GSM Jamming Detection

Application Note

GSM/GPRS Module Series

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About the document

History

Revision	Date	Author	Description
3.0	2013-06-14	Bob DENG	Initial
3.1	2015-04-08	Bob DENG	Added applicable modules

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1 Introduction

A Cellular Communication Jammer can totally paralyze all kinds of mobile and portable phones working in the GSM bands. Quectel standard modules offer jamming detection functionality allowing the unit to sense attempts to disrupt the GSM communication by interference with the GSM signal. Quectel module's sophisticated jamming detection enables enhanced security features and immediate alarm notification if communication interference is detected. This document gives a detailed explanation on how to use the Jamming Detection function of Quectel standard modules.

This document is applicable to all Quectel GSM modules.

2 Jamming Detection Overview

Quectel's Jamming Detection allows the user to identify active jamming of the GSM network. Many alarm, security and life critical operations rely on the use of GSM mobile communications. Criminals and those that intent on preventing time critical messages may use GSM Jammers to interfere with normal network operation. Quectel's Jamming Detection can allow Quectel module to detect GSM jamming signals. When jamming is detected, Quectel module sends a notification to MCU, reporting the presence of active jamming of the GSM mobile communication network.

Figure 1: Jamming Application Diagram

2.1. Application Overview

Quectel Jamming Detection supports to report the appearance and disappearance of jamming automatically via URC and/or set a hardware pin from low level to high level to notify the MCU. Also user can manually query the jamming status by the **QJDR** read command (see chapter 3.2). The following sections describe how to use these functionalities.

2.1.1. Report Jamming Status via URC

After Jamming Detection function is enabled by **AT+QJDR=1**,the Jamming Detection function can work well with the default settings .If jamming is detected, the module will report "**+QJDR: JAMMED**" through serial port. If jamming is removed, the module will report "**+QJDR: NO JAMMING**" through serial port. For detailed examples, please refer to chapter 4.1.

2.1.2. Report Jamming Status via URC Periodically

There are two ways to report URC for indicating jamming status. One is reporting URC only once as described in section 2.1.1; the other is reporting URCs periodically as described in this section. Firstly, enable the Jamming Detection function of Quectel module by **AT+QJDR=1**, and then set the **<period>** by **AT+QJDCFG**. If jamming is detected, the module will report a URC "**+QJDR: JAMMED**" through serial port every **<period>** seconds. If jamming is removed, the module will report "**+QJDR: NO JAMMING**" through serial port. For more examples, please refer to chapter 4.2.

2.1.3. Report Jamming Status via Pin Output

This feature supports that a pin is designed to indicate jamming by outputting different level. When jamming is detected, the PIN will output a HIGH level. In normal conditions (not jammed), the PIN will output a LOW level. If the module detects a Jammer then it will set the hardware output pin from LOW to HIGH level. In this case, the jamming status can be got by the pin status. The **<pinname>** parameter of **AT+QJDCFG** command can be used to configure a pin of module as a jamming indication pin. For more examples, please refer to chapter 4.3.

2.2. Configure Optimized Detection Parameters

Quectel Jamming Detection supports to optimize the detection conditions by configuring **<mnl>** and **<minch>** parameters of **AT+QJDCFG**. To detect and report the jamming, the following two basic conditions are verified.

One is checking whether RSSI (Received Signal Strength Indication, consistent with the **<rssi>** value that **AT+CSQ** command returns) is greater than the threshold **<mnl>**.The other is checking whether the count of disturbed channels is greater than the threshold **<minch>**.The following Figure 2 shows how jamming status is reported according to these two parameters **<mnl>** and **<minch>**. The thresholds of **<mnl>** and **<minch>** may be modified according to customer's local network environment. For detailed example, please refer to chapter 4.5.

