HUAWEI ME909u-523 LTE LGA Module
V100R001

Application Guide

Issue 04

Date 2014-12-08

Copyright © Huawei Technologies Co., Ltd. 2014. All rights reserved.

No part of this manual may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd. and its affiliates ("Huawei").
The product described in this manual may include copyrighted software of Huawei and possible licensors. Customers shall not in any manner reproduce, distribute, modify, decompile, disassemble, decrypt, extract, reverse engineer, lease, assign, or sublicense the said software, unless such restrictions are prohibited by applicable laws or such actions are approved by respective copyright holders.

Trademarks and Permissions

HUAWEI, HUAWEI, and are trademarks or registered trademarks of Huawei Technologies Co., Ltd.
LTE is a trade mark of ETSI.
Other trademarks, product, service and company names mentioned may be the property of their respective owners.

Notice

Some features of the product and its accessories described herein rely on the software installed, capacities and settings of local network, and therefore may not be activated or may be limited by local network operators or network service providers.
Thus, the descriptions herein may not exactly match the product or its accessories which you purchase.
Huawei reserves the right to change or modify any information or specifications contained in this manual without prior notice and without any liability.

DISCLAIMER

ALL CONTENTS OF THIS MANUAL ARE PROVIDED “AS IS”. EXCEPT AS REQUIRED BY APPLICABLE LAWS, NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE MADE IN RELATION TO THE ACCURACY, RELIABILITY OR CONTENTS OF THIS MANUAL.
TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL HUAWEI BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, OR LOSS OF PROFITS, BUSINESS, REVENUE, DATA, GOODWILL SAVINGS OR ANTICIPATED SAVINGS REGARDLESS OF WHETHER SUCH LOSSES ARE FORSEEABLE OR NOT.
THE MAXIMUM LIABILITY (THIS LIMITATION SHALL NOT APPLY TO LIABILITY FOR PERSONAL INJURY TO THE EXTENT APPLICABLE LAW PROHIBITS SUCH A LIMITATION) OF HUAWEI ARISING FROM THE USE OF THE PRODUCT DESCRIBED IN THIS MANUAL SHALL BE LIMITED TO THE AMOUNT PAID BY CUSTOMERS FOR THE PURCHASE OF THIS PRODUCT.

Import and Export Regulations

Customers shall comply with all applicable export or import laws and regulations and be responsible to obtain all necessary governmental permits and licenses in order to export, re-export or import the product mentioned in this manual including the software and technical data therein.

Privacy Policy

To better understand how we protect your personal information, please see the privacy policy at http://consumer.huawei.com/privacy-policy.

About This Document

Revision History

Document Version	Date	Chapter	Description
01	2014-05-22		Creation
02	2014-09-05	2.3.1	Updated reference process
		15	Added chapter 15: FOTA Application Scenarios
03	2014-10-30	12.1.4	Updated the description of step 1
04	2014-12-08	8.3.2	Updated notes of USB and sleep

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Contents

1 Overview 9
1.1 Conventions and Definitions 9
1.1.1 Conventions 9
1.1.2 Definitions 9
1.2 Basic AT Command Processing Principles 10
1.2.1 Ports 10
1.2.2 AT Command Processing Mechanism 10
1.2.3 Recommended Timeout Mechanism for AT Commands Processed by a Host 13
2 Initialization Application Scenarios 15
2.1 Startup Indication ^SYSSTART 15
2.1.1 Reference Process 15
2.1.2 Troubleshooting 15
2.2 Querying Basic Information 16
2.2.1 Reference Process 16
2.2.2 Troubleshooting 16
2.3 Network Service Operations 17
2.3.1 Reference Process 17
2.3.2 Troubleshooting 18
3 Network Searching and Registration Application Scenarios 19
3.1 Searching and Registering Network 19
3.1.1 Reference Process 19
3.1.2 Troubleshooting 21
4 ECM Application Scenarios 22
4.1 ECM Dialing 22
4.1.1 Reference Process 22
4.1.2 Troubleshooting 23
4.2 Querying the Dial-up Connection State 23
4.2.1 Reference Process 23
4.2.2 Troubleshooting 24
4.3 Disconnecting the Dial-up Connection 24
4.3.1 Reference Process 24
4.3.2 Troubleshooting 24

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5 SMS Application Scenarios 25
5.1 Overview 25
5.2 Initializing SMS 27
5.2.1 Reference Process 27
5.2.2 Troubleshooting 30
5.3 Sending Short Messages 30
5.3.1 Reference Process 30
5.3.2 Troubleshooting 32
5.4 Reading Short Messages 32
5.4.1 Reference Process 32
5.4.2 Troubleshooting 34
5.5 Deleting Short Messages 35
5.5.1 Reference Process 35
5.5.2 Troubleshooting 36
6 Phonebook Application Scenarios 37
6.1 Overview 37
6.2 Memory Operations 37
6.2.1 Reference Process 37
6.2.2 Troubleshooting 38
6.3 Reading Phonebook Entries 39
6.3.1 Reference Process 39
6.3.2 Troubleshooting 40
6.4 Writing/Deleting Phonebook Entries 41
6.4.1 Reference Process 41
6.4.2 Troubleshooting 42
6.5 Searching for Phonebook Entries 43
6.5.1 Reference Process 43
6.5.2 Troubleshooting 44
6.6 Querying User Number 44
6.6.1 Reference Process 44
6.6.2 Troubleshooting 44
6.7 Setting the TE's Character Sets 45
6.7.1 Reference Process 45
6.7.2 Troubleshooting 46
7 SIM Operation Application Scenarios 47
7.1 PIN Operations 47
7.1.1 Reference Process 47
7.1.2 Troubleshooting 49
7.2 CRSM Command 49
7.2.1 Reference Process 49
7.2.2 Troubleshooting 51

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

8 Sleeping and Waking Up Application Scenarios 52
8.1 Hardware Interfaces 53
8.2 Sequence Diagram 54
8.3 Software Interfaces 56
8.3.1 Principle 56
8.3.2 USB and Sleep 58
8.3.3 UART and Sleep 58
8.3.4 Module Wake-up 58
8.3.5 Host Woken up by Module 59
8.4 Application Scenarios: System with USB Connection only 60
8.4.1 Hardware Connection 60
8.4.2 Software Procedure 60
8.4.3 Advantages 61
8.5 Application Scenarios: System with USB and WAKEUP_OUT 61
8.5.1 Hardware Connection 61
8.5.2 Software Procedure 61
8.5.3 Advantages 62
8.6 System with Other Connection Methods 62
9 Thermal Protection Application Scenarios 63
9.1 Pre-configuration 63
9.1.1 Troubleshooting 63
9.2 Thermal Protection Process 63
10 Module Powering Off and Resetting Application Scenarios 65
10.1 Restarting the ME 65
10.1.1 Reference Process 65
10.1.2 Troubleshooting 65
10.2 Powering Off ME 65
10.2.1 Reference Process 65
10.2.2 Troubleshooting 66
11 GPS Application Scenarios 67
11.1 Introduction to GPS 67
11.1.1 GPS Positioning Methods 67
11.1.2 GPS Ports 69
11.2 Standalone Positioning 70
11.3 MSB Positioning Using the User Plane Protocol 71
11.4 MSA Positioning Using the User Plane Protocol 72
11.5 XTRA Positioning 73
11.6 GNSS Positioning 74
12 Local Upgrade Application Scenarios 76
12.1 Starting the Local Upgrade 76

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

12.1.1 Full Upgrade Flow 76
12.1.2 Launch the Local Upgrade 77
12.1.3 Transfer the Upgrade File 77
12.1.4 Test 78
12.1.5 Reference Process 81
12.1.6 Troubleshooting 82
12.2 Reporting the Local Upgrade State 82
12.2.1 Reference Process 82
12.2.2 Troubleshooting 82
13 LED Indication Application Scenarios 83
13.1 Overview 83
13.2 LED Setting Operations 84
13.2.1 Reference Process 84
13.2.2 Troubleshooting 85
14 Serial Port Configuration Application Scenarios 86
14.1 Baud Rate Configuration 86
14.1.1 Reference Process 86
14.1.2 Troubleshooting 86
14.2 Setting Hardware Flow Control 87
14.2.1 Reference Process 87
14.2.2 Troubleshooting 87
15 FOTA Application Scenarios 88
15.1 FOTA Process 88
15.1.1 Upgrade Module Firmware Over Air Through Delta Package 88
15.1.2 Procedure for FOTA Implementation 88
15.2 Setting FOTA Mode 91
15.2.1 Reference Process 91
15.2.2 Troubleshooting 91
15.3 Setting FOTA Connection Parameters 92
15.3.1 Reference Process 92
15.3.2 Troubleshooting 92
15.4 Manually Querying for Upgrade Firmware Version 93
15.4.1 Reference Process 93
15.4.2 Troubleshooting 94
15.5 Periodically Querying the Version 95
15.5.1 Reference Process 95
15.5.2 Troubleshooting 95
15.6 Manually Downloading the Version 96
15.6.1 Reference Process 96
15.6.2 Troubleshooting 97
15.7 Automatically Downloading the Firmware 98

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.7.1 Reference Process 98
15.7.2 Troubleshooting 98
15.8 Using the Resumable Data Transfer Function 98
15.8.1 Reference Process 98
15.8.2 Troubleshooting 99
15.9 Manually Cancelling the Download 99
15.9.1 Reference Process 99
15.9.2 Troubleshooting 100
15.10 Manually Upgrading the Version 100
15.10.1 Reference Process 100
15.10.2 Troubleshooting 101
15.11 Automatically Upgrading the Version 101
15.11.1 Reference Process 101
15.11.2 Troubleshooting 102
16 Appendix 103
16.1 Relative Documents 103
16.2 Acronyms and Abbreviations 103

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

1 Overview

This document is intended to provide references for customers to choose appropriate command sequences to start using the ME909u-523 module in a faster manner. This document also contains examples and relevant description.

This document will be updated based on customers' requirements.

1.1 Conventions and Definitions

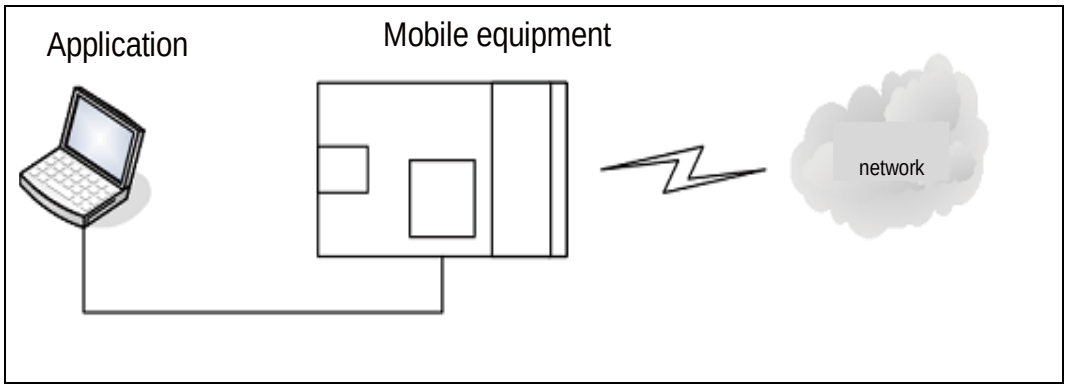
1.1.1 Conventions

Convention	Description
<…>	Value range of AT command parameters
XXXX	Personal Identification Number (PIN), Personal Unlock Key (PUK), or password

1.1.2 Definitions

Term	Definition
Connected	Indicates that a link has been set up between two modules or a module and a terminal.
Registered	Indicates that the module is registered with a LTE/UMTS/GSM network.
Module	HUAWEI LTE module

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.



1.2 Basic AT Command Processing Principles

1.2.1 Ports

The ME909u-523 module provides four ports to interact with its host:

- MODEM port: simulated using USB, for AT command interaction and establishing data connection.

  Port name: HUAWEI Mobile Connect-Modem
- PCUI port: simulated using USB, for AT command interaction only.

  Port name: HUAWEI Mobile Connect-PCUI Interface
- ECM port: simulated using USB, for establishing communication connection.

  Port name: CDC Ethernet Control Model (ECM)
- NMEA port: simulated using USB, sending unsolicited indications for NMEA positioning data and sending GPS AT command.

  Port name: HUAWEI Mobile Connect-GPS Interface

NOTE

The ME909u-523 module does not support the modem dialing-up.

The ME909u-523 also provides a port for debugging:

- DIAG port: Simulated using USB, for DIAG (diagnostic) command interaction (mainly used to debug modules at present).

  Port name: HUAWEI Mobile Connect-Application Interface

A host controls a module using AT commands. If AT commands are unavailable, a module can be deemed as unavailable.

1.2.2 AT Command Processing Mechanism

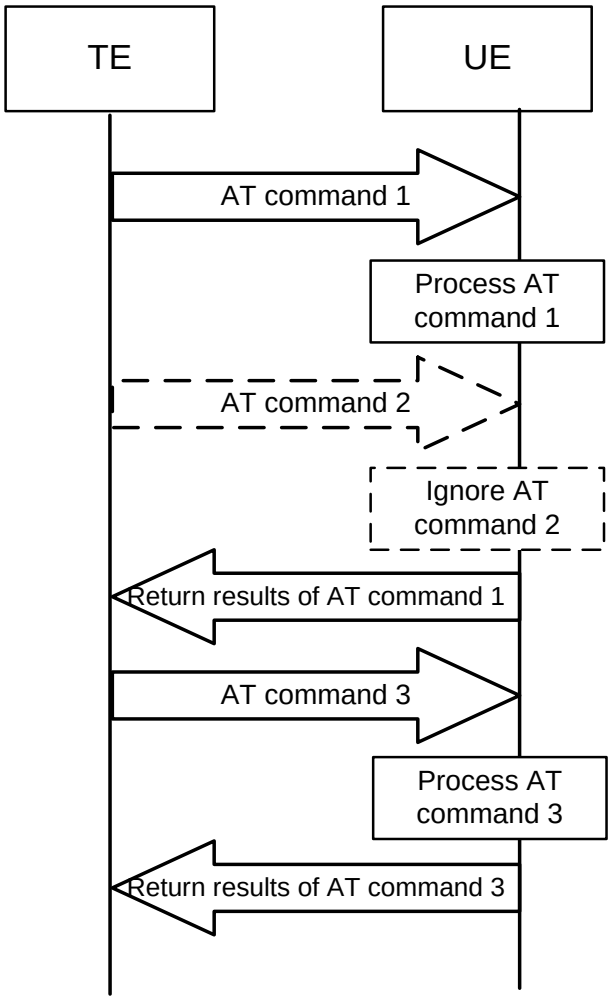
A module processes AT commands from the ports (MODEM, PCUI, GPS and UART) in series. An AT command can be processed when and only when the previous AT command processing has been completed. If the module is processing an AT command, a new AT command from the same port will be ignored and other commands from other ports will be buffered until the current AT command is processed.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

This rule also applies to COM ports converted from USB ports.

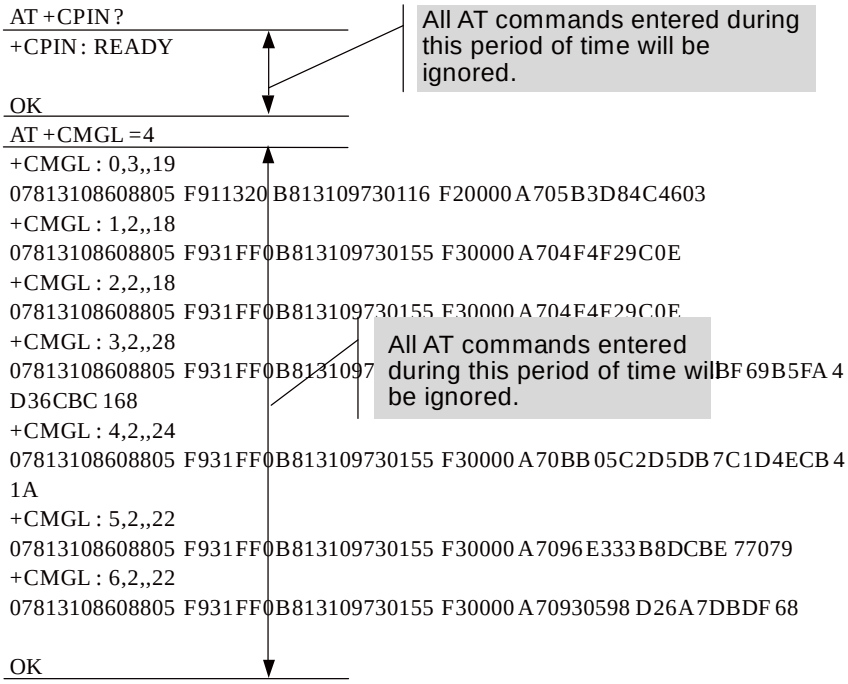
The processing of an AT command starts when the AT command is entered from the TE, and ends when the UE (the module) returns all the results in response the command.

Figure 1-1 AT command processing sequence diagram



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Example:



Some special AT commands can be aborted by new AT commands. Such special commands are called abortive commands.

The ME909u-523 supports the following abortive AT commands:

- The AT+COPS Set command
- AT+CLCK

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Example:

AT+COPS=1,2,23415 OK	Before the results of AT+COPS is returned, enter any characters (such as "AT"), the module will terminate the processing of AT+COPS and return **OK**. The entered characters are used to abort the command only .

Some commands can be executed when SIM card is inserted. It would return to SIM failure if SIM card is not inserted. For more information, see Property Description of related AT in *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

Example:

AT+CREG?

+CME ERROR: SIM failure

NOTE

SIM failure indicates that SIM card is not inserted.

1.2.3 Recommended Timeout Mechanism for AT Commands Processed by a Host

A module processes AT commands in series. Do not send another AT command before the result for the current command is returned or the current command times out (except when the current command is an abortive AT command). The following table lists AT command timeout durations (starting from the time when an AT command arrives at a port).

Table 1-1 AT command timeout duration

AT Command	Timeout Duration
General AT commands	30s
AT+CMSS/AT+CMGS (used to send text messages)	60s
AT+COPS=? (used to search for networks)	120s

After an AT command times out, it is recommended that the host check whether the module is functioning normally. The following procedure is provided for your reference:

1. The host sends **AT** to the module.
2. If the module returns failure information, go to step 5.
3. If the module returns success information, the module is functioning normally.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

4. If the host times out (the host waits for a response for over 30 seconds) three times when waiting for the response from the module, go to step 5. Otherwise go to step 1.
5. The host deems that the current module does not exist or is unavailable. Close the port, stop sending all AT commands, exit the procedure to determine whether the module is normal, and re-search for modules.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

2 Initialization Application Scenarios

2.1 Startup Indication ^SYSSTART

2.1.1 Reference Process

Command	Description
	A module, without solicitation, presents **^SYSSTART** to its host to indicate that the module is starting.
^SYSSTART	Indicate that a module is starting.

NOTE

- **^SYSSTART** is presented only when a module is starting and will not be presented after a module has started.
- **^SYSSTART** is presented only after the radio frequency (RF) initialization completes and will not be presented in offline mode.
- **^SYSSTART** is only report on URAT port, USB port not demanded.

2.1.2 Troubleshooting

Scenario	Possible Error Information	Solution
The module presents **^SYSSTART** during startup. After that, the module presents **^SYSSTART** again.	Indicate that the module has been reset.	If **^SYSSTART** is presented repeatedly, send the module to the specified repair center.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

2.2 Querying Basic Information

2.2.1 Reference Process

Command	Description
AT+GMR/CGMR	Query software version.
Software version **OK**	Software version. e.g. **11.430.37.00.00**
AT+GMI/CGMI	Query manufacturer identification.
Manufacturer Identification **OK**	For example: **Huawei Technologies Co., Ltd.**
AT+GMM/CGMM	Query model identification.
Model identification **OK**	For example: **ME909u-523**
AT+GSN/CGSN	Query product IMEI.
IMEI **OK**	For example: **865261010004010**

NOTE

The previously listed commands are query commands and cannot be used to configure settings.

