

QK-G021/022 GSM Remote Controller Application Notes

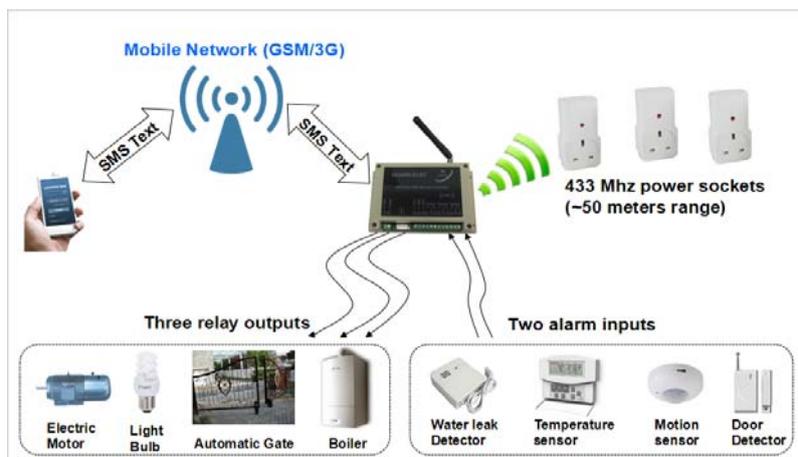
Features

- Remote Control from Mobile Phones
- Android and IOS APP Interface
- Easy to Install and Configuration (No PC required)
- Up to 4 Mobiles Phones per Unit
- Outputs Controlled by SMS Message
- Request Status via SMS
- In-build Clock for Programming the Switch State
- Automatically Send SMS Message on After Alarm Trigger
- 433Mhz Remote Control Transmitter (Up to 4 Terminals)
- Wireless PIR Motion Detector
- Waterproof Enclosure
- Compatible with All Major SIM Networks
- Tri-band GSM for Use in Europe & USA



Applications

- Remote Control by GSM Mobile Phones
- Remote Maintenance
- Remote Warnings / Alarms
- Electric Doors, Shutters
- Irrigation Systems
- Remote System Monitoring
- Plant Maintenance
- Valve control
- Pumping station
- Oil/gas pipelines control
- Central heating system
- Security Systems
- PLC and Automation System
- Alert / Panic Caller





Documents History

Issue	Date	Changes / Comments
1.0	04-10-2013	Initial release
1.39	03-07-2014	Fix a bug: Use 'BD1(mobile number)F' as the registration additional mobiles command. Still use '5+n(mobile number)F' for 1.0 and 1.1 hardware version.
1.40	30-07-2014	Release QK-G022R433US (American type power sockets) .
1.41	14-09-2014	Support V1.3 hardware version.
1.44	12-12-2014	Use 'WHOACTIVE' to replace 'RSTATUS' message to check the relays status.
1.45	03-04-2015	Support 'ONOFFRnxx' SMS command.
1.47	09-12-2015	Release QK-G022P433 (Support wireless PIR motion detector).

Order Information

Part No	Description
QK-G021	GSM remote control module
QK-G022	QK-G021 with waterproof enclosure
QK-G022R433UK	QK-G022 with RF transmitter, and three RF433Mhz control power sockets (UK type)
QK-G022R433EU	QK-G022 with RF transmitter, and three RF 433Mhz control power sockets (EU type)
QK-G022R433US	QK-G022 with RF transmitter, and three RF 433Mhz control power sockets (USA type)
QK-G022P433	QK-G022 with PIR sensor receiver, and one wireless 433Mhz PIR sensor

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1 INTRODUCTION

QK-G021/022 series remote controller is a versatile device which can be attached to many of electronic devices in homes, offices, plants, or wherever you need. It includes three independent relay switches, two digital alarm inputs, and one 433/315Mhz RF transmitter module. It allows operators to control/monitor remote equipments, machines, or power sockets by SMS (Short Message Service) through GSM network. Up to 4 mobile phone numbers (SIM card numbers) can be registered with the remote controller. These mobile phones can belong to families/ technicians or engineers who have the requirements to control/monitor corresponding devices.

- Three relays. Two of them have daily timer, which can setup the relay switch on/off time.
- Two digital alarm inputs. Various sensors can be monitored, and an alarm SMS could be sending out when the sensors are triggered.
- One 433/315Mhz RF transmitter module. RF power sockets within 25 meters of QK-G021/022 can be controlled by SMS sending from far end.
- Four control mobile phones. One main control terminal and other up to 3 additional control terminals can be registered with QK-G021/022.
- APP for Android and iOS(iPhone). Remote control/monitor supported by the finger touching job through a friendly interface (text free).

