# QK-G031 Temperature GSM Remote Controller

Features

- Remote control from mobile phones
- Remote temperature monitoring and control
- Android APP interface
- Easy to install and configure (no PC required)
- Up to 4 mobile phones per unit
- Outputs controlled by SMS message
- Request status via SMS
- In-built clock for programming the switch state
- Automatically sends SMS message after alarm trigger
- 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
- Irrigation systems
- Plant maintenance
- Valve control
- Pumping station remote operation
- Oil/gas pipeline control
- Central heating systems
- Security systems
- PLC and automation systems
- Alert/panic caller
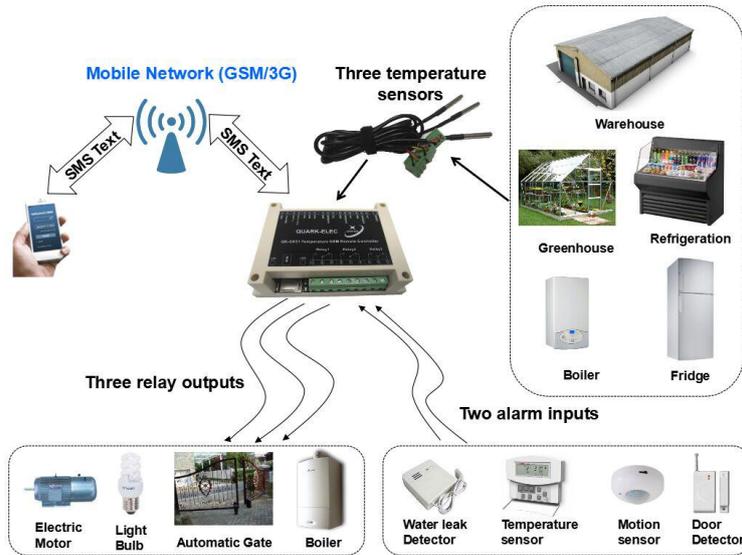
Product family information

The QK-G031 is backwardly compatibility with the QK-G021/G022, and includes all of the original functions, with the addition of the following new features:

---The switched relays can now be triggered by user specified temperature limits using the data from the input probes.

----The three temperature data channels can be interrogated by text message and a text message warning sent if the data falls outside the desired ranges.

--- An interface for a 12V chargeable battery is now available for backup power.

---Text message alerts if the mains supply fails, the module will automatically switch to battery supply, allowing time to address the fault.

--- 'Notice' text message if/when the mains supply is restored, the module will automatically switch back to the main power supply and the battery will re-charged by the mains.

--- Reset button to support higher level security. Main control SIM number can only be set within 300 seconds of reset button being pushed. This prevents remote intrusion.

Document history

Issue	Date	Changes / Comments
1.0	04-12-2016	Initial release

Order Information

Part No	Description
QK-G031	GSM temperature remote control module

Contents

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1 INTRODUCTION

The QK-G031 series remote controller is a versatile device which can be attached to many electronic devices in homes, offices, plant or wherever required. It includes three independent relay switches and two digital alarm inputs. It allows operators to control/monitor remote equipment or machines using SMS (Short Message Service) via the GSM network. Up to 4 mobile phone numbers (SIM card numbers) can be registered with the remote controller. These mobile phones can belong to technicians, engineers or individuals who have a requirement to control and/or monitor corresponding devices. It features;

