



BR2602e (-s/-u2) Programming Manual

December 19, 2022

V1.2

Version History

Version	Amendment	Date	Author
1.0	Initial version	2022-04-14	JunChen Liu
1.1	Add Central role command, add multi-connection and PDU mode command	2022-09-13	Rui Fan
1.2	Update default data, fix err command response	2022-12-19	Rui Fan

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1. Introduction

BR2602e (-s/-u2) Module is the Bluetooth v5.1 single mode module, and its firmware supports data transfer application over GATT server.

This document introduces module default setting and AT commands. Detailed function introduction and usages refer to 《BARROT _ BR2602e(-s/-u2)_Application Note》

This document only applies only for BR2602e (-s/-u2) module.

- Some configuration commands take effect after restart. Refer to the remarks section of the commands for reference.
- Pull low BOOT PIN to enter BOOT mode.
- Pull high PA7 PIN to enter SLEEP mode (Module is unable to receive or send data via UART); Pull low PA7 PIN, the module cannot enter SLEEP mode.

1.1. Default Setting

- Default pairing PIN code: 000000
- Module default device name: BR2602e(-s/-u2)
- BR2602e(-s/-u2) UART default setting: Baud rate 115200, 8 data bits, 1 stop bit, no parity, hardware flow control enabled.

2. FCC

FCC ID: 2AOXV-BR2602E-U2

This equipment may be operated in all European countries.

Labeling requirements. 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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to 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 in accordance with 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 receiver.
- Connect the equipment into 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure greater than or equal to 20cm compliance. This transmitter must not be colocated or operating in conjunction with any other antenna or transmitter.

The portable device is designed to meet the requirements for exposure to radio waves established by the Federal Communications Commission (USA).

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

3. Temperature Limit Characteristics

Parameter	Min	Max	Unit
Storage temperature	-40	120	°C
Operating temperature	-40	85	°C

4. Commands Format

4.1. Definition

The format of commands/indications in this document uses the following syntax:

\r carriage return

\n line break

<...> command elements. Inside angle brackets. Angle brackets are not included in the command.

[...] Optional command elements. Inside angle brackets. Angle brackets are not included in the command. Optional command elements can be ignored in the command and they may not appear in the indication.

4.2. Format

Commands format in this programming manual: AT command.

4.2.1. AT Commands

AT command is composed of ASCII characters, and it ends with “\r” (0x0d). Therefore, it should avoid using “\r” (0x0d) in the command. Once “\r” is appeared in the command, all data following “\r” will be discarded.

- Command

Command is sent from host to module in order to control the module to perform corresponding operations. The command is composed of three parts: prefix starting with “AT+”, command, suffix ending with “\r”. Command format is as follows:

Query: AT+<COMMAND>? \r

Set: AT+<COMMAND>=< Parameter > [, < Parameter >...]\r

AT+	Command prefix
< COMMAND >	Command. For example: NAME
<Parameter>	Parameter. At least one parameter. Numbers should be transferred to ASCII characters.
\r	Indication suffix.

- Indication

Return command results or parameters. The prefix is “\r \n”, the command, and the suffix is “\r\n”. The indication format is as follows:

\r\n+<INDICATION> [:< Parameter >, < Parameter >...]\r\n

\r\n+	Indication prefix
INDICATION	Indication, For example: OK,ERROR,+NAME
Parameter	Parameter. At least one parameter. Numbers should be transferred to ASCII characters.
\r\n	Indication suffix.

5. Commands & Indications

5.1. AT Commands

5.1.1. Query Firmware Version

Command	AT+GFWVER?\r
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Indication	\r\n<firmware version>\r\n\r\nOK\r\n
Parameter	firmware version
Note	N/A

5.1.2. Query Configuration Information Version

Command	AT+GVER?\r
Indication	\r\n<config_version> \r\n\r\nOK\r\n
Parameter	config_version Configuration information version
Note	N/A

5.1.3. Query Local Device Name

Command	AT+NAME?\r
Indication	\r\n+NAME:<name>\r\n\r\nOK\r\n
Parameter	name Device name. Default device name:BR2602e
Note	N/A

5.1.4. Set Local Device Name

Command	AT+NAME=<name>\r
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR \r\n
Parameter	name Device name. Default device name: BR2602e
Note	Device name maximum length is 21 bytes.

