device Information view displays the characteristics associated with Device Information service. The Device Information service is available to all Bluetooth 4.0 Low Energy hosts that access the RN4677 PICtail Board. It provides the identification information about the RN4677 BLE peripheral device.

FIGURE 2-35: DEVICE INFORMATION



2.5 USING RN4677 PICtail™ BOARD IN PICtail INTERFACE MODE

The PICtail interface is used to access the UART and the GPIOs available on the RN4677 module. The PICtail interface configures the RN4677 over the UART using an external PIC® MCU and then sends and receives raw data over the UART. The PICtail interface is also used to access GPIOs on the RN4677 using a PIC MCU.

Using the PICtail Plus (J2) or PICtail (J1) interface, the board can be plugged into any standard Microchip development board, such as the Explorer 16 Development Board (DM240001) or the PIC18 Explorer Board (DM183032), that supports the PICtail Plus or PICtail connection interface.

The PICtail interface is used to configure the RN4677 by updating Bluetooth parameters on the internal EEPROM, updating the RN4677 firmware on the internal flash, and entering the RN4677 into application mode. In application mode, pairing procedure is performed on the RN4677 after establishing a Bluetooth connection for SPP or BLE data transfer.

Figure 2-36 and Figure 2-37 show the pin mapping for the PICtail Plus 30-pin interface and the PICtail 28-pin interface.

FIGURE 2-36: PIN MAPPING FOR THE PICtail 30-PIN INTERFACE

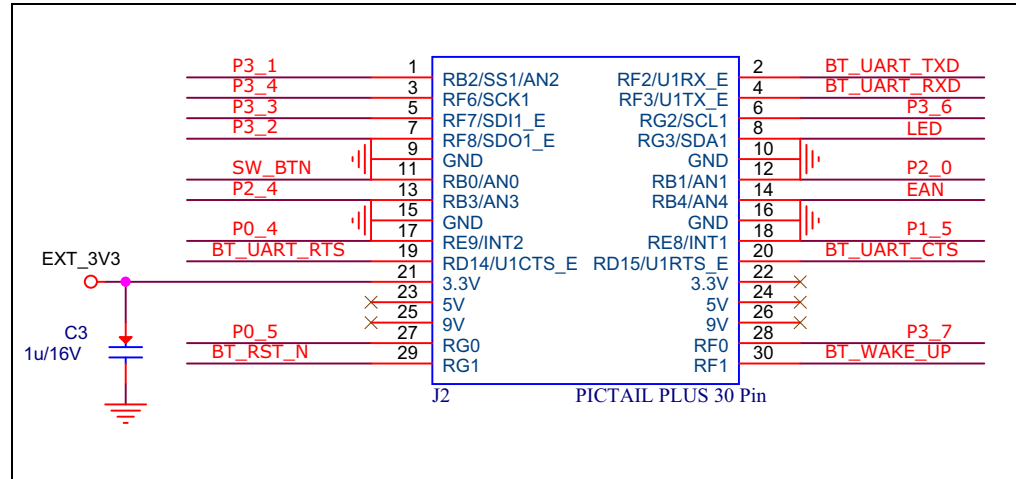
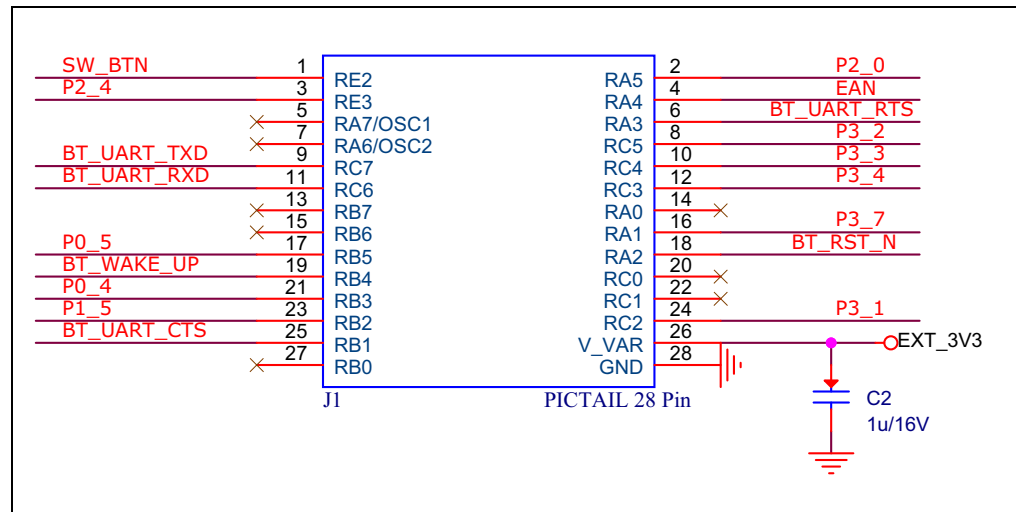


FIGURE 2-37: PIN MAPPING FOR THE PICtail 28-PIN INTERFACE



RN4677 PICtail™/PICtail Plus Board User's Guide

The RN4677 PICtail Board can be inserted into the PICtail Plus/PICtail interface header available on Microchip development tools as shown in [Figure 2-38](#) and [Figure 2-39](#).