- Three relays - two with daily timers which can be used to set up the relay switch on/off time.
- Two digital alarm inputs - various sensors can be monitored and an alarm SMS can be sent out when the sensors are triggered.
- One wireless PIR receiver (QK-G022P433 variant) - receiving wireless PIR motion detector alarm signals.
- Four control mobile phones - one main control terminal and up to 3 additional control terminals can be registered with QK-G031.
- APP for Android - remote control/monitor supported by a touch sensitive, user friendly interface (text free).
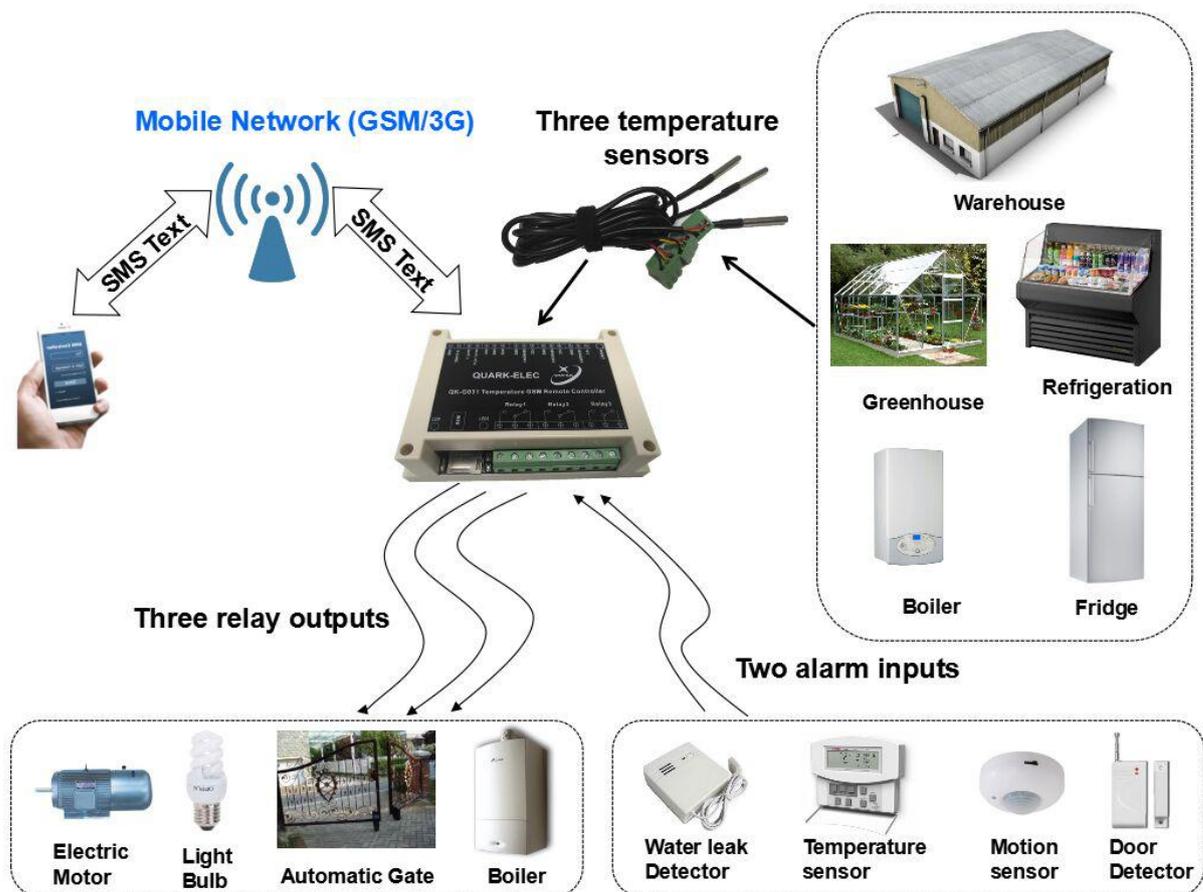

Figure 1 System diagram

2 PREPARING THE SIM CARD

All new SIM cards must be registered with the network provider before they can be used, usually by calling the network provider or by 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-G031 module. The PIN request option should be disabled from the SIM card before inserting it into the QK-G031 module. To check the PIN request status of your SIM card, place the card in an unlocked mobile phone and switch the phone on. If normal calls can be made without entering a PIN number, then it is disabled. Please also make sure voicemail is disabled before inserting the SIM card into the module.

If a 'pay as you go' (PAYG) SIM card is used, it is recommended that users choose to automatically 'Top-Up' when the credit falls below a certain limit. Some PAYG SIM cards will be de-activated by the network if they are 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-G31 a text 'DQSJ' (this can be done through the APP) and QK-G031 will reply with the local time by text message. This should be done once a month to keep the SIM card active.

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3 HARDWARE

3.1 Module

A general view of the internal module is shown as below and details of the connections are described in the next section.
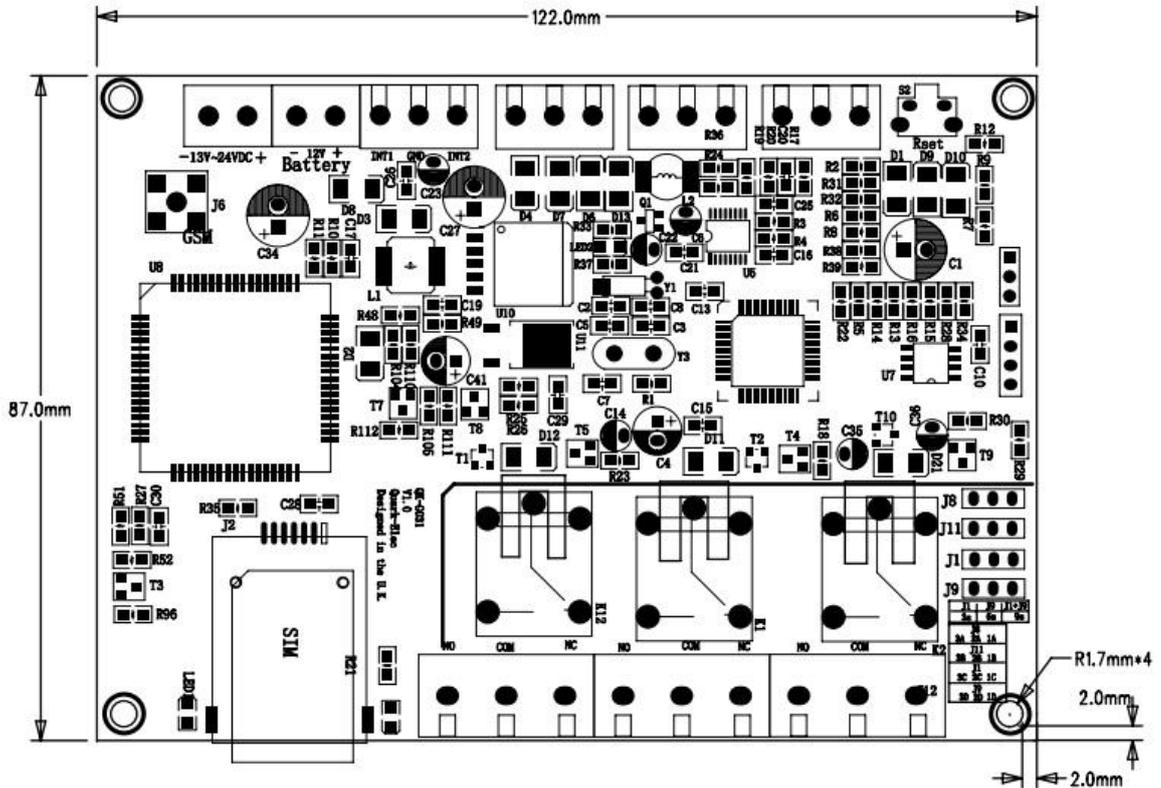
3.2 Power connections

