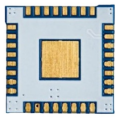
BNCOM BCM-SQ700-AS Bluetooth Module



BNCOM BCM-SQ700-AS Bluetooth Module User Guide

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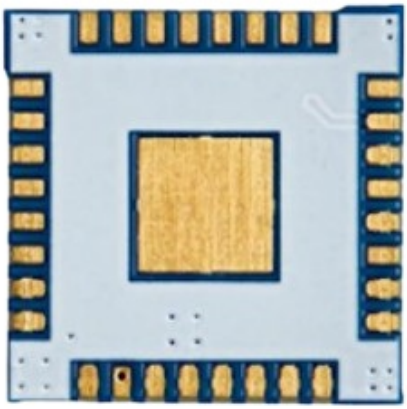

Revision History

DATE	VERSION	DESCRIPTION	AUTHOR
2023-08-04	0.0.1	Draft version	Hjbyun

Introduction

PURPOSE

This document presents the AT command set supported by the BnCOM Bluetooth audio module and describes the protocol used to control and configure.

INTENDED AUDIENCE AND PERTINENT SECTIONS

This document is intended for BnCOM customers, especially system integrators, about to implement Bluetooth modules in their applications. Readers of this document should be familiar with BnCOM modules and their ease of controlling using AT commands.

References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

1. ITU-T Recommendation V.250: “Serial asynchronous automatic dialing and control”.
2. Bluetooth Core specification v5.2
3. Supplement to the Bluetooth Code Specification
4. Bluetooth Profile Specification: “Hands-Free Profile 1.8”.
5. Bluetooth Profile Specification: “Advanced Audio Distribution v1.3.2”.
6. Bluetooth Profile Specification: “Audio/Video Remote Control v1.6.2”.

Definitions and abbreviations

Definitions

For the present document, the following syntactical definitions apply:

- <CR> Carriage return character is the command line and result code terminator character.
- <LF> Linefeed character.
- <…> Name enclosed in angle brackets is a parameter. The angle brackets themselves do not appear in the command line.
- […] Square brackets are used to indicate that the enclosed items are optional. The square brackets themselves do not appear in the command line.
- Underline Underlined defined sub-parameter value is the recommended default setting of this sub-parameter.

Abbreviations

For the present document, the following abbreviation applies:

- DCE Data Communication Controller
- DTE Data Terminal Equipment
- SRC A device is the SRC when it acts as a source of a digital audio stream that is delivered to the SNK of the piconet
- SNK A device is the SNK when it acts as a sink of a digital audio stream delivered from the SRC on the same piconet

AT Command syntax and procedures

In this document, the following naming conventions are used:

- DCE (Data Communication Equipment): Bluetooth Audio module.
- DTE (Data Termination Equipment): The terminal that commands the module, e.g., PC or MCU.

Command Line

Command line general format
A command line is made up of three elements: the prefix, the body, and the termination character.

- The command line prefix consists of the character “AT”.
- The body is made up of individual commands as specified later in this document.
- The termination character should be a carriage return character <CR> and it may not appear in the body.

The command line buffer can accept a maximum of 80 characters. If the characters entered exceeded this number, then ERROR will be returned.

Case Sensitivity of Commands
In this document, all AT commands are in uppercase letters.

Basic Syntax commands
The format of basic syntax commands is as follows: <command>[<number>]

- <command> is either a single character or the “&” character followed by a single character. Characters used in <command> shall be taken from the set of alphabetic characters.
- <number> may be a string of one character from “0” through “9” representing a decimal integer value.
- If a command expects <number> and it is missing, the default value is assumed.
- If a command does not expect a <number> and a number is present, an ERROR is generated.

Extended Syntax commands
The name of extended syntax commands always begins with the character “+” and the first character following the “+” shall be alphabetic in the range of “A” through “Z”.

Type of extended syntax commands
There are four types of extended syntax command operations:

- Test command – Checks whether a certain AT command is supported. +<name>=?
- Set command – Changes the settings. +<name>=<value> +<name>=<compound value>
- Read command – Retrieves the current settings. +<name>?
- Execution command – Act or retrieve information/status. +<name>

Information responses and result codes

Response format
Information responses and result codes always start and end with a carriage return character <CR> and a linefeed character <LF>. There are three types of result codes: final, intermediate, and unsolicited.