Note: Ensure that the RN4677 module on the board is facing the PIC PIM while inserting the RN4677 PICtail Board into either of the PICtail headers.

FIGURE 2-38: RN4677 PICtail™ BOARD INSERTED INTO PICtail PLUS INTERFACE

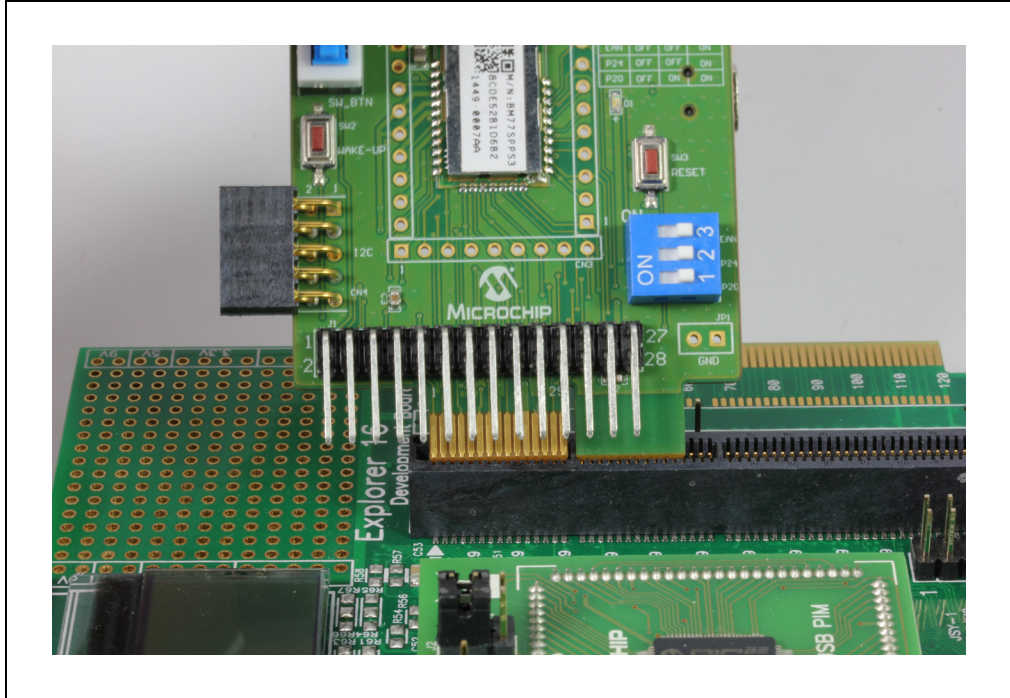
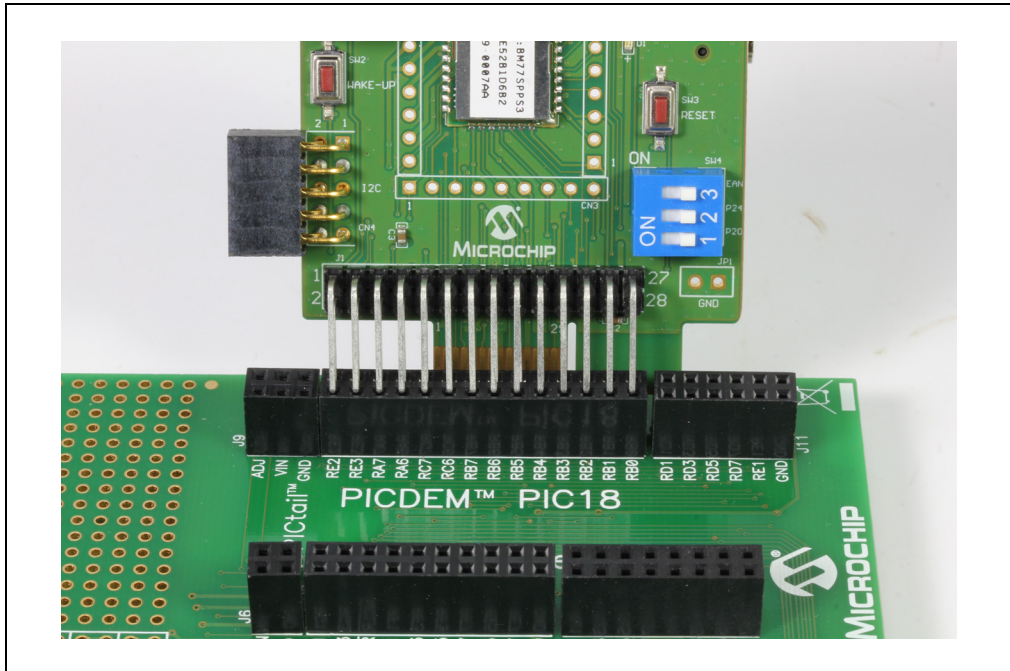