2.2.2 Troubleshooting

Scenario	Possible Error Information	Solution
AT+GSN/CGSN	**+CME ERROR: memory failure**	This error occurs when a module's IMEI is not specified. This problem is solved after the IMEI is written into the module.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

2.3 Network Service Operations

2.3.1 Reference Process

Command	Description
AT+CFUN?	Query a module's current mode. **1** indicates online mode.
+CFUN: 1 **OK**	
AT+CPIN?	Query whether a module's SIM card is password protected. **READY** indicates that the SIM card is ready.
+CPIN: READY **OK**	
AT^HCSQ?	Query the network signal quality.
^HCSQ: "WCDMA",30,30,58 **OK**	
AT+COPS?	Return the current network selection mode, information about the operator with which the module is registered, and the wireless access standard.
+COPS: "Network status information" **OK**	For example: **+COPS: 1,0, "China Mobile Com"**
AT+COPS=0	Automatically search for networks.
OK	
AT+CREG?	Query the state of the currently registered network.
+CREG: 0,1 **OK**	
AT+CREG=1	Set the **+CREG** unsolicited indication.
OK	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

AT+CGDCONT=1,"IP","CMNET"[1]	Set specific PDP context. It is an example of packet data service settings. Set the PDP context required by packet data service dial-up.
OK	

NOTE

[1] Set the correct APN when data service is initialized.

2.3.2 Troubleshooting

Scenario	Possible Error Information	Solution
AT+COPS?	**+CME ERROR: SIM failure**	No SIM card is detected. Insert a SIM card.
AT+CREG?	**+CME ERROR: SIM failure**	No SIM card is detected. Insert a SIM card.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

3 Network Searching and Registration Application Scenarios

3.1 Searching and Registering Network

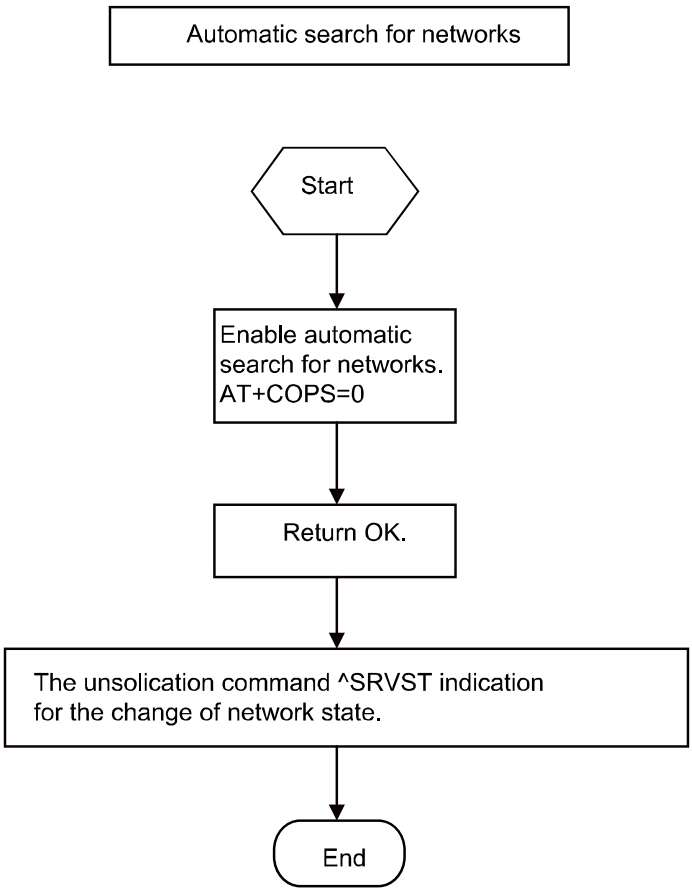
3.1.1 Reference Process

Command	Description
AT+COPS=0	Enable automatic search for networks.
OK	
AT+COPS=1,2,"46000"	Manual search for the appointed network.
OK	
AT+COPS=?	Search for all networks, and return the networks.
OK	
AT+CREG=2	Enable the unsolicited indication when network registration state changes.
OK	
AT^SYSCFGEX="00",3FFFFFFF,1,2,7FFFFFFFFFFFFFFF,,	Set the system mode, network access order, frequency band, roaming support, domain, and other features.
OK	
AT^SYSINFOEX	Query the system service state, domain, roaming status, and system mode.
^SYSINFOEX: 1,0,1,255,,3,"WCDMA",41,"WCDMA" **OK**	
AT^HCSQ?	Query the signal quality.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

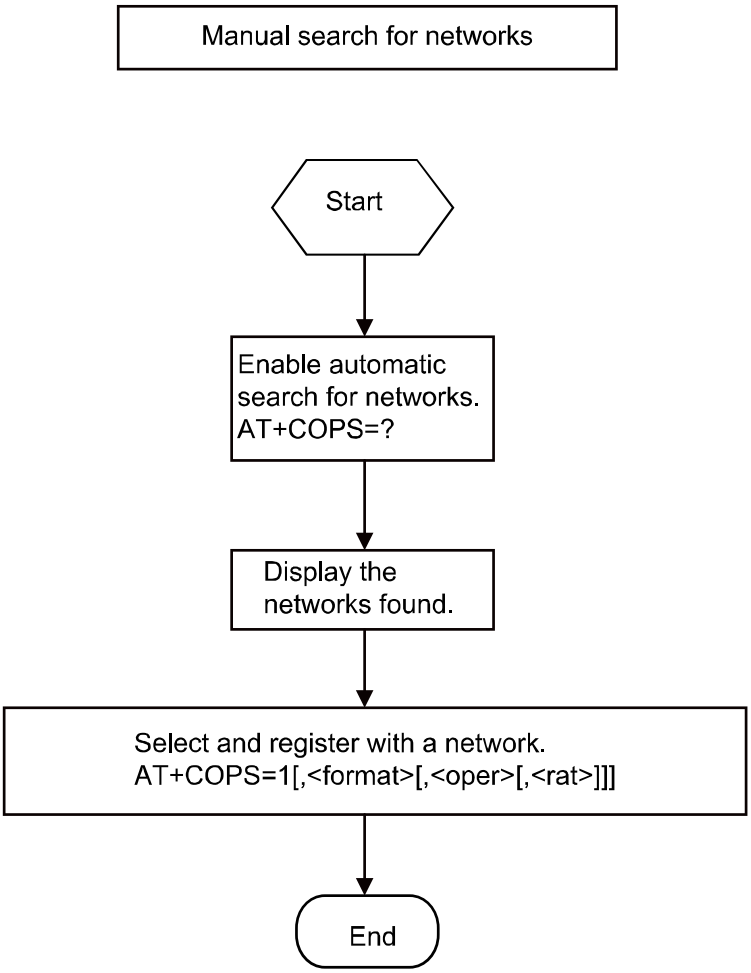
Command	Description
^HCSQ: "WCDMA",15,12,46 **OK**	

Figure 3-1 Automatic search for networks



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 3-2 Manual search for networks



3.1.2 Troubleshooting

Scenario	Possible Error Information	Solution
AT+COPS?	**+CME ERROR: SIM failure**	No SIM card is detected. Insert a SIM card.
AT+CREG?	**+CME ERROR: SIM failure**	No SIM card is detected. Insert a SIM card.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

4 ECM Application Scenarios

4.1 ECM Dialing

4.1.1 Reference Process

Command	Description
AT^NDISDUP=?	Check the parameter range supported by the command.
^NDISDUP: (1-16),(0-1) **OK**	
AT^NDISDUP=1,1,"1234"	Set up a dial-up connection using the APN provided by the network server.
OK	The command is successfully executed.
^NDISSTAT: 1,,,"IPV4"	Report the dial-up connection state.
AT^NDISDUP=1,1,"4321","huawei", "huawei",1	Set up a dial-up connection using the account, password, and authentication mode provided by the network server.
OK	The command is successfully executed.
^NDISSTAT: 1,,,"IPV4"	Report the dial-up connection state.

The process of obtaining the IP address:

1. After host application sending AT^NDISDUP command to launch or terminal the ECM connection, Huawei module will report the ^NDISSTAT command to indicate the connection state.
2. Host application can get the connection state from ^NDISSTAT report, if the connection state updated, the host application should to launch the dhcp client to update the ECM IP address or disable the ECM.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

3. Host application also can send AT command AT^NDISSTATQRY? to query the current ECM connection state, and determine to update or disable the ECM by the dhcp client.

4.1.2 Troubleshooting

Scenario	Possible Error Information	Solution
AT^NDISDUP=1,1,"1234"	**+CME ERROR: SIM failure**	No SIM card is detected. Insert a SIM card.
AT^NDISDUP=1,1,"4321", "huaei","huawei",1	**OK** **^NDISSTAT: 0,33,,"IPV4"** **^NDISEND:1,29**	**NDISEND** indicates the failure reason during the dial-up. **29** indicates that the authenticated information is not correct.
AT^NDISDUP=1,1,"abcd"	**OK** **^NDISSTAT: 0,33,,"IPV4"** **^NDISEND:1,33**	**NDISEND** indicates the failure reason during the dial-up. **33** indicates that request service is not specified. In this case, the network don not support this APN "abcd".

4.2 Querying the Dial-up Connection State

4.2.1 Reference Process

Command	Description
AT^NDISSTATQRY?	Query the dial-up connection state.
^NDISSTATQRY: 0,0,,"IPV4" **OK**	Report that the connection is not set up.
AT^NDISSTATQRY?	Query the dial-up connection state.
^NDISSTATQRY: 1,,, "IPV4" **OK**	Report that the connection is set up.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

4.2.2 Troubleshooting

None

4.3 Disconnecting the Dial-up Connection

4.3.1 Reference Process

Command	Description
AT^NDISDUP=1,0	Disconnect the dial-up connection.
OK	The command is successfully executed.
^NDISSTAT:0,,,"IPV4"	IPv4 changes from the connected state to the disconnected state.

4.3.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5 SMS Application Scenarios

5.1 Overview

Short Message Service (SMS) is a text messaging service using a service center (SC) to transfer short text messages between MEs and Short Message Entities (SMEs).

A message must contain the following information before it is sent:

For a PDU mode message:

- Length of TPDU package
- Message content: To compose or send a PDU mode message, the message must contain all the message attributes and be encoded in PDU format. A PDU consists of the following:
  - Service Center Address (SCA): composed of the address length, SCA type and SCA reverse byte.
  - First octet: contains the message type indicator, TP-RP, TP-UDHI, TP-SRR, TP-VPF, TP-RD, and TP-MTI.
  - Short text message statement.
  - Destination address: consisting of the destination address, address length and destination address type.
  - Protocol identifier.
  - Data encoding scheme.
  - Validity duration.
  - Data length.
  - User data: consisting of the user data header and the data encoded in PDU format.

Figure 5-1 shows an example of data encoded in PDU format of submitted type.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 5-1 Example of data encoded in PDU format of submitted type

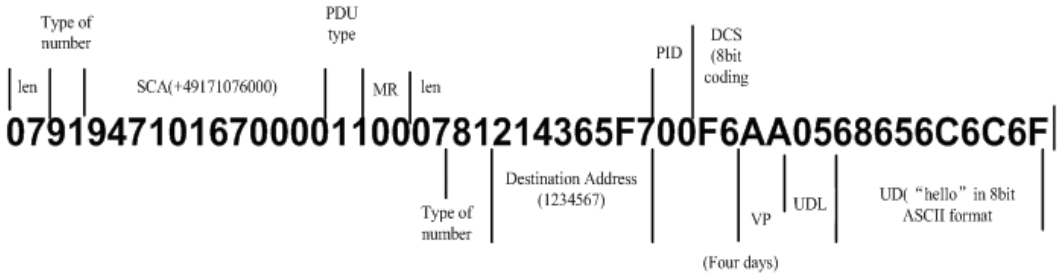
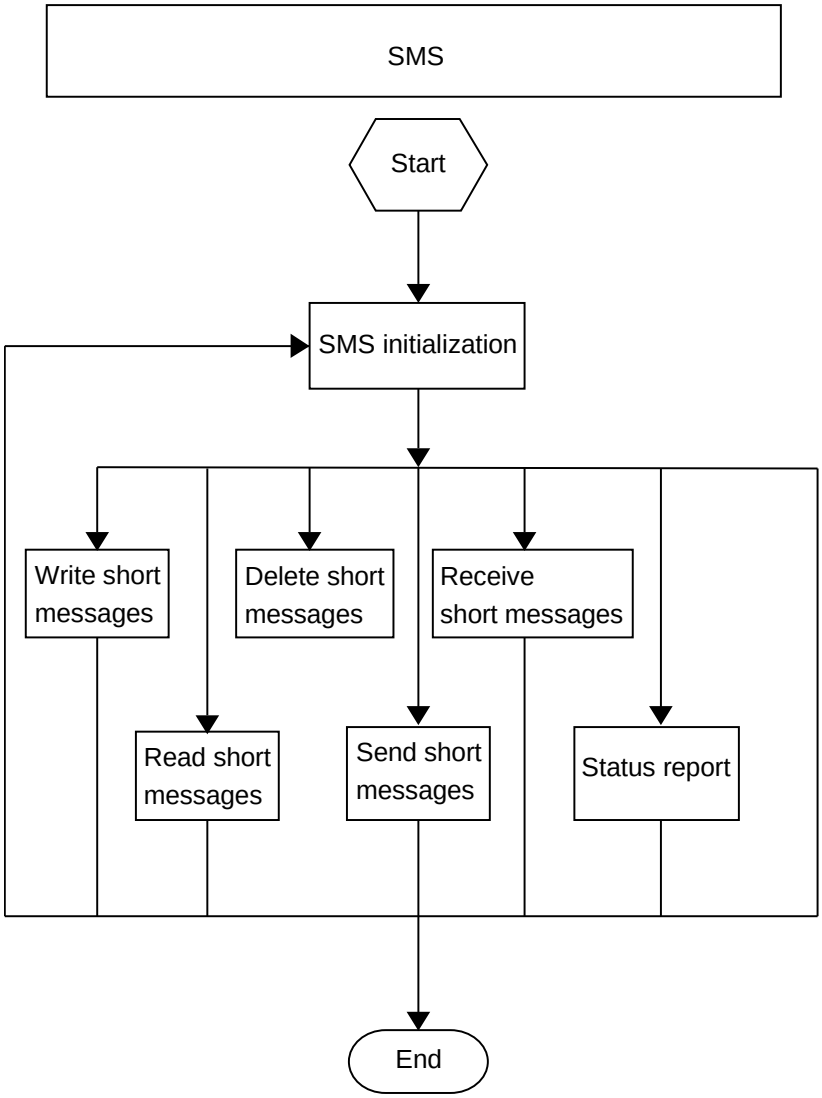


Figure 5-2 shows the general SMS process.

Figure 5-2 General SMS process



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5.2 Initializing SMS

5.2.1 Reference Process

Command	Description
AT+CSCA?	Query the SMSC address.
+CSCA: "13800688509",129 **OK**	
AT+CSCA="+8613800755500"	Set the SMSC address to the SMSC number of China Mobile's Shenzhen Branch.
OK	
AT+CSMS?	Query the short message service type.
+CSMS: 0,1,1,1 **OK**	
AT+CNMI?	Query the configuration of the new message indications to TE.
+CNMI: 0,0,0,0,0 **OK**	
AT+CNMI=2,1,2,2,0	Configure the new message indications to TE.
OK	
AT+CPMS?	Query the preferred short message storage.
+CPMS: "SM",12,20,"SM",12,20,"SM",12,20 **OK**	
AT+CPMS="SM"	Set SM as short message storage medium.
OK	
AT+CGSMS?	Query the MO SMS bearer domain.
+CGSMS: 1 **OK**	
AT+CMGF?	Query the short message format.
+CMGF: 0	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
OK	
AT+CMGF=0	Set the short message format to PDU.
OK	

Use the **AT+CMGF** command to set short message format: **AT+CMGF=0** sets the short message format to PDU.

The SMSC address provided by the service provider must be specified. In PDU mode, the SMSC address is contained in the PDU packets. Therefore, in PDU mode, the **AT+CSCA** command is optional.

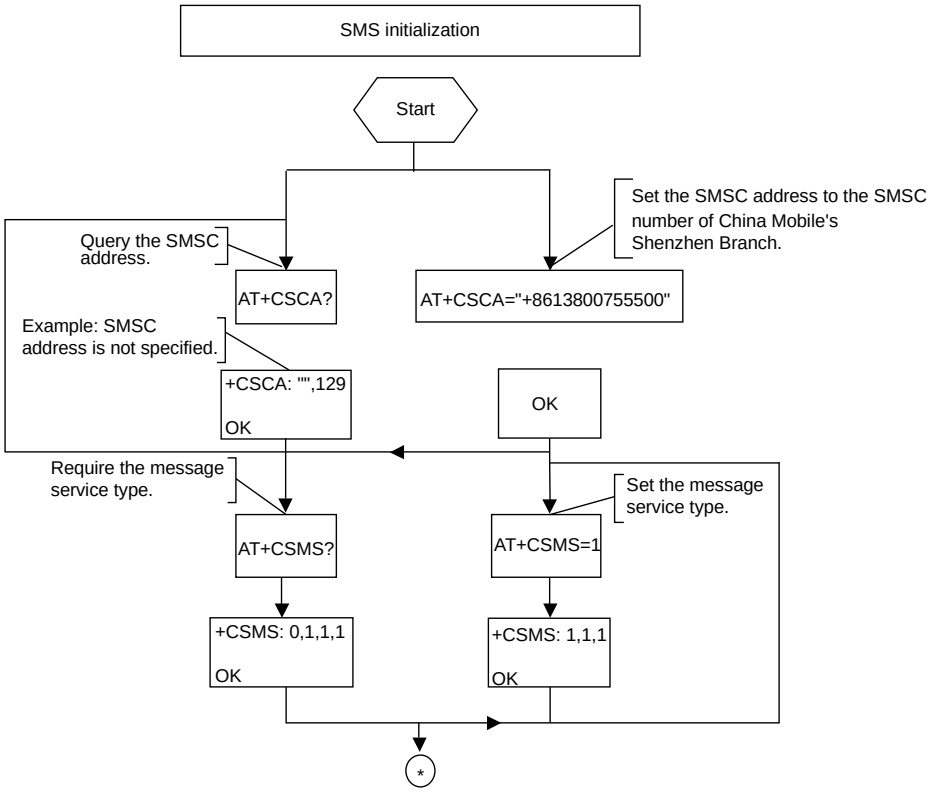
To use the SMS features specified in the GSM 07.05 Phase 2+, the **AT+CSMS** command must be used to enable the features.

Use the **AT+CNMI** command to set the unsolicited indications.

Use the **AT+CPMS** command to select the preferred short message storage (SIM or ME). The ME909u-523 supports only the SM (SIM card) storage.

Use the **AT+CGSMS** command to select the MO SMS bearer domain (PS or CS domain). For ME909u-523, the CS domain is the preferred MO bearer domain.