The QK-G031 module can be supplied by 12-24V DC power. Connect a 12V DC power supply to the power input screw terminals and switch on the power supply. The red power LED will flash at 1 second intervals once the system has finished initialization. The blue network LED indicator will initially flash quickly and, once logged onto the network, it will flash more slowly, approximately once every 3 to 4 seconds.

3.3 Battery connections

The QK-031 supports backup battery inputs. The battery can be an auxiliary power supply for operation during mains power failure. A 12V rechargeable Li-ion or Lead-acid battery can be connected to battery input terminals on the QK-G031.

Connection to a battery can allow the QK-G031 to operate for up to a few days (depending on the battery capacity) without mains power. QK-G031 will alert the operator when mains power has been lost and recovered. The battery will recharge when power is restored. When recharging the battery, the mains power input should be at least 2V higher than the battery's full voltage level. Therefore, the mains power supply voltage should be 14-24V.

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3.4 Relay working modes

The QK-G031 is equipped with three digital output relays. Two of them support the daily timers for the output actions. The relays can switch to ON/OFF states according to the timer settings. The jumpers are at the bottom right of the PCB board. The enclosure needs to be removed to set these up. These two relays also support two working modes, self-lock and latching control.
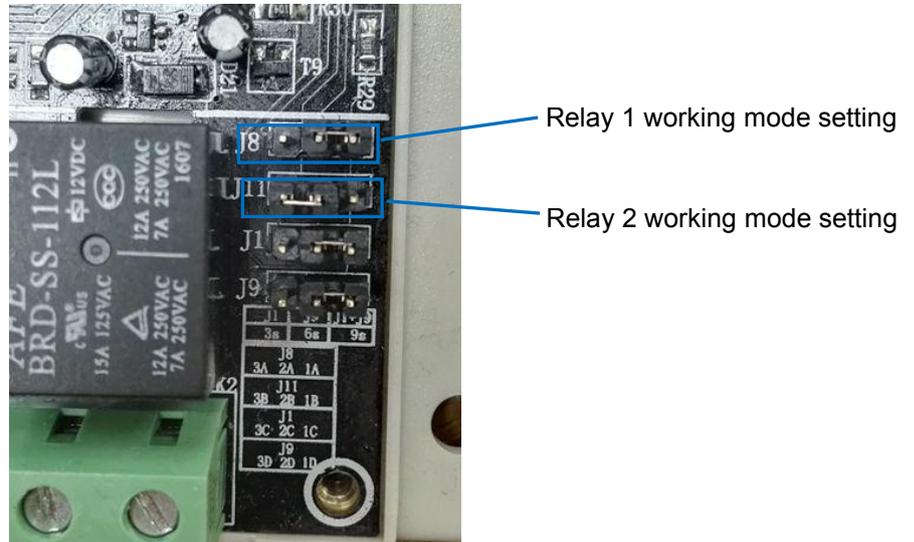

Figure 2 Relay working mode configurations

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

3.5 Delay time setting on latching mode

Working in latching mode, operators can configure QK-G031 with different delay times for Relay 1 and Relay 2 by setting the delay time jumpers.

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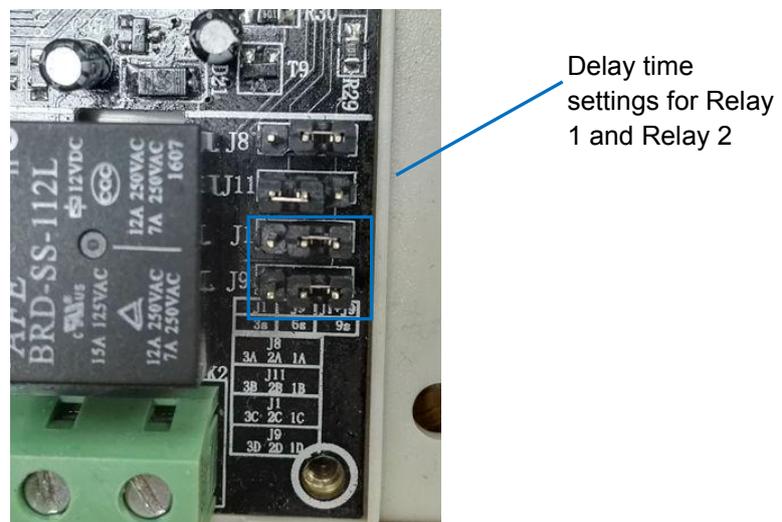
Figure 3 Delay time setting for relays
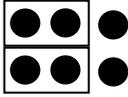
	Delay time set as: 12 seconds
	Delay time set as: 9 seconds
	Delay time set as: 6 seconds
	Delay time set as: 3 seconds
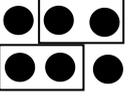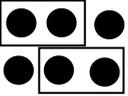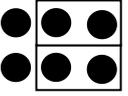
QK-G031 provides SMS commands in 'ONOFFRnxx#' format to support other delay times (from 3 seconds to 99 seconds), where 'n' indicates the relay number (1 or 2) and xx means the delay times (from 03 to 99 seconds). More details about this command can be found at section 6.