- A final result codes indicate that the execution of currently running AT commands is finished. As an example, it can be any one of the following types: If the command is successful.

  OK

  If the command has the wrong format/the command is invalid/the command is not applicable, etc.

  ERROR
- An intermediate result code (IRC) is a report of the progress of a DCE action.
  - +<name>
  - +<name>: <value>
  - +<name>: <compound_value> Note that a single space character separates the colon character from the <value>.
- Unsolicited result codes (URC) indicate the occurrence of an event not directly associated with the issuance of a command from DTE.

Range of values

For example, the following are some examples of value range indications:

- (0) Only the value 0 is supported
- (1,2,3) The values 1, 2, and 3 are supported
- (1-3) The values 1 through 3 are supported

Informative examples

Extended syntax result codes			
Command	**Syntax**	**Example**	**Possible Response(s)*1**
Test	+<name>=?	AT+UART=?**<CR>**	**<CR><LF>** +UART: (9600-1382400),(1,2),(N,O,E)**<CR><LF>** **<CR><LF>**OK**<CR><LF>**
Set	+<name>=[<value>]	AT+UART=115200,1,N**<CR>**	**<CR><LF>**OK**<CR><LF>**
Read	+<name>?	AT+UART?**<CR>**	**<CR><LF>** +UART: 115200,1,N**<CR><LF>** **<CR><LF>**OK**<CR><LF>**
Execution	+<name>	AT+UART**<CR>**	**<CR><LF>**ERROR**<CR><LF>**

General Commands

Attention

Description
Attention command determines the presence of a DCE, i.e., the Bluetooth audio module.

Syntax

Command	**Possible Response(s)**
AT	OK | No response

Defined values
None

Result codes
OK If the DTE and DCE are connected properly No response

Soft reset Z

Description

This command forces a reboot (warm reset) of the module

Syntax

Command	Possible Response(s)
ATZ	OK | ERROR

Defined values
None

Result codes
OK If the DTE and DCE are connected properly No response

Examples

```
ATZ
OK
                                    # Rebooted within a second.
PAIRING
```

Set to factory-defined configuration &F

Description
This command resets all settings to their factory default values specified by the manufacturer

Syntax

Command	Possible Response(s)
AT&F[<value>]	OK | ERROR

Defined values*1

- 0 Restore factory settings and reboot within a second*1
- 1 Remove all paired device lists
- (other) Reserved for manufacturer proprietary use

Examples

```
AT&F0
OK
                                    # Rebooted within a second
PAIRING
```

Version information +VERSION

Description

- Display firmware version

Command	Possible Response(s)
AT+VERSION?	+VERSION: <major>.<minor>.<patch> OK

Defined values

None

Examples

```
AT+VERSION?
+VERSION: 00.00.01
OK
```

Bluetooth local name +LOCALNAME

Description
Change Bluetooth local name

Syntax

Command	Possible Response(s)
AT+LOCALNAME=<name>	OK | ERROR
AT+LOCALNAME?	+LOCALNAME: <name> OK

Defined values
<name> 1 to 31 characters in length

Examples

```
AT+LOCALNAME=BCM-SQ700-AS      # Set local name
OK
AT+LOCALNAME?                  # Read current local name
+LOCALNAME: BCM-SQ700-AS
OK
```

Bluetooth local address +LOCALADDR

Description
This command can be used to read the local Bluetooth address.

Syntax

Command	Possible Response(s)
AT+LOCALADDR?	+LOCALADDR: <address> OK

Defined values

- None

Examples

```
AT+LOCALADDR?                    # Read address
+LOCALADDR: 74F07D000000
OK
```

Power On/Off +POWER

Description
This command is used to power on or off the module

Syntax

Command	Possible Response(s)
AT+POWER=<value>	OK | ERROR
AT+POWER=?	+POWER: (list of supported <value>) OK

Defined values

- 0 Power off
- 1 Power on
- (other) Reserved for manufacturer proprietary use.

Examples

```
READY                            # Ready
AT+POWER=1
OK
PAIRING                          # Pairing
```

Connection establishment +CONNECT

Description
This command attempts to establish a connection to the last connected device

Syntax

Command	Possible Response(s)
AT+CONNECT[=<MAC>]	OK | ERROR

Defined values*1 <MAC> Device MAC address

Notes

*1: If <MAC> is missing, the value last paired device mac address is assumed.