Figure 5-3 SMS initialization process – part 1



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 5-4 SMS initialization process – part 2

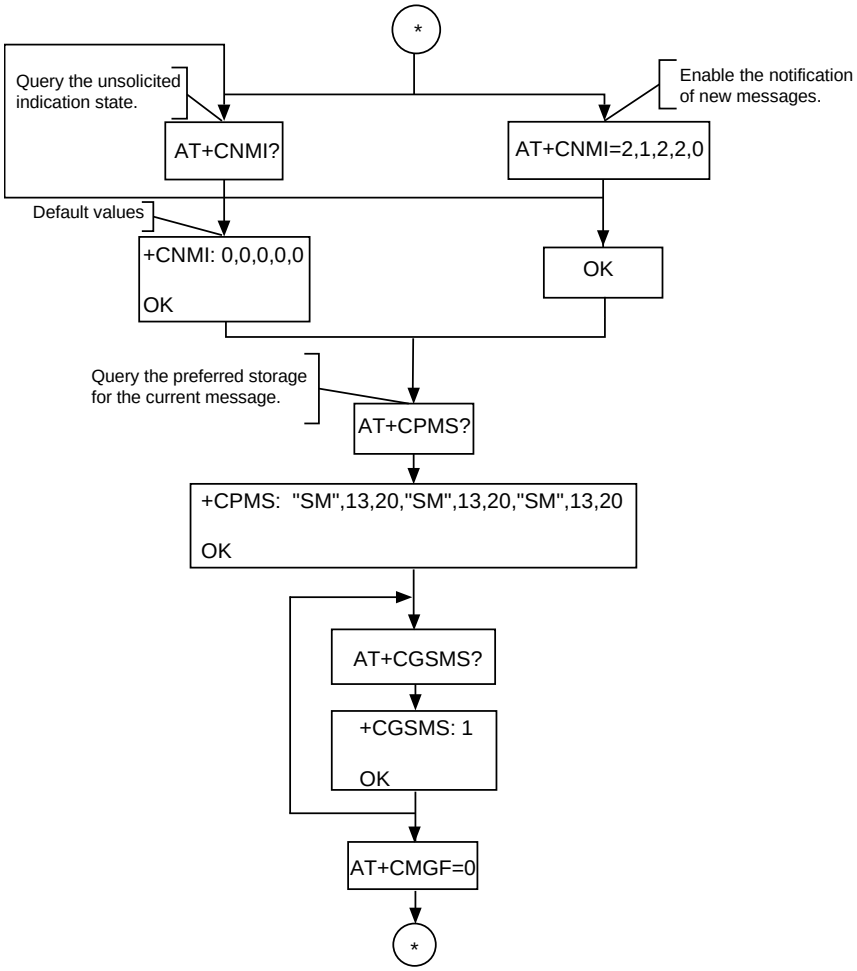
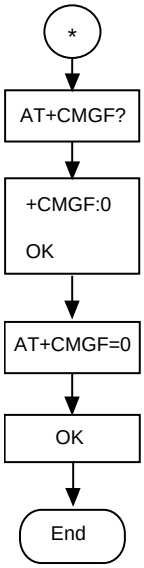


Figure 5-5 SMS initialization process – part 3



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5.2.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM PIN required**	Enter the correct PIN.
	+CMS ERROR: SIM busy	SIM card initialization has not completed. Try again later.

5.3 Sending Short Messages

5.3.1 Reference Process

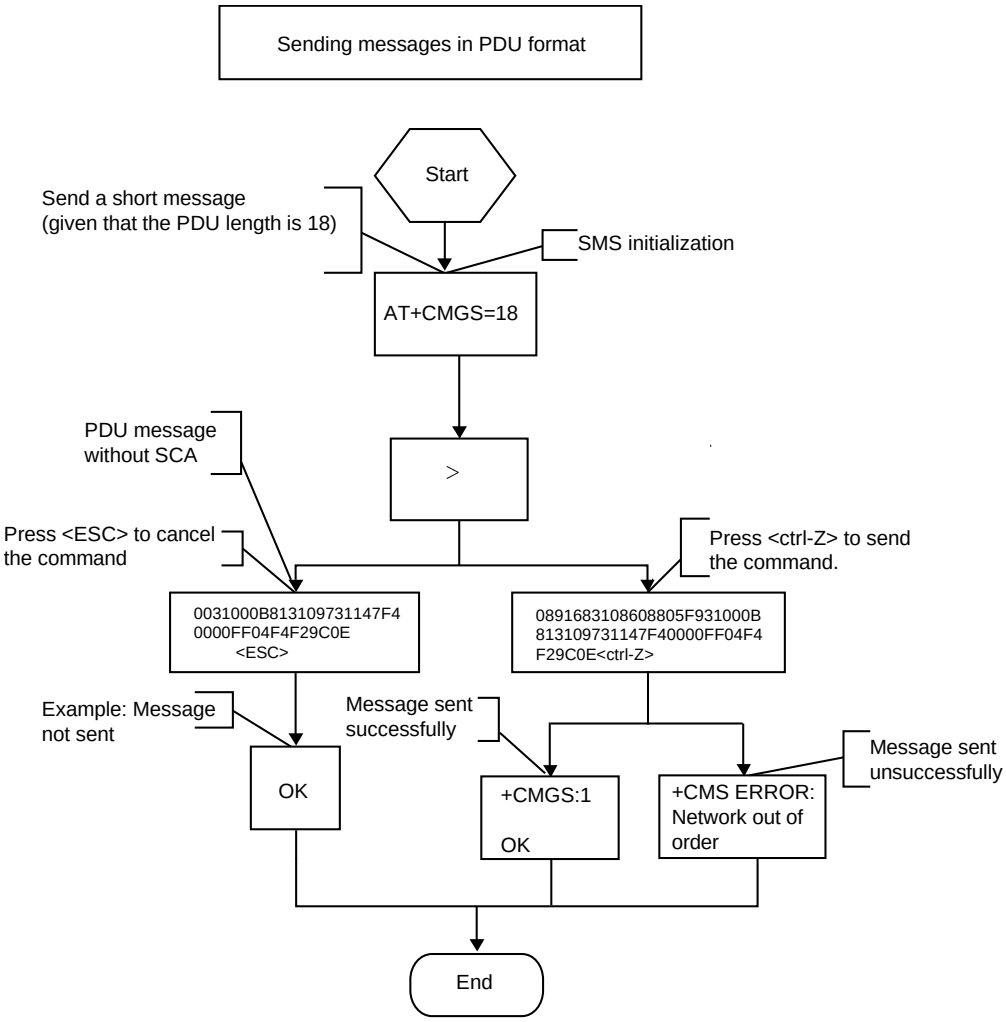
Command	Description
AT+CMGF=0	Set the short message format to PDU.
OK	
AT+CSCA?	Query the SMSC address.
+CSCA: "13800688509",129 **OK**	
AT+CMGS=18 **>0031000B813109731147F40000FF04F4F29C0E\x0A**	Send a PDU message without the service center address. The value of SMSC address is the setting of +CSCA command.
+CMGS: 168 **OK**	The message is successfully sent.
AT+CMGS=18 **>0891683108608805F931000B813109731147F40000FF04F4F29C0E\x1A**	Send a PDU message with the correct service center address.
+CMGS: 169 **OK**	The message is successfully sent.
AT+CMGS=18 **>0891683108608805F031000B813109731147F40011FF04F4F29C0E\x1A**	Send a PDU message with the wrong service center address.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
+CMS ERROR: Network out of order	The message is unsuccessfully sent.

Messages in PDU format must be converted using external tools or users' software. Tools for encoding and parsing messages in PDU format are available on the Internet.

Figure 5-6 Sending short messages in PDU format



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5.3.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CMS ERROR: Network out of order**	Check the validity of the service center address or the state of the current network.

5.4 Reading Short Messages

5.4.1 Reference Process

Command	Description
AT+CMGL=0	List all received unread messages.
+CMGL: 2,0,,48 **0891683108608805F9040D91683109732097F200000143261900100 1F506215744FD3D1A0E930C84296D9EC370BFDE86C2F23228FFAEFF00** **+CMGL: 4,0,,64** **0891683108608805F9040D91683109732097F200000140326131050032506215744FD3D1A0E930C84296D9EC370BFDBE83C2B0380F6A97416FF7B80C6AVFE5E510** **OK**	The format of short messages can refer to the **AT+CMGL** command.
AT+CMGR=4	Read the message stored in the message storage location 4.
+CMGR: 1,,64 **0891683108608805F9040D91683109732097F200000140326131050032506215744FD3D1A0E930C84296D9EC370BFDBE83C2B0380F6A97416FF7B80C6AVFE5E510** **OK**	The format of short messages can refer to the **AT+CMGR** command.

There are two methods to read short messages:

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

- Method 1: Use the **AT+CMGL** command to list the messages that are in specified state and stored in the preferred message storage. The following table describes the message states. If the message sate is received unread messages, the REC UNREAD state will be changed to REC READ after the **AT+CMGL** command is executed.

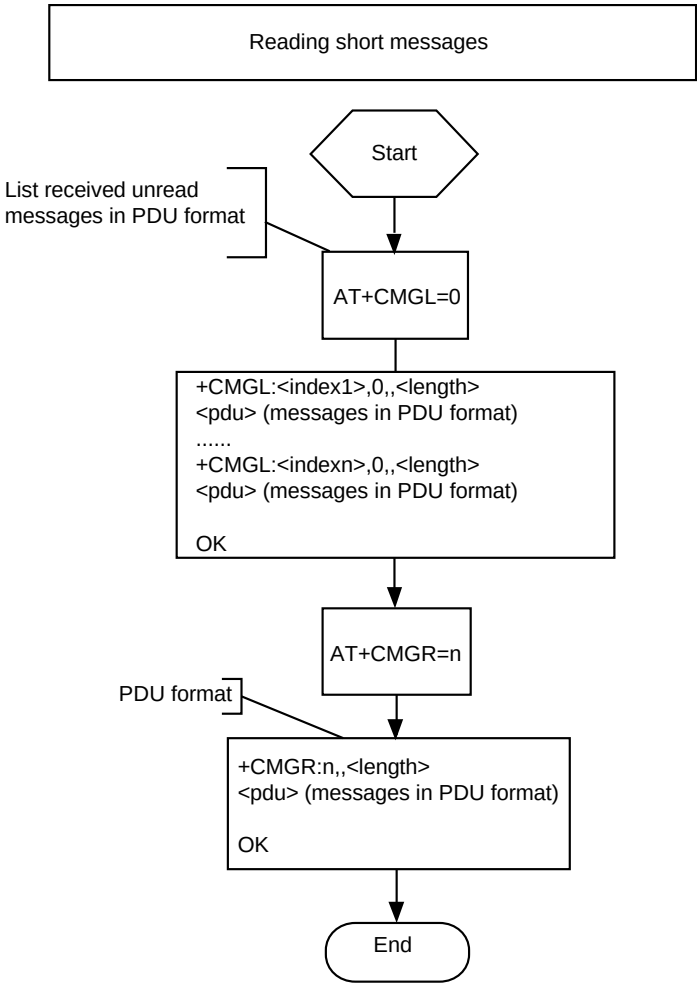
Message State	PDU Mode
Received unread messages	0
Received read messages	1
Stored unsent messages	2
Stored sent messages	3
All messages	4

- Method 2: Use the **AT+CMGR** command to read a message from a specified storage location in the message storage. If the message is a received unread message, its state will be changed to REC READ after it is read using the **AT+CMGR** command.

You can use the **AT+CMGL** command to list all short messages so that you can view the messages' storage locations.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 5-7 Reading short messages



5.4.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CMS ERROR: invalid memory index**	Check the validity of the index.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

5.5 Deleting Short Messages

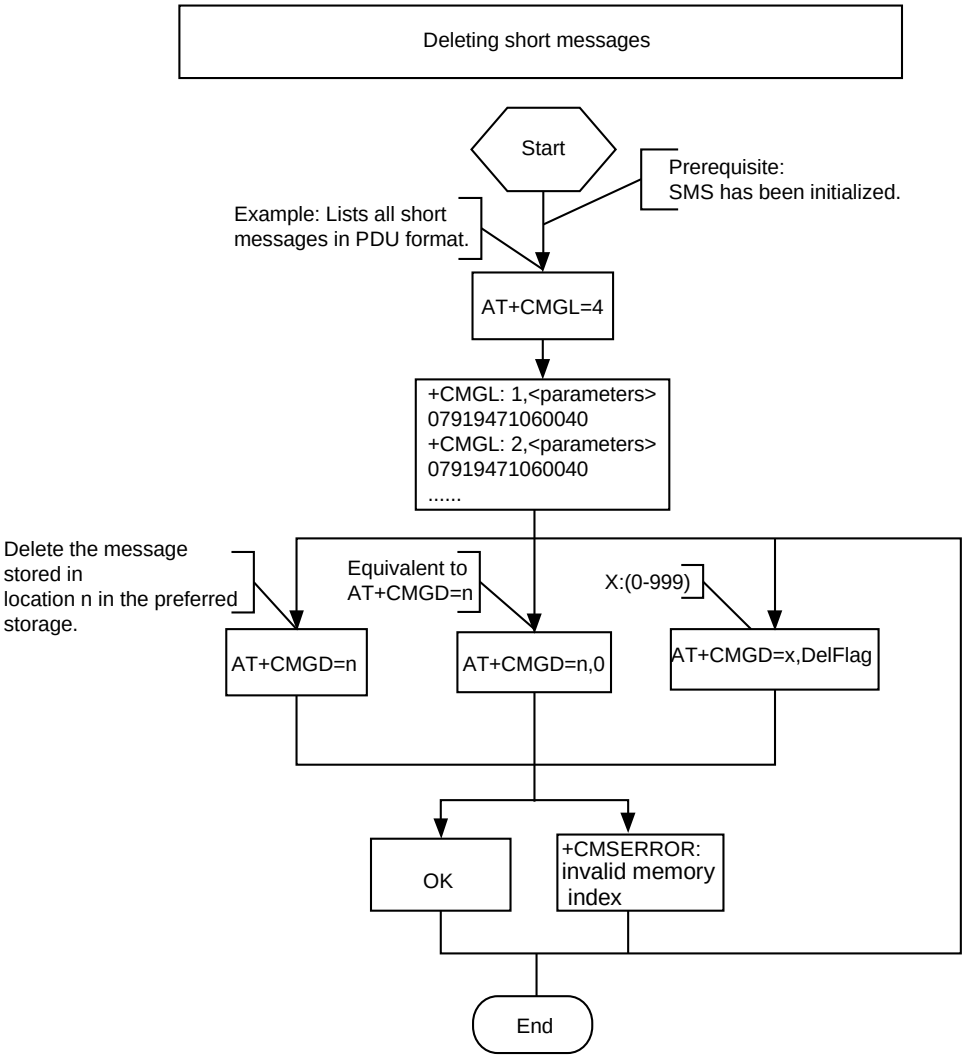
5.5.1 Reference Process

Command	Description
AT+CMGF=0	Set the message format to PDU mode.
OK	
AT+CMGL=4	List all short messages (PDU mode).
+CMGL: 6,2,,30 **0011000A9171798762130000A713C8329BFD6681D0EF3B282C2F83F2EFFA0F** **+CMGL: 11,1,,36** **07919471060040132 40C91947159826990000030804131157480 13C8329BFD6681D0EF3B282C2F83F2EFFA0F** **OK**	
AT+CMGD=1	Delete the message stored in storage location 1.
OK	

- Either all messages stored in the preferred message storage or a message stored in the specified storage location in the preferred message storage can be deleted.
- All read or unread messages that have been received can be deleted.
- If no messages are stored in the preferred message storage, "OK" is returned when the action to delete messages is completed.
- Meanings of the DelFlag value:
  - 1: Delete all read messages in the preferred message storage, and keep the unread, sent and unsent messages.
  - 2: Delete all read and sent messages in the preferred message storage, and keep the unread and unsent messages.
  - 3: Delete all read, sent, and unsent messages in the preferred message storage, and keep the unread messages.
  - 4: Delete all messages in the preferred message storage, including the unread messages.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 5-8 Deleting short message



5.5.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CMS ERROR: invalid memory index**	Check the validity of the index.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

6 Phonebook Application Scenarios

6.1 Overview

As a product embedded into a host, the phonebook scenarios include that read, write, query and delete the phonebook entries in the SIM card.

Read Phonebook: use the **AT+CPBR** command to read phonebook entries.

Write phonebook: use the **AT+CPBW** command to save the phonebook entries into the SIM card.

Delete phonebook: use **AT+CPBW** command to delete the phonebook entries in the SIM card.

6.2 Memory Operations

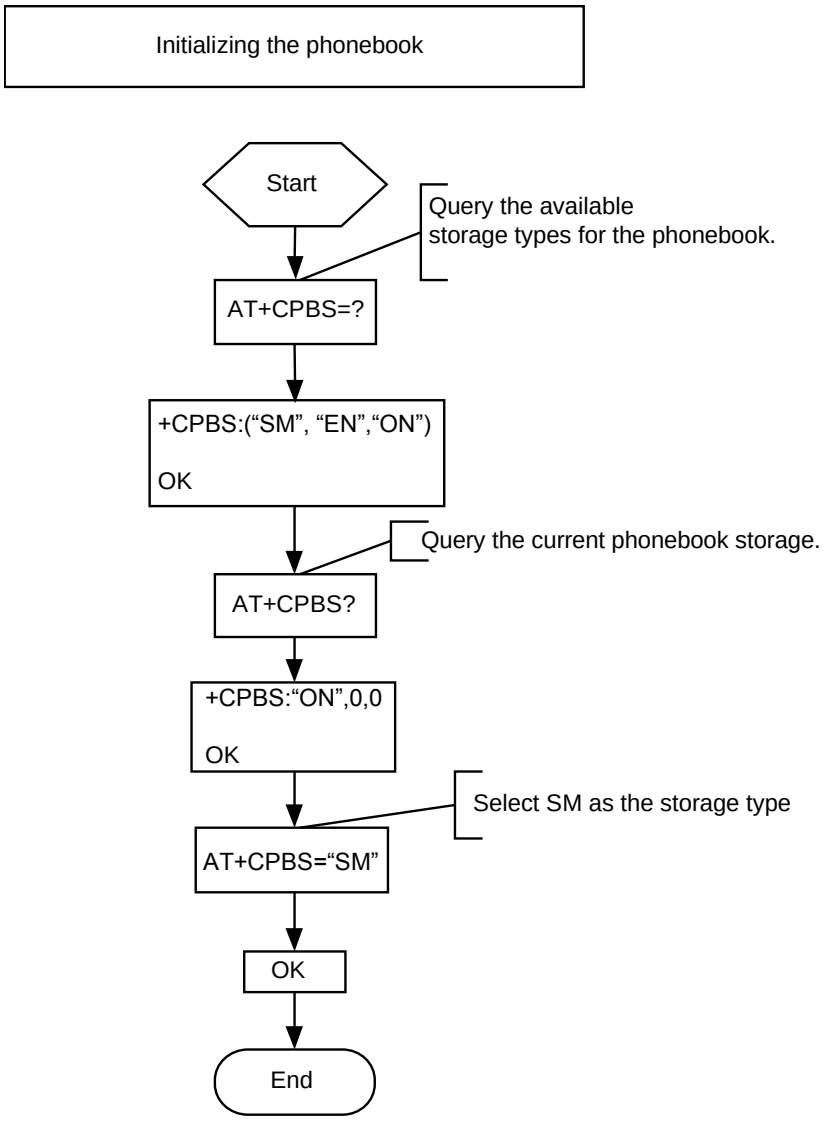
6.2.1 Reference Process

Command	Description
AT+CPBS=?	Query the current storage type.
+CPBS: ("SM","EN","ON") **OK**	
AT+CPBS="SM"	Set the current storage type to "SM".
OK	
AT+CPBS?	**241** indicates that 241 entries have been stored in the storage. **250** indicates that the maximum storage capacity of the current storage ("SM") is 250 entries.
+CPBS: "SM",241,250 **OK**	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Note that the AT commands for reading and writing phonebook entries can be used only after the phonebook storage is selected. To select a phonebook storage, use the **AT+CPBS** command.

Figure 6-1 Initializing the phonebook



6.2.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM busy**	Phonebook initialization has not completed. Try again later.
	+CME ERROR: SIM PIN required	Enter the correct PIN.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Scenario	Possible Error Information	Solution
	+CME ERROR: SIM PUK required	Enter the correct PUK.

