GSM RF Test Application Note

GSM/GPRS/GNSS Module Series

Version: 1.0

Date: 2021-10-27

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
-	2021-10-27	Waner PAN	Creation of the document
1.0	2021-10-27	Waner PAN	First official release

Contents

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1 Introduction

This document is a reference guide for AT commands and responses of GSM RF test.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Series	Module
Mxx	M66
	M66 R2.0
	M66-DS
	M72 R3.0
	M89
	M95 R2.0
	M08-R
	M65
	M95-R
MCxx	MC60
	MC90
	MC65

2 Application Note

2.1. AT Command Introduction

2.1.1. Definitions

- **<CR>**   Carriage return character.
- **<LF>**   Line feed character.
- **<...>**   Parameter name. Angle brackets do not appear on the command line.
- **[...]**   Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals to its previous value or the default settings, unless otherwise specified.

- <u>**Underline**</u>   Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 2: Type of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of corresponding Write Command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of a corresponding Write Command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or

perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about how to use the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendation or suggestions about how you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and that they should be executed in a given sequence.

2.3. M66/M66 R2.0/M66-DS/M72 R3.0/M89/M95 R2.0/MC60/MC90

2.3.1. AT+QRFTEST Transmit/Receive in FTM Mode

AT+QRFTEST Transmit/Receive in FTM Mode	
Test Command **AT+QRFTEST=?**	Response +QRFTEST: (1-TX,2-RX),(band:0-3),(arfcn:0-1023),<(tsc:0-7),(pcl:0-19),(afc)>/<(gain)>,(burst type:0-6/pattern:0-1) OK
Write Command When **<mode>**=1, transmit in FTM mode **AT+QRFTEST=<mode>,<band>,<arfcn>,<tsc>,<pcl>,<afc>,<burst type>**	Response OK If the error is related to ME functionality: **+CME ERROR: <err>** If there is any other error: ERROR
Write Command When **<mode>**=2, receive in FTM mode **AT+QRFTEST=<mode>,<band>,<arfcn>,<gain>,<pattern>**	Response OK If the error is related to ME functionality: **+CME ERROR: <err>** If there is any other error: ERROR

Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will not be saved.

Parameter

<mode>	Integer type. Transmit/Receive in FTM mode.
	1 Transmit in FTM mode
	2 Receive in FTM mode
<band>	Integer type. The supported band in GSM.
	0 EGSM900
	1 DCS1800
	2 PCS1900
	3 GSM850
<arfcn>	Integer type. ARFCN of supported channels in GSM.
	0–124, 975–1023 EGSM900
	512–885 DCS1800
	512–810 PCS1900
	128–251 GSM850
<tsc>	Integer type. Time slot. Range: 0–7.
<pcl>	Integer type. Power control level.
	5–19 GSM850/EGSM900
	0–15 DCS1800/PCS1900
<afc>	The compensation value of automatic frequency control. It is only valid for 4100 Hz.
<burst type>	Integer type. The mode for transmitted pulse.
	0 Random 0 or 1 to be transmitted with timeslot
	1 1 to be transmitted without timeslot
	2 Random 0 or 1 to be transmitted with synchronous sequence
	3 0 to be transmitted continuously
	4 1 to be transmitted continuously
	5 Alternate bits to be transmitted continuously
	6 Pseudo random number to be transmitted continuously
<gain>	Integer type. The gain value of the RF receiving circuit. It is only valid for 40 dBm.
<pattern>	Integer type. Receiving mode.
	0 Receive continuously
	1 Receive burst
<err>	Error code. See *Chapter 4* for details.

NOTE

This command is available only when the parameter **<fun>** of **AT+CFUN=<fun>,[<rst>]** is 0.

2.3.2. AT+QMAXTXPWR   Limit the Maximum Transmit Power

AT+QMAXTXPWR Limit the Maximum Transmit Power	
Test Command AT+QMAXTXPWR=?	Response +QMAXTXPWR: (list of supported **<pwr_value>**s) **OK** If error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Read Command AT+QMAXTXPWR?	Response +QMAXTXPWR: <pwr_value> **OK** If the error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Write Command AT+QMAXTXPWR=<pwr_value>	Response **OK** If error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will not be saved.