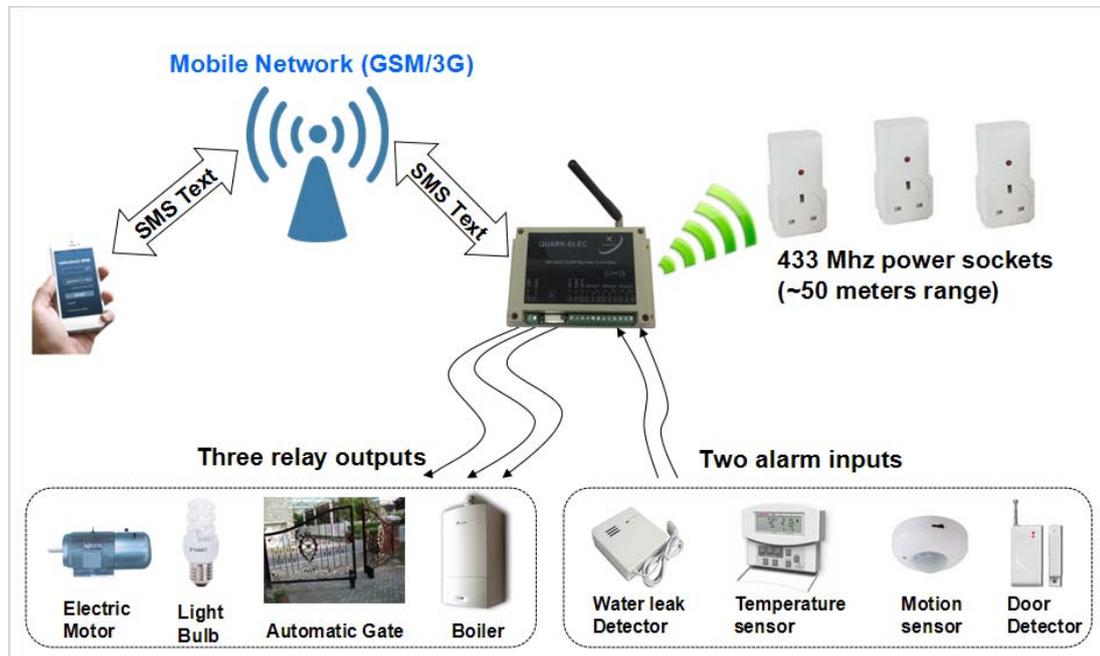


Figure 1 System diagram

2 PREPARING SIM CARD

All new SIM cards have to be registered with the network provider before they can be used, usually by calling the network provider or registering online please refer to the instructions supplied with your SIM card.

After successfully registering the SIM card, ensure there is sufficient credit on the card for programming confirmation texts to be sent from QK-G021/022 module. The PIN request option

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should be disabled from the SIM card before inserting it into QK-G021/022 module. To check the PIN request status of your SIM card, place the card in an unlocked mobile phone, switch the phone on. If a normal calls can be made without entering a PIN number then it's disabled. Please also make sure the voicemail is disabled before insetting the SIM card into the module.

It is recommended that if a 'pay as you go' (PAYG) SIM card used please choose to automatically 'Top-Up' when the cards credit falls below a certain limit. Some of PAYG SIM cards will be de-activated by the network if not used to make an outgoing voice call or send an SMS text message within a specific period. To prevent this simply send the QK-G021/022 a text 'DQSJ' (this can be done through APP), QK-G021/022 will reply the local time by text message. Do this once a month to keep the SIM card active.

3 HARDWARE

3.1 Module

General view of the module are show as below and details of each function parts are described from the next section.

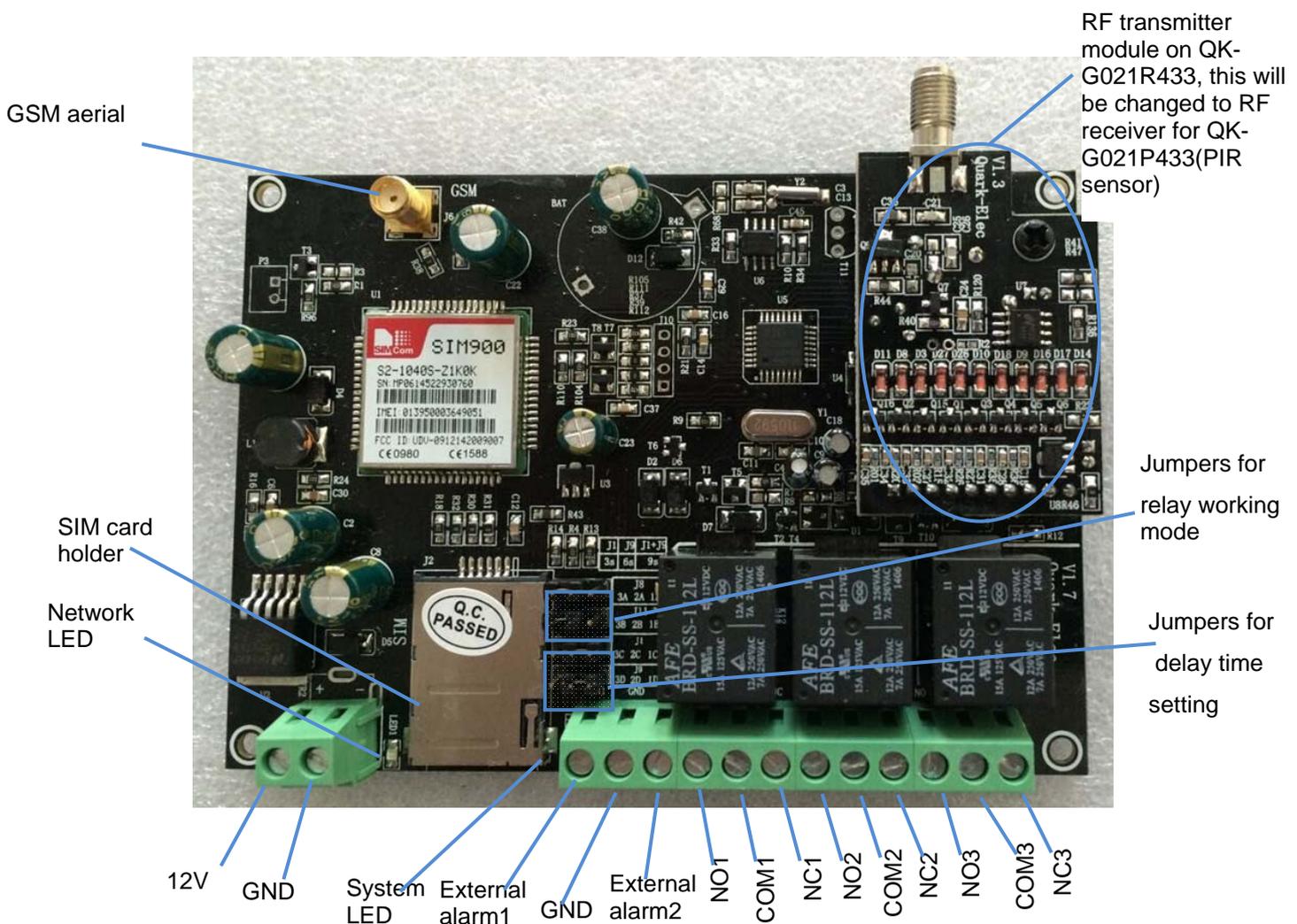


Figure 2 General view of the control module (V1.7)

	Self-lock control.
	Latching control, which means relay go back to normal status after a period of seconds.

