

BC92

Release Notes and FAQs

NB-IoT Module Series

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About the Document

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1 Introduction

This document describes release notes and some frequently asked questions (FAQs) for Quectel BC92 module.

NOTE

For details on the AT commands that are not additionally noted in this document, please refer to *Quectel_BC92_AT_Commands_Manual*.

2 Release Notes

2.1. The Baud Rate Features of BC92 Module

The baud rate setting of the main UART port of the BC92 module cannot exceed 57600 bps, and the default baud rate is 9600 bps. The baud rate of the debug port is fixed at 921600 bps and cannot be configured.

```
//The example for modifying the baud rate of main UART port.  
AT+IPR=9600 //Set the baud rate to 9600 bps.  
OK  
AT+IPR? //Query the current configuration  
+IPR: 9600  
  
OK  
AT+IPR=? //Test command  
+IPR: (2400,4800,9600,14400,19200,28800,33600,38400,57600)  
  
OK
```

2.2. Execution and Return Value Format for AT Commands

For BC92 module, refer to the format in *Quectel_BC92_AT_Commands_Manual* to carry parameters when entering the AT command. The AT command cannot carry extra spaces or characters. In the URC or the return value of AT command, the colon is followed by a space as the separator between the colon and the rest content.

```
//The example for AT commands execution and return value.  
AT+IPR=9600 //The AT command cannot carry extra spaces or characters.  
OK  
AT+IPR?  
+IPR: 9600 // In the URC or the return value of AT command, the colon is  
// followed by a space as the separator between the colon and  
// the rest content.
```


OK

2.3. The Mode of Deep Sleep and Wake-up

When the module is in deep sleep mode, the related peripherals are turned off to minimize the power consumption of the module. The serial port no longer responds to the AT command, and the CPU stops running. At this time, the module is almost in the shutdown state, and only the RTC keeps running.

The module is composed of Modem and AP. The Modem is responsible for communication with the core network. The AP is responsible for the operation of the operating system and application layer programs. Generally, when the Modem is in PSM mode and the AP is in Idle status, the module enters deep sleep mode.

2.3.1. Enter Deep Sleep Mode

Whether the module enters deep sleep mode depends on two main factors:

- Whether the current running status of AP is in Idle status.
- Whether the current configuration allows the module to enter deep sleep mode.

When the AP is in Idle status, the module checks if the current configuration allows the module to enter deep sleep mode. When the AP is in Idle status and you can enable deep sleep mode by **AT+QSCLK=1**, each of the following three conditions can carry the module to enter deep sleep mode:

- The PSM function of the Modem has been enabled by **AT+CPSMS=1**, and the Modem is in PSM mode (For the details of the Modem PSM mode, see **Chapter 4.3**).
- The PSM function of Modem is disabled by **AT+CPSMS=0**, but the eDRX function is enabled by **AT+CEDRXS=1**, and the eDRX period is greater than 327.68 s, the module will also enter deep sleep mode after PTW. (For the details of the Modem eDRX mode, please refer to **Chapter 4.2.3**).
- If the module cannot detect the USIM card after booting, it will also enter deep sleep mode.

NOTE

AT+CPSMS can be used to set the time of the active-time (T3324) requested by the module to the core network (The default request value is 2 minutes, whether the request value is valid or not depends on the network). If the Modem needs to enter PSM mode, it must reach the T3324 timeout. Therefore, the longer the T3324 time is set, the longer the module waits for entering deep sleep mode.

2.3.2. Forbid Entering Deep Sleep Mode

When the module does not need to enter deep sleep, or need to temporarily disable deep sleep before working, each of the following related AT commands can be used to configure that:

- Disable the deep sleep by **AT+QSCLK=0**. It is applicable to scenarios where the real-time requirements are not high, such as temporarily disabling the deep sleep function of the module before it works normally. Make sure the main UART port can always transmit the AT commands successfully during the operation. At this point, Modem will switch to Connected, Idle, or PSM according to the protocol (see **Chapter 4**). After the operation is completed or when deep sleep is required, the module is allowed to enter deep sleep by **AT+QSCLK=1**.
- While disabling the deep sleep by the command **AT+QSCLK=0**, disable the PSM and eDRX function of Modem by **AT+CPSMS=0**, **AT+CEDRXS=0** respectively. It is applicable to scenarios where power consumption requirement is not high but real-time requirements are high. At this point, the Modem will only switch between Connected and Idle.