Parameter

<pwr_value>	Integer type. The maximum transmit power. Unit: dBm.
	18–33 Custom scope
	255 The maximum power value is not defined
<err>	Error code. See **Chapter 4** for details.

2.3.3. AT+CDETXPW   Decrease or Increase the Power of Certain PCL

AT+CDETXPW Decrease or Increase the Power of Certain PCL	
Test Command **AT+CDETXPW=?**	Response **+CDETXPW=<rf_band>(list of supported <rf_band>s),<tx _slots>(list of supported <tx_slots>s),<PCLx>,<dbValue> [,<dirc>]** **OK**
Read Command **AT+CDETXPW?**	Response **+CDETXPW: (dB)** **850: {<slot1>,<slot2>,<slot3>,<slot4>}** **900: {<slot1>,<slot2>,<slot3>,<slot4>}** **1800: {<slot1>,<slot2>,<slot3>,<slot4>}** **1900: {<slot1>,<slot2>,<slot3>,<slot4>}** **OK**
Write Command **AT+CDETXPW=<rf_band>,<tx_slots>[,<PCLx>[,<dbValue>[,<dirc>]]]**	Response **OK** If all the optional parameters are omitted, query the decreased or increased power of all PCL with certain slot in certain band: **+CDETXPW: (dB)** **<rf_band>(<tx_slots>):** **{<dbValue>,<dbValue>,…,<dbValue>}** **OK** If **<dbValue>** and **<dirc>** are omitted, query the decreased or increased power of certain PCL with certain slot in certain band: **+CDETXPW: (dB)** **<rf_band>(<tx_slots>)[<PCLx>]: <dbValue>** **OK** If **<dirc>** is omitted, set to decrease the power of certainPCL with certain slot in certain band: OK If optional parameters are specified, set to decrease or increase the power of certain PCL with certain slot in

	certain band: OK If the error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will be saved to NVRAM automatically.

Parameter

<rf_band>	Integer type. Specify the band.
	850 GSM850
	900 EGSM900
	1800 DCS1800
	1900 PCS1900
<tx_slots>	Integer type. Specify the slot number of TX.
	1 **<slot1>**
	2 **<slot2>**
	3 **<slot3>**
	4 **<slot4>**
<slotn>	Integer type. The value of TX slot. Unit: dBm.
<PCLx>	Integer type. The power control level.
	5–19 For GSM850 and EGSM900
	0–15 For DCS1800 and PCS1900
	255 Apply to every PCLs for the specific band
<dbValue>	Integer type. Decreased/Increased value of power. Unit: dBm.
<dirc>	Integer type. Decreased or increased mode.
	0 Decreased mode
	1 Increased mode
<err>	Error code. See *Chapter 4* for details.

NOTE

Some modules do not support the parameter **<dirc>**. For the specific modules, please contact Quectel Technical Supports.

2.4. M08-R/M65/M95-R/MC65

2.4.1. AT+QRFTEST Transmit/Receive in FTM Mode

AT+QRFTEST Transmit/Receive in FTM Mode	
Test Command **AT+QRFTEST=?**	Response **+QRFTEST: (**list of supported **<mode>**s),(list of supported **<band>**s),(list of supported **<arfcn>**s),(list of supported **<tsc>**s),(list of supported **<pcl>**s) OK
Write Command When **<mode>**=1, transmit in FTM mode **AT+QRFTEST=<mode>,<band>,<arfcn>,<tsc>,<pcl>**	Response OK If the error is related to ME functionality: **+CME ERROR: <err>** If there is any other error: ERROR
Write Command When **<mode>**=2, receive in FTM mode **AT+QRFTEST=<mode>,<band>,<arfcn>,<exp_power>**	Response +QRFTEST: <RX_power> **OK** If the error is related to ME functionality: **+CME ERROR: <err>** If there is any other error: ERROR
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will not be saved.

Parameter

<mode>	Integer type. Transmit/Receive in FTM mode.
	0 Exit from TX/RX mode
	1 Transmit in FTM mode
	2 Receive in FTM mode
<band>	Integer type. The supported band in GSM.