3.4 Delay time setting on latching mode

Working on latching mode, operators can configure QK-G021 with different delay time for Relay1/ Relay2 by setting the delay time jumpers.

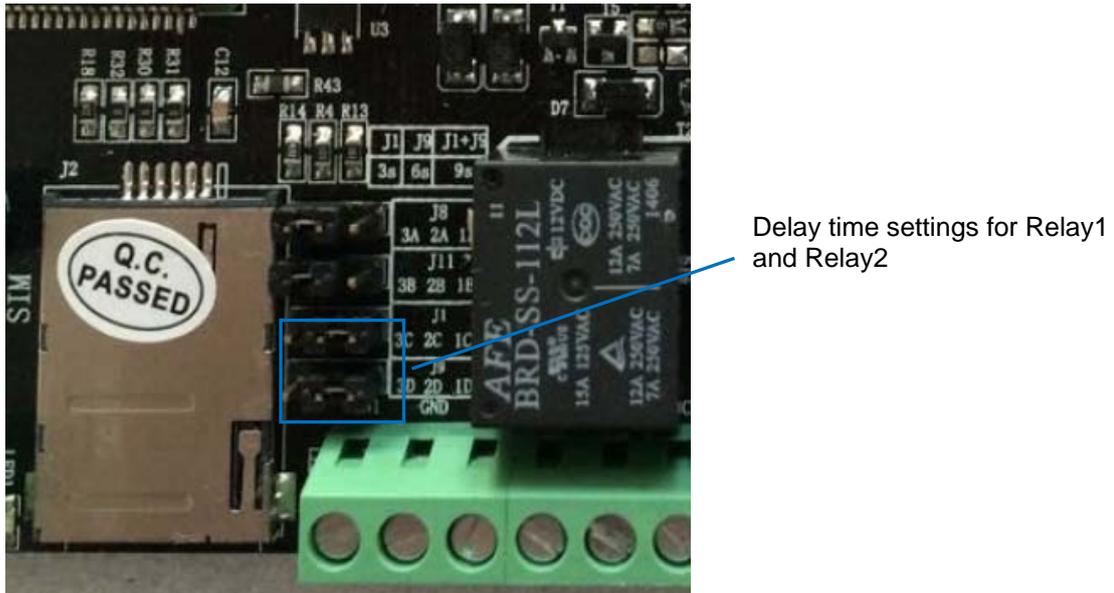
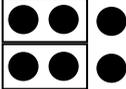
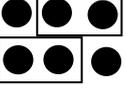
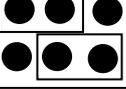
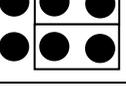


Figure 5 Delay time setting for Relays

	Delay time set as:12 seconds
	Delay time set as:9 seconds
	Delay time set as:6 seconds
	Delay time set as: 3 seconds

On V1.6 and later hardware version, QK-G021/022 provide SMS command in 'ONOFFRnxx' format to support other delay times(from 03 seconds to 99 seconds), where 'n' indicates the relay number(1 or 2) and xx means the delay times(from 03 to 99). More details about this command can be found on section 6.

3.5 Alarm function and Digital input connection

QK-G021/022 has two external alarm input connectors. Various sensors can be connected to it. For example, door/windows sensor, motion sensor, temperature/wind detector, carbon dioxide detector, water leak detector. Combined with these sensors/detectors, QK-G021/022 can be set up as a protection/alarm system.

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QK-G021/022 external alarm inputs are active when it's applied a trigger pulse or a constant level of 0V. If the sensor/detectors are triggered and send the low level signal (0V) to QK-G021/022, QK-G021/022 will send out the SMS to the registered mobile terminals. Meanwhile, the corresponding relays will also be activated.

Alarm input port	Corresponding relay number
External alarm 1(INT1)	Relay1
External alarm 2(INT2)	Relay2
*Alarm input function doesn't support Relay 3 on standard QK-G021/22. But wireless PIR detector works with Relay3 on QK-G022P433 variant. More details can be found on section ' Wireless PIR detector(QK-G022P433 variant)'.	

There are two typical ways to connect the external alarm inputs to QK-G021/022. External alarm device can be used as switches or a input source for INT1/INT2 of QK-G021/022 module.