FIGURE 2-39: RN4677 PICtail™ BOARD INSERTED INTO PICtail INTERFACE



Appendix A. RN4677 Module PIN Assignment

A.1 RN4677 MODULE PIN ASSIGNMENT

Figure A-1 shows the pinout for RN4677 module.

FIGURE A-1: RN4677 MODULE PIN ASSIGNMENT

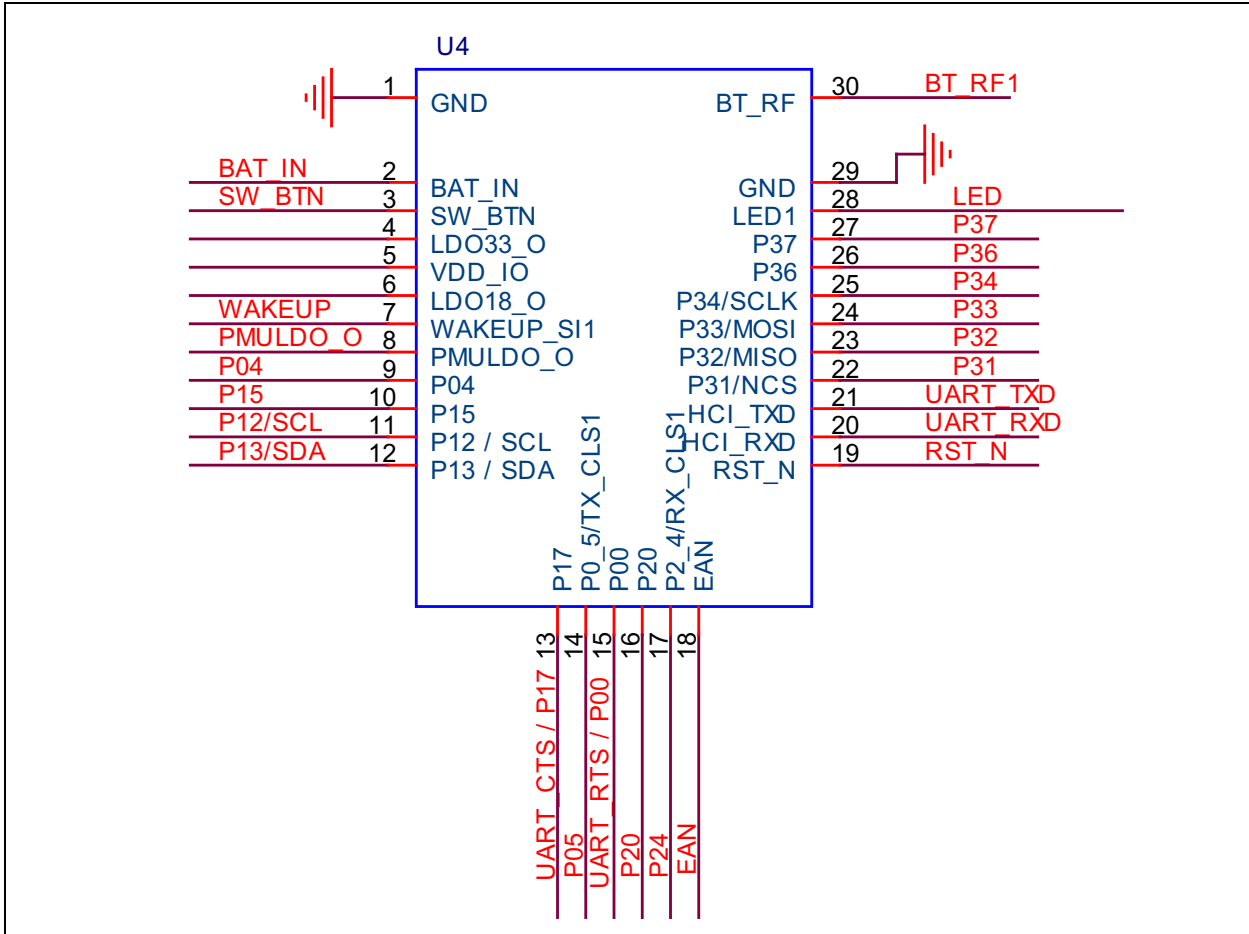


Table A-1 describes the module's pins.