3.6 Alarm function and digital input connection

QK-G031 has two external alarm input connectors and various sensors can be connected to them. For example, door/windows sensors, motion sensors, wind detectors, carbon dioxide detectors and water leak detectors. Using these sensors/detectors, QK-G031 can be set up as a protection/alarm system.

QK-G031 external alarm inputs are activated when a trigger pulse or a constant level of 0 V is applied. If the sensor/detectors are triggered and they send the low level signal (0 V) to QK-G031, QK-G031 will send out an SMS to the registered mobile terminals. Meanwhile, the corresponding relays will also be activated.

Alarm input port	Corresponding relay number
External alarm 1 (INT1)	Relay 1
External alarm 2 (INT2)	Relay 2

There are two typical ways to connect the external alarm inputs to QK-G031. External alarm devices can be used as switches or as an input source for INT1/INT2 of the QK-G031 module.
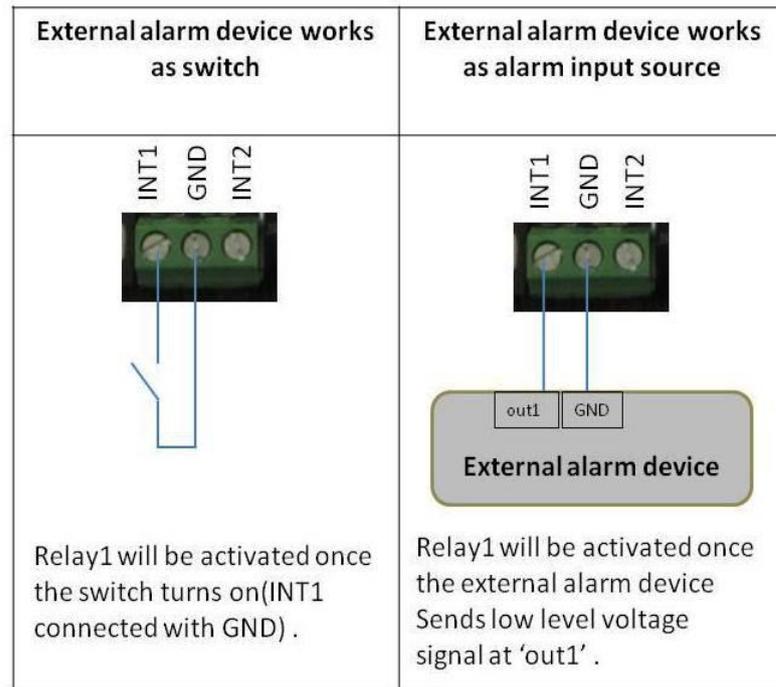
Figure 4 External alarm device connecting methods

3.7 Registration of SIM cards

Users can setup the authorised telephone numbers within QK-G031. The controller will verify the incoming number if they are indexed in the registered SIM numbers, the QK-G031 controller will hang up and then execute the actions.

3.8 SIM card slot

The SIM card should be inserted into the SIM card slot before applying the power.   Most 3 V SIM cards can work with the QK-G031 module. SIM registration can take a few minutes after powering up and the network LED flashes at 1 Hz after registration is completed.

3.9 Enclosure

The enclosure is made of IP56 Insulation Class 2 plastic, external dimensions; 145 x 90 x 41 mm.
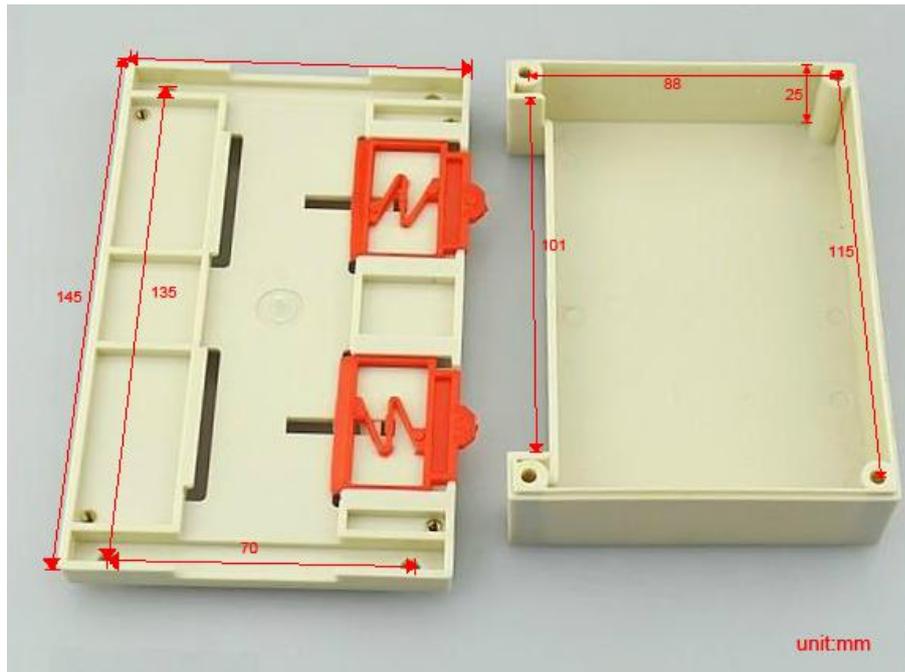
Figure 5 Enclosure

