RM520N-GL

Voice over ttyUSB Application Note

5G Module Series

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About the Document

Revision History

Version	Date	Author	Description
-	2022-09-16	Shaun DUAN	Creation of the document
1.0	2023-08-01	Shaun DUAN	First official release

Contents

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1 Introduction

This document introduces the voice over ttyUSB feature and related AT commands of Quectel RM520N-GL module.

1.1. Special Mark

Table 1: Special Mark

Mark	Definition
*	Unless otherwise specified, when an asterisk (*) is used after a function, feature, interface, pin name, AT command, or argument, it indicates that the function, feature, interface, pin, AT command, or argument is under development and currently not supported; and the asterisk (*) after a model indicates that the sample of such a model is currently unavailable.

2 Design

2.1. Overview

In the voice over ttyUSB mode, the device provides a virtual serial port (USB NMEA Port) through the USB interface to transmit raw PCM data.

During a voice call, the module receives or transmits the voice data through an air interface. The voice data received by the module will be decoded to PCM data through DSP and then transmitted to the host device through the USB. Then the host device will be able to play the PCM data through the loudspeaker. Inversely, the host device can obtain the PCM data through the microphone and then transmit it to the module through the USB. Then the module DSP encodes the PCM data to voice signal and sends it through an air interface.

2.2. Data Flow Diagram

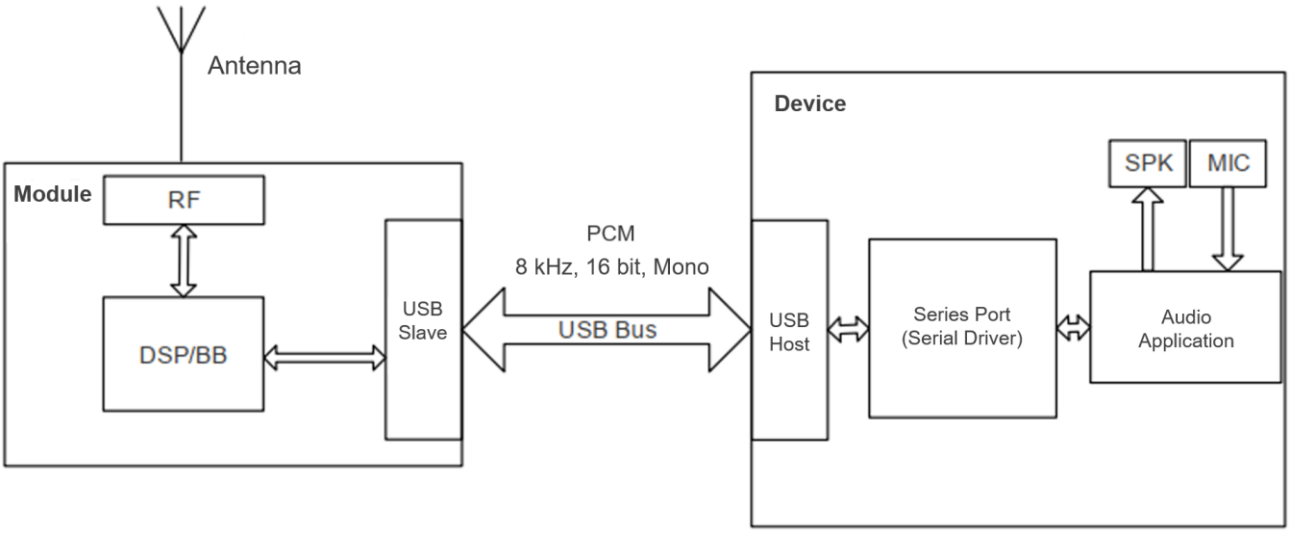

Figure 1: Data Flow Diagram

3 Voice over ttyUSB AT Commands

3.1. AT Command Introduction

3.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on the command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals to its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

3.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 2: Types of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of the corresponding command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or perform a specific action.

3.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence.

3.3. AT+QPCMV Enable/Disable Voice Channel

This command enables or disables the voice channel. After the channel is enabled, when you make a voice call, the received voice data will be decoded to PCM data by the module, and then outputted to the device through the port for PCM data transmission. Inversely, the device writes the PCM data to the port and the data will be transmitted to the other party over network.

AT+QPCMV Enable/Disable Voice Channel	
Test Command **AT+QPCMV=?**	Response **+QPCMV: (**list of supported **<enable>**s**),(**list of supported **<option>**s**)** **OK**
Read Command **AT+QPCMV?**	Response **+QPCMV: <enable>,<option>** **OK**
Write Command **AT+QPCMV=<enable>[,<option>]**	Response **OK** If there is any error: **ERROR**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately; The configurations will not be saved.

Parameter

<enable>	Integer type. Enable/disable the voice channel. 1 Enable 0 Disable
<option>	Integer type. Configure the port for PCM data transmission.

0	USB NMEA port. Its device node on the host is */dev/ttyUSB1* generally
1	Debug UART*
2	UAC mode. The module is used as a USB sound card*
3	PCIe channel*

NOTE

1. Users should set the input and output PCM channels (*channel*) of the host device to Mono, sampling rate (*rate*) to 8 kHz, and format (*format*) to 16-bit linear.
2. The PCM data (*data_size*) is inputted and outputted in a unit of 320 bytes, which is also the size of PCM data processed by the module at a time.
   Calculation: *data_size* = *channel* × *period_size* × *period_count* × *format* ÷ 8, wherein:
   - *period_size* is the number of frames in each PCM period.
   - *period_count* is the number of PCM period.