2.3.3. Wake Up from Deep Sleep Mode

When the module is in deep sleep mode, the following three conditions can carry the module to wake up:

- PSM_EINT pin wake-up. BC92 module provides an interrupt pin. By pulling down this interrupt pin the module can wake up from deep sleep mode. After the module wakes up, it can respond to the AT command normally, but the Modem is still in PSM mode, and the module will enter deep sleep mode soon again, therefore, it is recommended to execute **AT+QSCLK=0** immediately after module wake-up to temporarily turn off the deep sleep function for business processing. If there is uplink data transmission, the Modem automatically exits the PSM state.
- TAU cycle wake-up. When reaching T3412 timeout, the module wakes up actively and perform TAU. At this time, the Modem exits the PSM state and the downlink data is reachable.
- eDRX cycle wake-up. When reaching eDRX cycle, the module wakes up actively and perform DRX. At this time, the Modem exits the PSM state and the downlink data is reachable.

2.4. SN and IMEI Number

SN and IMEI number have already been written into BC92 module before leaving the factory and cannot be modified. Execute **AT+CGSN=0** and **AT+CGSN=1** to query SN and IMEI number respectively.

2.5. AT+CFUN Command

AT+CFUN enables/disables the RF function. Before module power-on, check whether a USIM card has been inserted and identified or not. When you execute **AT+CFUN=1**, the RF function is enabled and the network attaching is performed. When you execute **AT+CFUN=0**, the RF function is disabled and network detaching is performed.

2.6. AT+CGDCONT and AT+QCGDEFCONT Commands

Both **AT+CGDCONT** and **AT+QCGDEFCONT** can be used to configure PDP related parameters, such as IP type (IP/IPV6), APN, etc.

In NB network:

After BC92 module attaches network, the first PDP (<cid>=1) is activated and IP address is obtained automatically. The related parameters of first PDP can only be configured by **AT+QCGDEFCONT**, and the settings are saved into module and take effect after module restart.

AT+CGDCONT configures the PDP except the first PDP, and queries all PDP configurations and IP addresses.

In GSM network:

Only **AT+CGDCONT** can be used to configure PDP related parameters of the module, and the first PDP is not activated automatically when the module powers on. After the module is attached to the GSM network, **AT+CGDCONT** configures one PDP first, and then you can execute **AT+CGACT** to activate one PDP manually.

2.7. Query IP Address

Both **AT+CGDCONT** and **AT+CGPADDR** can be used to query the IP address of the module.

AT+CGDCONT queries the PDP related configurations, including IP address, IP type and APN corresponding to <cid>. If <cid> corresponded PDP is not activated, the IP address will show all 0.

AT+CGPADDR can only be used to query the IP address while **AT+CGPADDR=<cid>** can be used to query the IP address corresponding to the specified <cid>. The command **AT+CGPADDR?** can be used to query the IP addresses of all activated PDP.

It is recommended that **AT+CGPADDR** gets the IP address, and **AT+CGDCONT** configures and queries the PDP configuration.

2.8. Attach Network

For the full-band module BC92 (Band 3, Band 5, Band 8, Band 20, and Band 28), when searching for the network for the first time and the module successfully identifies the valid cell and attaches the network, the module saves the frequency point at that time. And the module selects the saved frequency point in priority at the next network attaching. The time for attaching is about 10-15 seconds (ECL=0), the actual time depends on the network environment at that time.

```
//The example for attaching network
RDY                //Boot the module

+CFUN: 1

+CPIN: READY
AT+CREG=1          //Open automatic report when network status changes
OK

+CREG: 1           //Network attached successfully
```

2.9. Exception Recovery

When an exception occur, the module is recovered by software rebooting and hardware rebooting as follows:

1. **Software Reboot:** Software rebooting by inputting **AT+QRST=1** in the serial port, but if there is no response on serial port, this method does not take effect.
2. **Hardware Reboot:** Hardware rebooting by pulling down the RESET pin for at least 1 second. This method is taken if the software rebooting fails.

NOTES

It is suggested to reserve power-off logic in user's circuit design. In extreme cases, when both hardware and software restart cannot be restored, restart them after powering off the module.

3 FAQs

- 1) Q: How to check the values of T3324 and T3412 by AT command?
A: If the PSM function is enabled and the network has already sent the values of T3324 and T3412, when **AT+CEREG=4** or **AT+CEREG=5** is executed, the values of T3324 and T3412 can be queried by **AT+CEREG?**.

- 2) Q: How long does the module take to enter into deep sleep?
A: Entering deep sleep mode mainly depends on the current running status of the module and AT command configuration (For AT command configuration, see **Chapter 2.3.1**). Generally, after the last data packet is sent, if there is no data interaction within 20 s, the core network issues a disconnection indication, and then the Modem enters Idle status, and enters PSM mode if it reaches the T3324 timeout. At this time, if there is no task on the AP side (the AP is in the Idle status), the module enters the deep sleep mode.