Figure 6 QK-G031 (with enclosure)

4 APP ON ANDROID

The APP provides a touch sensitive, user friendly interface (text free) for operator control of the QK-G031.

The latest APP for the Android platform can be downloaded from the following link:
http://www.quark-elec.com/download/apps

The Android platform should be at least V 2.1 or higher. An APP for the iOS platform may be released in future..

4.1 Setup

After installation, on opening the APP for the first time, users will see the following page for finishing the setup process:
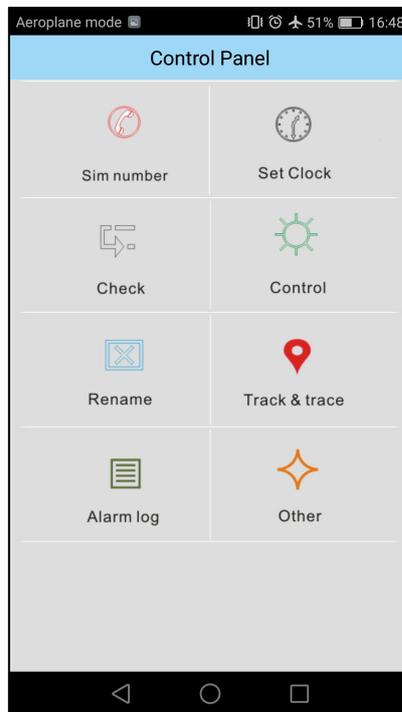
Figure 7 Setup page

4.2 Set QK controller SIM number

Input the number of the SIM card which is inserted in QK-031. All command SMS messages will be sent to this number via the APP.
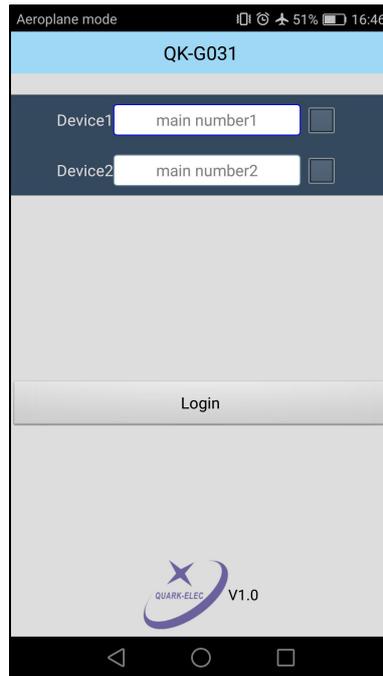
Figure 8 Set QK controller SIM number

Once the SIM card number has been stored, the APP will reply with a confirmation message as shown below:
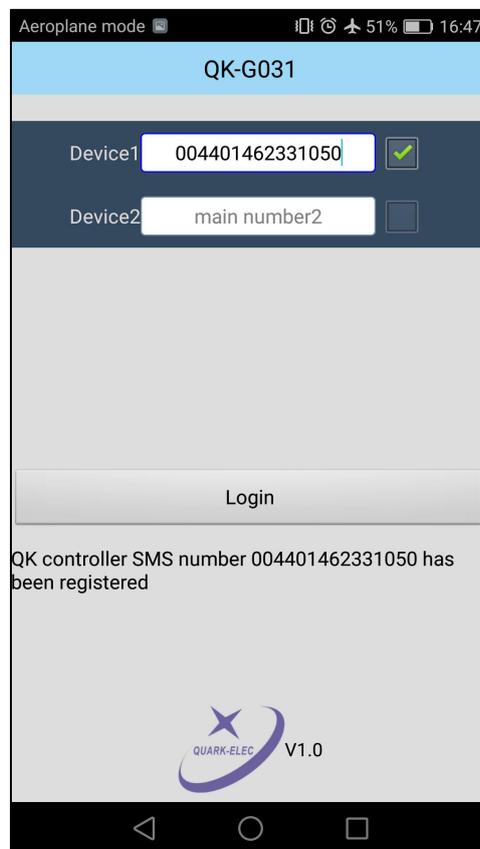
Figure 9 Successful set up of the QK controller SIM number