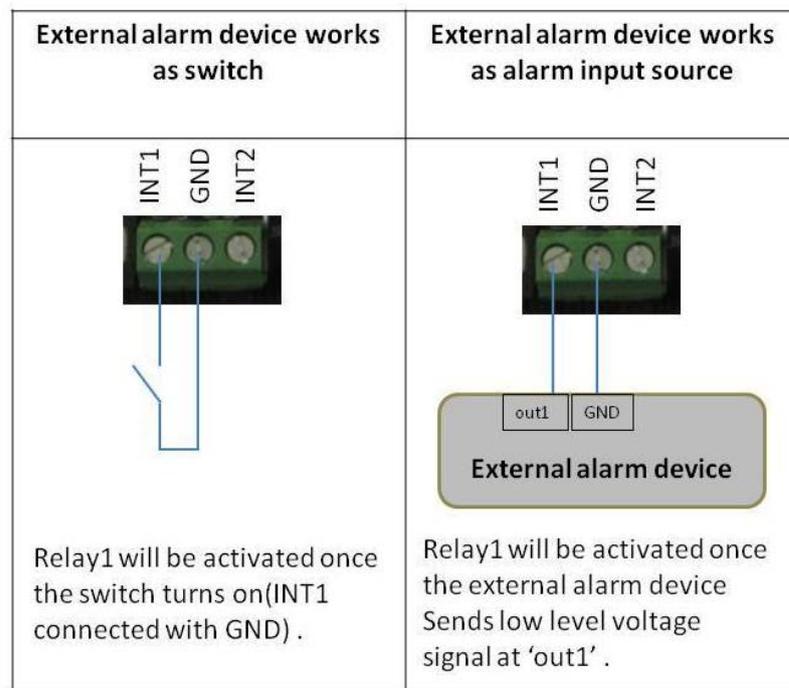


Figure 6 External alarm device connecting methods

3.6 Registration of SIM cards

The user can setup the authorized telephone numbers to QK-G021/022. The controller will verify the incoming numbers, if it is indexed in the registered SIM numbers, QK-G021/022 controller will hang up then execute the actions.

3.7 SIM card slot

The SIM card should be inserted into SIM card slot before applying the power. Most 3V SIM card can proper working with QK-G021/022 module. The registering can take up to few minutes after power up. Network LED flashes at 1Hz after registration completed.

3.8 RF transmitter paring(QK-G022R433 variant)

QK-G022R433 series controller has a 433Mhz RF transmitter module. It can pair with up to four RF switch sockets. So the operator is able to switch ON/OFF the switch sockets through SMS

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message from far end. Please be noted QK-G022R433 variant doesn't support wireless PIR sensors alarm input(which QK-G022P433 support).



Figure 7 RF power socket & QK-G022

QK-G021/022 RF module works at 433.92MHz with ASK modulation. It can talk to the paired switch sockets within 40 meters range in open area.

The switch sockets have been paired and ready to use if they ordered together with QK-G021/022. However the operator can always pair or release the pairing by following steps:

- Insert the RF switch socket into a powered mains wall socket.
- The LED light on the socket should flash at 1 second intervals indicating it's ready to pair with the QK-G021/022. If the lights doesn't flash, press and hold the ON/OFF button for 5 seconds to clear the memory indicated by the quickly flashing LED.
- Send the SMS as 'ONRFn', where n is the RF socket number(could be 1,2 or 3). This step can also be operated through APP by press the corresponding RF switch n 'ON' button.



Figure 8 RF Switch ON buttons

- Once QK-G021/022 receive the SMS and send out the pairing signal, the LED light on the socket will flash briefly more quickly and then flash at 1 second intervals. This RF switch socket should have been successfully paired now.
- Repeat above process for each different switch sockets.

Simply plug-in the appliance which you want to operate remotely into the socket, press the corresponding ON button on APP that is paired to the socket. The appliance will turn on.

3.9 RF main sockets

Customer can select USA, European or UK type RF main sockets. Like most of the similar RF main sockets in the market, customer should keep at least 0.2 meter distance between one RF main socket and the other. This is due to EMC interference between these RF main sockets.

Although QK-G021/022 have running specific algorithm to increase the RF transmission reliability, Quark-elec cannot guarantee 100% of proper action rate of RF main sockets. QK-G021/022 RF signal could be affect by other nearby RF devices such as bell ring, car key, cordless phone, mobile phone, RF alarm system. The following is a real test result taken in a house environment.

Distance between QK-G022 and 433Mhz RF main sockets	Proper action rate (RF main sockets been successfully triggered by QK-G022)
2 meters	100.0%
5 meters	100.0%
8 meters	99.7%
10 meters	98.1%
15 meters	95.6%
20 meters	93.2%

3.10 Wireless PIR detector(QK-G022P433 variant)

QK-G022P433 series controller has a 433Mhz RF receiver module. It can pair with one wireless PIR (Passive Infrared sensor) motion detector(also called PIR sensor). Please be noted QK-G022P433 cannot pair with any RF main sockets.

QK-G022P433's RF receiver module works at 433.92MHz. It can talk to the paired wireless PIR sensor within 25 meters range in open area. Once QK-G022P433 receive an alarm signal from the paired PIR detector, Relay 3 will be activated and locked until 'EXTRT' been send out to unlock Relay3.

The switch sockets have been paired and ready to use if they ordered together with QK-G021/022. However the operator can always pair or release the pairing by following steps:

- Switch off the PIR detector.
- Power up QK-G021/022 module, wait at least 60 seconds.
- With a small flat head screw driver, press and hold the button on the receiver module. The LED light on the receiver module will turn off. Release the button until the LED light turns on. Once the LED light turns on, the memory on the module has been erased and ready to pairing.



Figure 9 QK-G022P433 module

- Press the button on the module quickly again. The LED light will turns off again. Now the module is on 'ready-to-pair' mode. It will only stay in this status for 10 seconds. During this 10 seconds, switch on the PIR detector and facing the sensor side to the operator's body. This allows PIR detector sends an detecting signal. The LED will flash six times once PIR paired with QK-G022P433 module. If the pairing process could not be completed during this 10 seconds. Operator can always press the button again to repeat this step.
- By now QK-G022P433 has successfully paired with the wireless PIR detector.

To prove this, please restart QK-G022P433 and hold the wireless PIR detector in hand(facing the sensor side to the operator's body). After about 10 seconds, a click sound will come from QK-G022P433. This comes from Relay3 action triggered by the PIR detector.