	0	EGSM900
	1	DCS1800
	2	PCS1900
	3	GSM850
<arfcn>	Integer type. ARFCN of supported channels in GSM.	
	EGSM900: 0–124, 975–1023	
	DCS1800: 512–885	
	PCS1900: 512–810	
	GSM850: 128–251	
<tsc>	Integer type. Time slot. Range: 0–7.	
<pcl>	Integer type. Power control level.	
	GSM850/EGSM900: 5–19	
	DCS1800/PCS1900: 0–15	
<exp_power>	Integer type. Expected power. Range: -110 to -15. Unit: dBm.	
<RX_power>	Integer type. Received power. Unit: dBm.	
<err>	Error code. See *Chapter 4* for details.	

> **NOTE**
>
> This command takes effect only after **AT^REBOOT=2** has been executed.

2.4.2. AT+QMAXTXPWR   Limit the Maximum Transmit Power

AT+QMAXTXPWR Limit the Maximum Transmit Power	
Test Command **AT+QMAXTXPWR=?**	Response **+QMAXTXPWR: (**list of supported **<pwr_value>**s**)** **OK** If error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Read Command **AT+QMAXTXPWR?**	Response **+QMAXTXPWR: <pwr_value>** **OK** If the error is related to ME functionality: +CME ERROR: <err>

	If there is any other error:
	ERROR
Write Command	Response
AT+QMAXTXPWR=<pwr_value>	**OK**
	If error is related to ME functionality:
	+CME ERROR: <err>
	If there is any other error:
	ERROR
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately.
	The configuration will be saved automatically

Parameter

<pwr_value>	Integer type. The maximum transmit power. Unit: dBm.	
	18–26,29	Custom scope
	255	The maximum power value is not defined
<err>	Error code. See *Chapter 4* for details.	

2.4.3. AT+CDETXPW   Decrease or Increase the Power of Certain PCL

AT+CDETXPW Decrease or Increase the Power of Certain PCL	
Test Command	Response
AT+CDETXPW=?	**+CDETXPW: <rf_band>(**list of supported **<rf_band>**s),**<tx _slots>(**list of supported **<tx_slots>**s),**<PCLx>,<dbValue> [,<dirc>]**
	OK
Read Command	Response
AT+CDETXPW?	**+CDETXPW: (dB)**
	850: {<slot1>,<slot2>,<slot3>,<slot4>}
	900: {<slot1>,<slot2>,<slot3>,<slot4>}
	1800: {<slot1>,<slot2>,<slot3>,<slot4>}
	1900: {<slot1>,<slot2>,<slot3>,<slot4>}
	OK
Write Command	Response
AT+CDETXPW=<rf_band>,<tx_slots>[	**OK**

,**<PCLx>[,<dbValue>[,<dirc>]]]**	If all the optional parameters are omitted, query the decreased or increased power of all PCL with certain slot in certain band: **+CDETXPW: (dB)** **<rf_band>(<tx_slots>):** **{<dbValue>,<dbValue>,…,<dbValue>}** **OK** If **<dbValue>** and **<dirc>** are omitted, query the decreased or increased power of certain PCL with certain slot in certain band: **+CDETXPW: (dB)** **<rf_band>(<tx_slots>)[<PCLx>]: <dbValue>** **OK** If **<dirc>** is omitted, set to decrease the power of certain PCL with certain slot in certain band: OK If optional parameters are specified, set to decrease or increase the power of certain PCL with certain slot in certain band: OK If the error is related to ME functionality: +CME ERROR: <err> If there is any other error: ERROR
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will be saved to NVRAM automatically.

Parameter

<rf_band>	Integer type. Specify the band.	
	850	GSM850
	900	EGSM900
	1800	DCS1800
	1900	PCS1900

<tx_slots>	Integer type. Specify the slot number of TX.
	1 **<slot1>**
	2 **<slot2>**
	3 **<slot3>**
	4 **<slot4>**
<slotn>	Integer type. The value of TX slot. Unit: dBm.
<PCLx>	Integer type. The power control level.
	5–19 For GSM850 and EGSM900
	0–15 For DCS800 and PCS1900
	255 Apply to every PCLs for the specific band
<dbValue>	Integer type. Decreased/Increased value of power. Unit: dBm.
<dirc>	Integer type. Decreased or increased mode.
	<u>0</u> Decreased mode
	1 Increased mode
<err>	Error code. See *Chapter 4* for details.