Examples

```
CONNECTABLE                    # Connectable
AT+CONNECT=112233445566        # Connect
OK
CONNECT 112233445566           # Connecting to 112233445566
+CONNECTED: 112233445566       # Connected
```

Release connection +DISCONNECT

Description
This command used to disconnect the active connection

Syntax

Command	Possible Response(s)
AT+DISCONNECT	OK | ERROR

Defined values
None

Examples

```
CONNECTED: 112233445566        # Connected
AT+DISCONNECT                  # Initiate to disconnect
OK
+DISCONNECTED: 112233445566    # Disconnected
PAIRING                        # Pairing
```

HFP Commands

Answer an incoming call +ANSWER

Description

- Answer an incoming call

Syntax

Command	Possible Response(s)
AT+ANSWER	OK | ERROR

Defined values

- None

Examples

```
INCOMING CALL                   # Incoming call
RING                            # Ringing
CID: 01012345678                # CID is optional
...
AT+ANSWER                       # Answer the incoming call
OK
ONGOING CALL                    # Call active
```

Reject/Terminate a call +CHUP

Description

- This command rejects an incoming call or terminates an ongoing call process

Syntax

Command	Possible Response(s)
AT+CHUP	OK | ERROR

Defined values

- None

Examples

```
ONGOING CALL                    # Call active

AT+CHUP                         # Terminate a call
OK
CALL ENDED                      # Call terminated
```

Place a call with the phone number +DIAL

Description

- This command initiates outgoing voice calls by providing the destination phone number to the AG.

Syntax

Command	Possible Response(s)
AT+DIAL=<value>	OK | ERROR | NO CARRIER

Defined values
“0…9, *, #, +, -“ Dialing digits

Result codes

- OK If the value is valid
- ERROR If the value is not recognized or not supported

Examples

```
CONNECTED: 01,112233445566          # Connected
AT+DIAL=+82-10-1234-5678            # Dialing to "082 010 1234 5678"
OK
```

Last number re-dial +BLDN

Description

- This command initiates outgoing voice calls by recalling the last number dialed by the AG.

Syntax

Command	Possible Response(s)
AT+BLDN	OK | ERROR | NO CARRIER

Defined values

- None

Result codes

- OK If the value is valid
- ERROR If the value is not recognized or not supported
- NO CARRIER If network service is not available

Examples

```
CONNECTED: 01,112233445566          # Connected
AT+BLDN                             # Place call to the last number dialed
OK
OUTGOING CALL                       # Outgoing call initiated
```

Volume gain SCO +VGM

Description
Adjust the speaker volume level of the SNK device via SCO

Syntax

Command*1	Possible Response(s)
AT+VGM=<value>	OK | ERROR
AT+VGM?	+VGM: <gain> OK
AT+VGM=?	+VGM: (range of supported <value>) OK

Defined values

- 0 to 15 Decimal integers indicating the speaker gain
- + Volume up
- – Volume down

Notes

- 1: can only adjust the volume during a call.

Examples.

```
AT+VGM=8                    # Set the volume to 8 level
OK
AT+VGM=+                    # Increase volume level
OK
AT+VGM?                     # Read current volume level
+VGM: 9
OK
```

Configuration Commands

I2S internal settings +SETI2S

Description

- Change the settings of I2S used internally

Syntax

Command	Possible Response(s)
AT+SETI2S=<cmd>,<value>	OK | ERROR

Defined values

■ Defines the possible audio output hardware types		
<cmd>	1	
<value>*1	**0**	Internal hardware DAC
	1	I2S
■ Master or slave operation		
<cmd>	2	
<value>	0	Slave
	1	Master
■ Specifies whether to resample music rates for i2s output (in HZ)		
<cmd>	3	
<value>	0	No resampling
	44100	44.1kHz
	48000	48.0kHz
■ Specifies the number of bits in each audio sample		
<cmd>	4	
<value>	0	16 bits
	1	24 bits
	2	32 bits
■ Select between left justified and right justified		
<cmd>	5	
<value>	**0**	Left justified
	1	Right justified
■ Justified delays by 1 bit		
<cmd>	6	
<value>	0	No delay
	1	1-bit delay
■ Specifies the I2S bit clock rate (BCLK) as a multiple of the sample rate, output when running is in I2S master mode		
<cmd>	7	
<value>	0...**64**	
■ Specifies the I2S master clock rate (MCLK) as a multiple of the sample rate		
<cmd>	8	
<value>	**0**	Disable
■ Specifies whether to resample voice rates for i2s output (in HZ)		
<cmd>	9	
<value>	**0**	No resampling
	44100	44.1kHz
	48000	48.0kHz

Notes

- 1: Changes to this value should be rebooted to take effect.