   For the module, the default value of *channel* is 1, default *period_size* is 80 and default *period_count* is 2, and these values are not allowed to be configured. For the host device, you can adjust *period_count* and *period_size* as needed.
3. This solution is of low scalability and users cannot change the size of the PCM data to be transmitted.

4 Functional Test

This chapter introduces the steps to perform a test on the voice function.

4.1. Test Environment

- A Quectel RM520N-GL module
- A host device with Linux system
- A device used for calling, such as a mobile phone (a mobile phone is used as an example in this chapter)

NOTE

1. Execute **AT+QDAI=x,0,0,4,0,0,1,1** to set to PCM master mode (default configuration).
2. The configurations by the commands above take effect after the module is rebooted. For details of the AT commands, see ***document [1]***.

4.2. Test Steps

Step 1: Power on the module, and register on network.

Step 2: Execute **AT+QPCMV=1,0** to select the port for PCM data transmission as the input and output port of PCM data.

Step 3: Execute **ATD** to call the mobile phone or use **ATA** to answer an incoming call from the mobile phone, for the purpose of keeping the module in a voice call.

Step 4: Configure the host device to receive 320 bytes of data from the port for PCM data transmission every 20 ms for PCM related applications (broadcasting or storage). Check whether the PCM data received by the host device is from the mobile phone.

Step 5: After the module receives the PCM data, it sends the data via the air interface. Check whether the mobile phone can hear the voice transmitted from the host device.

Step 6: After executing **ATH** to disconnect the call, the port for PCM data transmission will stop transmitting PCM data.

Step 7: Execute **AT+QPCMV=0** to disable the voice channel.

NOTE

1. The USB NMEA port appears as */dev/ttyUSB1* on the host device.
2. If a test program for the host device is needed, consult Quectel Technical Support (support@quectel.com).
3. For details of **ATD**, **ATA**, and **ATH** commands, see ***document [1]***.

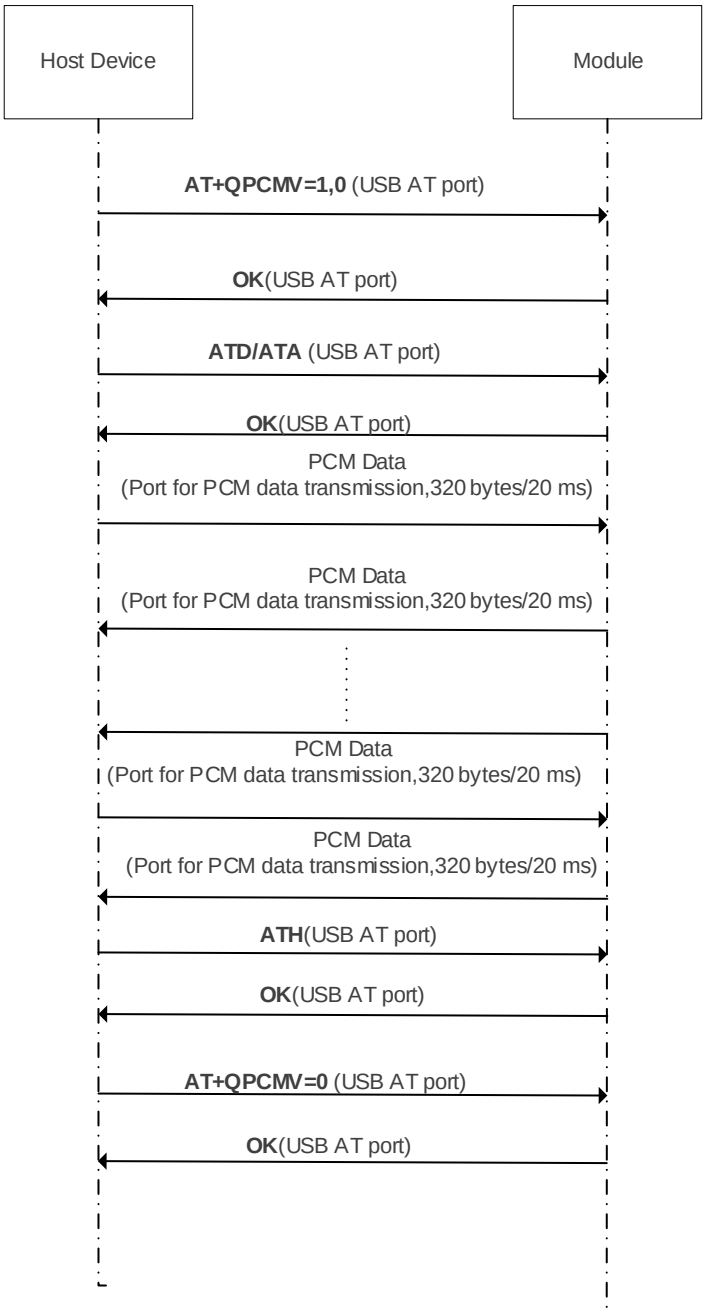

Figure 2: Test Flow Chart

5 Appendix References

Table 3: Related Documents

Document Name
[1] Quectel_RG520N&RG525F&RG5x0F&RM5x0N_Series_AT_Commands_Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
BB	Baseband
DSP	Digital Signal Processing/Digital Signal Processor
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
PCIe	Peripheral Component Interconnect Express
PCM	Pulse Code Modulation
TA	Terminal Adapter
UAC	USB Audio Class
USB	Universal Serial Bus