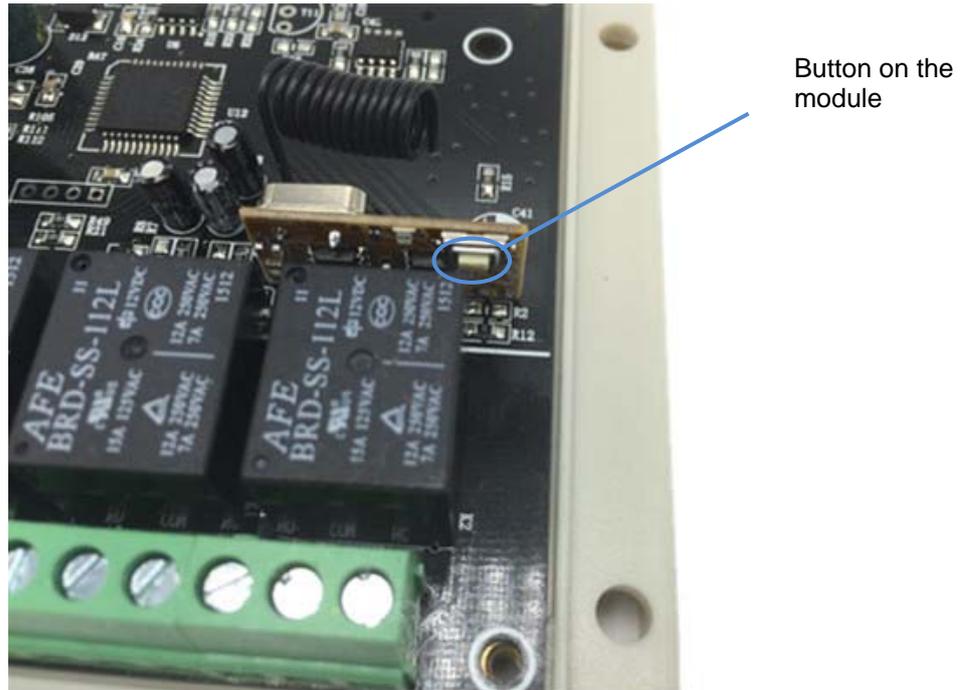


Figure 10 RF receiver module



Figure 11 Wireless PIR detector

3.11 Enclosure

IP56 Insulation Class 2 plastic enclosure, 145mm*90*41 external dimension.

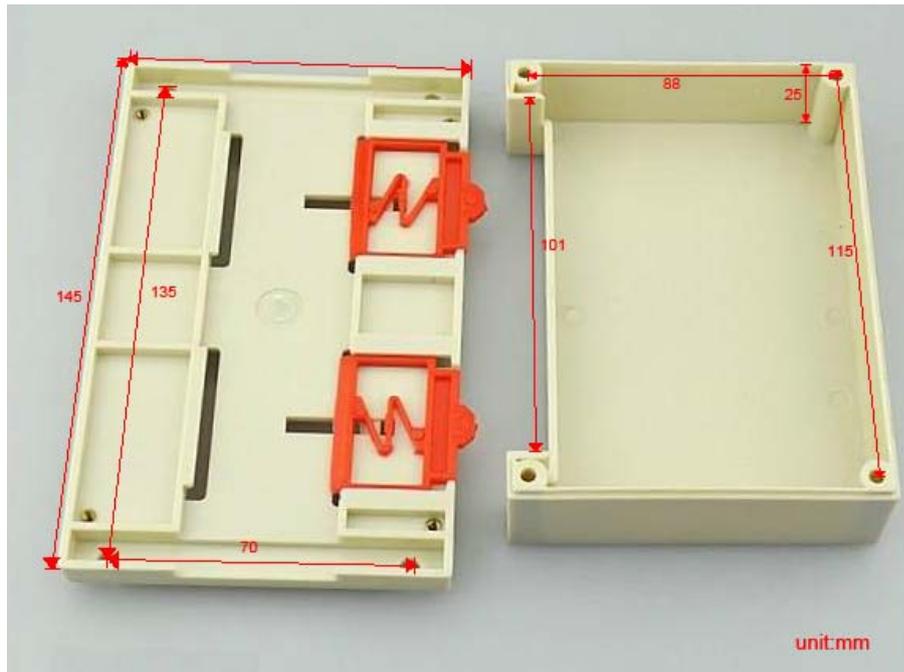


Figure 12 Enclosure drawing



Figure 13 GK-G022 (with enclosure)

4 APP ON ANDROID AND IOS

APP provides the interface for operators to control GK-021/022 by the finger touching job through a friendly interface (text free).

The latest APP for Android platform can be download from the following link. The Android platform should be at least 2.1 or higher version. APP for IOS platform will be available soon.

<http://www.quark-elec.com/download/apps>

4.1 Setup

After installation, to open APP in the first time, you should see the following page to finish the setup process.

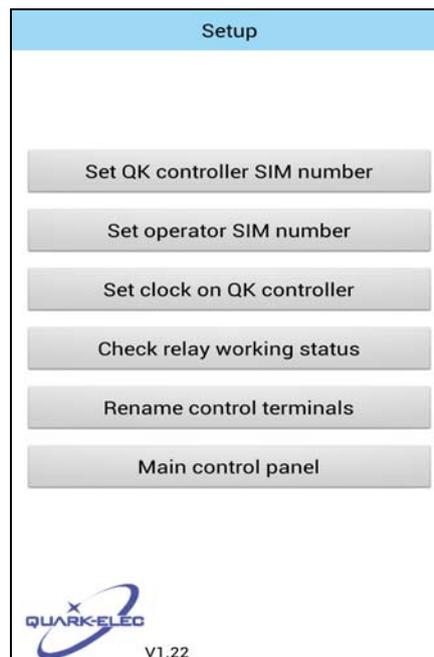


Figure 14 Setup page

4.2 Set QK controller SIM number

In put the SIM card number which inserted in GK-021/022. All command SMS will be send to this number through APP.

