GENERAL

at commands quectel

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Understanding AT Commands for Quectel Modules

Quectel, a leading provider of cellular modules, equips developers with a powerful interface to control and configure their devices: the AT command set. AT commands—short for Attention commands—are a standardized way to communicate with modems over a serial interface. Whether you're building an IoT gateway, a mobile broadband router, or a vehicle telematics system, mastering Quectel AT commands unlocks the full potential of the module's hardware and firmware. This guide dives deep into the structure, categories, and practical usage of Quectel AT commands, offering you a step by step reference that balances theory with real world application.

Why AT Commands Matter for Quectel Users

When you purchase a Quectel module—such as the EC20 LTE, EC25 NB IoT, or the BG96 LTE M/NB IoT combo—you're not just getting a piece of silicon. You're receiving a programmable interface that lets you:

- Configure network registration and security.
- Manage data connections and TCP/IP sockets.
- Send and receive SMS messages.
- Control power states and low power modes.
- Access advanced features like voice, GPS, or firmware updates.

AT commands are the lingua franca of cellular modules, and Quectel's implementation follows the 3GPP and AT command specifications closely. By learning the syntax and semantics, you can write firmware that runs on a microcontroller, a Linux system, or even a cloud service that directly speaks to the module.

Getting Started: The Basics of AT Command Syntax

Every AT command starts with the prefix AT (short for "Attention"). Following the prefix, the command may include parameters, separators, and optional terminators. A typical command looks like this:

AT+CGATT=1\\n\\n\\nHere's a quick breakdown of the components:

- Command prefix: AT
- Command identifier: +CGATT (attaches the device to the GPRS network)
- Parameter list: 1 (value to set)
- Separator: = (used for commands that set or query parameters)
- Response terminator: CRLF (carriage return + line feed, typically sent automatically by the terminal)

Commands can be categorized into three main types:

1. Query commands – return the current state or configuration. Example: AT+CGATT?
2. Set commands – change a configuration value. Example: AT+CGATT=1
3. Command execution – trigger an action without parameters. Example: AT+CSQ (query signal quality)

When a command is processed, the module replies with either OK (success) or ERROR (failure). For query commands, the module usually precedes the OK with the requested information.

Connecting to the Quectel Module: Hardware and Software Setup

Before you can issue AT commands, you must establish a reliable serial connection. Quectel modules typically

expose a UART interface that can be connected to a microcontroller, a Linux serial port, or a USB to UART adapter. The default baud rate is often 115200 /bps, but you can reconfigure it using the AT+IPR command.

1. Connect the module's TX pin to the RX pin of your host device, and vice versa.
2. Match the ground (GND) and supply voltage (3.3 /V or 1.8 /V, depending on the module).
3. Open a terminal program (e.g., PuTTY, minicom, or a serial library in Python).
4. Send the command AT and expect an OK response.

Once the basic communication is confirmed, you can begin configuring the module. A common first step is to set the APN for your carrier:

AT+CGDCONT=1,"IP","your.apn.here"\\n\\n\\nWith the APN configured, you can bring up a data context and start sending packets over the network.

Exploring Quectel AT Command Categories

Quectel's AT command set is extensive, covering everything from basic modem control to advanced IoT features. Below, we break down the main categories and provide representative commands that illustrate each group's functionality.

1. System and Power Management

These commands allow you to monitor and control the module's hardware state, firmware, and power consumption.

- AT+CGMR – Query firmware version.
- AT+CFUN=0/1/4 – Set full functionality, minimal functionality, or reset.
- AT+CPWROFF – Shut down the module.
- AT+CSCLK – Configure clock settings.
- AT+CGPADDR – Get IP address of the context.

2. Network Registration and Status

Network registration commands help you determine the module's connectivity status and network parameters.

- AT+CREG? – Query GPRS network registration.
- AT+CGREG? – Query GPRS registration for 3G/4G.
- AT+COPS? – Query operator selection.
- AT+CSQ – Query signal quality.
- AT+CGATT? – Check GPRS attachment state.

3. SMS Management

SMS commands let you send, receive, and manage text messages. Quectel supports both text and PDU modes.

- AT+CMGF=1/0 – Set text or PDU mode.
- AT+CMGS="phone" – Send SMS.
- AT+CMGL="ALL" – List all stored messages.
- AT+CMGD=1 – Delete a message.
- AT+CMGR=1 – Read a message.

4. Data Connection and TCP/IP Sockets

These commands manage data contexts and TCP/IP sockets, essential for IoT applications that need to send HTTP requests or stream data.

- AT+CGDCONT=1,"IP","apn" – Define PDP context.

- AT+CGACT=1,1 – Activate context 1.
- AT+CIPSTART="TCP","host","port" – Open a TCP socket.
- AT+CIPSEND – Send data over the socket.
- AT+CIPCLOSE – Close the socket.
- AT+CIPSTATUS – Query socket status.

5. Advanced Features (NB IoT, LTE M, Voice, GPS)

Quectel modules often support specialized modes for narrowband IoT, LTE M, voice, and location services.

- AT+CGDCONT=1,"NB","apn" – Define NB IoT context.
- AT+CGATT=1 – Attach to NB IoT network.
- AT+CGPS=1 – Enable GPS.
- AT+CGPSINFO – Query GPS data.
- AT+CLIP – Caller ID for voice calls.
- AT+CPBS="SM" – Phonebook management for voice.

6. Firmware and OTA Updates

Updating the module's firmware is critical for security and feature enhancements. Quectel provides AT commands to initiate OTA updates.

- AT+QFWUPD="url" – Start firmware update from a URL.
- AT+QFWUPD? – Query update status.
- AT+QFWUPD=0 – Cancel update.

Building a Practical AT Command Sequence

Below is a typical workflow for setting up a Quectel module for an IoT device that needs to send sensor data to a cloud endpoint via HTTP.

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