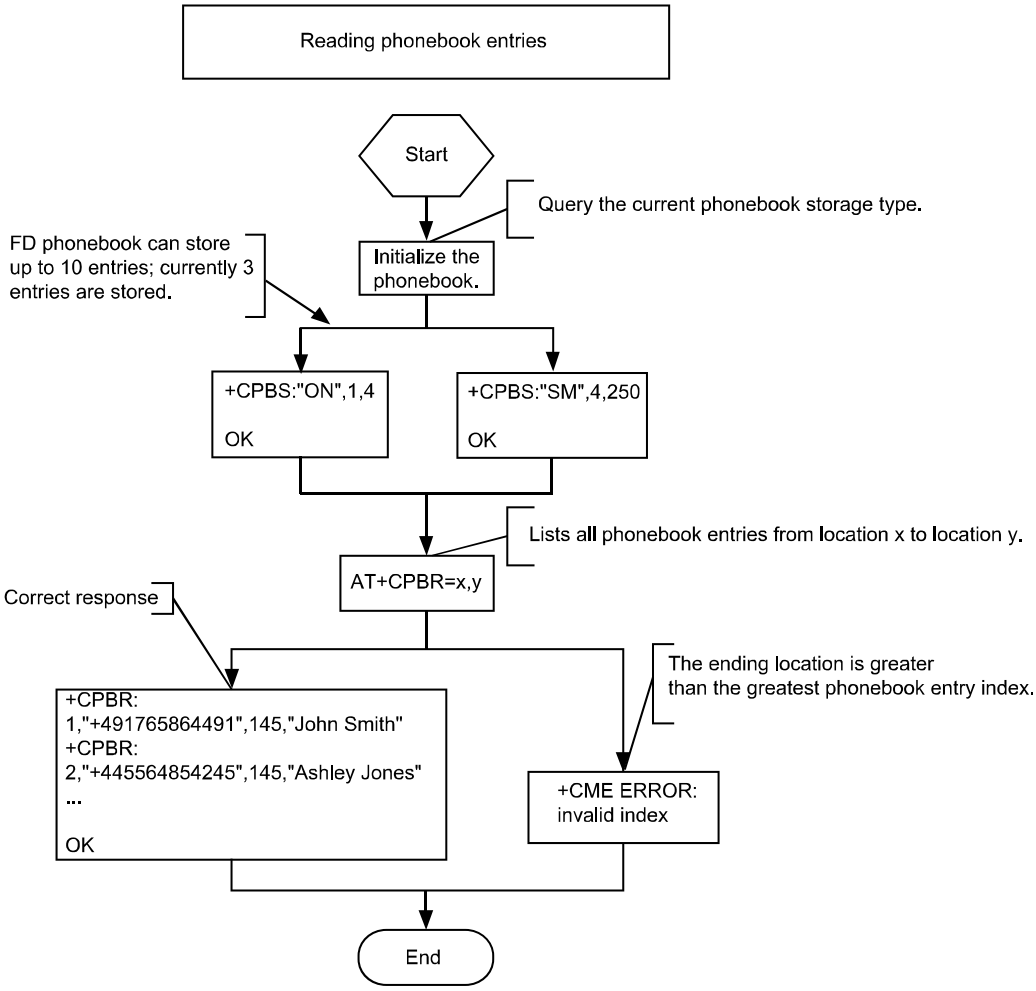
6.3 Reading Phonebook Entries

6.3.1 Reference Process

Command	Description
AT+CPBS?	Query the phonebook storage selection and the maximum number of entries that can be stored.
+CPBS: "SM",9,20 **OK**	
AT+CPBR=1,20	List all phonebook entries by their indexes.
+CPBR: 1,"+491765864491",145,"John Smith" **+CPBR: 2,"+44545896638",145,"Paul Williams"** **+CPBR: 3,"+44556565657",145,"Joe Anderson"** **+CPBR: 4,"+445636934485",145,"Oscar Thomso”** **+CPBR: 5,"+445565656899",145,"Hannah Adams"** **+CPBR: 6,"+447982865563",145,"Samantha Young"** **+CPBR: 7,"+449585315798",145,"Alexis Wright"** **+CPBR: 8,"+445415454646",145,"Abigail Cox"** **+CPBR: 12,"+446565689115",145,"Kyla Clark"** **OK**	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 6-2 Reading phonebook entries



6.3.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM busy**	Phonebook initialization has not completed. Try again later.
	+CME ERROR: SIM PIN required	Enter the correct PIN.
	+CME ERROR: SIM PUK required	Enter the correct PUK.
AT+CPBR=<index1>	**+CME ERROR: invalid index**	The index is invalid. Check that index 1 is within the supported range.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Scenario	Possible Error Information	Solution
AT+CPBR=<index1>,<index2>	**+CME ERROR: invalid index**	The index is invalid. Check that index 1 and index 2 are within the supported range and that index 1 is not greater than index 2.
AT+CPBR=<index1>	**+CME ERROR: not found**	No entries are found in the storage locations in index 1. Check that there have been entries successfully written into these locations.
AT+CPBR=<index1>,<index2>	**+CME ERROR: not found**	No entries are found in the storage locations between index 1 and index 2. Check that there have been entries successfully written into these locations.

6.4 Writing/Deleting Phonebook Entries

6.4.1 Reference Process

Command	Description
AT+CPBR=?	Query the ranges of parameters related to the phonebook entries.
+CPBR: (1-250),24,14 **OK**	
AT+CPBW="5","13903702805",,"test"	Write a phonebook record.
OK	
AT+CPBW=1	Delete the entry in index 1 in the phonebook.
OK	

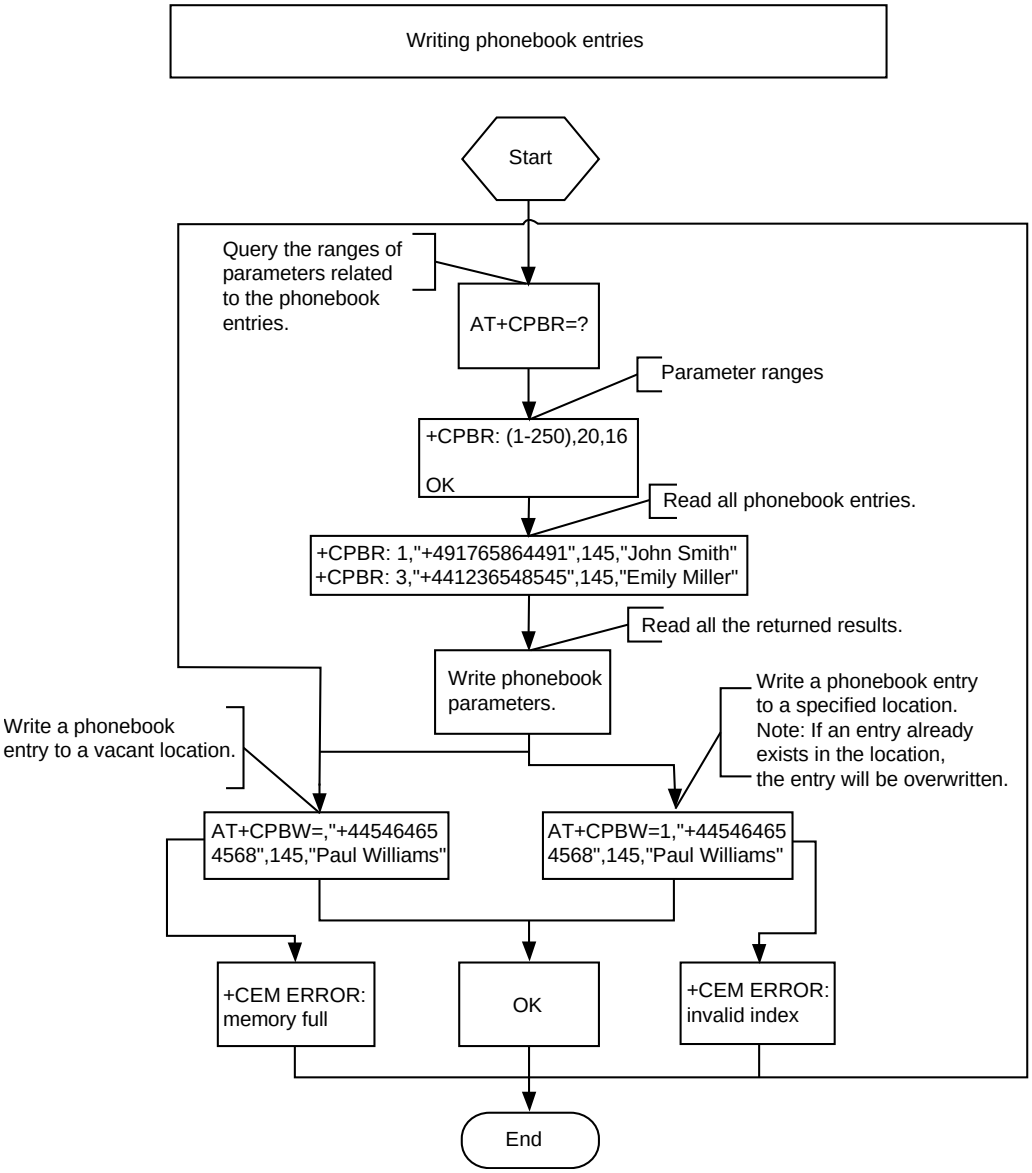
There are two methods to edit phonebook entries using the **AT+CPBW** command:

- Write an entry to a specified location. This method edits the location where a phonebook entry exists or writes a new entry to a vacant location.
- Write a new phonebook entry to the next location of a location that already has a phonebook entry. This method does not require a specified storage location. The

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

AT+CPBW command can be used to edit phonebook entries of the "SM" or "ON" type.

Figure 6-3 Writing phonebook entries



6.4.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM busy**	Phonebook initialization has not completed. Try again later.
	+CME ERROR: SIM PIN required	Enter the correct PIN.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Scenario	Possible Error Information	Solution
	+CME ERROR: SIM PUK required	Enter the correct PUK.
Error information is returned when writing an entry into the phonebook.	**+CME ERROR: dial string too long**	Check that the phone number is not too long.
Error information is returned in response to one of the previous commands.	**+CME ERROR: invalid index**	Check that the location index and phone number type are valid.
Error information is returned when writing an entry into the phonebook.	**+CME ERROR: invalid characters in dial string**	The phone number to be written into the phonebook contains invalid characters. Delete the invalid characters and try again.
AT+CPBW=,"12345678901234567890123",128,"80534E4E3A"	**+CME ERROR: memory full**	The storage is full. Delete some entries and try again.

6.5 Searching for Phonebook Entries

6.5.1 Reference Process

Command	Description
AT+CPBF=<findtext>	Search the current storage for phonebook entries that contain the <findtext> field.
+CBPF: <index1>,<number>,<type>,<text> **+CBPF: <index2>,<number>,<type>,<text>** **...** **OK**	
AT+CPBF=?	Return the maximum phone number length and maximum name length supported by the current phonebook storage.
+CPBF: <nlength>,<tlength> **OK**	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

6.5.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM busy**	Phonebook initialization has not completed. Try again later.
	+CME ERROR: SIM PIN required	Enter the correct PIN.
	+CME ERROR: SIM PUK required	Enter the correct PUK.
AT+CPBF=<findtext>	**+CME ERROR: not found**	No matches were found. Check whether the current phonebook storage has entries that match the search criterion.

6.6 Querying User Number

6.6.1 Reference Process

Command	Description
AT+CNUM	Query the SIM number.
+CNUM: [<alpha1>],<number1>,<type1> **+CNUM: [<alpha2>],<number2>,<type2>** **...** **OK**	

6.6.2 Troubleshooting

Scenario	Possible Error Information	Solution
Error information is returned in response to one of the previous commands.	**+CME ERROR: SIM busy**	Phonebook initialization has not completed. Try again later.
	+CME ERROR: SIM PIN required	Enter the correct PIN.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Scenario	Possible Error Information	Solution
	+CME ERROR: SIM PUK required	Enter the correct PUK.

6.7 Setting the TE's Character Sets

6.7.1 Reference Process

Command	Description
AT+CSCS=?	Query the character sets supported by the UE.
+CSCS: ("IRA","GSM","UCS2") **OK**	
AT+CSCS?	Query the current character set.
+CSCS: "IRA" **OK**	
AT+CPBR=1	Read the first phonebook entry. The TE character set is the International Reference Alphabet (IRA). The content of the first entry's name field is "HUAWEI".
+CPBR: 1,"0123456789",129,"HUAWEI" OK	
AT+CSCS="UCS2"	Set the TE's character set to UCS alphabet.
OK	
AT+CPBW=1,"0123456789",129,"004800550041005700450049"	The character set is the UCS alphabet. The content of the phonebook entry's name field is 004800550041005700450049, which is "HUAWEI" in the IRA.
OK	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
AT+CPBR=1	Read the first phonebook entry. The TE character set is UCS alphabet. The content of the first entry's name field is 004800550041005700450049 ("HUAWEI" in the IRA).
+CPBR: 1,"0123456789",129,"004800550041005700450049" OK	

6.7.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

7 SIM Operation Application Scenarios

7.1 PIN Operations

7.1.1 Reference Process

Command	Description
AT+CLCK="SC",1,"<pwd>"	Enable PIN authentication. (<pwd> specifies the PIN. See note 1.)
OK	
AT+CLCK="SC",2	Request the SIM card state.
+CLCK: 1 **OK**	"**+CLCK: 1**" means that the SIM card is not blocked.
AT+CLCK="SC",0," <pwd>"	Disable the SIM card lock. (<pwd> specifies the PIN. See note 1.)
OK	
AT+CLCK="SC",2	Request the SIM card state.
+CLCK: 0 **OK**	"**+CLCK: 0**" means that the SIM card is not blocked.
AT+CLCK="SC",1,"<pwd>"	Enable PIN authentication. (<pwd> specifies the PIN. See note 1.)
OK	
AT+CPIN="<pwd>"	Request the PIN after the module restarts.
OK	
AT+CPIN?	Request the PIN state.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
+CPIN: READY **OK**	
AT+CLCK="SC",2	Request the SIM card state.
+CLCK: 1 **OK**	"**+CLCK: 1**" means that the SIM card is not blocked.
AT+CPWD="SC","<oldpwd>","1234"	Change the PIN (1234 will be the new PIN).
OK	
AT+CPWD="SC","1113","1233"	Enter an incorrect PIN (first attempt).
+CME ERROR: incorrect password	
AT+CPWD="SC","3333","1233"	Enter an incorrect PIN (second attempt).
+CME ERROR: incorrect password	
AT+CPWD="SC","4711","1233"	Enter an incorrect PIN (third attempt).
+CME ERROR: SIM PUK required	
AT+CPIN?	Check whether the password is requested.
+CPIN: SIM PUK **OK**	
AT+CPIN="12345678","0000"	Enter the SIM PUK and specify the new SIM PIN (activate new "SC" lock).
OK	

NOTE

- After PIN authentication is enabled using **AT+CLCK**, the module must be restarted for the change to take effect.
- Either **AT^CPIN** or **AT+CPIN** can be used to authenticate the PIN.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

7.1.2 Troubleshooting

Scenario	Possible Error Information	Solution
Enable PIN authentication. **AT+CLCK="SC",1,"<pwd>"**	**+CME ERROR: operation not allowed**	If PIN authentication has been enabled, it cannot be enabled again. Check whether PIN authentication has been enabled.
Enter the PIN. **AT+CPIN="<pwd>"**	**+CME ERROR: incorrect password**	Enter the correct PIN. The original PIN is provided by the operator.
	+CME ERROR: SIM PUK required	Incorrect PINs have been entered three times and the SIM card is blocked. Run **AT+CPIN="<PUK>","<pwd>"** to enter the PUK to unblock the SIM card. The PUK is provided by the operator and cannot be changed by users. If incorrect PUKs are entered 10 times, the SIM card will be permanently blocked.
Changes the PIN. **AT+CPWD="SC","<oldpwd>","<newpwd>"**	**+CME ERROR: incorrect password**	<oldpwd> must be the current PIN. Like the PIN authentication, if incorrect PINs are entered three times, the PUK will be required. If incorrect PUKs are entered 10 times, the SIM card will be permanently blocked.

7.2 CRSM Command

7.2.1 Reference Process

Command	Description
AT+CRSM=176,12258,0,0,10	Read the file EFiccid with a transparent structure. (**12258** is 0X2FE2, the EFiccid file's FID).
+CRSM: 144,0,"<record>" **OK**	After the command is processed successfully, the EFiccid file's content (<record>) is returned.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
AT+CRSM=178,28476,1,4,176,,"7F10"	Use an absolute path to read the first entry from the EFsms file on the SIM card's DFtelecom folder.
+CRSM: 144,0,"<record>" **OK**	<record> is the content of the first entry. The length of <record> is 176 bytes.
AT+CRSM=192,12258	Get response of EFiccid.
+CRSM: 144,0,"<response>" **OK**	<response> is the response data of EFiccid. For details about <response>, refer to the *ETSI TS 102.221* protocol.
AT+CRSM=214,28421,0,0,2,"0012"	Update the content of the transparent structure EFli file on the SIM card.
+CRSM: 144,0,"" **OK**	Update succeeded.
AT+CRSM=220,28476,1,4,176,"1111", "7F10"	Update the content of the linear fixed structure EFsms file on the SIM card.
+CRSM: 144,0,"" **OK**	Update succeeded.
AT+CRSM=242	Obtain the current directory information.
+CRSM: 108,"<length>","<status>" **OK**	<length> indicates <status>'s length in byte. <status> indicates the current directory status by hexadecimal.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

- To read or update a file, appropriate commands must be used according to the file's structure type (for details, refer to the description of file properties in the *3GPP TS 31.102* protocol). For transparent structure files, use 176 (Read Binary) and 214 (Update Binary). For linear fixed structure files, use 178 (Read Record) and 220 (Update Record).
- If <pathid> is not contained in the command, the module will prefer to access the files with the same FID in the current directory.
- Files can be accessed only when the access criteria are met. Otherwise the SIM card will return PSWs indicating that the access authentication failed. If an EF file's read privilege is PIN protected and the module does not have the PIN authenticated, PSWs indicating that the access authentication failed will be returned after the **AT+CRSM** command is used to read the EF file.
- To use the AT+CRSM command to access the file content on the SIM card, the parameters contained in the command must strictly meet the requirements in the ETSI TS 102.221 and 3GPP TS 31.102. For detailed requirements, refer to the ETSI TS 102.221 and 3GPP TS 31.102.

7.2.2 Troubleshooting

Scenario	Possible Error Information	Solution
Update the content of the linear fixed structure EFsms file on the SIM card. **AT+CRSM=178,12258,0,0,10**	**+CRSM: 105,129,""** **OK**	The status word (SW) indicates a Read command error occurred. Files with a transparent structure should be read using 176 (READ BINARY).
Update the content of the linear fixed structure EFsms file on the SIM card. **AT+CRSM=220,28476,1,4,176,"1111","7F10"**	**+CRSM: 105,130,""** **OK**	The PSW indicates that the security conditions were not met. To update the EFsms file, the correct PIN is required.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

8 Sleeping and Waking Up Application Scenarios

As an embedded component in the host, the module also consumes power, which increases the power consumption of the integrated product. Therefore, the most important task of power management is to reduce the power consumption of the integrated product by enabling the module's sleep mode when necessary.

The host and the module need to wake each other up from sleep if communication is required. Therefore, another task of power management is to provide a wake-up control mechanism for the host and module.

Power management involves three parts: the host system software (including the USB driver/UART driver/GPIO driver/sleep mechanism functions), connection hardware between the host and module, and the module's software wake-up mechanism.

This chapter is mainly concerned with the module's software wakeup mechanism, including the wake-up principle, how USB related events impact on the waking up of the module and remotely waking up the module, and how the module remotely wakes up the host.

This chapter briefly describes the power management related connection hardware between the host and module.

This chapter does not describe the host system software. For example, if the host runs on a Windows or Mac system, Huawei will provide a USB driver program corresponding to the module. If the host runs on an Android system, Huawei will provide *Guide to Kernel Driver Integration in Linux for Huawei Modules* for users to configure the USB-based wakeup function of the module. If the host runs on a Linux system, power management is supported only when the Linux Kernel version is 2.6.35 or later.

This document describes typical module application scenarios. A host can be designed based on the actual system features and the application scenarios of the module to reduce power consumption of both the module and integrated product.

After the host is designed as recommended by this document, the module's power consumption and the whole unit's power consumption can meet the performance requirements. For details, see related description in the product manual.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

To set the host to be in the standby state, check the module's GPS service state first. If the GPS service is enabled, the host should send AT^WPEND to disable the GPS service. Otherwise, the module cannot enter sleep mode.