5.1.5. Query Local Bluetooth Address

Command	AT+LBDADDR?\r
Indication	\r\n+LBDADDR:<bdaddr>\r\n\r\nOK\r\n
Parameter	bdaddr Local device Bluetooth address
Note	N/A

5.1.6. Set Local Bluetooth Address

Command	AT+LBDADDR=<bdaddr>\r
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR \r\n
Parameter	bdaddr 12bytes ASCII Bluetooth address, such as 047F0E4563AE
Note	Take effect after restart

5.1.7. Query Baud Rate

Command	AT+BAUD?\r
----------------	------------

Indication	\r\n+BAUD:<baud>\r\n\r\nOK\r\n	
Parameter	baud	Baud rate. Default value: 115200
Note	N/A	

5.1.8. Set Baud Rate

Command	AT+BAUD=<baud>\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR\r\n	
Parameter	baud	Baud rate. Default value: 115200
Note	Take effect after restart. Commonly used baud rates are 38400, 57600, 115200, 230400, 256000, 460800, 921600 and etc.	

5.1.9. Query Advertising Status

Command	AT+ADV?\r	
Indication	\r\n+ADV:<adv>\r\n\r\nOK\r\n	
Parameter	adv	0: no advertising; 1: advertising.
Note	N/A	

5.1.10. Set Advertising Status

Command	AT+ADV=<adv>\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERR:<err_code>\r\n	
Parameter	adv	0: stop advertising; 1: start advertising.
Note	N/A	

5.1.11. Query Advertising Parameters

Command	AT+ADVPARAM?\r	
Indication	\r\n+ CONNPARAM:<adv_interval>\r\n\r\nOK\r\n	
Parameter	adv_interval	Advertising interval. Default value is 20 which equals to around 20ms actual advertising interval. The shorter the broadcast interval, the easier the device is to be searched, but the greater the power consumption
Note	20ms < adv_interval < 10240ms	

5.1.12. Set Advertising Parameters

Command	AT+ADVPARAM=<adv_interval>\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERR:<err_code>\r\n	
Parameter	adv_interval	Advertising interval. Default value: 20

		The shorter the broadcast interval, the easier the device is to be searched, but the greater the power consumption
--	--	--

5.1.13. Query Advertising Data

Command	AT+ADVDATA?\r	
Indication	Succeed: \r\n+ADVDATA:<data>\r\n Fail: \r\nERR:<err_code>\r\n	
Parameter	data	Advertising data within 31 bytes

5.1.14. Query Scanning Data

Command	AT+SRDATA?\r	
Indication	Succeed: \r\n+SRDATA:<data>\r\n Fail: \r\nERR:<err_code>\r\n	
Parameter	data	data within 31bytes

5.1.15. Set Scanning Data

Command	AT+SRDATA=<data>\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERR:<err_code>\r\n	
Parameter	data	data within 31bytes
Note	Refer to the command: AT+ADVDATA=<data>\r	

5.1.16. Query Connect Parameters

Command	AT+CONNPARAM?\r	
Indication	\r\n+ CONNPARAM:<intervalMin>,<intervalMax>,<connLatency>,<connTimeout>\r\n\r\nOK\r\n	
Parameter	Recommended values: intervalMin, 6 intervalMax, 12 connLatency, 0 connTimeout, 400 Definitions in Bluetooth spec: <i>intervalMin: (2 octets)</i>	
	Range	
	6 - 3200	Defines minimum value for the connection event interval in the following manner: connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.