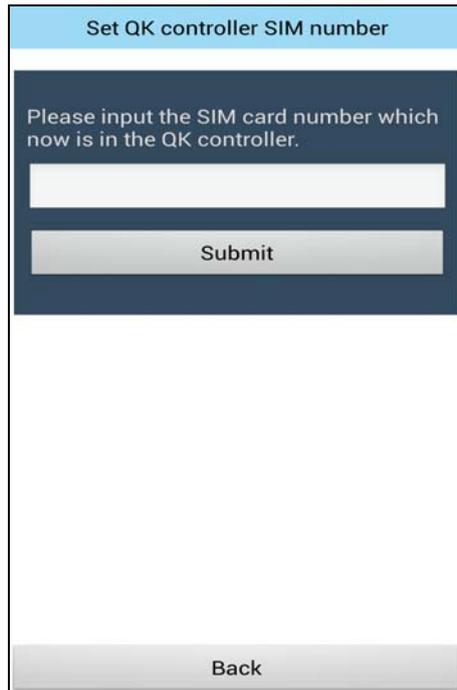


Figure 15 Set QK controller SIM number

Once the SIM card number been stored, APP will reply a successful message shown as below.

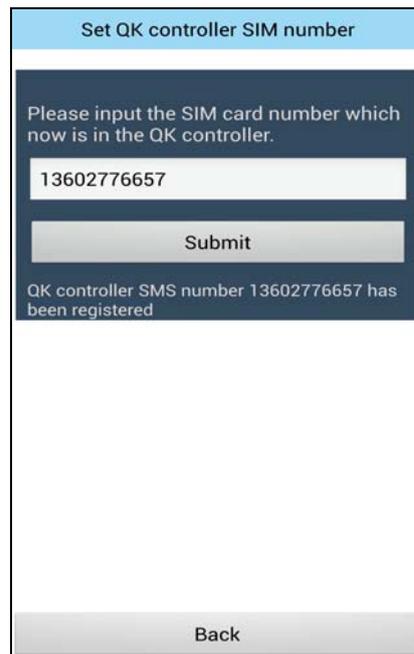


Figure 16 Set QK controller SIM number successful

4.3 Register SIM cards

GK-021/022 allows one mobile phone as the main terminal and up to 3 additional terminals. The following interface allows the operator to register, delete and check these SIM card numbers.

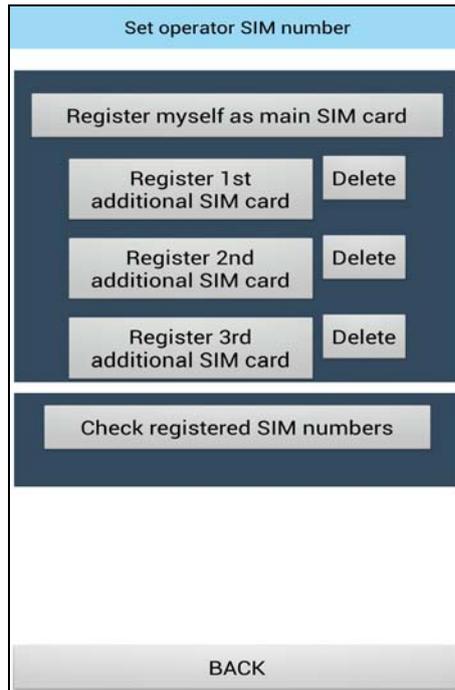


Figure 17 Register SIM cards

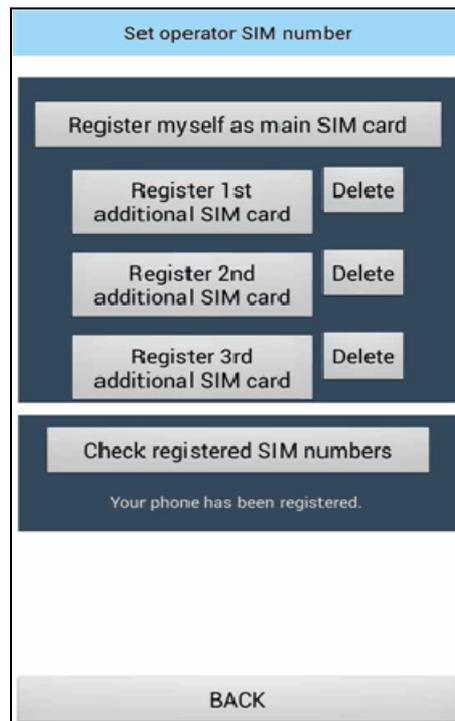


Figure 18 Register successfully

4.4 Set the clock on QK controller

GK-021/022 can automatically execute actions at the time set by operator. To do this, the real time clock on QK controller should be set previously. This page allows operator to check and set the time on GK-021/022. Using this function, CR2032 battery should be used on the module. On V1.7 or later hardware version, solid capacitor used instead of CR2032 battery. With solid capacitor ,the read time clock can keep working at least 12 minutes after power off) .