8.1 Hardware Interfaces

The module communicates with the host using mainly USB or UART. For details about pins related to power management, see Table 8-1 .

For corresponding interface numbers and reference design for the pins, see *HUAWEI ME909u-523 LTE LGA Module Hardware Guide* or *HUAWEI ME909u-523 LTE Mini PCIe Module Hardware Guide*.

Table 8-1 Power management related pins

Interface	Pin name	Direction	Functional Description	Diagram
PCIE	WAKE#	Output	When a wake-up source arrives, this pin output a low-level-voltage pulse lasting for 1s during which if other wake-up sources arrive, the module will ignore the later wake-up requests. In other words, the module will not output a second pulse during this 1s.	Figure 8-1
LGA	WAKEUP_OUT	Output	When a wake-up source arrives, this pin output a high-level-voltage pulse lasting for 1s during which if other wake-up sources arrive, the module will ignore the later wake-up requests. In other words, the module will not output a second pulse during this 1s.	Figure 8-2
LGA	WAKEUP_IN	Input	When the pin carries a high-level voltage, the states of the module are as follows: The module will be prohibited to enter sleep mode if the module is awake. The module will be woken up if the module is in sleep mode. When the pin carries a low-level voltage, the module is allowed to enter sleep mode. (By default, the pin is set to INPUT/PD, which is, the software detects a low-level voltage on the pin when the pin is not connected.)	Figure 8-3

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Interface	Pin name	Direction	Functional Description	Diagram
LGA	SLEEP_STATUS	Output	Indicate the state of the module. When the pin carries a high-level voltage, the module is in working mode. When the pin carries a low-level voltage, the module is in sleep mode.	Figure 8-4

NOTE

The PCIE interface does not support UART.

8.2 Sequence Diagram

Figure 8-1 WAKE# PIN output sequence

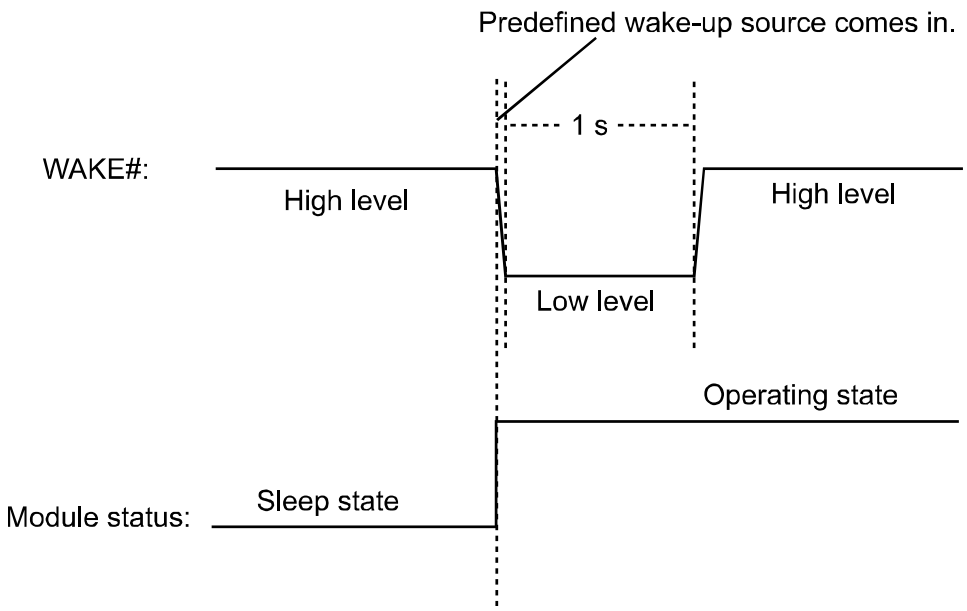


Figure 8-2 WAKEUP_OUT PIN output sequence

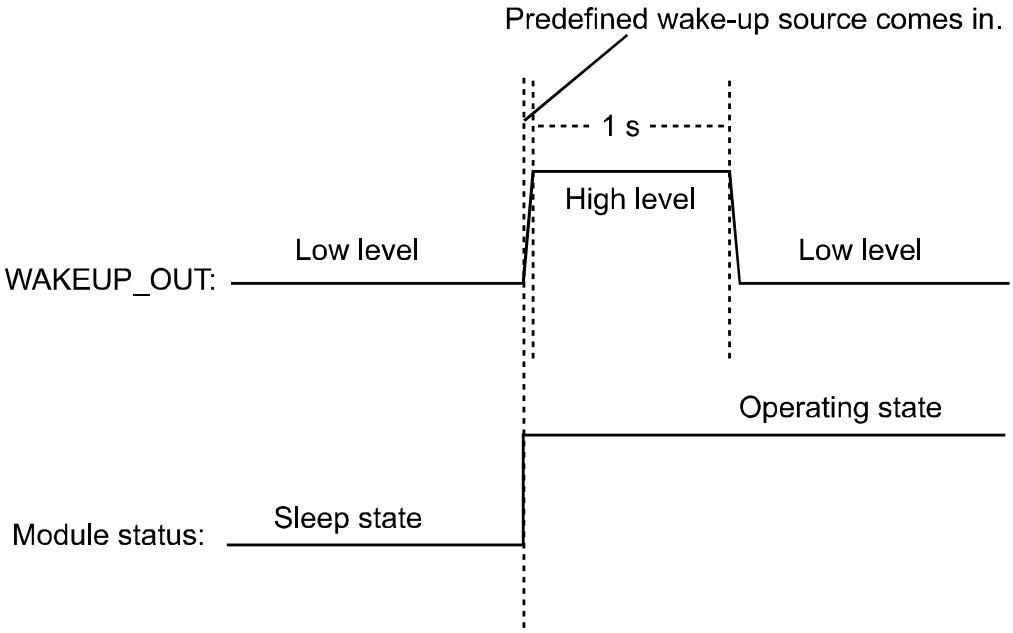
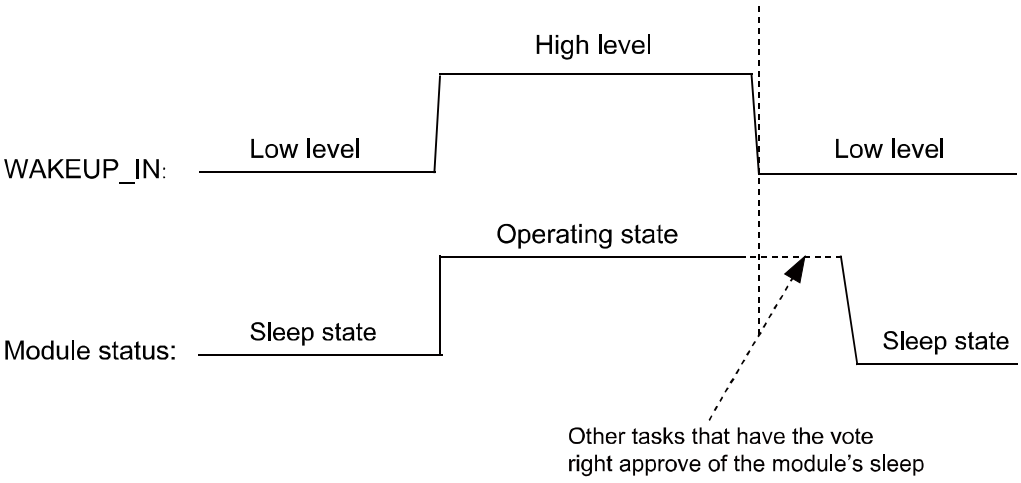


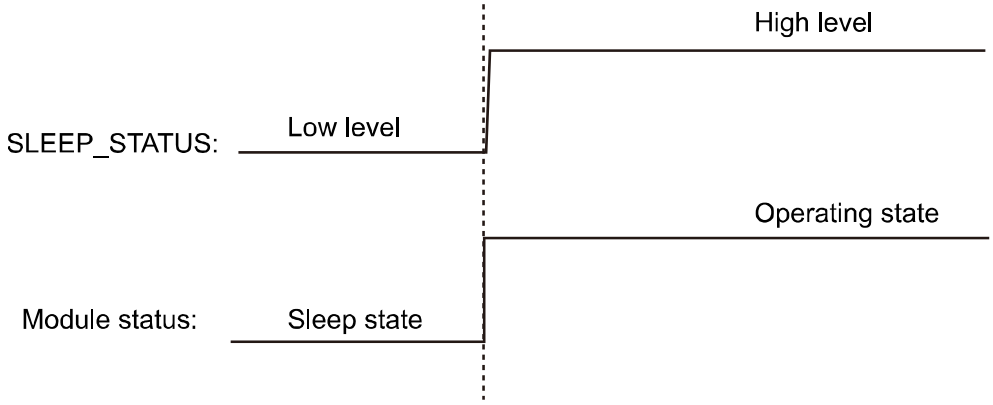
Figure 8-3 WAKEUP_IN PIN input sequence



About the vote, see section 8.3.1 .

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 8-4 SLEEP_STATUS PIN output sequence

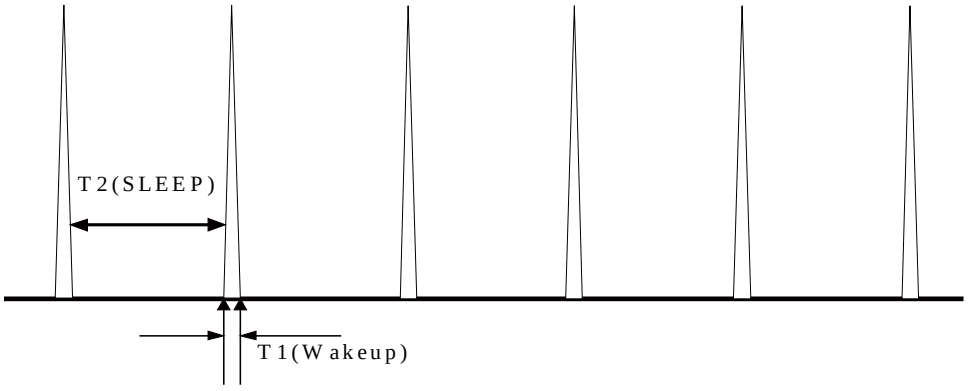


8.3 Software Interfaces

8.3.1 Principle

The module runs on a multi-task software system. The sleep task is granted with the lowest priority and assigned to detect whether the module can enter sleep mode. Other tasks (such as the RF, SIM card, USB) have voting rights. They vote to decide whether the module can enter sleep mode. When no other tasks are running, the sleep task is executed. If the sleep task detects that all other tasks agree on the module's sleep, the module enters sleep mode, as shown in Figure 8-5 . At this time, the baseband chip reduces the work frequency, and the RF enters the Discontinuous Reception (DRX) mode.

Figure 8-5 Currency state when the module is in sleep mode



For more information about the module's sleep procedure, see Figure 8-6 .

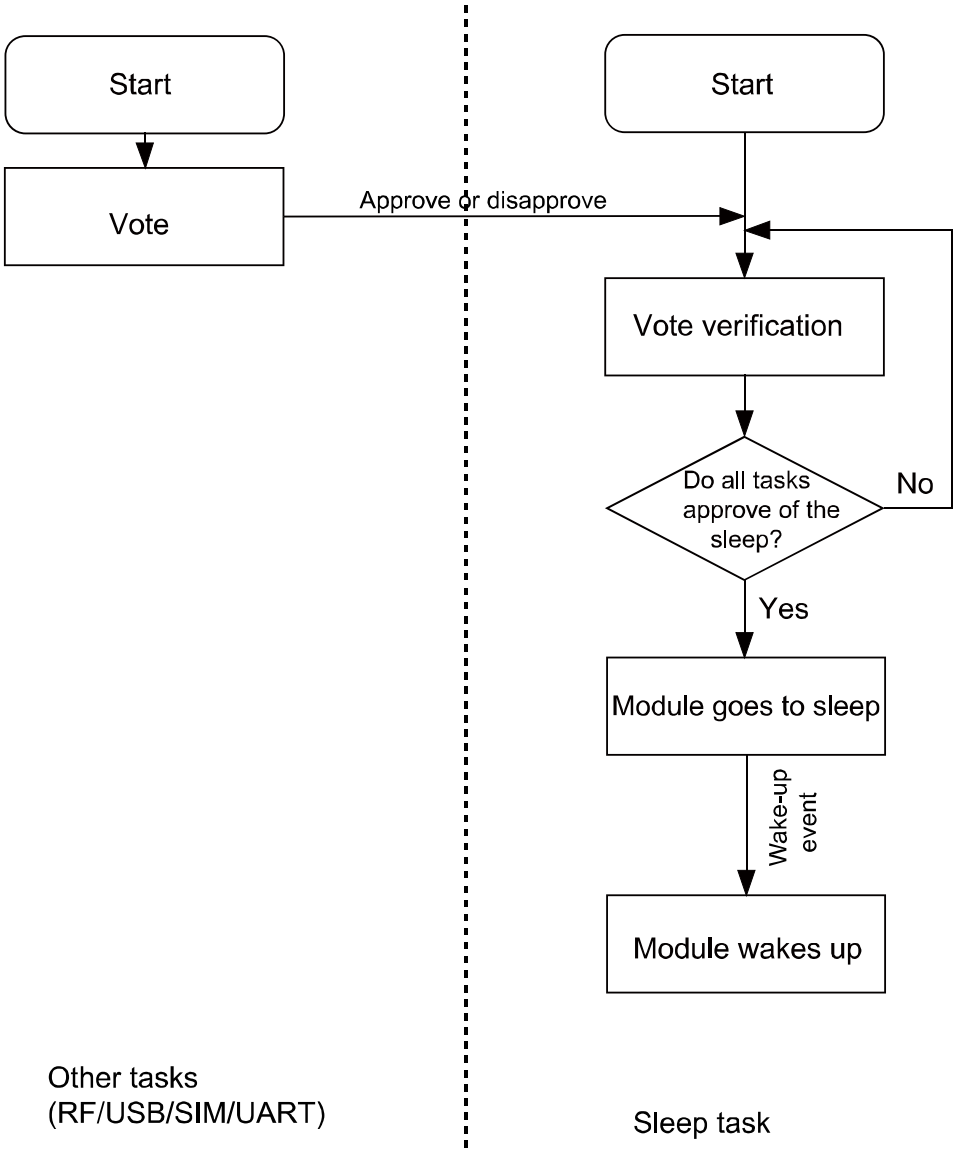
Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

The module's sleep mode is different from working mode or flight mode set using the **AT+CFUN** command. The RF will be turned off when the module enters LPM mode using the command **AT+CFUN=0** while the RF will enter DRX mode without being turned off when the module is in sleep mode. For more details, refer to *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

The module enters sleep mode automatically when the sleep task detects that all other tasks agree on the module's sleep. The sleep period of the module depends on the current working state and circumstance. The period may last for several seconds, or up to several minutes.

Figure 8-6 Sleep procedure



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

8.3.2 USB and Sleep

USB is an important communication channel between the module and the host. According to the USB protocol, normally a hub or a root hub periodically sends Start of Frame (SOF) data packages (one data package per ms using full-speed USB and one package per 125 µs using high-speed USB). Through this mechanism, USB always votes to stop the module from entering sleep mode.

When the USB driver provided by Huawei detects that the module and the host have not exchanged data in 5 seconds, the USB driver will enable the port's suspend feature, stopping SOF data packages being sent and suspending the USB controller. This enables the USB to vote to agree the module's sleep.

NOTE

- If the USB driver used is developed by users or is integrated with external application, ensure that the USB driver supports the USB suspend features (including selective suspend and global suspend, as defined in the USB standard.)
- Before the D+/D– connection between the host and the module disconnects, the **AT^WAKEUPCFG=1,1,***x* command (*x* is determined by the customers based on the *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*) must be sent to disable the USB remote wake-up function. Otherwise, after the module is woken up, it cannot enter sleep mode again because it keeps waking up the host over the USB.
- After the D+/D– connection between the host and the module resumes, the **AT^WAKEUPCFG =1,3,***x* command (*x* is determined by the customers based on the *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*) must be sent to enable the USB remote wake-up function. Otherwise, the module cannot wake up the host over the USB.

8.3.3 UART and Sleep

UART is an important communication channel between the module and the host. If the host uses UART (a TTL level Interface), it can connect to the module's UART directly. If the host uses RS232, it can connect to the module's UART through a conversion chip such as MAX232.

NOTE

If the module is in sleep state, the host send data to module only by UART that can’t wakeup the module. It must be used with WAKEUP_IN pin.

8.3.4 Module Wake-up

RF periodically wakes up the module based on the DRX cycle (depending on the actual configuration of the network system), as shown in Figure 8-5 .

Other aperiodic events include:

1. The host sends data using USB or pulls WAKEUP_IN up.
2. Changes on the network, for example, an incoming call, an incoming text message, a signal change, a network working mode change, a network search, an IP data package (when a dial-up network connection is set up).
3. Software system events such as a timer
4. Abnormal events, for example, an antenna drops or a SIM card becomes loose.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

8.3.5 Host Woken up by Module

Wake-up Source

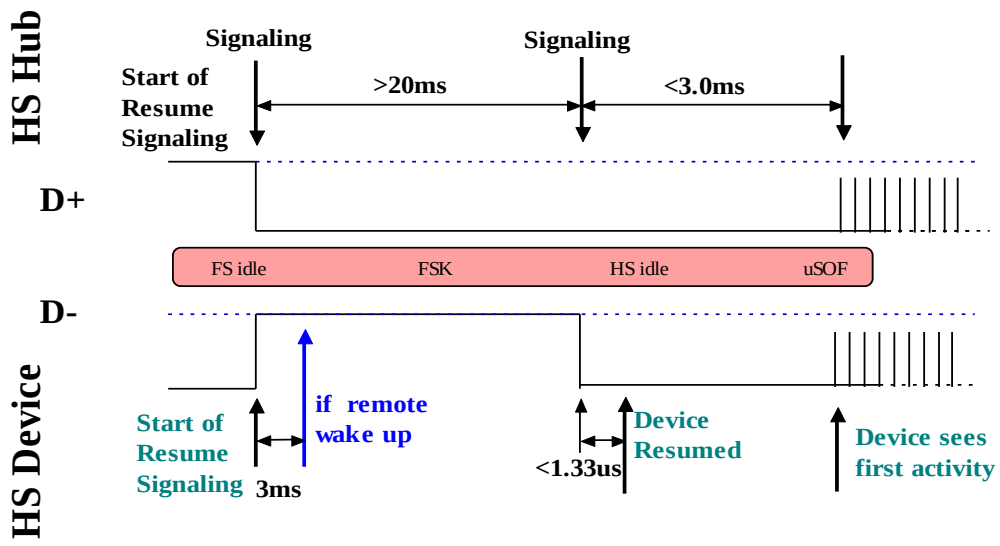
A wake-up source is a module event that can wake up the host, for example, an incoming voice call, a text message, data (PPP data, TCP/UDP data from the network), and unsolicited messages.

Remotely Waking up the Host Using USB

When the host is in sleep mode and the USB controller is in suspended mode, if the module needs to send data to the host (for example, a wake-up source has arrived), the module sends a remote wake-up signal that lasts 3 ms to inform the host to start USB resume (as shown in Figure 8-7). To complete the procedure, the following conditions must be met:

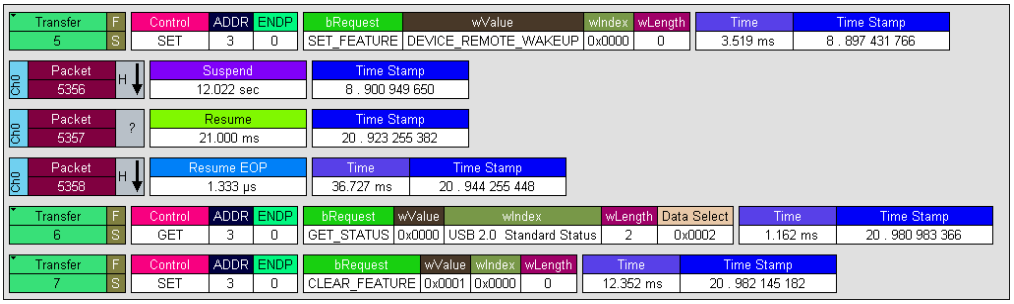
1. The USB controller on the host supports USB remote wake-up and can wake up the host.
2. The USB driver enables or disables remote wake-up by executing SET_FEATURE and CLEAR_FEATURE commands. Therefore, remote wake-up must be enabled on the USB driver before USB enters suspended mode.
3. When the host receives the remote wake-up signal from the module, the host needs to send a full speed K signal that lasts at least 20 ms. When the USB controller resumes, the host must send the SOF token within 3 ms from the startup of the idle state. Otherwise, the module enters suspended mode again, as shown in Figure 8-7 .