- 3) Q: Is there any difference of network attaching between after the module is powered on and after the module wakes up in the PSM mode?
A: Yes.

For the network attaching after the module is powered on, the system first needs to search for the optimal effective cell. After the cell is found, the module sends an attach registration authentication request to the core network. After the authentication succeeds, the application data can be sent.

For the network attaching after the module wakes up in PSM mode, since the core network has been successfully registered before the module enters PSM, the application data can be sent as long as the most efficient cell is found.

- 4) Q: What is the USIM card voltage supported by the BC92 module?
A: BC92 supports both 1.8 V and 3 V, and automatically recognizes the USIM card voltage.

- 5) Q: Does BC92 module support the feature of NETLIGHT?
A: The NETLIGHT feature is supported and disabled by default.
And if this feature is needed, it can be enabled by executing **AT+QLEDMODE=1**, and this setting takes effect after module rebooting.

4 Appendix A Modem Mode

This chapter describes the mode changes when the Modem communicates with the core network, including the mode of Connected, DRX, ED RX, Idle and PSM. The details of each mode are shown as below.

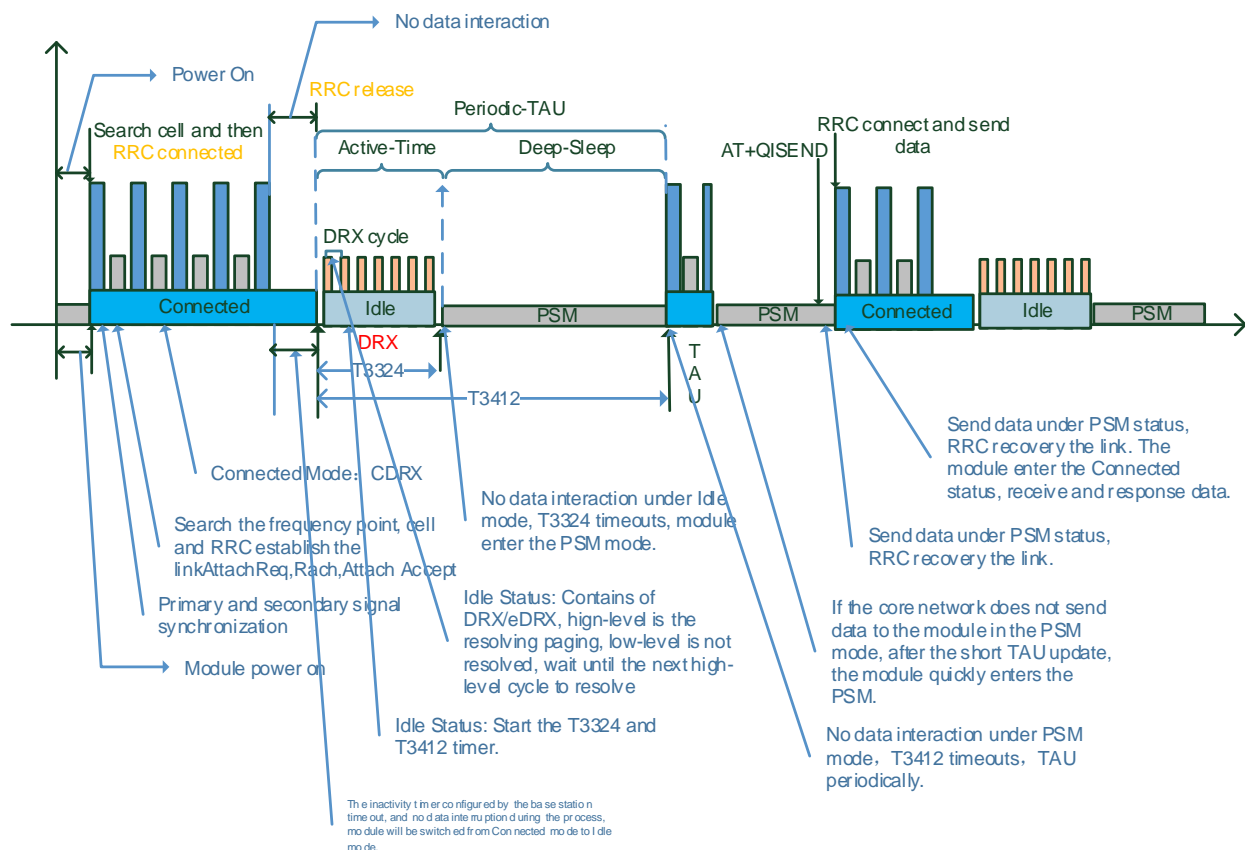


Figure 1: The Details of Each Modem Mode

4.1. Connected

After network attaching, Modem is under Connected status and the module can send/receive data. If there is no data interaction for a while, Modem enters Idle status.