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4.3   Register SIM cards

QK-G031 allows one mobile phone to function as the main terminal and up to 3 additional phones to function as control terminals. The following interface allows the operator to register, delete and check the SIM card numbers:
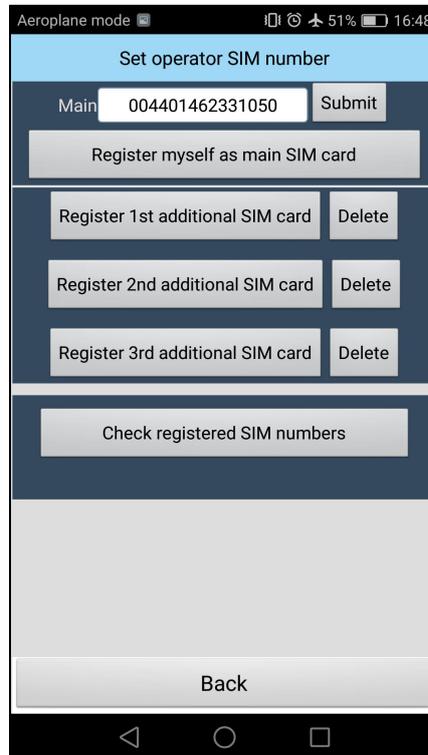
Figure 1 Register SIM cards
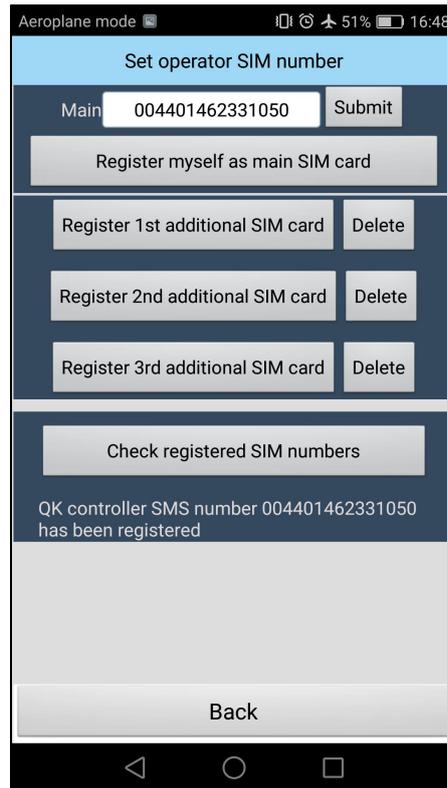
Figure 11 Register successfully

4.4   Setting the clock on the QK controller

QK-G031 can automatically execute actions at the time set by the operator. To do this, the real time clock on the QK controller should be set. This page allows the operator to check and set the time on QK-G031. When using this function, the CR2032 battery should be used on the module. On V1.5 or later hardware versions, a solid capacitor is used instead of the CR2032 battery. With a solid capacitor, the real time clock can keep working for at least 12 minutes after power off.
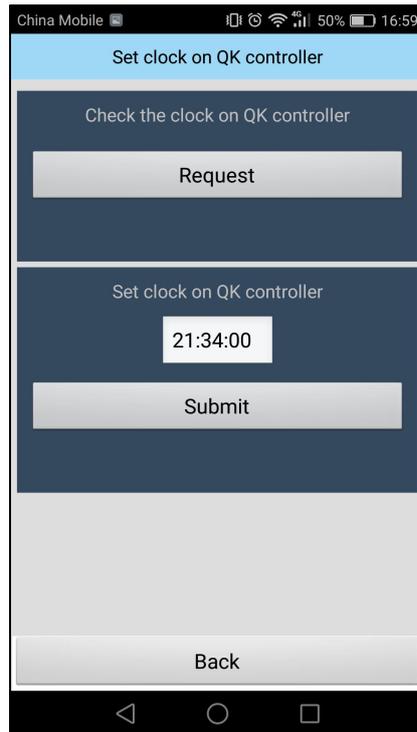
Figure 12 Check the clock on QK controller
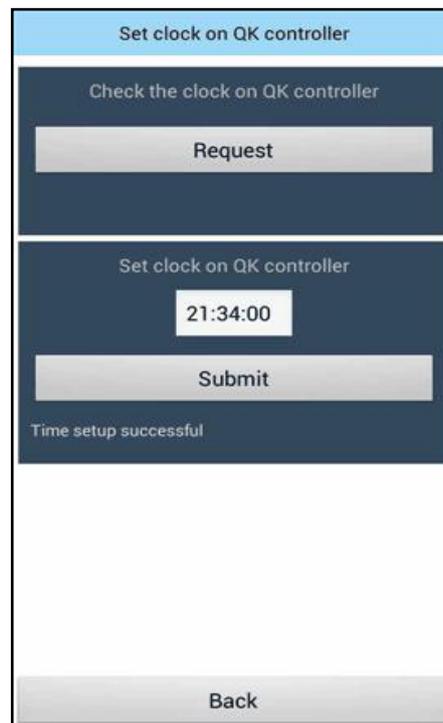
Figure 13 Successfulyl setting   the clock on QK controller

4.5 Check relay working mode

QK-G031 has three individual relays which support two working modes, namely self-lock and latching control. When working in latching mode, the relay takes active action for a few seconds