TABLE A-1: PIN DESCRIPTION

RN4677 Pin	RN4677U Pin	Symbol	Type	Description
1	—	GND	Power	Ground reference
2	—	GND	Power	Ground reference
3	1	GND	Power	Ground reference
4	2	BAT_IN	Power	Battery Input. Main positive supply input. Connect to 10 µF low ESR ceramic capacitor.
5	3	SW_BTN	DI	Software Button H: Power On / L: Power Off

RN4677 PICtail™/PICtail Plus Board User's Guide

TABLE A-1: PIN DESCRIPTION (CONTINUED)

RN4677 Pin	RN4677U Pin	Symbol	Type	Description
6	4	LDO33_O	Power	Internal 3.3V LDO regulator output. Connect to 10 µF low ESR ceramic capacitor.
7	5	VDD_IO	Power	I/O positive supply input. Ensure VDD_IO and MCU I/O voltages are compatible.
8	6	LDO18_O	Power	Internal 1.8V LDO regulator output. Connect to 10 µF low ESR ceramic capacitor.
9	7	WAKEUP	DI	Wakeup from Shutdown mode (active-low; internal pull up)
10	8	PMULDO_O	Power	Power management unit output. Connect to 1 µF low ESR ceramic capacitor.
11	9	P04	DO	Status Indicator 2 (STATUS_IND_2)
12	10	P15	DO	Status Indicator 1 (STATUS_IND_1)
13	11	P12/SCL	DO	I ² C SCL (Do not connect)
14	12	P13/SDA	DIO	I ² C SDA (Do not connect)
15	13	P17/CTS	DIO	Configurable control or indication pin or UART CTS (input)
16	14	P05	DIO	Configurable control or indication pin
17	15	P00/RTS	DIO	Configurable control or indication pin or UART RTS (output)
18	16	P20	DI	System configuration (internal pull up)
19	17	P24	DI	System configuration (internal pull up)
20	18	EAN	DI	System configuration (internal pull down)
21	19	RST_N	DI	Module Reset (active-low; internal pull up). Apply a pulse of at least 63 ns.
22	20	RXD	DI	UART data input
23	21	TXD	DO	UART data output
24	22	P31	DIO	Configurable control or indication pin (when configured as input: internal pull up)
25	23	P32	DIO	Configurable control or indication pin (when configured as input: internal pull up)
26	24	P33	DIO	Configurable control or indication pin (when configured as input: internal pull up)
27	25	P34	DIO	Configurable control or indication pin (when configured as input: internal pull up)
28	26	P36	DIO	Do not connect
29	27	P37	DIO	Configurable control or indication pin (when configured as input: internal pull up)
30	28	LED1	DO	Status LED
31	29	GND	Power	Ground reference
—	30	BT_RF	AIO	External antenna connection (50 Ohm)
32	—	GND	Power	Ground reference
33	—	GND	Power	Ground reference

Note: Pin type abbreviation: A = Analog, D = Digital, I = Input, O = Output.