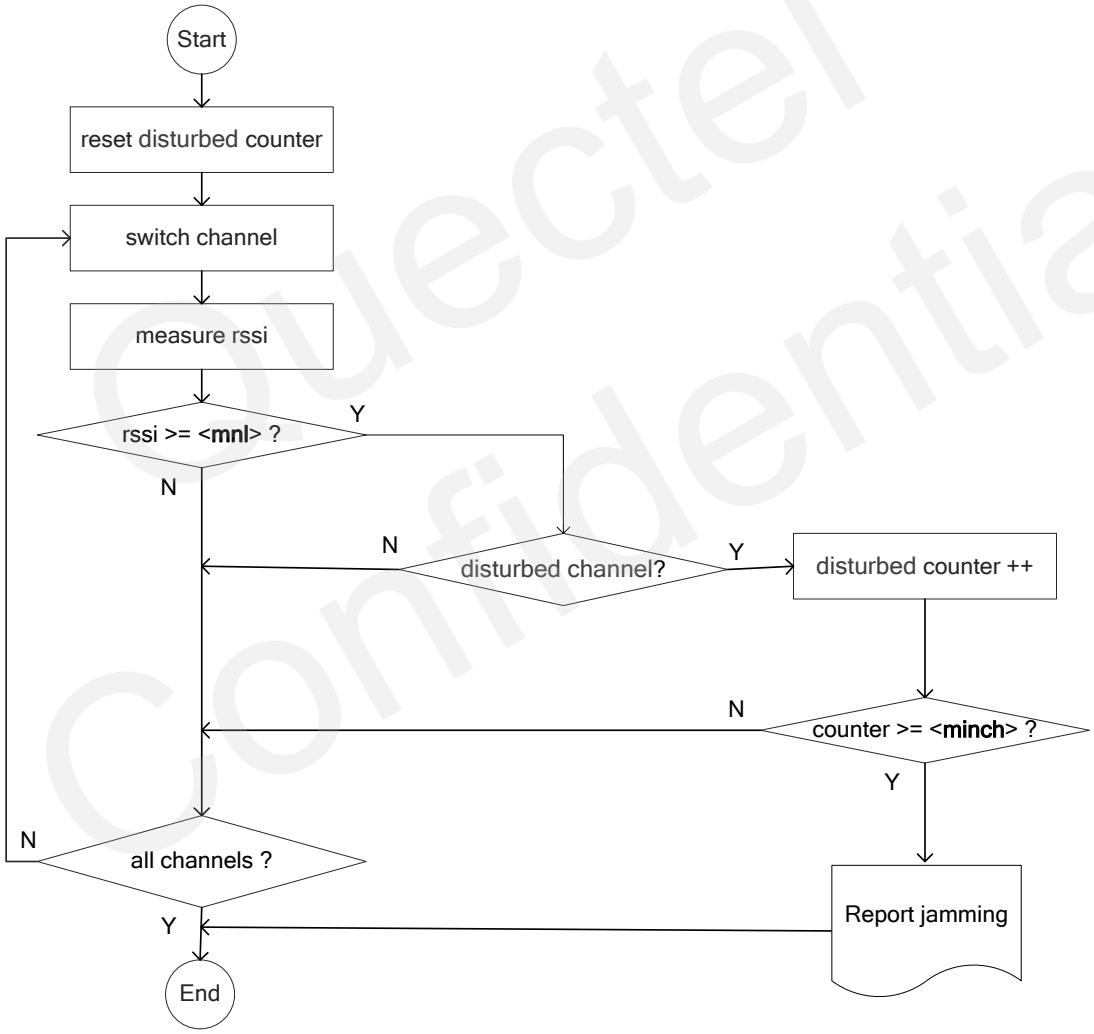

Figure 2: Optimized Detection Parameter

3 AT Commands Description

Quectel Jamming Detection can be configured by **AT+QJDCFG** command and activated by **AT+QJDR** command. If a Cellular Communication Jammer is active in its range, the module can detect and give indication to the user either via URC or by setting a hardware output pin from low to high level.

3.1. AT+QJDCFG Jamming Detection Configuration

This command allows module to configure the options of Jamming Detection feature. These options include the Jamming Detection's conditions, the Jamming notification methods, etc. Parameters will be automatically saved into NVRAM after they are configured successfully.

AT+QJDCFG Jamming Detection Configuration	
Test Command **AT+QJDCFG=?**	Response **+QJDCFG:** **("URC","PERIOD","PIN","MNL","MINCH"),(value)** **OK**
Read Command **AT+QJDCFG?**	Response **+QJDCFG: "URC",<urcenable>** **"PERIOD",<period>** **"PIN",<pinname>** **"MNL",<mnl>** **"MINCH",<minch>** **OK**
Jamming Detection will be configured to report jamming status via URC through serial port **AT+ QJDCFG="urc",<urcenable>**	Response **OK** **ERROR**
Jamming Detection will be configured to report jamming status via URC periodically through serial port. **AT+ QJDCFG= "period",<period>**	Response **OK** **ERROR**
Jamming Detection will be configured to report jamming status via the PIN. **AT+ QJDCFG="pin",<pinname>**	Response **OK** **ERROR**

Maximum Received Signal Strength **AT+ QJDCFG="mnl",<mnl>**	Response **OK** **ERROR**
Disturbed Channel Minimum Number. **AT+ QJDCFG="minch",<minch>**	Response **OK** **ERROR**
Reference	

Parameters

<urcenable>	Configure whether to report Jamming status via URC. 0 Disable status reporting via URC through serial port. 1 Enable status reporting via URC through serial port.
<period>	Configure whether to report Jamming status via URC periodically. 0 Disable Jamming status reporting via URC periodically. 1-N Report Jamming status via URC every **<period>** seconds.
<pinname>	This is a string type parameter to configure which pin is used to report jamming status. "" Disable the function of jamming status reporting via a pin. "RI" Module's RI pin is dedicated to report jamming status; the other RI function will be disabled. "DCD" Module's DCD pin is dedicated to report jamming status; the other DCD functions will be disabled.
<mnl>	Maximum Received Signal Strength. 0-17-31 Please refer to chapter 2.2.
<minch>	Disturbed Channel Minimum Number 0-5-254 Please refer to chapter 2.2.

3.2. AT+QJDR Jamming Detection Report

Jamming Detection can be activated by QJDR command. Parameters will be automatically saved into NVRAM after they are configured successfully.