(depending on the time setting on the jumpers on the board.) and then reverts to normal status. When working in self locking mode, the unit will maintain active status until the next trigger input. QK-G031can also report the relay working status via SMS to the operators. And check the temperature for each sensor.
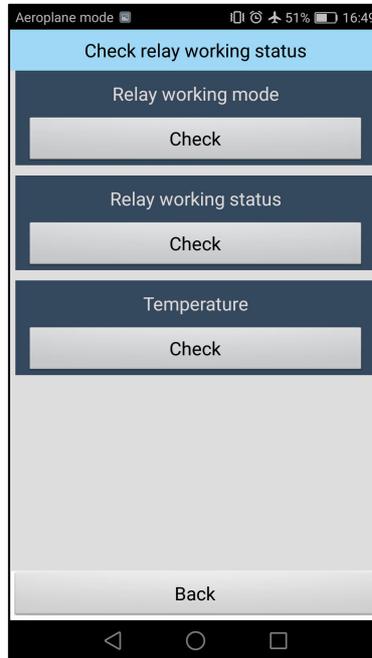
Figure 14 Check relay working mode

4.6   Rename control terminals

The control terminals can be renamed as a meaningful name in APP.

Figure 15 Rename control terminals

4.7   Control panel

The control panel provides the main operating interface (RF control function is not available for the later version module).

Figure 16 Control panel interface

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5 CONFIGURATION

The following steps are required to configure QK-G031 for first time use:

- Insert the SIM card into the SIM card slot
- Power up
- Press the 'Reset 'button and send '888888' as an SMS to the QK-G031 controller. If successful, the user will receive the message 'Your phone has been registered'.
- If additional mobile terminals are required, the operator should send 'BDn (mobile terminal number) F' to the QK-G031 controller. Up to 3 additional terminals can be configured. At this point, the operator is ready to use QK-G031. Details about the SMS command and response messages can be found in the next section.

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 main SIM card. This action should be done within 300 seconds of pressing the reset button on the module.	888888	Registers the main mobile terminal with QK-G031 module by sending '888888' to QK-G031 model. If registration is successful, the module will reply with 'Thanks for using Quark-elec products. Your main phone has been registered.' If the reset button has not been pressed within the preceding 300 seconds a 'failure' message will be sent : 'Registration not allowed. Please reset Quark-elec module first.'' Each QK-G031 module can only have one **main** registered SIM card number.
Register additional SIM cards	BDn(mobile number)F n=1, 1st mobile terminal n=2, 2nd mobile terminal	Once the main mobile terminal is registered with QK-G031, another three mobile terminals can be paired with QK-G031. For example, by sending BD107919157124F, the first mobile terminal (number is 07919157124) has been paired with QK-G031.

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	n=3, 3rd mobile terminal	Similarly, BD207909135124F means pairing QK-G031 with the second terminal (whose number is 07909135124). The message 'Your number n phone has been registered' will be returned by QK-G031, if mobile terminal n is successfully paired.
Delete additional SIM cards	DELn n=1, 1st mobile terminal n=2, 2nd mobile terminal n=3, 3rd mobile terminal	The registered SIM cards can be deleted from the authorized SIM list by sending DELn. The deleted SIM terminals can no longer control QK-G031.
Check registered SIM numbers	WHORED	QK-G031 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-G031 will reply with the relay state information in 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-G031 will reply with the relay state information in the following format: 'Port n OFF, where n is the relay number.'
Check relay working mode	RMODE	QK-G031 will reply with the relay working mode information in the following format: 'MMMM1MMMM2', where MMMM could be INCH or SELF. INCH refers to Latching control mode (relay will act for 3 seconds and then revert to the normal position), and SELF refers to Self-lock mode. For example, INCH1SELF2 means, relay 1 works in Latching control mode and relay 2 works in Self-lock mode.
Check relay working status	WHOACTIVE	QK-G031 will reply with the relay working status information similar to the following format: 'R1,R2,R3:ACTIVE;DEACTIVE;ACTIVE.' Where ACTIVE means the related relay has been triggered (COM port connected to NO port), DEACTIVE means the related relay is in the 'normal' state.

One-off relay switch toggling	ONOFFRnxx# n=1, Relay 1; n=2, Relay 2. xx range from 03 to 99, indicating the delay time in seconds.	For example, by receiving ONOFFR175#, the first relay (Relay 1) will be triggered on for 75 seconds and then switched off, whether QK-G031 is working in Latching mode or in Self-lock mode. QK-G031 will reply with the relay information in the following format: 'Port 1 is ON and will be OFF 75 seconds afterwards. ' This is a one-off command, only valid for one time action. The APP does not support this command, so the operator should use SMS to send this message.
Timer		
Set time on QK-G031	SThhmmss Where hhmmss is the current time	For example, by sending 'ST153014', the operator can set QK-G031 time as 15:30:14. QK-G031 will return the message 'Time setup successful' to accept this setting. If the operator sends the wrong time format, QK-G031 will return the message 'Time setup failed'.
Check the local time on QK-G031	DQSJ	By sending 'DQSJ', the operator will receive the local time. The message received would be 'Time at terminal is 12:30:32' .
Set Switching Relays ON time	ONnhhmmss n=1, Relay 1 n=2, Relay 2 hhmmss is the Switch ON time.	For example, by sending 'ON2163000', the operator can set Switch Relay 2 ON at 16:30:00. Message 'Port 2 will switch ON at 15:30:00' will be returned to the operator if the setting is successful.
Set Switching Relays OFF time	OFFnhhmmss n=1, Relay 1 n=2, Relay 2 hhmmss is the Switch OFF time.	For example, by sending 'OFF2194520', the operator can set Switch Relay 2 OFF at 19:45:20. Message 'Port 2 will switch OFF at 19:45:20' will be returned to the operator if the setting is successful.