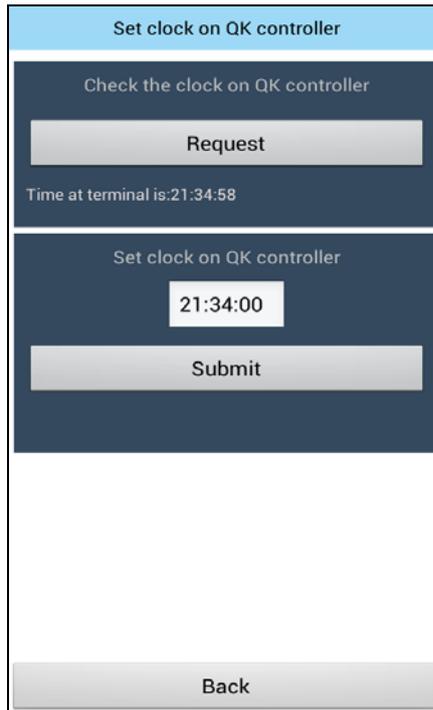


Figure 19 Check the clock on QK controller

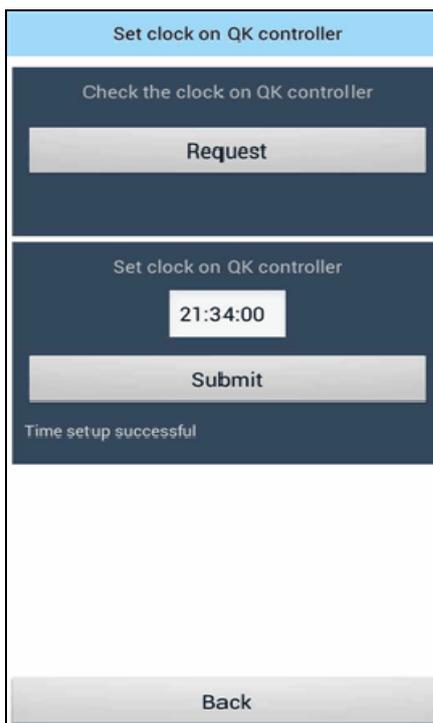


Figure 20 Set the clock on QK controller successful

4.5 Check relay working mode

GK-021/022 has three individual relays, which support two working mode: Self-lock and latching control. When it working on latching mode, the relay takes active action for 3 seconds and then back to normal status. While working on self-locking mode, it will keep the active status until next trigger single input.

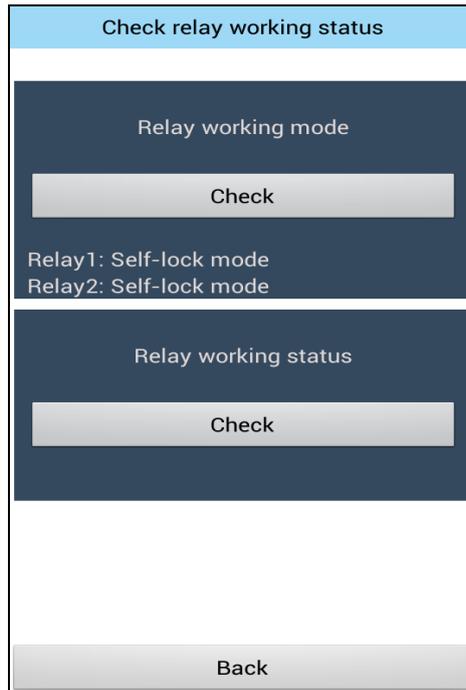


Figure 21 Check relay working mode

GK-021/022 can also report the relay working status through SMS to the operators. This function is only supported on V1.2 and later version modules.

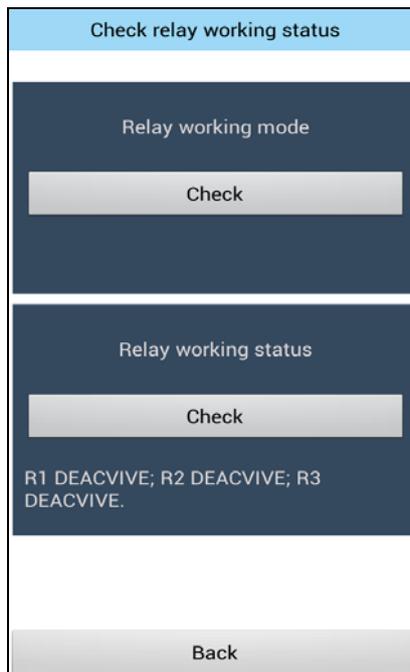


Figure 22 Check relay working status

4.6 Rename control terminals

The control terminals can be recalled as meaningful name in APP.



Figure 23 Rename control terminals

4.7 Control Panel

Control panel provides the main interface for operating.



Figure 24 Control panel interface

5 CONFIGURATION

The following is required to configure QK-G021/022 for the first time using.

- Insert SIM card into controller box
- Power up;
- Send '888888' as SMS to QK-G021/022 controller, if successfully, you should receive 'Your phone has been registered'.
- If additional mobile terminals needed, the operator should send 'BDn(mobile terminal number)F' to QK-G021/022 controller. Up to 3 additional terminals can be configured. By

now, the operator is ready to use QK-G021/022. Details about the SMS command and response SMS can be found in the next chapter.

6 COMMAND AND RESPONSE SMS

Remember that all SMS text commands must always be sent using CAPITAL LETTERS. DO NOT add spaces or any other characters

Function	Command	Note
Register SIM cards		
Register myself as main SIM card	888888	Register the main mobile terminal with QK-G021 module by sending '888888' to QK-G021/022 model. The module will reply with 'Your phone has been registered.' if registration successful. One QK-G021 module can only have one main registered SIM card number.
Register additional SIM cards	BDn(mobile number)F n=1, 1 st mobile terminal n=2, 2 nd mobile terminal n=3, 3 rd mobile terminal	Once the main mobile terminal registered with QK-021/022, it can pair another three mobile terminals with QK-021/022. For example, by sending BD107919157124F, the first mobile terminal (number is 07919157124) has been paired with QK-021/022. Similar, BD207909135124F, means to pair QK-021/022 with the second terminals (number is 07909135124). Message 'Your No n phone has been registered' will be replied by QK-021/022, if the n mobile terminal successfully paired.
Delete additional SIM cards	DELn n=1, 1 st mobile terminal n=2, 2 nd mobile terminal n=3, 3 rd mobile terminal	The registered SIM cards can be deleted from the authorized SIM list by sending DELn. The deleted SIM terminals cannot control QK-021/022 any longer.
Check registered SIM numbers	WHORED	QK-021/022 will reply with the authorized SIM list in the following format: 'No.1 SIM is xxxxxxxx; No.2 SIM is xxxxxxxx; No.3 SIM is xxxxxxxx.'
Switching Relay & Mode checking		
Switching relay ON	DKYn n=1, Relay 1; n=2, Relay 2; n=3, Relay 3.	QK-021/022 will reply with the relay state information as the following format: 'Port n ON, where n is the relay number.'
Switching Relay OFF	GBYn n=1, Relay 1; n=2, Relay 2 n=3, Relay 3.	QK-021/022 will reply with the relay state information as the following format: 'Port n OFF, where n is the relay number.'
Check relay working mode	RMODE	QK-021/022 will reply with the relays working mode information with the following format:



		<p>'MMMM1MMMM2', where MMMM could be INCH or SELF. INCH refer to Latching control mode (replay will take action for 3 seconds and then back to normal position), and SELF refers to Self-lock mode.</p> <p>For example, INCH1SELF2 means, relay1 works at Latching control mode and relay2 works at Self-lock mode.</p>
Check relay working status	WHOACTIVE	<p>QK-021/022 will reply with the relays working status information similar as the following format:</p> <p>'R1,R2,R3:ACTIVE;DEACTIVE;ACTIVE.'</p> <p>Where ACTIVE means the related relay has been triggered (COM port connect to NO port), DEACTIVE means the related relay is on the normal status.</p>
One-off relay switch toggling *	<p>ONOFFRnxx</p> <p>n=1,Relay 1; n=2, Relay 2.</p> <p>xx range from 03 to 99, indicate the delay time in seconds.</p>	<p>For example, by receiving ONOFFR175, the first relay(Relay1) will be triggered on for 75 seconds and then switch off no matter QK-G021/022 working in Latching mode or Self-lock mode. QK-021/022 will reply with the relay information as the following format:</p> <p>'Port 1 is ON and will be OFF 75 seconds afterwards.'</p> <p>This is a one-off command, only valid for one time action. And the APP doesn't support this command, so operator should use SMS to sending this message.</p>

*Only support on V1.6 and later hardware version.

433Mhz RF Module

Switching RF module1 ON	<p>ONRFn</p> <p>n=1 for 1st RF terminals</p> <p>n=2 for 2nd RF terminals</p> <p>n=3 for 3rd RF terminals n=4 for 4th RF terminals</p>	<p>QK-021/022 will reply with the relay state information as the following format:</p> <p>'RFn socket is ON', where n is the RF terminal number.</p>
Switching RF module1 OFF	<p>OFFRFn</p> <p>n=1,1st RF terminals;</p> <p>n=2,2nd RF terminals;</p> <p>n=3,3rd RF terminals;</p> <p>n=4, 4th RF terminals</p>	<p>QK-021/022 will reply with the relay state information as the following format:</p> <p>'RFn socket is OFF', where n is the RF terminal number.</p>

Timer

Set time on QK-021/022	<p>SThmmss</p> <p>Where h:mm:ss is current time</p>	<p>For example, by sending 'ST153014' the operator set QK-G021/022 time as 15:30:14. QK-021/022 will response a message as 'Time setup successful' to accept this setting. If the operator send the wrong time format, QK-G021/022 will</p>
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		response a message as ' Tim setup failed' .
Check the local time on QK-021/022	DQSJ	By sending 'DQSJ', the operator will receive the local time. An example received message looks like 'Time at terminal is 12:30:32' .
Set Switching Relays ON time	ONnhhmss n=1, Relay 1 n=2, Relay2 hhmmss is the Switch ON time.	For example, by sending 'ON2163000', the operator set Switch Relay2 ON at 16:30:00. Message as 'Port 2 will switch ON at 15:30:00' will be reply to operator if the setting successful.
Set Switching Relays OFF time	OFFnhhmss n=1, Relay 1 n=2, Relay2 hhmmss is the Switch ON time.	For example, by sending 'OFF2194520', the operator set Switch Relay2 OFF at 19:45:20. Message as 'Port 2 will switch OFF at 19:45:20' will be reply to operator if the setting successful.
Switch off the Timer setting	GDSn n=1, Relay 1 n=2, Relay2	Message as 'Timer on Relayn has switched OFF' will be reply to operator if the setting successful, where n is '1' or '2'. Note: The local time will not be affected by switching off the timer.

Monitoring/Alarm Input

Release relays status which triggered by the external signals.	EXTRT	After been triggered by the external signals, the related relay will be locked on the normal state. By sending 'EXTRT', the relays will be release and available for responding SMS command again.
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QK-G021/022 have two digital input port. It can be used to monitor the external signals. These two external input ports can accept 0V to 5V voltage level. In the case the input voltage level below 1.0V, the main mobile terminal will receive a warning message as 'Port n has been triggered ', where n is the relay number. And the relay n will switch to the normal state (NC will be close state and NO will be open state). Sending 'EXTRT' can release the relays and get them available for responding SMS commands.

7 OPERATING SPECIFICATIONS

Item	Specification
Frequency bands	Quad-band: GSM850,EGSM 900,DCS1800,PCS1900.
SMS	MT,MO,CB,Test and PDU mode
Operating temperature ¹	-25°C to +80°C
Storage temperature	-40°C to +85°C
DC supply	12.0V(+/-10%)
Average supply current (typical quiescent)	40mA
Maximum supply current(during SMS transceiver activity)	600mA
GSM receive sensitivity	-107dBm

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GSM transmitting power	Class 4(2W) at GSM850,EGSM 900. Class 1(1W) at DCS1800,PCS1900.
433Mhz transmitting power	1W
433Mhz modulation mode	ASK (AM)
RF transmission power	<10mW
RF emission distance	25 to 50 meters (open air condition)
Rated current on relay	7A240VAC
Rated voltage on relay	90V-245V
RF main socket power rating	< 2000W

For more technical information and enquires please go to Quark-elec forum:

<http://quark-elec.com/forum/>

For sales and purchasing information, please email us: info@quark-elec.com



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