> **NOTE**
>
> Some modules do not support the parameter **<dirc>**. For the specific modules, please contact Quectel Technical Supports.

3 Examples

3.1. AT+QRFTEST

```
//M66/M66 R2.0/M66-DS/M72 R3.0/M89/M95 R2.0/MC60/MC90 modules
AT+CFUN=0                        //Disable GSM protocol stack.
OK
AT+QRFTEST=1,0,9,0,19,4100,0     //Transmit in FTM mode.
OK
AT+QRFTEST=2,0,9,40,0            //Receive in FTM mode.
OK
//M08-R/M65/M95-R/MC65 modules
AT^REBOOT=2
OK
AT+QRFTEST=1,0,80,0,10           //Transmit in FTM mode.
OK
AT+QRFTEST=2,0,62,-70            //Receive in FTM mode.
+QRFTEST: -71

OK
AT^REBOOT=0
OK
```

3.2. AT+QMAXTXPWR

```
//M08-R/M65/M95-R/MC65 modules
AT+QMAXTXPWR=?
+QMAXTXPWR: (18-26,29,255)

OK
//M66/M66 R2.0/M66-DS/M72 R3.0/M89/M95 R2.0/MC60/MC90 modules
AT+QMAXTXPWR=?
+QMAXTXPWR: (18-33,255)

OK
```

```
AT+QMAXTXPWR?              //Query the current settings.
+QMAXTXPWR: 255            //There is no customized maximum power value at present.

OK
AT+QMAXTXPWR=28            //The maximum transmit power is set to 28 dBm.
OK
AT+QMAXTXPWR?              //Query the current configuration.
+QMAXTXPWR: 28             //The value of current customized maximum power is 28 dBm.

OK
```

3.3. AT+CDETXPW

```
AT+CDETXPW=850,2,7,2        //Decrease 2 dBm of PCL 7 with TX slot 2 in the 850 MHz band.
OK
AT+CDETXPW=900,1,255,2      //Decrease 2 dBm of every PCL (5–19) with TX slot 1 in the 900 MHz
                             band.
OK
AT+CDETXPW=900,1,255,2,1    //Increase 2 dBm of every PCL (5–19) with TX slot 1 in the 900 MHz
                             band.
OK
AT+CDETXPW=900,1            //Query the power of all PCL (5–19) with TX slot 1 in the 900 MHz band.
+CDETXPW: (dB)
900(1): {2,2,2,2,2,2,2,2,2,2,2,2,2,2,2}

OK
AT+CDETXPW=900,1,5          //Query the power of the PCL 5 with TX slot 1 in the 900 MHz band.
+CDETXPW: (dB)
900(1)[5]: 2

OK
AT+CDETXPW=850,2,7          //Query the power of the PCL 7 with TX slot 2 in the 850 MHz band.
+CDETXPW: (dB)
850(2)[7]: -2

OK
```

4 Summary of CME ERROR Codes

The CME ERROR code **<err>** indicates an error related to mobile equipment or network.

The details about **<err>** for M66, M66 R2.0, M66-DS, M72 R3.0, M89, M95 R2.0, MC60 and MC90 modules are described in the *Table 3*.

Table 3: Related CME ERROR Codes (1)

<err>	Meaning
4	Operation not supported
603	Syntax error
3518	Invalid parameter
3765	Invalid input value
3773	Invalid CFUN state
3774	Invalid ARFCN

The details about **<err>** for M08-R, M65, M95-R and MC65 modules are described in the *Table 4*.

Table 4: Related CME ERROR Codes (2)

<err>	Meaning
49	Invalid parameter
53	Operation not supported

5 Appendix Reference

Table 5: Terms and Abbreviations

Abbreviation	Description
ARFCN	Absolute Radio-Frequency Channel Number
FTM	Factory Test Mode
GSM	Global System for Mobile Communications
PCL	Power Control Level
RF	Radio Frequency
RX	Receive
TX	Transmit