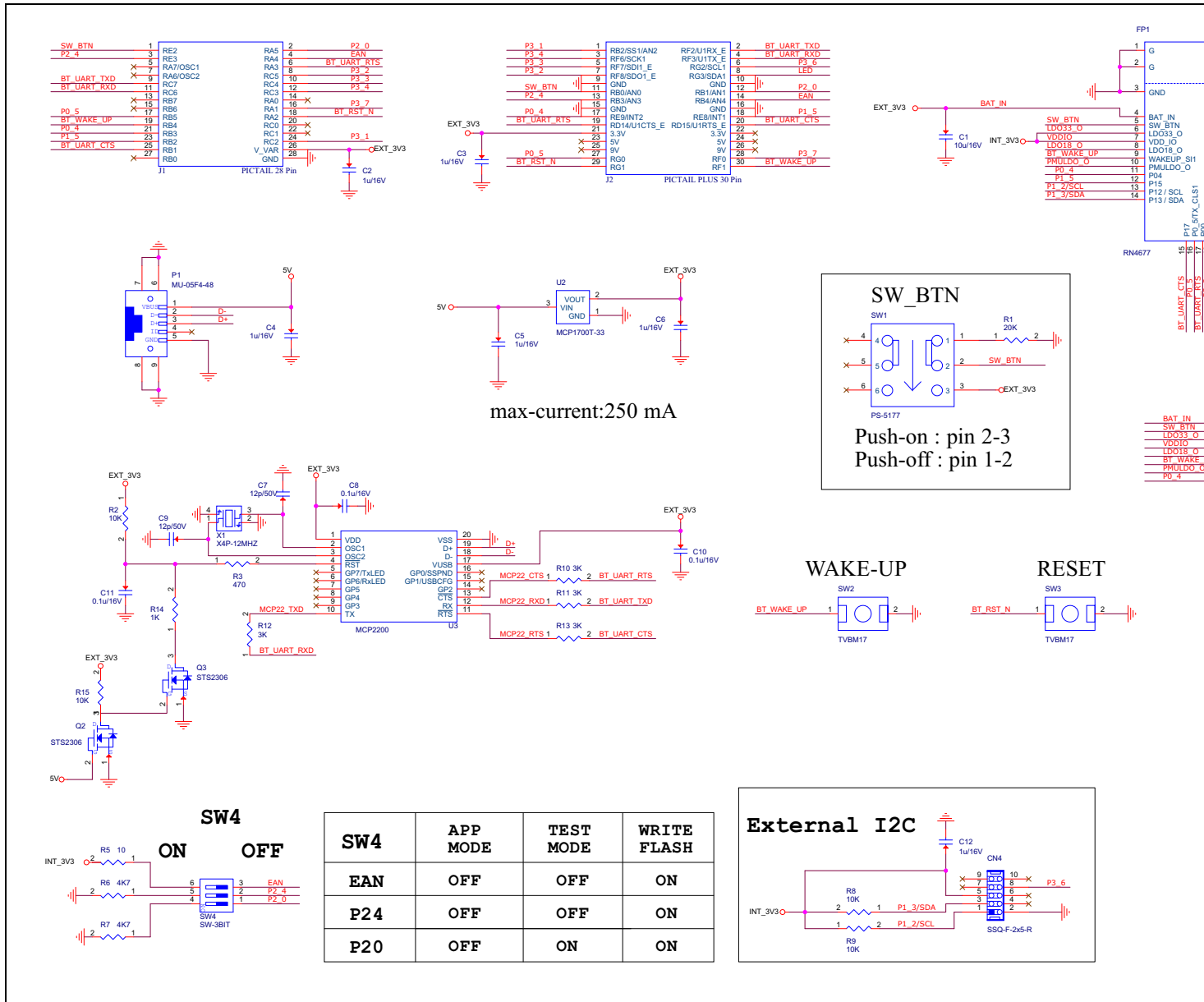
RN4677 PICtail™/PICtail PLUS BOARD USER'S GUIDE

Appendix B. Schematics

B.1 RN4677 PICtail™/PICtail Plus Board Schematics

Figure B-1 shows the RN4677 PICtail/PICtail Plus Board schematics.

FIGURE B-1: RN4677 PICTail™/PICTAIL PLUS BOARD SCHEMATICS



Appendix C. Questions and Answers

C.1 QUESTIONS AND ANSWERS**1. Is the RN4677 Module Data Sheet available?**

Yes. The RN4677 data sheet is available for download on www.microchip.com/RN4677.

2. When I connect the RN4677 PICtail board to the host PC, the COM port does not appear. What should I do?

Try to unplug the USB cable and plug it back to the PC. Check if the MCP2200 drivers are installed. Otherwise, download and install the MCP2200 drivers.

3. What is the maximum supported Baud Rate of RN4677 UART?

The maximum baud rate is 921600 used with 16 MHz crystal.

4. How do you change Bluetooth® parameters such as name, Device Info, COD, rate, inquiry and page scan windows?

The configuration settings are accessed using the ASCII Command interface. Enter Command mode using \$\$\$ as described in [Section 2.4.1 "Bluetooth Classic® \(SPP\) Connection to Host PC"](#) and issue commands to change the desired settings. For more information on the Command mode, the available commands and their description, refer to the "*RN4677 Bluetooth® 4.0 Dual Mode Module User's Guide*" (DS50002377A).

5. What is the default security mode for SPP?

Simple Secure Pairing (SSP)/"Just Works" mode.

6. Is there an Android™ BTLE demonstration application?

At this time, Android support for dual-mode Bluetooth devices, such as the RN4677, is limited to Bluetooth Classic SPP data service.

7. Is the source code for iOS and Android APP available?

Contact your Microchip representative to request the source code packages for the smartphone Apps.



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