Figure 8-7 USB resume time sequence



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 8-8 Successful procedure of remote wake-up



WAKEUP_OUT Waking up the Host

The module will output a 1s pulse using WAKE# as shown in Figure 8-1 or WAKEUP_OUT as shown in Figure 8-2 when a wake-up source arrives. The host wakes itself up after detecting the level change.

Remote Wake-up Configuration

The power consumption of the host increases if it is frequently woken up. The host can configure the module's wake-up sources using ^WAKEUPCFG and ^CURC command so as to reduce the power consumption.

The ^WAKEUPCFG command can be used to choose wake-up sources and the wake-up channel (USB or WAKEUP_OUT). The ^CURC command can choose unsolicited messages. For more details, refer to AT Command Interface Specification.

8.4 Application Scenarios: System with USB Connection only

A host runs on Android, with support for USB suspend, USB remote resume, voice calling, and text messages.

8.4.1 Hardware Connection

The host connects to the module using USB.

8.4.2 Software Procedure

Command	Description
AT^WAKEUPCFG=?	Query the parameter range of **WAKEUPCFG**.
^WAKEUPCFG: (0-1),(0-3),(0-15) **OK**	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
AT^WAKEUPCFG=1,2,15	Configure the module to make sure that incoming calls, text messages, data, and unsolicited messages can remotely wake up the host using USB.
OK	
AT^CURC=?	Query the parameter range of **CURC**.
^CURC: (0-1) **OK**	

8.4.3 Advantages

With software configuration, while the system requirements (calling and text messages) are met, the number of times the host is woken up by unsolicited messages, and consequently the power consumption, are reduced.

8.5 Application Scenarios: System with USB and WAKEUP_OUT

A host running Android, with support for text messages, but has not USB remote resume or voice calling.

8.5.1 Hardware Connection

The host must connect to the module using USB and WAKEUP_OUT pins

8.5.2 Software Procedure

Command	Description
AT^WAKEUPCFG=?	Query the parameter range of **WAKEUPCFG**.
^WAKEUPCFG: (0-1),(0-3),(0-15) **OK**	
AT^WAKEUPCFG=1,1,14	Configure the module to make sure that text messages, data, and unsolicited messages can remotely wake up the host using the WAKEUP_OUT pin.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

OK	
AT^CURC=?	Query the parameter range of **CURC**.
^CURC: (0-1) **OK**	

8.5.3 Advantages

A solution is provided for systems not supporting USB remote resume.

With software configuration, while the system requirements (calling and text messages) are met, the number of times the host is woken up by unsolicited messages, and consequently the power consumption, are reduced.

8.6 System with Other Connection Methods

If the host can be connected to the module only using UART, you can refer to the *HUAWEI ME909u-523 LTE LGA Module Hardware Guide* or *HUAWEI ME909u-523 LTE Mini PCIe Module Hardware Guide*. If the host can connect to the module using USB/UART/WAKEUP_OUT and can support USB remote wake-up and UART remote wake-up, prioritize USB remote wake-up over WAKEUP_OUT remote wake-up. For details about the software procedure, refer to the earlier sections while considering the host system feature.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

9 Thermal Protection Application Scenarios

9.1 Pre-configuration

Command	Description
^THERM: 1	When the temperature is higher than the temperature protection threshold, the module enables thermal protection: The module turns off its RF and reports to the host.
^THERM: 0	When the temperature is lower than the temperature protection hysteresis threshold, the module disables thermal protection: turns on its RF and reports to the host.

9.1.1 Troubleshooting

None

9.2 Thermal Protection Process

- When the module's temperature is lower than 101°C, the module works normally.
- When the module's temperature is higher than 101°C, the module enables thermal protection: turns off its RF transmission and presents the **^THERM: 1** indication. When the module's temperature is higher than 107°C, the module will turn off after 15 seconds. When the module's temperature is lower than 93°C, the module disables thermal protection: turns on its RF transmission, and presents the **^THERM: 0** indication.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

- During an emergency call, if thermal protection is enabled, the module will present an indication but will not take thermal protection actions such as turning off its RF or shutting down.
- After thermal protection is enabled, users cannot make emergency calls.
- Thermal protection is designed to protect the module from being damaged by over temperature. To work in high temperature environments, both the module and its peripheral components must be able to resist the same temperature.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

10 Module Powering Off and Resetting Application Scenarios

10.1 Restarting the ME

10.1.1 Reference Process

Command	Description
AT+CFUN=1,1	Restart the module.
OK	

The ME can be reset or restarted using the **AT+CFUN** command. After the restart, the module must register with the network and authenticate its SIM card's PIN.

10.1.2 Troubleshooting

None

10.2 Powering Off ME

10.2.1 Reference Process

Command	Description
AT^MSO	Power off the module.
OK	

After the command is received, the module will power-off.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

10.2.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

11 GPS Application Scenarios

11.1 Introduction to GPS

11.1.1 GPS Positioning Methods

Table 11-1 GPS positioning methods

Positioning methods	Description	Benefits	Drawbacks
Standalone	This is a traditional GPS positioning method. Using this method, a module receives satellite signals directly and makes calculations to obtain positioning results.	No communication with the network is invoked, incurring no data traffic between the module and the network.	Long time to first fix (TTFF) in code mode.
Mobile Station Based (MSB) positioning using the User Plane Protocol	Requests the assistant data from the network to assist and accelerate the positioning. This method is one of the Assisted GPS (A-GPS) methods.	• Significantly reduces the TTFF after cold start and increases the rate of successful positioning. • Enables positioning in environments with very poor satellite signals.	Requires the assistant data from the network, incurring network traffic.
Mobile Station Assisted (MSA) using the User Plane Protocol	Requests data from the network to assist and accelerate the positioning. After receiving satellite data, the module sends the satellite data to the network for calculations, and the network returns the calculation results to the module. This method is one of the A-GPS methods.	• Reduces the TTFF after cold start and increases the rate of successful positioning. • Hands most workload to the network, reducing the module's workload. • Enables positioning in environments with poor satellite signals (network dependent).	Requires complex interaction with the network, incurring network traffic.

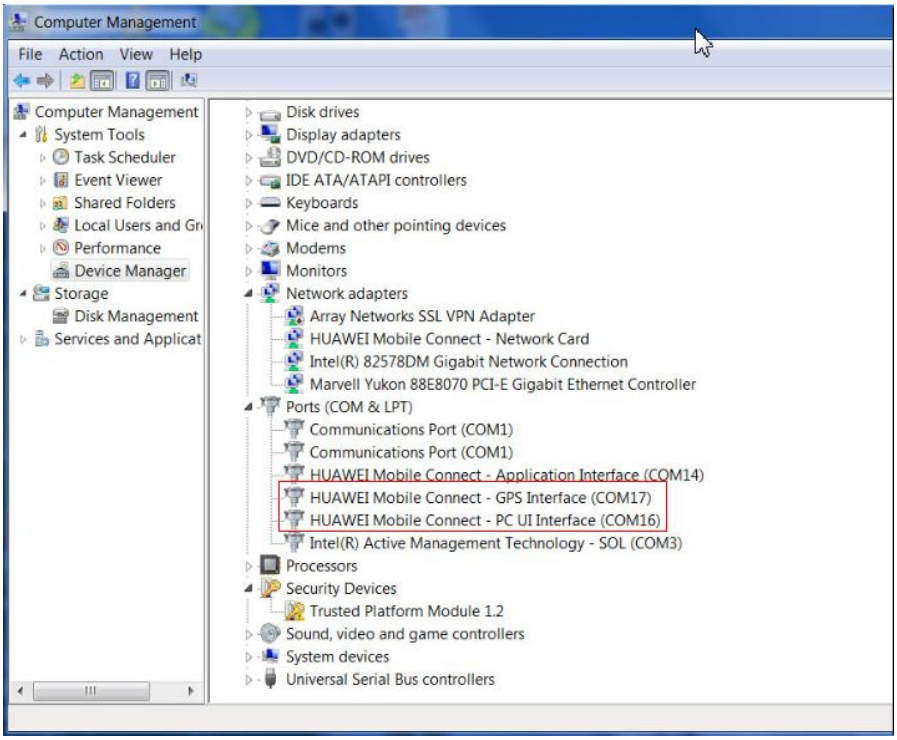
Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Positioning methods	Description	Benefits	Drawbacks
XTRA positioning	Downloads XTRA data from the Qualcomm's XTRA server to assist positioning. The XTRA data is valid for 7 days.	• Reduces the TTFF after cold start. • Long valid period for the XTRA data, eliminating frequent data downloading.	• Cannot reduce the TTFF after cold start as significantly as the A-GPS methods. • The XTRA data's ability to assist positioning declines as time goes by.
Cell ID	Base station mode, this approach will be based on the cell ID number of the mobile terminal is located to determine the location of the user.	This mode can be use when other optioning methods are failed.	Very low accuracy.
Global navigation satellite system (abbreviated as GNSS)	Uses both the GPS and GLONASS for positioning.	Using more satellites, increases the successful positioning rate and the positioning accuracy.	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

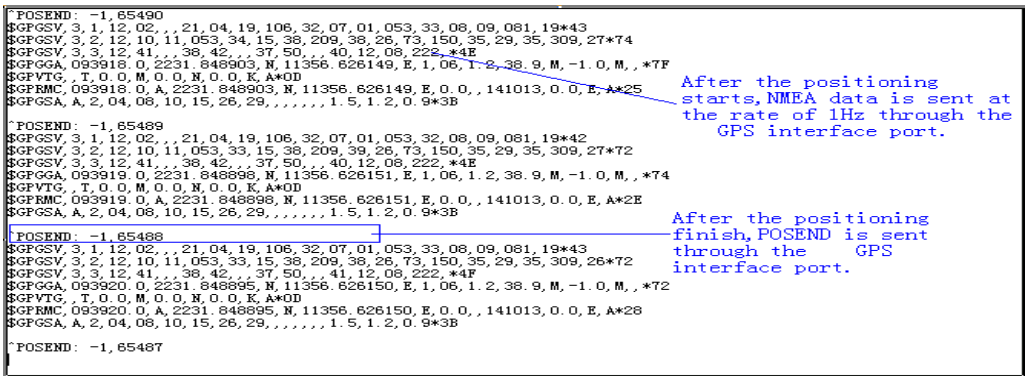
11.1.2 GPS Ports

Figure 11-1 GPS Interface detected after the module is connected to a computer



GPS Interface port is used to send GPS-related AT commands and unsolicited indications for NMEA positioning data.

Figure 11-2 Data sent through the GPS interface ports



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

11.2 Standalone Positioning

Command	Description
AT^WPDOM=0	Set the positioning method to Standalone.
OK	
AT^WPDST=0	Set the session type to single positioning.
OK	
AT^WPDST=1	Set the session type to tracking and positioning.
OK	
AT^WPDFR=65535,1	Set the number of positioning times and the interval between each positioning for the tracking and positioning. If the session is a single positioning, you do not need to set these parameters.
OK	
AT^WPQOS=255,500	Set the positioning service quality. The first parameter indicates the response time, and the second indicates the horizontal accuracy threshold.
OK	
AT^WPDGP	Start positioning.
OK	
^POSEND: -1,9	The first value indicates positioning end reason, and the second indicates the left positioning times.

NOTE

- The Standalone method can be used when the module has no SIM card inserted.
- If there is an ongoing positioning session, the session must be terminated before setting the positioning parameters so that the parameters can take effect for the positioning to be started. This rule applies to all positioning methods.
- Execute **AT^WPEND** command can terminate the current positioning session.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

11.3 MSB Positioning Using the User Plane Protocol

Command	Description
AT^WPDOM=5	Set the positioning method to MSB.
OK	
AT^WPDST=1	Set the session type to tracking and positioning.
OK	
AT^WPDFR=65535,1	Set the number of positioning times and the interval between each positioning for the tracking and positioning.
OK	
AT^WPQOS=255,500	Set the positioning service quality. The first parameter indicates the response time, and the second indicates the horizontal accuracy threshold..
OK	
AT^WPURL=SUPL.GOOGLE.COM:7276	Set the A-GPS server address and port number. This address is just Google AGPS server. Some of the AGPS server requires certificate authentication.
OK	
AT+CGDCONT=15,"IP","CMNET"	Set the PDP context required by A-GPS dial-up. By default, A-GPS dial-up uses the fifteenth PDP context. "CMNET" is the APN of network that module have registered.
OK	
AT^WPDGP	Start positioning.
OK	
^POSEND: -1,9	The first value indicates positioning end reason, and the second indicates the left positioning times.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

- The MSB method requires the module to register with a network, and will incur data traffic during positioning. When the MSB positioning fails, the module will automatically switch to the Standalone positioning if NV3756=1, but will not switch to the Standalone positioning if NV3756=0.
- During the AGPS positioning process, please do not search the network, because this operation will influence the positioning time.

11.4 MSA Positioning Using the User Plane Protocol

Command	Description
AT^WPDOM=1	Set the positioning method to MSA.
OK	
AT^WPDST=1	Set the session type to tracking and positioning.
OK	
AT^WPDFR=65535,1	Set the number of positioning times and the interval between each positioning for the tracking and positioning.
OK	
AT^WPQOS=255,500	Set the positioning service quality. The first parameter indicates the response time, and the second indicates the horizontal accuracy threshold.
OK	
AT^WPURL=SUPL.GOOGLE.COM:7276	Set the A-GPS server address and port number. This address is just Google AGPS server. Some of the AGPS server requires certificate authentication.
OK	
AT+CGDCONT=15,"IP","CMNET"	Set the PDP context required by A-GPS dial-up. By default, A-GPS dial-up uses the fifteenth PDP context. "CMNET" is the APN of network that module have registered.
OK	
AT^WPDGP	Start positioning.
OK	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

- The MSA method requires the module to register with a network, and incurs data traffic during positioning. If GPS response time in the positioning QoS is set to a too small value, the MSA positioning may fail.
- During the AGPS positioning process, please do not search the network, because this operation will influence the positioning time.

11.5 XTRA Positioning

Command	Description
AT^WPDOM=6	Set the positioning method to gpsOneXTRA.
OK	
AT^XTRASTA	Query the status of XTRA data. If the date of the obtained XTRA data is more than seven days earlier than the current date, the XTRA data is invalid, and the module needs to download new XTRA data. (The XTRA data's ability to assist positioning declines as time goes by. Therefore, it would be appropriate to set the XTRA data's valid period to three days. You can also download the latest XTRA data without querying the existing XTRA data information.)
OK **^XDSTATUS: 0,0,0,0**	Notify XTRA data query result.
AT^XTRATIME……	Upper layer applications use this command to access the SNTP server to obtain the current time information, and inject the information into the module.
OK **^TIMESETRULT: 0**	Notify XTRA time injected result.
AT^XTRADATA……	Upper layer applications use this command to access the XTRA server to download XTRA data, packetize the data, and inject the data into the module. (You can also inject the XTRA data from the host into the module.) There are two types of XTRA files stored on the XTRA server: • Xtra.bin file: contains predicted two-line orbital elements for GPS satellites, about 45 KB. • Xtra2.bin file: contains predicted two-line orbital elements for GPS and GLONASS satellites, about 80 KB.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
OK	
^DATASETRULT: 50	Notify XTRA data injected result.
AT^WPDST=1	Set the session type to tracking and positioning.
OK	
AT^WPDFR=65535,1	Set the number of positioning times and the interval between each positioning for the tracking and positioning.
OK	
AT^WPQOS=255,500	Set the positioning service quality. The first parameter indicates the response time, and the second indicates the horizontal accuracy threshold.
OK	
AT^WPDGP	Start positioning.
OK	
^POSEND: -1,9	The first value indicates positioning end reason, and the second indicates the left positioning times.

NOTE

XTRA date must be injected before XTRA data is injected.

11.6 GNSS Positioning

The GNSS positioning uses both the GPS and GLONASS satellites for positioning.

Command	Description
AT^WGNSS=1	Set GNSS as the positioning system to use both the GPS and GLONASS satellites for positioning. To switch from one positioning system to another, the module must restart. To switch the module to use GPS satellites only, run **AT^WGNSS=0** and restart the module.
OK	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
AT^WPDOM=*a value within the value range*	For the MSA and MSB positioning methods, the data obtained from the server is two-line orbital elements of GPS satellites, which will not help the GLONASS positioning, but the module will still search for GLONASS satellites.
OK	
AT^WPDST=1	Set the session type to tracking and positioning.
OK	
AT^WPDFR=65535,1	Set the number of positioning times and the interval between each positioning for the tracking and positioning.
OK	
AT^WPQOS=255,500	Set the positioning service quality. The first parameter indicates the response time, and the second indicates the horizontal accuracy threshold.
OK	
AT^WPDGP	Start positioning.
OK	
^POSEND: -1,9	The first value indicates positioning end reason, and the second indicates the left positioning times.

NOTE

After **AT^WGNSS** is executed, the module must be restarted to allow the settings configured by **AT^WGNSS** to take effect.