	<i>intervalMax: (2 octets)</i>	
	Range	Parameter Description
	6 - 3200	Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> . Range: 0x0006 to 0x0C80 Time = <i>intervalMax</i> * 1.25 msec Time Range: 7.5 msec to 4 seconds.
	<i>connLatency: (2 octets)</i>	
	Range	Parameter Description
	0 - 499	Slave latency for the connection in number of connection events. Range: 0x0000 to 0x01F3
	<i>connTimeout: (2 octets)</i>	
	Range	Parameter Description
	10 - 3200	Supervision timeout for the LE Link. Range: 0x000A to 0x0C80 Time = <i>connTimeout</i> * 10 msec Time Range: 100 msec to 32 seconds

5.1.17. Set Connect Parameters

Command	AT+CONNPARAM=<intervalMin>,<intervalMax>,<connLatency>,<connTimeout>\r				
Indication	Succeed: \r\nOK\r\n Fail: \r\nERR:<err_code>\r\n				
Parameter	Recommended values: intervalMin, 6 intervalMax, 12 connLatency, 0 connTimeout, 400				
	Definitions in Bluetooth spec: <i>intervalMin: (2 octets)</i>				
	<table><tr><th>Range</th><th></th></tr><tr><td>6 - 3200</td><td>Defines minimum value for the connection event interval in the following manner: connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.</td></tr></table>	Range		6 - 3200	Defines minimum value for the connection event interval in the following manner: connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.
Range					
6 - 3200	Defines minimum value for the connection event interval in the following manner: connIntervalMin = Interval Min * 1.25 ms. Interval Min range: 6 to 3200 frames where 1 frame is 1.25 ms and equivalent to 2 BR/EDR slots. Values outside the range are reserved. Interval Min shall be less than or equal to Interval Max.				

	<i>intervalMax: (2 octets)</i>	
	Range	Parameter Description
	6 - 3200	Maximum value for the connection event interval. This shall be greater than or equal to <i>intervalMin</i> . Range: 0x0006 to 0x0C80 Time = <i>intervalMax</i> * 1.25 msec Time Range: 7.5 msec to 4 seconds.
	<i>connLatency: (2 octets)</i>	
	Range	Parameter Description
	0 - 499	Slave latency for the connection in number of connection events. Range: 0x0000 to 0x01F3
	<i>connTimeout: (2 octets)</i>	
	Range	Parameter Description
	10 - 3200	Supervision timeout for the LE Link. Range: 0x000A to 0x0C80 Time = <i>connTimeout</i> * 10 msec Time Range: 100 msec to 32 seconds

5.1.18. Search BLE Devices

Command	AT+SCAN=<scan>\r	
Indication	Succeed: \r\ndev_addr, addr_type, rssi \r\nUUID:dev_uuid \r\nNAME:dev_name \r\nMANU:manu_data \r\n fail: \r\nERR:<err_code>\r\n	
Parameter	scan	1: start searching; 0: stop searching
Note	UUID、NAME、MANU only display when they are included in advertising package. If they are not included, then they will not show. Their display sequence is not fixed and is determined by the advertising package data. Using \r\n as the end of the advertising data. This command is not currently supported.	

5.1.19. Set Target Service

Command	AT+TARGETUUID=< service_uuid >\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERR: err_code	
Parameter	service_uuid	Service UUID to be connected. Only support 16bits UUID. Regarding 128bits service, choose 12 and 13 bytes of it.

		16 bits: FF00 AT+TARGETUUID=FF00\r 128 bits: 4953 5343 -FE7D-4AE5-8FA9-9FAFD205E455 AT+TARGETUUID=5343\r
Note	This command is not currently supported.	

5.1.20. Connect

Command	AT+CONN=<addr_type>,< bdaddr >\r	
Indication	Succeed: \r\nOK\r\n \r\nIM_CONN:<cid>\r\n Fail: \r\nERR: err_code	
Parameter	bdaddr	mac address of device to be connected
	Addr_type	0:public address type;1: random address type
Note	Only support service specified by connection (set with the command: AT+TARGETUUID). The service should include two Characteristics at least. One Characteristic is properties including Notify; Another Characteristic is properties including Write or Write Without Response. If the above conditions are not satisfied, the connection will automatically release. If there are multiple Characteristics that meet the above criteria in the service, the module will select the first Characteristic for data transmission. This command is not currently supported.	