Switch off the Timer setting	GDSn n=1, Relay 1 n=2, Relay 2	Message 'Timer on Relay n has switched OFF' will be returned to the operator if the setting is successful, where n is '1' or' 2'. Note: The local time will not be affected by switching off the timer.
Monitoring/alarm input		
Release relay status which is triggered by external signals.	EXTRT	After it has been triggered by the external signals, the related relay will be locked in the normal state. By sending 'EXTRT', the relays will be unlocked and available to respond to SMS commands again.
Disable function which has been triggered by external signals.	EXTGBn n=1, Relay 1 n=2, Relay 2 n=3, only available for PIR wireless PIR detector (QK-G022P433 variant)	By sending 'EXTGBn', the external alarm input n will be disabled. Message 'Alarm input n has been disabled.' will be returned to the operator if the setting is successful, where n is '1' '2' or '3'. By sending 'EXTRT' all external alarm inputs will be active. This 'disable' command isn't affected by re-powering up the module, however, 'EXTRT' will be.

QK-G031 has two digital input ports which can be used to monitor external signals. These two external input ports can accept 0 V to 5 V voltage levels. Should the input voltage level be below 1.0 V, the main mobile terminal will receive the warning message 'Port n has been triggered', where n is the relay number. The relay n will switch to the normal state (NC will be the closed state and NO will be the open state). Sending 'EXTRT' will release the relays and make them available to respond to SMS commands again.

Temperature senor		
Check the temperature on the sensors	DQWD	QK-G031 will reply with the sensor temperatures and the relay on/off setting temperatures similar to the following; 'Ch1:25[15to27],Ch2:Off[21to32], Ch3:26[25to36] '. This sample message indicates that, sensor 1 is measured as 25⌣, and relay1 is set to switch on at

		15°C and switch off at 27°C . Sensor 2 has been disabled and relay2 is set to switch on at 21°C and switch off at 32°C. Sensor 3 is measured as 26°C and relay3 is set to switch on at 25°C and switch off at 36°C. Example messages 2: Ch1:Notavailable[15to25], Ch2:off[21to32], Ch3:36[25to37] This message indicates that sensor1 has not been fitted or is damaged, sensor2 has been disabled and sensor3 is measured as 36°C.
Disable the temperature sensor	GBWDxxx# x=0 indicates 'enable the sensor' while 1 means 'disable the sensor'.	For example, by sending 'GBWD101# ', sensor1 will be enabled, sensor2 will be disabled, and sensor3 will be enabled. A message similar to 'Channels have been set as Ch1:On, Ch2:Off, Ch3:On' will be returned to the operator if the setting is successful.
Set the temperature limit for relays	TEMPnxxxxtoxxxx# n=1, Relay 1; n=2, Relay 2; n=3, Relay 3. xxxx is a 4bit signed number ranges from -055 to +125, indicating the setting temperature. The first xxxx is the 'switch on' temperature setting and the second one is for 'switch off' temperature setting.	For example, by sending 'TEMP1-005to+035#', relay 1 will be switched on if the 'sensor1' temperature is at or lower than -5°C , and the relay will be switched off when the temperature is at +35°C or higher. Message 'Channel1 has been set as On at 25 and Off at 35' will be returned to operator if the setting is successful.
Disable temperature warning message	GBTEMPBJ	By sending this message, QK-G031 will not send the operator the following message (or similar) if one of the sensors reaches the limit temperature (relay takes action): Ch1:22[26to32], Ch2:Off[21to32], Ch3:25[25to36]

		Message 'Temperature warning messages function disabled.' will be sent to the operator if the setting is successful.
Enable temperature warning message	DKTEMPBJ	Message 'Temperature warning messages function enabled.' will be sent to the operator if the setting is successful.
Mains/Battery power supply		
Mains power dropout warning		If the mains power supplier drops out, QK-G031 will automatically switch to using the backup battery and the following message will be send to the operator: Main power has been lost. QK-G031 is now powered by battery only. Current battery level is 12.2V (requested minimum level is 10.5V).
Main power recovered message		When the mains power is restored QK-G031 will automatically switch back to using mains power. The following message will be sent to the operator. Mains power has been restored. QK-G031 is powered by mains again now.

7 OPERATING SPECIFICATIONS

Item	Specification
Frequency bands	Quad-band: GSM850, EGSM 900, DCS1800, PCS1900.
SMS	MT, MO, CB, test and PDU mode
Operating temperature	- 25°C to + 80°C
Storage temperature	- 40°C to + 85°C
DC supply	12.0-24.0V (+/-5%)
Average supply current (typical quiescent)	40 mA
Maximum supply current (during SMS transceiver activity)	600 mA
GSM receiver sensitivity	-107 dBm
GSM transmitting power	Class 4 (2 W) at GSM850, EGSM 900. Class 1 (1 W) at DCS1800, PCS1900.
Temperature sensor working range	-55 to +125♡
Rated voltage on relay	90 V - 245 V
RF main socket power rating	< 2000 W

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

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

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

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