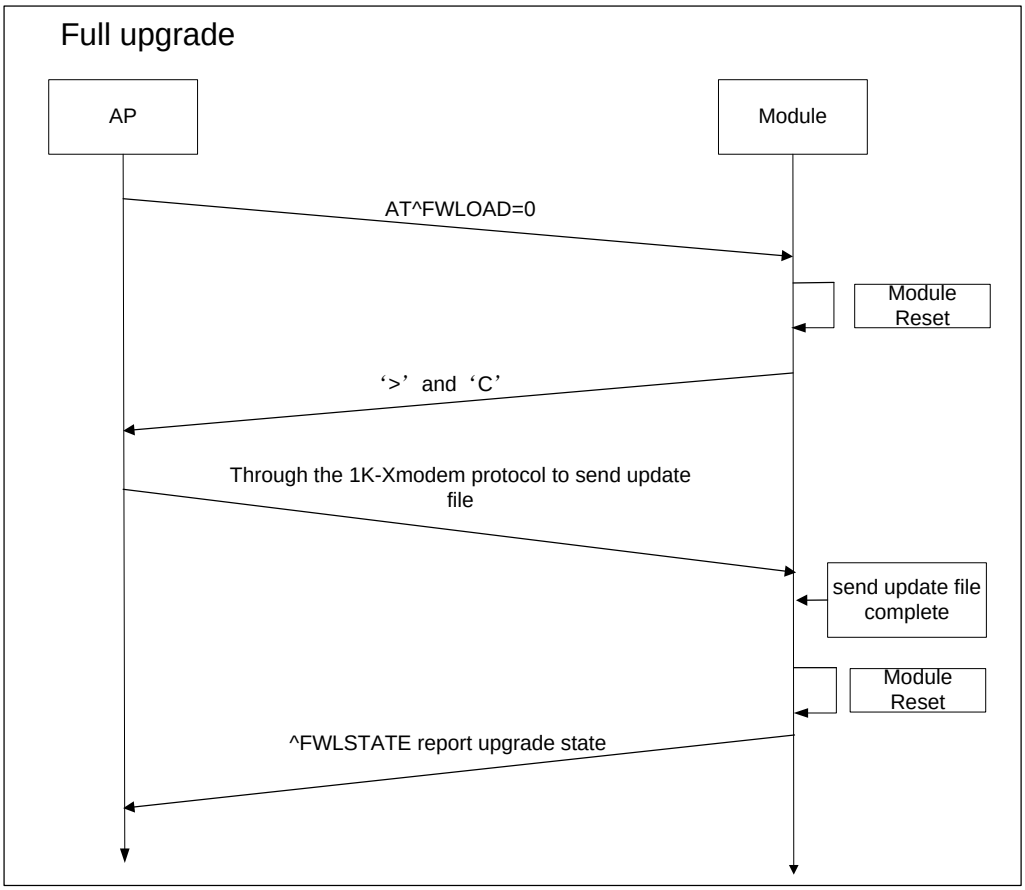
Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

12 Local Upgrade Application Scenarios

12.1 Starting the Local Upgrade

12.1.1 Full Upgrade Flow

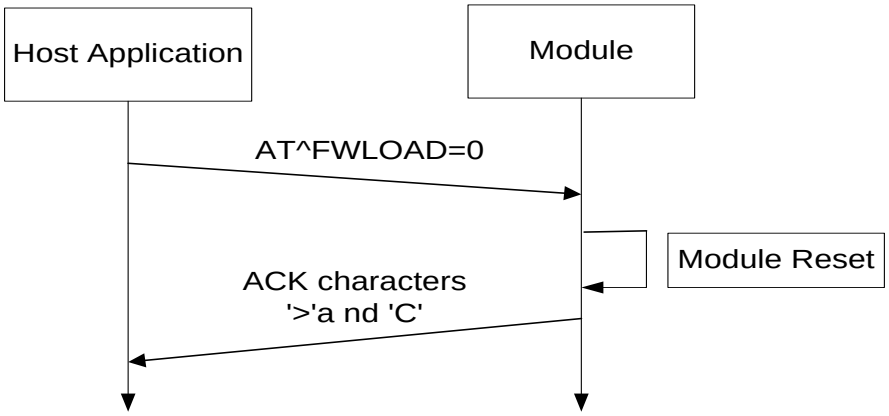
Figure 12-1 Full upgrade flow



Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

12.1.2 Launch the Local Upgrade

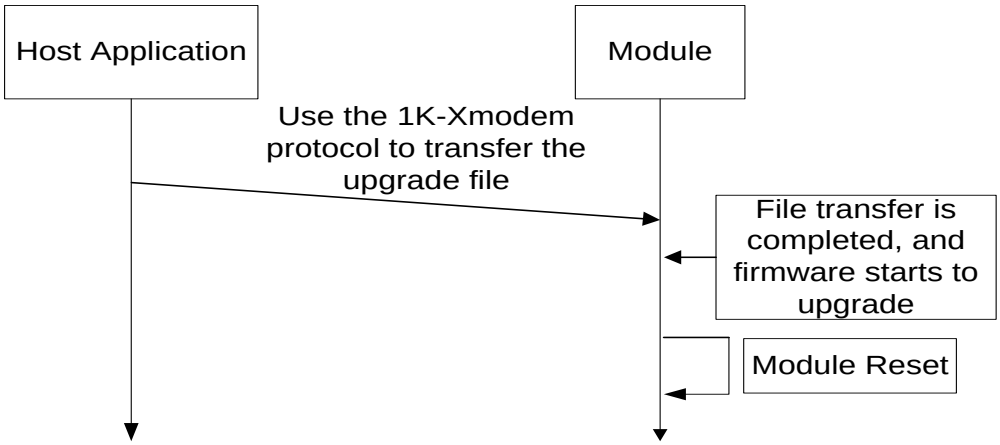
Figure 12-2 Launch the upgrade flow



The local upgrade can be used on PCUI port. After the host application sends the "**AT^FWLOAD**" command, the module will be reset to start the upgrade flow. And then the ACK characters '>' and 'C' will be returned to inform that the host application can receive firmware data. The character '>' is only reported once, and the duration between two 'C' characters will be about 10 seconds. And there are maximum ten 'C' characters will be reported before the module finally return failed upgrade state.

12.1.3 Transfer the Upgrade File

Figure 12-3 Transfer the upgrade file



After the upgrade file is transferred to the module, the module will start to upgrade the firmware directly. Finally, the module will be automatically reset to finish the upgrade flow. The host application should re-open the module's port and wait for the upgrade state AT command "**AT^FWLSTATE**".

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

12.1.4 Test

Tools and Test Steps

This section takes the full upgrade flow for example; the test is taken on Windows 7 or XP system with Hyper Terminal tool.

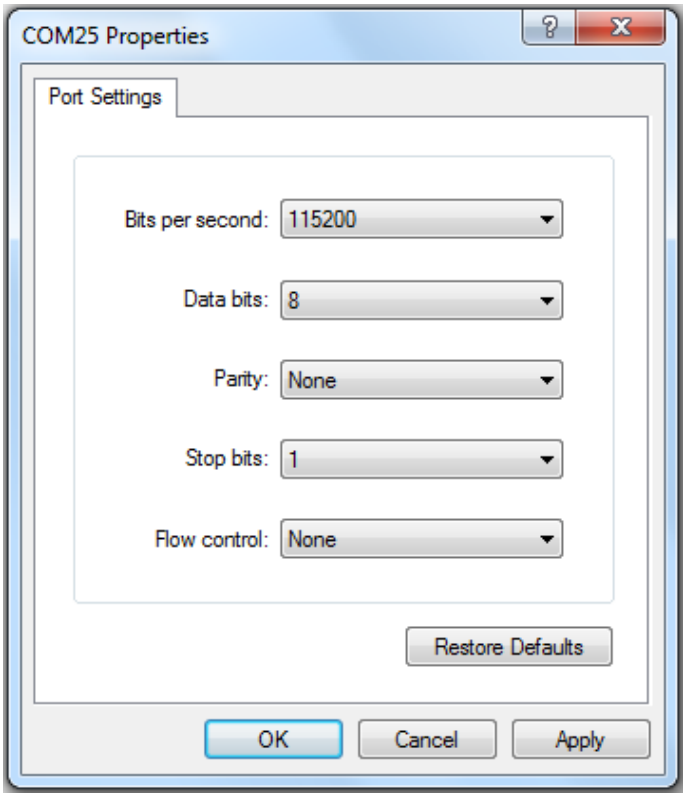
NOTE

The Hyper Terminal tool supports 1k-Xmodem protocol to transfer files.

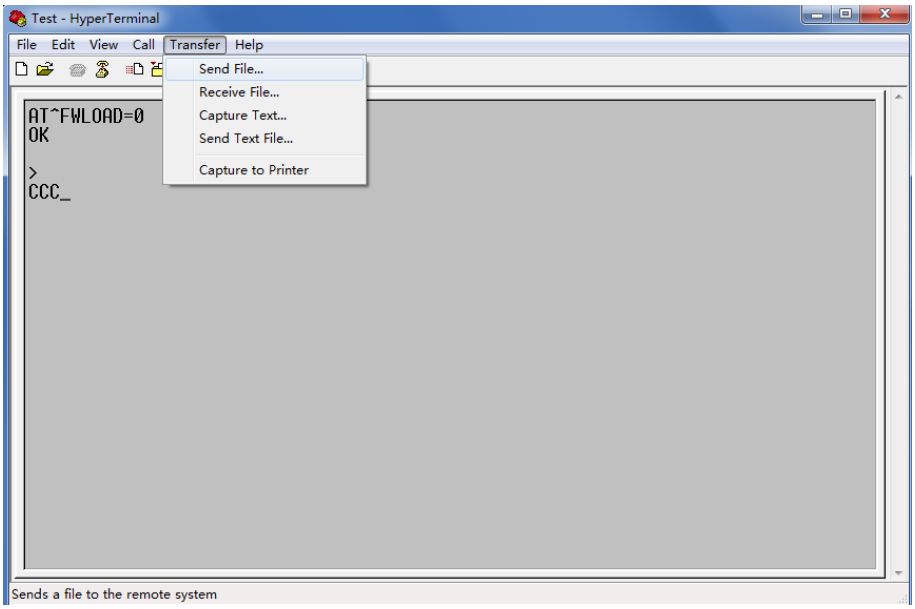
Step 1 Open the **Hyper Terminal tool** and choose the PCUI port number. (In this document, the PCUI port is **COM25**.)

Step 2 Set the parameters of the COM25 port.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

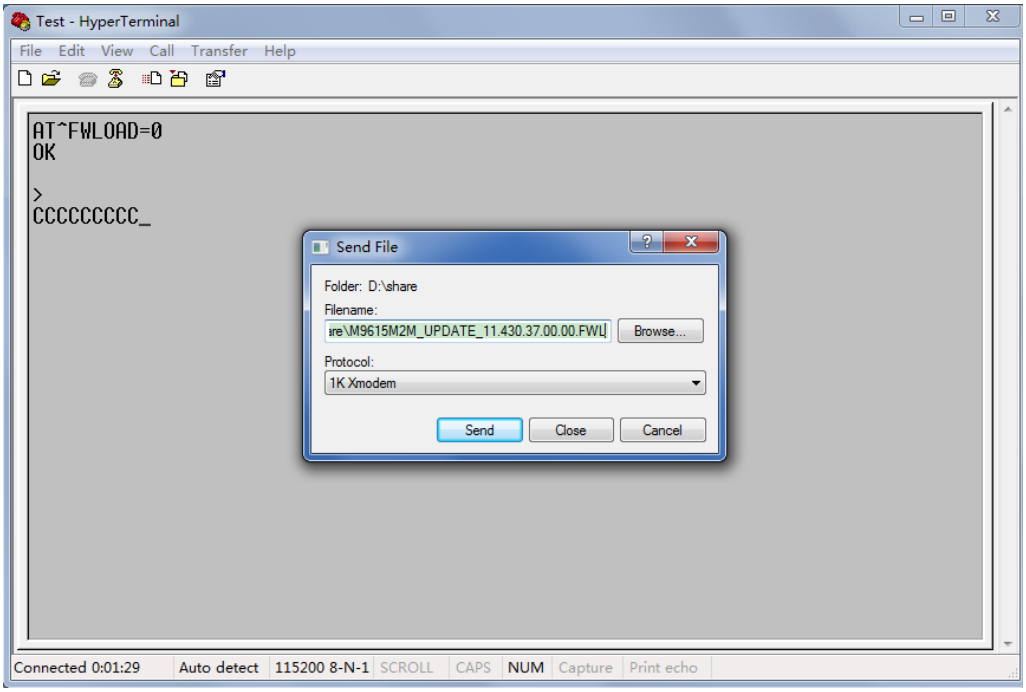


Step 3 Run the **AT^FWLOAD=0** command, and launch a full upgrade.

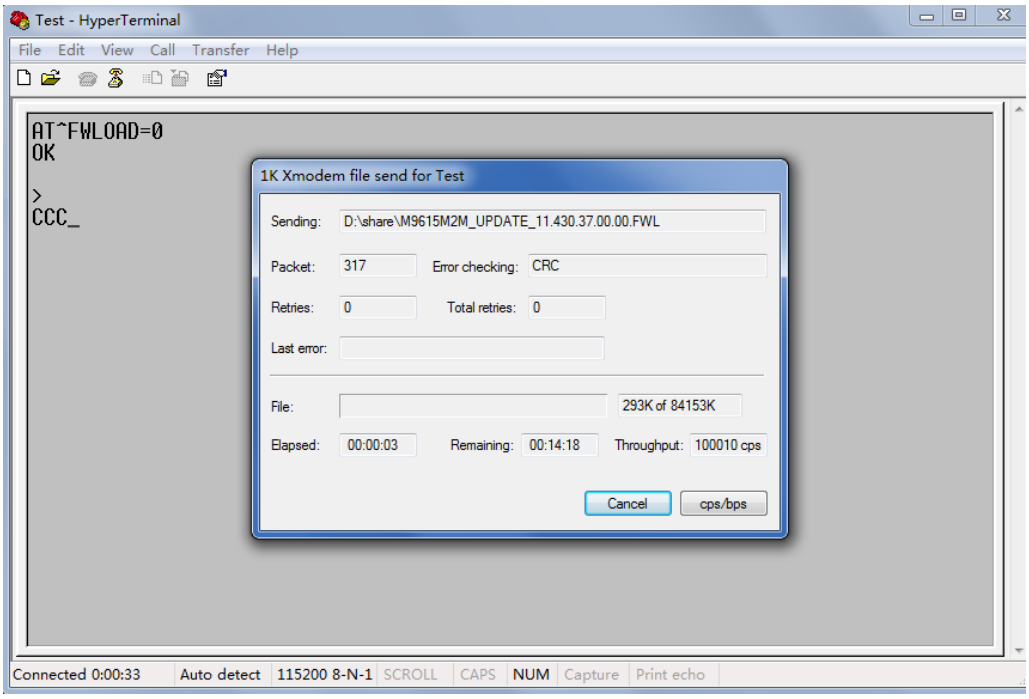


Step 4 Choose the file which will be sent to the module and choose the **1K Xmodem** protocol.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.



Step 5 Begin to transfer the local file to the module flash.



Step 6 After finishing the file transmission, start the upgrade. And the module will reset automatically to finish the upgrade.

- If the upgrade is successful, the module will return **^FWLSTATE: 90**.
- If the upgrade comes across some error, the **^FWLSTATE** will give an error code.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Requirement of the AP

The AP is required to have 4 KB RAM at least (used to store the cache data). If AP needs to support the full upgrade, AP FLASH memory must be larger than 80 MB (the full size of ME909u-523 firmware upgrade files is 80 MB).

1. AP should be able to access and load the upgrade files.
2. AP should have a file transmission tool, this tool need to support 1K-Xmodem protocol.

Finding the PCUI port on Android and Linux System

Step 1 Enter **/sys/bus/usb/drivers/option**, and look out the following types of folders.

```
1-1.1:2.2  1-1.1:2.4
1-1.1:2.3  1-1.1:2.5
```

Step 2 Enter these folders, and view the **bInterfaceProtocol** value.

```
# cd 1-1.1\:2.4
```

```
# ls
bAlternateSetting   ep_86
bInterfaceClass     modalias
bInterfaceNumber    power
bInterfaceProtocol  subsystem
bInterfaceSubClass  supports_autosuspend
bNumEndpoints       ttyUSB2
driver              uevent
ep_04
```

If the **bInterfaceProtocol** value is **12**, the port is PCUI.

```
InterfaceProtocol
12
```

12.1.5 Reference Process

Command	Description
AT^FWLOAD=0	Start the full upgrade.
>	
C	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

NOTE

- After the module reports '**C**', the host transmits the upgrade package to the module using the 1K-Xmodem protocol.
- Full upgrade only supports on USB PCUI port.

12.1.6 Troubleshooting

If using the full upgrade on some hosts, after the module is restarted, the PCUI port number may be changed. So you need to find the corresponding port, and then send the local upgrade package.

12.2 Reporting the Local Upgrade State

12.2.1 Reference Process

Command	Description
AT^FWLOAD=0	
> **C** **The board restarts, and the upgrade starts.**	
^FWLSTATE: 90	Report that the local upgrade succeeds.

NOTE

After the data have been transmitted completely and successfully, the MT will not send **OK** to the TE.

12.2.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

13 LED Indication Application Scenarios

13.1 Overview

Light Emitting Diode (LED) indicates the MT's current state. Table 13-1 shows the HUAWEI default LED program, including LED mode to different states.

Table 13-1 HUAWEI default LED program

LED Mode	Service State
Permanently off	Off line
100 ms on/100ms off/100 ms on/1700ms off	Power on Initialization
100 ms on/100ms off/100 ms on/1700ms off	Register fail and no service
100 ms on/100ms off/100 ms on/1700ms off	Connect to no service area
100 ms on/1900ms off	Register on WCDMA
Permanently on	Connect on WCDMA
Permanently on	Transmit data on WCDMA
Permanently on	Connect on HSPA
Permanently on	Transmit on HSPA
100 ms on/1900ms off	Register on LTE
Permanently on	Connect on LTE
Permanently on	Transmit data on LTE

NOTE

LED ON indicates LED GPIO High and LED OFF indicates LED GPIO Low.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

13.2 LED Setting Operations

13.2.1 Reference Process

Command	Description
AT^LEDCTRL=?	Check the parameter range supported by the command.
^LEDCTRL: (0-2),00003FFF,(0-1),(1-100),(1-100),(1-100),(1-100) **OK**	
AT^LEDCTRL?	Query the current LED program, **1** indicates adapting HUAWEI default program.
^LEDCTRL: 1 **OK**	
AT^LEDCTRL=0	Turn off LED function.
OK	
AT^LEDCTRL=1	Configure HUAWEI default program.
OK	
AT^LEDCTRL=2,00000001,0	Configure that offline state LED mode is Permanently off.
OK	
AT^LEDCTRL=2,00000001,1,10,10	Configure that offline state LED mode is single flash and cycle time is 2s (1s on/1s off).
OK	
AT^LEDCTRL=2,00000001,1,1,1,1,17	Configure that offline state LED mode is double flash and cycle time is 2s (0.1s on/0.1s off/0.1s on/1.7s off).
OK	
AT^LEDCTRL=2,0000000F,1,1,1,1,17	Configure that offline, power on initialization, register fail no service and connect to no service state LED mode are double flash. Cycle time is 2s (0.1s on/0.1s off/0.1s on/1.7s off).
OK	
AT^LEDCTRL=2,00007000,1	Configure that register successful on LTE, connect and transmit state LED mode are Permanently on.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Command	Description
OK	
AT^LEDCTRL=2,3FFFFFFF ,1	Configure that all service state LED modes are Permanently on.
OK	

NOTE

After LED mode is configured, it will take effective immediately. We suggest to configure all the LED modes corresponding to its service states. If one LED mode does not configure, the corresponding service state will adapt LED mode to Permanently OFF.