4.2. Idle, DRX and eDRX

4.2.1. Idle status

Module sends/receives data when modem is under Idle status, and switch to Connected status during data sending/receiving. If there is no data interaction for a short time, modem enters PSM mode.

When modem is under Idle status, you can execute **AT+CEDRXS** to enable/disable eDRX to determine whether to use DRX or eDRX.

4.2.2. DRX Mode

DRX is one of the Modem working modes.

In order to save power, the module listens to the paging channel once per DRX cycle to check if downlink services arrives.

As shown in **Figure 2**, when Modem is under Connected status if there is no data interaction for a short time, core network will send connection release indication and then Modem enters Idle status. In the time of T3324, Modem is under DRX paging status. Since the DRX cycle is generally short, it is considered that during this time, if the IoT platform has downlink data, the delay of receiving data by the module is generally short.

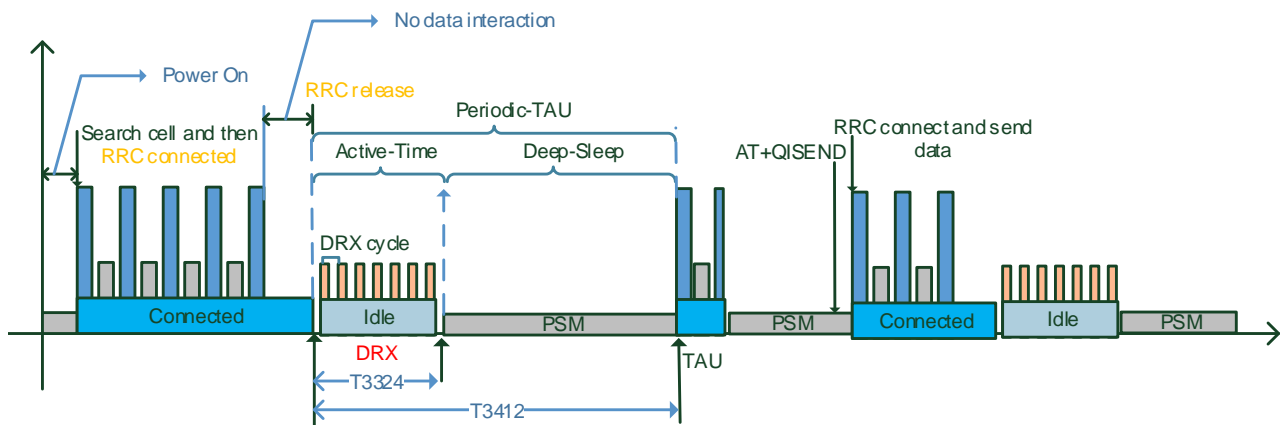


Figure 2: The Details of DRX

NOTES

1. Common DRX cycles are 1.28 s and 2.56 s.
2. DRX is determined by network and the module cannot configure it.

- The DRX is suitable for scenario with high real-time requirements but low power consumption requirements, such as smart street lights.

4.2.3. eDRX Mode

eDRX is one of the Modem working modes.

eDRX is a technology introduced by 3GPP Rel.13. eDRX has a longer paging cycle than DRX, which enables the terminal to save power better, but it also causes longer downlink data delay. The module can only listen to the paging channel within the PTW according to the DRX cycle in order to receive the downlink services, and the module cannot listen the paging channel or receive the downlink services if it is out of the PTW.