AT+QJDR Jamming Detection Report	
Test Command **AT+QJDR=?**	Response **+QJDR: (0,1)** **OK**
Read Command **AT+QJDR?**	Response **+QJDR: NO JAMMING** or

	+QJDR: JAMMED
Write Command **AT+ QJDR=<mode>**	Response **OK** **ERROR**
Reference	

Parameters

<mode>

0 Jamming Detection function is disabled (factory default is 0).

1 Jamming Detection function is enabled.

About URC description, please refer to chapter 3.3.

3.3. URC Description

3.3.1. Disturbed Indicator

If the module detects a Jammer, it will send the URC "**+QJDR: JAMMED**" to the serial port.

Indication of Jammer Presence
+QJDR: JAMMED

3.3.2. Jammer Removal Indicator

If the Jammer was removed then it will send the message **"+QJDR: NO JAMMING"** to the serial port.

Indication of Jammer Removal
+QJDR: NO JAMMING

4 Example

4.1. Report Jamming via URC

```
AT+QJDR=1                    // Enable Jamming Detection.
OK
```

In normal condition

```
AT+QJDR?                     // Query the current jamming status.
+QJDR: NO JAMMING            // In normal condition, no jamming is detected.
OK
```

In a jamming environment, please refer to chapter 2.2.

```
+QJDR: JAMMED                // The URC will be reported automatically. Jamming has been detected.

AT+QJDR?                     // Query the current jamming status.
+QJDR: JAMMED                // In a jamming environment, jamming is detected.
OK
```

Jammer removed

```
+QJDR: NO JAMMING            // The URC is reported automatically. No jamming is detected.

AT+QJDR?                     // Query the current jamming status.
+QJDR: NO JAMMING            // No jamming is detected.
OK
```

4.2. Report Jamming via URC Periodically

```
AT+QJDR=1                    // Enable Jamming Detection.
OK

AT+QJDCFG="period",5         // Set the <period> as 5. URC will be reported every 5 seconds.
OK
```

In a jamming environment, please refer to chapter 2.2.

```
+QJDR: JAMMED                // The URC will be reported automatically every 5 seconds. Jamming
                             has been detected.

…
+QJDR: JAMMED                // The URC will be reported automatically every 5 seconds. Jamming
                             has been detected.
….
```

If Jammer removed

```
+QJDR: NO JAMMING            // The URC is reported automatically. No jamming is detected.

AT+QJDCFG="period",0         // Disable reporting URC periodically.
OK
```

4.3. Report Jamming via Pin

If Quectel's module detects a jammer, it will set the hardware output pin from low level to high level.

```
AT+QJDR=1                    // Enable Jamming Detection.
OK

AT+QJDCFG="pin","RI"         //The jamming status can be reported via RI PIN and RI function is disabled.
OK

AT+QJDCFG="pin",""           // Disable the function of jamming status reporting via the pin.
OK
```

4.4. Start and Stop Jamming Detection

```
AT+QJDR=?                   // Test mode.
+QJDR: (0,1)

OK

AT+QJDR?                    // Query the current jamming status.
+QJDR: NO JAMMING           // No jamming detected.
OK

AT+QJDR=1                   // Enable Jamming Detection function.
OK

//Turn on jammer

+QJDR: JAMMED               // The jammer has been detected and then jamming is reported.

//Turn off jammer

+QJDR: NO JAMMING           // Report the jammer have been removed.
AT+QJDR=0                   // Disable Jamming Detection function.
OK
```

4.5. Configure Jamming Detection

```
AT+QJDCFG=?                 // Test mode.
+QJDCFG: ("URC","PERIOD","PIN","MNL","MINCH"),(value)

OK

AT+QJDCFG?                  // Query the current parameter configuration.
+QJDCFG: "urc",1            // The default configuration of <urcenable> is 1. It represents that reporting
                               jamming status via URC is enabled.
+QJDCFG: "period",0         // The default value of the <period> is 0. It represents that reporting jamming
                               status via URC periodically is disabled.
+QJDCFG: "pin",""           // The default value of the <pinname> is empty. It represents that reporting
                               Jamming status via a pin is disabled.
+QJDCFG: "mnl",17           // The default value of <mnl> is 17
+QJDCFG: "minch",5          // The default value of <minch> is 5
OK
```

```
AT+QJDCFG="period",5   // Set <period> is 5. It represents that jamming status is reported via URC
                          through serial port every 5 seconds.
OK

AT+QJDCFG="mnl",16     // Set <mnl> as 16.
OK


AT+QJDCFG="minch",6  // Set <minch> as 6.
OK


AT+QJDR=1              // Enable Jamming Detection function.
OK

//Turn on jammer

+QJDR: JAMMED          // Jamming has been detected and reported.

//Turn off jammer

+QLJDR: NO JAMMING   // Report the jammer has been removed.
AT+QJDR=0              // Disable Jamming Detection function.
OK
```

5 Appendix A Reference

Table 1: Terms and Abbreviations

Abbreviation	Description
BSIC	Base Station Identity Code
RSSI	Received Signal Strength Indication
URC	Unsolicited Result Code
MNL	Maximum Noise Level
MINCH	Minimum Channel Number