Examples

```
AT+SETI2S=4,48000          # Set resampling music rates for i2s output to 48000
OK
```

UART configuration +UART

Description
Change baud rate, parity, and stop bits of UART in run-time

Syntax

Command	Possible Response(s)
AT+UART=<baud>,<stop>,<parity>	OK | ERROR
AT+UART?	+UART: <baud>,<stop>,<parity> OK
AT+UART=?	+UART: (list of supported <baud>),(list of supported <stop>),(list of supported <parity>) OK

Defined values

<baud>	The UART baud rate
9600	
19200	
38400	
115200	
230400	
460800	
921600	
1382400	

<stop>	The number of stop bits
1	One bit
2	Two bits

<parity>	The parity to use
N	None
O	Odd
E	Even

Examples

```
AT+UART=115200,1,N          # Change UART to 115200 baud, 1 stop bit, no parity
OK
AT+UART?                    # Read current settings
+UART: 115200,1,N
OK
```

Information text and result codes

An information text is a string message provided by the DCE. It can be output at any time to inform the DTE of a specific event or status change.

URC	Description
POWER OFF	The DCE is powered off
CONNECTABLE	The DCE is connectable
PAIRING	The DCE is discoverable
PAIR FAILED	Pairing is failed or timed-out
CONNECT FAIL	Connection failed
+CONNECTED: <MAC>	Connected n Parameters <MAC> Address of the connected device n Example CONNECTED: AABBCCDDEEFF
+DISCONNECTED: <MAC>	Disconnected n Parameters <MAC> Address of disconnected device n Example DISCONNECTED: AABBCCDDEEFF

APPENDICES

APPENDIX A: LED Pattern

Status	LED Num	Working
Pairing	0	blink interval 0.2s n 0.1s ON, 0.1s OFF, ⋯ Repeated
Connected	0	blink interval 1s n 0.1s ON, 0.9s OFF, ⋯ Repeated
IDLE	0	blink interval 2s n 0.1s ON, 1.9s OFF, ⋯ Repeated
Streaming	1	blink-blink interval 2s n 0.05s ON, 0.05s OFF, 0.05s ON, 1.85s OFF, ⋯ Repeated
Call incoming	0, 1	blink-blink interval 1s n 0.05s ON, 0.05s OFF, 0.05s ON, 0.85s OFF, ⋯ Repeated
Calling	1	blink-blink interval 2s n 0.05s ON, 0.05s OFF, 0.05s ON, 1.85s OFF, ⋯ Repeated

APPENDIX B: ISSUES

List all unresolved issues, TBDs, pending decisions, findings required, conflicts, etc.

ISSUES		
ID	**DESCRIPTION**	**PARTY RESPONSIBLE**

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, under Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used by the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This

equipment should be installed and operated with a minimum distance of 20 cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:
This device is intended only for OEM integrators under the following conditions: The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter tests will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change, or new Certification. Please involve an FCC certification specialist to determine what will be exactly applicable to the end product.

Validity of using the module certification:
If these conditions cannot be met (for example certain laptop configurations or colocation with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve an FCC certification specialist to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:
The software provided for firmware upgrade will not be capable of affecting any RF parameters as certified for the FCC for this module, to prevent compliance issues.

End product labeling:
This transmitter module is authorized only for use in devices where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The end product must be labeled in avisiblea reaw withtheo followinthe g: “C contains CCID: 2A PDI-BCM-LA100-AS”.

Information that must be placed in the end user manual:
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product that integrates this module. The end user manual shall include all required regulatory information/warnings as shown in this manual.

RSS-GEN Section
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Documents / Resources

	**BNCOM BCM-SQ700-AS Bluetooth Module** [pdf] User Guide BCM-SQ700-AS Bluetooth Module, BCM-SQ700-AS, Bluetooth Module, Module

References

- **User Manual**