13.2.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

14 Serial Port Configuration Application Scenarios

14.1 Baud Rate Configuration

14.1.1 Reference Process

Command	Description
AT+IPR?	Query the baud rate currently used by a module.
+IPR: 115200 **OK**	
AT+IPR="<baud rate>"	Set a module's baud rate. After a new baud rate is specified, the module communicates using the new baud rate.
OK	

NOTE

- If a module's baud rate is too low, its communication speed will be slow.
- At present, the ME909u-523 supports the following baud rates: 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.
- In future, the higher speed baud rate may be supported, such as 230400, 460800, 921600, 1000000, 1500000, 2500000, 3000000, 3500000 and 4000000

14.1.2 Troubleshooting

Scenario	Possible Error Information	Solution
Specify a baud rate not supported by a module.	**AT+IPR="<baud rate>"** **ERROR**	Check that the specified baud rate is within the range of supported baud rates.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

14.2 Setting Hardware Flow Control

14.2.1 Reference Process

Command	Description
AT+IFC=0,0	Turn hardware flow control off. After hardware flow control is turned off, communication between the UE and the DTC is not restricted by flow control.
OK	
AT+IFC=2,2	Turn hardware flow control on. After hardware flow control is turned on, communication between the UE and the TE is restricted by flow control: Data transmission stops when UE's or TE's buffer level exceeds 80% and resumes when the buffer level is below 20%.
OK	

14.2.2 Troubleshooting

None

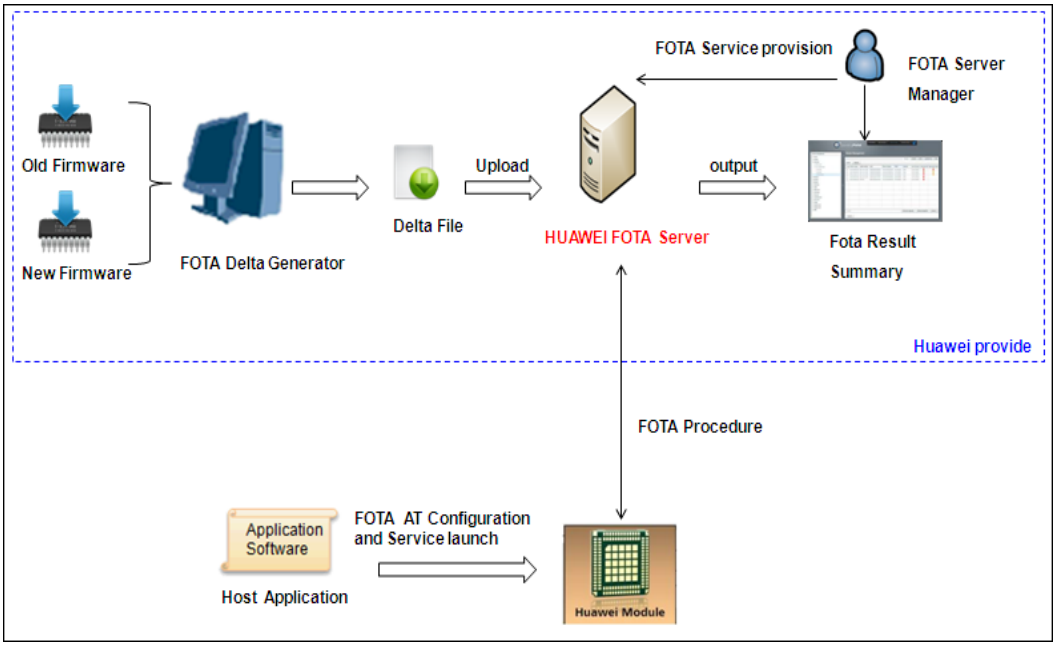
Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15 FOTA Application Scenarios

15.1 FOTA Process

15.1.1 Upgrade Module Firmware Over Air Through Delta Package

Figure 15-1 Upgrade module firmware over air through delta package

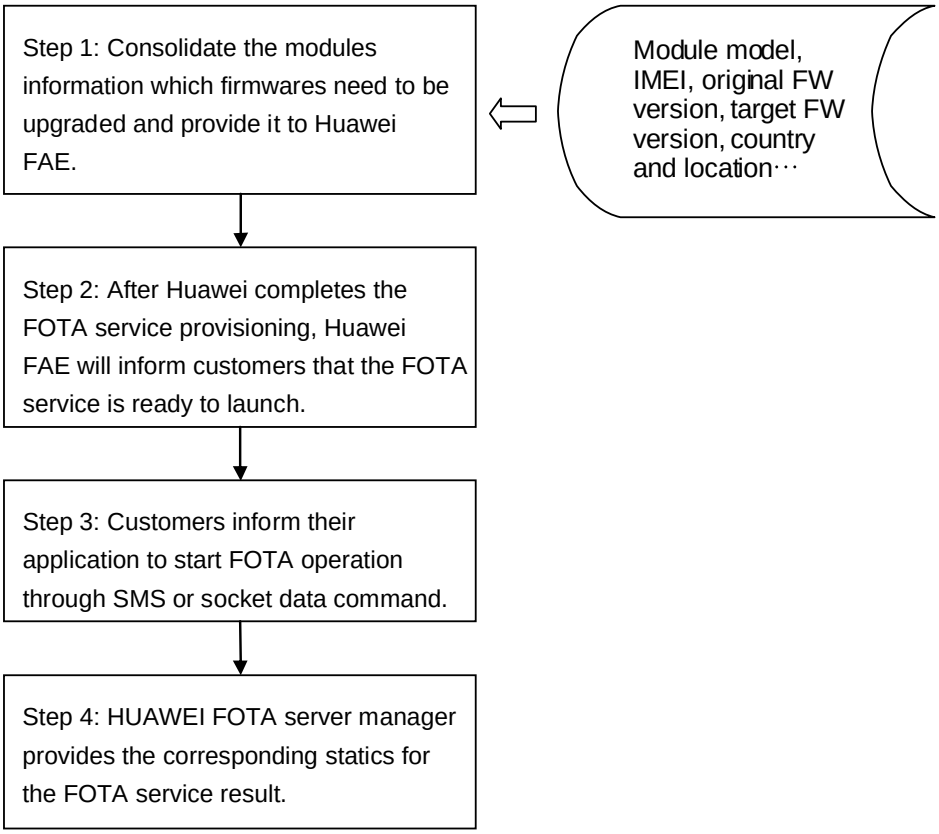


15.1.2 Procedure for FOTA Implementation

This section describes the workflow of HUAWEI Module FOTA feature.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Figure 15-2 FOTA data flow



NOTE

If the module is powered off during the firmware installing progress, after the module is restarted, the firmware will resume installing at the last point.

AT command example (after customer application received SMS from HUAWEI FOTA server or socket command to perform FOTA upgrade):

Command	Description
AT+GMR	Query the module's software version.
12.815.01.03.00 **OK**	
AT^FOTACFG="1234","","",2[1]	Configure APN.
OK	
AT^FOTAMODE=0,0,1,1	Set FOTA mode.
OK	
AT^FOTASTATE?	
^FOTASTATE: 10	Indicate that the FOTA state is idle.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

OK	
AT^FOTADET	Start to detect if new version exists in Huawei FOTA server.
OK **^FOTASTATE: 11**	
^FOTASTATE: 12,12.815.01.04.00,79114,"Support send sms background"	Get the module's new version "12.815.01.04.00".
AT^FOTADL=1	Start to download the new version and upgrade.
OK **^FOTASTATE: 30**	Indicate that it is downloading FW delta file.
AT^FOTADLQ	Query file download.
^FOTADLQ: 1,"IMAGE",1324,1324 **^FOTADLQ: 2,"XNV",47104,77778** **OK**	
^FOTASTATE: 40	Indicate that FW delta file is completely downloaded.
^FOTASTATE: 50	Indicate that FW is ready to update.
^FOTASTATE: 90	After few minutes, FW is successfully upgraded.
AT+GMR	Query the module's software version after the upgrade.
12.815.01.04.00 **OK**	The software version has been changed.

NOTE

[1] **<APN>** should be configured before any FOTA function is enabled. Here is an example and the module needs to be configured according to the specific network.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.2 Setting FOTA Mode

15.2.1 Reference Process

Command	Description
AT^FOTAMODE=?	Check the parameter range supported by the command.
^FOTAMODE: (0-1),(0-1),(0-1),(0-1),(1-65535) **OK**	
AT^FOTAMODE?	Query the current settings.
^FOTAMODE: 0,0,0,1,7 **OK**	Return the current FOTA mode: manual query, manual download, manual upgrade, and resumable data transfer enabled The value 7 indicates that the query cycle is seven days, which is meaningless when manual query is used.
AT^FOTAMODE=1,1,1,1,15	Configure FOTA mode as auto query, auto download, auto upgrade, and resumable data transfer enabled. And the auto query cycle is set to 15 days.
OK	

NOTE

- Parameter settings are all saved upon power-off.
- All parameters will be restored to their default values after the upgrade.

15.2.2 Troubleshooting

Scenario	Possible Error Information	Solution
An error message is returned.	**+CME ERROR: Error command parameters**	The parameter is incorrectly set. For details, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.3 Setting FOTA Connection Parameters

15.3.1 Reference Process

Command	Description
AT^FOTACFG="cmnet","","",2	Set the APN to **cmnet** and authentication mode to **CHAP**. Leaves the user name and password blank. These parameters should be set according to the contracted values.
OK	
AT^FOTACFG?	Query the current settings.
^FOTACFG: "cmnet","","",2 **OK**	

NOTE

- Parameter settings are all saved upon power-off.
- **<APN>** may be modified by other operations, so **<APN>** should be configured before any FOTA function is enabled.
- This command does not provide a test command. For details, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

15.3.2 Troubleshooting

Scenario	Possible Error Information	Solution
An error message is returned.	**+CME ERROR: Operation not supported**	The operation is not supported. For details, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.
An error message is returned.	**+CME ERROR: Error command parameters**	The parameter is incorrectly set. For details, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.4 Manually Querying for Upgrade Firmware Version

15.4.1 Reference Process

Command	Description
AT^FOTACFG="cmnet","","",2	This command is used to configure the PDP context. For example, sets the APN to **cmnet** (the value of APN is provided by the network server) and authentication mode to **CHAP**.
OK	
AT^FOTAMODE=0,0,0,1	Configure FOTA mode as manual query, manual download, manual upgrade, and resumable data transfer enabled.
OK	
AT^FOTASTATE?	Query the current FOTA state.
^FOTASTATE: 10 **OK**	Indicate that the FOTA state is idle.
AT^FOTADET	Check for updates.Ensure that the module is registered with a valid network before you run this command.
OK	Return **OK** (success) or return **+CME ERROR** (failure).
^FOTASTATE: 11	Report that the query operation is in process.
^FOTASTATE: 12,12.815.01.04.00,79114,"Support send sms background"	Report information about the new version, including the version number, size of the file to be downloaded, and change description.
AT^FOTASTATE?	Query the current FOTA state.
^FOTASTATE: 12 **OK**	Indicate that a new version is found.
AT^FOTADL=0	Delete the detected new version.
OK	
AT^FOTASTATE?	Query the current FOTA state.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

^FOTASTATE: 10	Indicate that the FOTA state is idle.
OK	
AT^FOTADET	Check for updates after deleting the new version on the server.
OK	
^FOTASTATE: 11	
^FOTASTATE: 14	Report that no new version is found.

NOTE

- Version detection is allowed only if the FOTA state is idle.
- If the module is undergoing the PS data service or IPSTACK service, the FOTA service cannot be initiated, including version detection, download, and upgrade.
- The parameter **<description>** of the ^FOTASTATE command is a string composed of ASCII characters. This parameter is used to describe the changed items (corresponding to the feature items in **changelog.xml** in the upgrade package) of the new version. The parameter contains a maximum of five records, each containing up to 255 characters. Records are separated by semicolon.

15.4.2 Troubleshooting

Scenario	Possible Error Information	Solution
An error message is returned.	**+CME ERROR: FOTA is in collision state**	Check whether the PS data service or IPSTACK service is going on, or use **AT^FOTASTATE?** command to check whether the FOTA state is idle.
An error message is returned.	**+CME ERROR: Previous command is not complete**	Wait for the previous command to be completely executed.
An error message is returned.	**+CME ERROR: SIM PIN required**	Use the PIN to unlock the SIM card.
The module reports a query failure.	**^FOTASTATE: 13,<error_code>**	Upon a query failure, the module restores the FOTA state to idle and deletes the downloaded files. For error codes, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.5 Periodically Querying the Version

15.5.1 Reference Process

Command	Description
AT^FOTAMODE=1,0,0,1,7	Configure FOTA mode as auto query, auto download, auto upgrade, and resumable data transfer enabled and the query cycle to seven days.
OK	The command is successfully executed. The module automatically checks for updates when the query time arrives.
^FOTASTATE: 11	Report that the query operation is in process.
^FOTASTATE: 12,12.815.01.04.00,79114,"Support send sms background"	Report information about the new version.

NOTE

- Periodical query is based on either of the two timekeeping modes: network timekeeping or local timekeeping. If network timekeeping is unavailable, local timekeeping is used. Local timekeeping may not be accurate.
- Local timekeeping is affected by **AT+CCLK** command. Upon a power-off event, the CCLK value changes to **1980**. After you choose to use local timekeeping and change the CCLK value, the query operation cannot be carried out at the correct time.

15.5.2 Troubleshooting

Scenario	Possible Error Information	Solution
Auto query is in use.	No query operation is initiated when the query time arrives.	1. Check if the FOTA state is idle. If not, change the FOTA state to idle by using the **AT^FOTADL=0** command. 2. Check whether the PS data service or IPSTACK service is going on. If yes, terminate the service.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.6 Manually Downloading the Version

15.6.1 Reference Process

Command	Description
AT^FOTASTATE?	Query the current FOTA state.
^FOTASTATE: 12 **OK**	Indicate that a new version is found.
AT^FOTADL=1	Run this command to manually download the version or to resume data transfer.
OK **^FOTASTATE: 30**	The command is successfully executed. Report that the download is in process.
AT^FOTADL=2	Run this command to manually download Pause.
OK **^FOTASTATE: 31**	The command is successfully executed. Report that the download is pending. If the resumable data transfer mode is disabled, the command will return "+CME ERROR: Operation not supported".
AT^FOTADL=1	Run this command to manually download the version or to resume data transfer.
OK **^FOTASTATE: 30**	The command is successfully executed. Report that the download is in process.
AT^FOTADLQ	Query the download progress.
^FOTADLQ: 1,"IMAGE",1324,1324 **^FOTADLQ: 2,"XNV",47104,77778** **OK** **^FOTASTATE: 40**	Return that the IMAGE file size is 1324 bytes, and 1324 bytes have been downloaded. The XNV file size is 77778 bytes, and 47104 bytes have been downloaded. Report that the version is completely downloaded and passes the MD5 verification.
AT^FOTADL=?	Query the parameters supported by the command.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

^FOTADL: (0-2) **OK**	Return the supported parameters. 0: not to download. 1: download. 2: download pause

NOTE

- Version download is allowed only if the FOTA state is **12** (new version detected) and **31** (download pending).
- The prerequisites for version download and query are:

  Module registered with a valid network.

  No ongoing PS data service or IPSTACK service.

15.6.2 Troubleshooting

Scenario	Possible Error Information	Solution
An error message is returned.	**+CME ERROR: Operation not supported**	The command is incorrect.
An error message is returned.	**+CME ERROR: SIM PIN required**	Use the PIN to unlock the SIM card.
An error message is returned.	**ERROR**	The command is executed in incorrect FOTA state. Ensure that the FOTA state is **12** or **31** before you run the command.
The module reports a download failure.	**^FOTASTATE: 20,<error_code>**	Upon a download failure, the module restores the FOTA state to idle and deletes the downloaded file. For error codes, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.7 Automatically Downloading the Firmware

15.7.1 Reference Process

Command	Description
AT^FOTAMODE=0,1,0,1	Configure auto download mode.
OK	
AT^FOTADET	Run this command to manually check for upgrades.
OK	
^FOTASTATE: 11	Report that the query operation is in process.
^FOTASTATE: 12,12.815.01.01.00,79102,"Support send sms background"	Report that a new version is found and information about the new version.
^FOTASTATE: 30	Automatically download the new version and reports that the download is in process.
^FOTASTATE: 40	Report that the version is completely downloaded and passes the MD5 verification.

15.7.2 Troubleshooting

None

15.8 Using the Resumable Data Transfer Function

15.8.1 Reference Process

Command	Description
AT^FOTAMODE=0,0,0,1	Enable resumable data transfer.
OK	
AT^FOTASTATE?	Query the FOTA state.
^FOTASTATE: 31	Indicate that the download is pending.
OK	
AT^FOTADL=1	Resume the transmission from the break point.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

OK	
^FOTASTATE: 30	Report that the download is in process.
^FOTASTATE: 40	Report that the download is complete.

NOTE

If resumable data transfer is disabled, the download pending due to network disconnection or TCP link breakoff will be regarded as a download error.

15.8.2 Troubleshooting

Scenario	Possible Error Information	Solution
The function of resumable data transfer is disabled, and the network or TCP link is disconnected.	**^FOTASTATE: 20,18** **Or other download error**	The module deletes the downloaded file and restores the FOTA state to idle.
The function of resumable data transfer is enabled, and the module is powered off.	**^FOTASTATE: 31**	The module prompts that the download can be resumed.

15.9 Manually Cancelling the Download

15.9.1 Reference Process

Command	Description
AT^FOTADL=1	Initiate the version download.
OK	
^FOTASTATE: 30	Report that the download is in process.
AT^FOTADL=0	Cancel the download, delete the downloaded file, and restore the FOTA state to idle.
OK	The command is successfully executed.
AT^FOTASTATE?	

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

^FOTASTATE: 10 **OK**	Report that the operation to cancel the download is complete. The FOTA state is idle.

15.9.2 Troubleshooting

None

15.10 Manually Upgrading the Version

15.10.1 Reference Process

Command	Description
AT^FOTASTATE?	
^FOTASTATE: 40 **OK**	Report that the download is complete.
AT^FWUP	Run this command to manually start the upgrade.
OK	The command is successfully executed.
^FOTASTATE: 50	Report that the upgrade starts. The module restarts, and then starts the upgrade.
^FOTASTATE: 90	Report that the upgrade succeeds.

NOTE

- The module restarts several times during the upgrade. Ensure that during this process, the module is powered on. Do not send AT commands during the upgrade.
- If the upgrade fails, the module enters forcible loading mode, you can perform any of the following:

  1. One-click upgrade from devices running Windows (full upgrade using the .exe file)

  2. Upgrade from devices that run Android or Linux using **UpdateWizard** (full upgrade using the .bin file)

  3. Local upgrade no matter the host having the operation system or not (for details, see chapter 12 .

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

15.10.2 Troubleshooting

Scenario	Possible Error Information	Solution
An error message is returned.	**+CME ERROR: Previous command is not complete**	Wait for the previous command to be completely executed.
An error message is returned.	**+CME ERROR: FOTA is in collision state**	1. Check whether the PS data service or IPSTACK service is going on. 2. Check that the FOTA state is not **40** (download is complete).
An error message is returned.	**ERROR**	The command format is incorrect. Please see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.
The module reports an upgrade failure.	**^FOTASTATE: 80,<error_code>**	The module automatically changes the FOTA state to idle and deletes the downloaded file. You can use the **AT^FOTADL=0** command to set the FOTA state to idle manually. For error codes, see the latest version of *HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification*.

15.11 Automatically Upgrading the Version

15.11.1 Reference Process

Command	Description
AT^FOTAMODE=0,1,1,1	Configure FOTA mode as auto download and auto upgrade.
OK	
AT^FOTADET	Check for upgrades.

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

OK	
^FOTASTATE: 11	
^FOTASTATE: 12,12.815.01.02.00,79114,"Support send sms background"	Return information about the new version.
^FOTASTATE: 30	Automatically download the version.
^FOTASTATE: 40 **^FOTASTATE: 50**	Report that the version is completely downloaded and passes the MD5 verification.
^FOTASTATE: 90	Report that the module is ready for the upgrade. Report that the upgrade succeeds.
AT^FOTASTATE?	Query the FOTA state.
^FOTASTATE: 10	The FOTA state changes to idle after the upgrade.
OK	

15.11.2 Troubleshooting

None

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

16 Appendix

16.1 Relative Documents

1. HUAWEI ME909u-523 LTE LGA Module AT Command Interface Specification
2. 3GPP TS 27.007 AT command set for User Equipment (UE)
3. 3GPP TS 27.005 Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
4. 3GPP TS 23.040 Technical realization of the Short Message Service(SMS)
5. 3GPP TS 31.102 Universal Subscriber Identity Module(USIM) application
6. 3GPP TS 24.008 Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
7. 3GPP TS 29.002 Mobile Application Part (MAP) specification
8. 3GPP TS 22.004 General on supplementary services
9. ETSI TS 102.221 Smart Cards; UICC-Terminal interface; Physical and logical characteristics

16.2 Acronyms and Abbreviations

Table 16-1 List of Abbreviations

Acronym or Abbreviation	Expansion
3GPP	Third Generation Partnership Project
AGPS	Assisted Global Positioning System
APN	Access Point Name
AT	Attention
CS	Circuit Switched (CS) domain
DCE	Data Circuit Equipment
DTE	Data Terminal Equipment
ECM	Ethernet Control Model

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.

Acronym or Abbreviation	Expansion
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IMEI	International Mobile Equipment Identity
IP	Internet Protocol
LTE	Long Term Evolution
ME	Mobile Equipment
PDP	Packet Data Protocol
PDU	Protocol Data Unit
PIN	Personal Identity Number
PPP	Point-to-Point Protocol
PUK	PIN Unblocking Key
PS	Packet Switched (PS) domain
QoS	Quality of Service
SIM	Subscriber Identity Module
SMS	Short Message Service
TE	Terminal Equipment
UART	Universal Asynchronous Receiver/Transmitter
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
USIM	Universal Subscriber Identity Module
WCDMA	Wideband CDMA

Table 16-2 Phonebook-related abbreviations

Abbreviation	Full Name
SM	SIM phonebook
EN	SIM emergency number
ON	SIM own numbers

Huawei Proprietary and Confidential
Copyright © Huawei Technologies Co., Ltd.