5.1.21. Connect

Command	AT+CONNOUT=<addr_type>,< bdaddr >\r	
Indication	Succeed: \r\nOK\r\n \r\nIM_CONN:<cid>\r\n Fail: \r\nERR: err_code	
Parameter	bdaddr	mac address of device to be connected
	Addr_type	4:public address type;3: random address type
Note	Compatible with BR8051 command set	

5.1.22. Disconnect

Command	AT+DISC=<cid>\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR	
Parameter	cid	Channel ID 0~1: peripheral connect(in) channel 0-7: Central connect(out) channel

	Channel ID is reported when connection is established
Note	This command is not currently supported.

5.1.23. Query Transmit Power

Command	AT+TXPOWER?\r
Indication	\r\n+TXPOWER:<power>\r\n\r\nOK\r\n
Parameter	power Transmit power. Default value: 0
Note	Power is an integer between -19 and 7

5.1.24. Set Transmit Power

Command	AT+TXPOWER=<power>\r
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR \r\n
Parameter	power Transmit power. Default value: 0
Note	Take effect after restart Power is an integer between -19 and 7

5.1.25. Query Multi-connection Mode

Command	AT+MULTICONN?\r
Indication	\r\n+ MULTICONN:<enable>\r\n\r\nOK\r\n
Parameter	enable 0: close; 1: open
Note	N/A

5.1.26. Set Multi-connection Mode

Command	AT+MULTICONN =< enable >\r
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR
Parameter	enable 0: close; 1: open
Note	N/A

5.1.27. Query PDU Mode

Command	AT+COMMAND?\r
Indication	\r\n+ COMMAND:<enable>\r\n\r\nOK\r\n
Parameter	enable 0: close; 1: open
Note	N/A

5.1.28. Set PDU Mode

Command	AT+COMMAND =< enable >\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR	
Parameter	enable	0: close; 1: open
Note	N/A	

5.1.29. Send Data With PDU Mode

LSB				MSB
octet 0	octet 1	octet2	octet 3	octet 4
'A'	'T'	'>'	<Opcode = 0x0101>	
<Total Parameters length>		<conn_hdl>		[data]
.				
.				
.				
[data]	[data]	[data]	[data]	'\r'

AT>	Command prefix, 3 bytes, ASCII。
opcode	Opcode 2 bytes。0x0101
length	Length, 2 bytes; all parameters with connection id and data.
conn_hdl	Connection id。
data	The data will send
\r	Command suffix, 1Byte, ASCII
Note	Open PDU mode will enter command mode, after connected will indicate: IM_CONN xxxx Send data need indicate connection id。 IM_CONN 0080 0080: the connection id of connect

5.1.30. Disconnect Command With PDU Mode

Command	AT+DISC =< cid >\r	
Indication	Succeed: \r\nOK\r\n Fail: \r\nERROR	
Parameter	cid	Connection id
Note	N/A	

5.2. AT Indications

5.2.1. Ready

Indication	\r\nIM_READY\r\n
Parameter	N/A
Note	Initialization completes or the connection is released. It is connectable.

5.2.2. Connect

Indication	\r\nIM_CONN:<cid>\r\n	
Parameter	cid	Channel ID 8: passive connect(in) channel 0-7: active connect(out) channel Channel ID is reported when connection is established
Note	N/A	

5.2.3. Disconnect

Indication	\r\nIM_DISC:[cid] \r\n	
Parameter	cid	Channel ID 8: passive connect(in) channel 0-7: active connect(out) channel
Note	N/A	

6. Company Profile

BARROT TECHNOLOGY CO., LTD. – Barrot is a world leading one-stop chipset level solution provider who offers wireless connectivity and audio intelligent hardware solutions featuring with own IPs. The company is an associated member of The Bluetooth SIG, and it is the only one who contributes to Bluetooth specification definition in Greater China. Barrot owns three high-tech IPs: Bluetooth RF, Bluetooth stack and Acoustic algorithms, so Barrot offers most integrated, robust, reliable, and easy-to-use wireless turn-key solutions for IOT, Automotive and Wireless audio applications.

Barrot devotes itself to being the most reliable short distance wireless technologies' solution provider in the world.

7. Contact Information

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