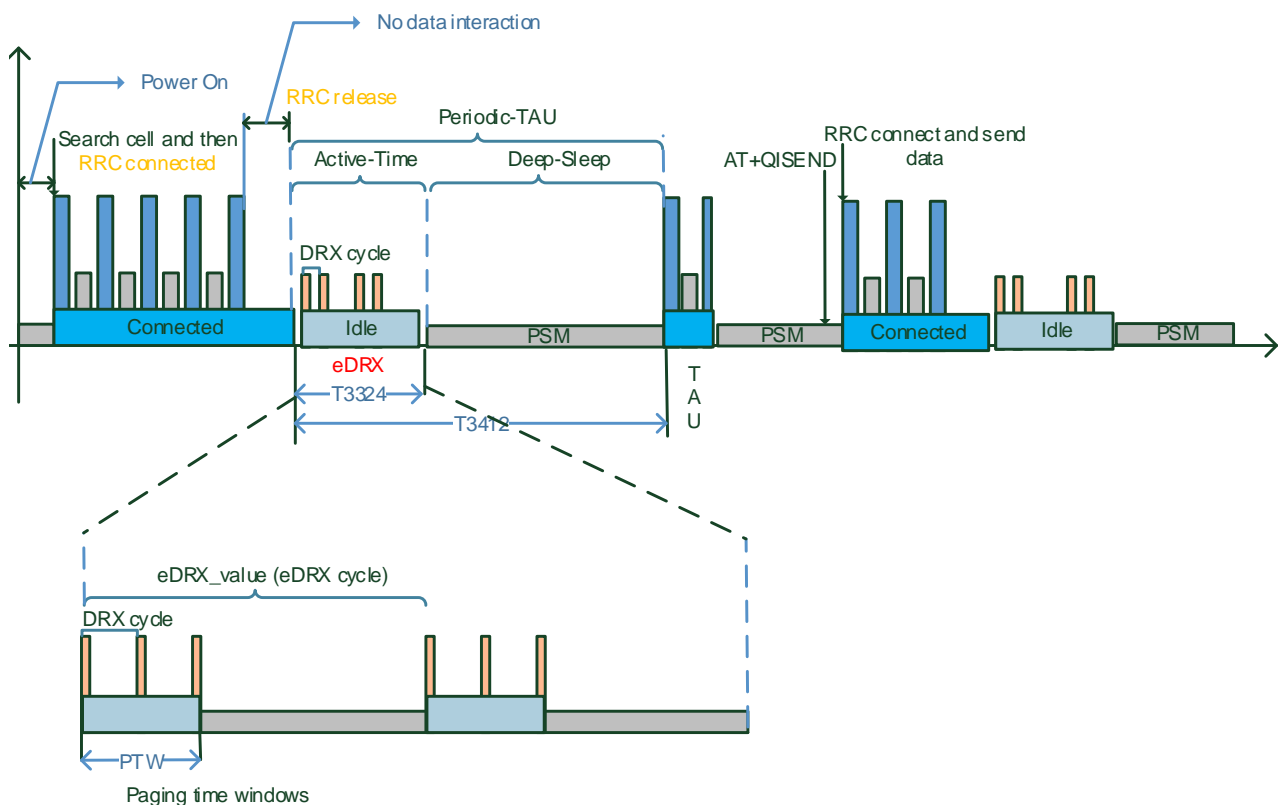


Figure 3: The Details of eDRX

NOTES

- Common eDRX cycles are 20.48 s and 81.92 s.
- eDRX can be configured by **AT+CEDRXS**, but the network determines whether to accept it being configured.

4.3. PSM Mode

PSM is one of Modem working modes. Under this mode, the terminal turns off the signal transceiver and does not listen to the paging on the wireless side. Therefore, although it is still registered in the network, the signaling is unreachable and the module cannot receive the downlink data. The duration (T3412) is configured by the core network. If there is uplink data to be transmitted or the TAU cycle ends, the Modem enters Connected mode.

PSM is a technology introduced by *3GPP Rel.12*; the principle is to allow the Modem to close the signal transmission and reception and AS related functions after a period of Idle state (T3324), thereby reducing the power consumption for antenna, radio frequency, signaling processing, etc.. During the PSM, the module does not receive any network paging and closes the networking activities including searching for cell messages, cell reselection, etc. For the network side, the module no longer receives downlink data, and is unreachable at this time.

NOTE

You can use **AT+CPSMS** to enable/disable PSM and configure the duration of TAU and active-time, but the network determines whether to accept the configuration.

5 Appendix B References

Table 1: Terms and Abbreviations

Abbreviation	Description
AP	Application Process
APN	Access Point Name
AS	Access Layer
CPU	Central Processing Unit
DRX	Discontinuous Reception
DTLS	Datagram Transport Layer Security
ECL	Enhanced Coverage Level
eDRX	Extended Discontinuous Reception
FAQ	Frequently Asked Question
IMEI	International Mobile Equipment Identity
IoT	Internet of Things
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LPWA	Low-Power Wide-Area
LwM2M	Lightweight M2M
PDN	Public Data Network
PDP	Packet Data Protocol
PSM	Power Saving Mode
PTW	Paging Time Window
RF	Radio Frequency

RTC	Real Time Clock
SN	Serial Number
TAU	Tracking Area Update
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
