M8
Hardware Operating Instructions

KQ GEO Technologies Co., Ltd.

Preface

Thank you for choosing KQ GEO's M8. The M8 is ahigh-accuracy and high-performance multi-frequency GNSS RTK and mapping system professionally designed for surveying fieldwork by KQ GEO.

Please read the instructions especially the notes and reminding items before you start the fieldwork!

The below contents of M8 are introduced in sequence: the appearance and technical specifications, the basic operations, the external radio instructions, and troubleshooting.

Regards to the K8as the controller for M8, the detailed information will be introduced in their corresponding manuals.

To make sure the optimal performance of the instrument, please use the original accessories in the standard package, or the recommended accessories by KQ GEO referring to the KQ GEO instructions or manuals. Any damage caused by improper operations or unspecified accessories, users should bear all the consequences.

This instruction is aimed to guide users how to use the M8 correctly for best performance. The pictures attached are only for reference. And any update is without notice. Users can visit our company website www.kqgeo.com or contact the local distributor directly for more lasted information.

Content

Overview

- M8Overview
- Function Features
- Technical Specifications
- Notes and Reminding Items

M8Overview

The M8 is a high-accuracy and high-performance multi-frequency GNSS RTK and mapping system professionally designed for surveying fieldwork by KQ GEO. With the most advanced high-precision real-time kinematic positioning technologies, M8is able to search and track all the GNSS satellites signal in view so as to provide users with high-accuracy, high-efficiency and most reliable RTK survey performance. Being an outstanding assistant and tool in different fields such as electric power, transportation, agriculture, forestry, and land survey, it can do high-accuracy RTK, wide-range control survey, construction stakeout, topographic mapping, high accuracy marine surveyand etc.

Together with the K8 as the standard packaged controller, M8 system is the professional RTK while completes the data collection and processing both during fieldwork, providing powerful and flexible solution for various GNSS applications. It does greatly improve the fieldwork efficiency.

Function Feature

- Dual power supply design, industry's highest large capacity Li-ion battery, supports hot plug power battery replacement
- Configured with software supporting GPS, GLONASS, and BDS
- Seamless compatible with various CORS systems
- Linux intelligent system
- Support GPS, GLONASS, BDS, Galileo
- Support WASS, EGNOS, MSAS, GAGAN
- Fast initialization and satellite tracking technology
- Intelligent fault diagnosis and audio reminder function
- Built-in high-performance processor can process 20Hz data
- Built-in transmitting-receiving UHF radio, GPRS, Bluetooth
- Support one-key setup for base
- Standardized design, exchangeable baseand rover

Technical Specifications

Processor	454MHz industrial level processor	
Memory capacity	256M Byte DDR2 SDRAM	
Saving capacity	2G Byte NAND Flash	
GNSS technical parameters		
Mother board type	PCC BD970/NovAtel OEM 628	
Tracking channel	220 channel (BD970）: -GPS: L1 C/A, L2E, L2C, L5 -GLONASS: L1 C/A, L1 P, L2 C/A, L2 P -GIVOVE-A/B -BD-2: B1/B2 -SBAS	120 channel (OEM628): –GPS: L1, L2, L2C –GLONASS: L1, L2 –Galileo: E1、GIVOVE-A/B –Compass –SBAS
Positioning accuracy	Single point positioning: 2-3 m	
	Static network post-processing: horizontal: ±(2.5 mm＋1ppm) height: ±(5 mm＋1ppm)	
	PPP(static) post-processing: 5cm	
	PPP(dynamic) post-processing: 10cm ~ 20cm	
	Dynamic route post-processing: 5cm ~ 20cm	
	RTK: horizontal: ±(10 mm＋1ppm) Height: ±(20 mm＋1ppm)	
Communication parameters		
GSM	GSM（850/900/1800/1900MHz）	
Bluetooth	2.4GHz V2.0+EDR	
U disc	Support U disc storage extension up to 64GB, support hot plug	
Built-in UHF	Adjustable 0.5W/1W, support 5 km working distance, 9600 or 19200bps	
Indicator led	Power led, satellite led, communication led	
Key	One power key, two function keys	
Port	USB 2.0/ RS232 serial port, debugging port /TNC UHF antenna port	
Application function	Speaker for voice broadcast	
Power supply		
Battery	Dual power supply + assistant battery design (6800mAh×2+650mAh), the main battery supports hot plug, changing battery without powering off	
Power supply	Support 9~36V DC battery as power supply; Support 220V AC as power supply	
Hardware physical		

Size	ϕ184.5×105mm
Weight	1.5kg (with battery)
Working circumstance	
Workingtemperature	–45°C~+65°C
Memory temperature	–55°C~+85°C
Water/ dust-proof	IP67

Note

Although M8is made of corrosion-resistant and impact-resistant materials, this kind of sophisticated instrument still needs careful usage and maintenance. Please preserve it in dry environment as possible. To improve the stability and service life, the M8 should avoid being exposed to extreme environment, such as being used in damp, high temperature, low temperature, corrosive gas or liquid, etc.

To ensure the continuity and quality of the satellite tracking, the space over observation site should be as open as possible, without large obstacles over 15° elevating angle. To reduce various electromagnetic interference to GNSS satellite signal, please make sure no strong electromagnetic interference in 200m range around the observation site, such as TV tower, microwave station, high-voltage transmission. To avoid or to reduce the multi-path influence, the site should be set far away from the terrain and ground features where the electromagnetic wave signal reflection is strong, such as high buildings, large area waters, etc.

Note:

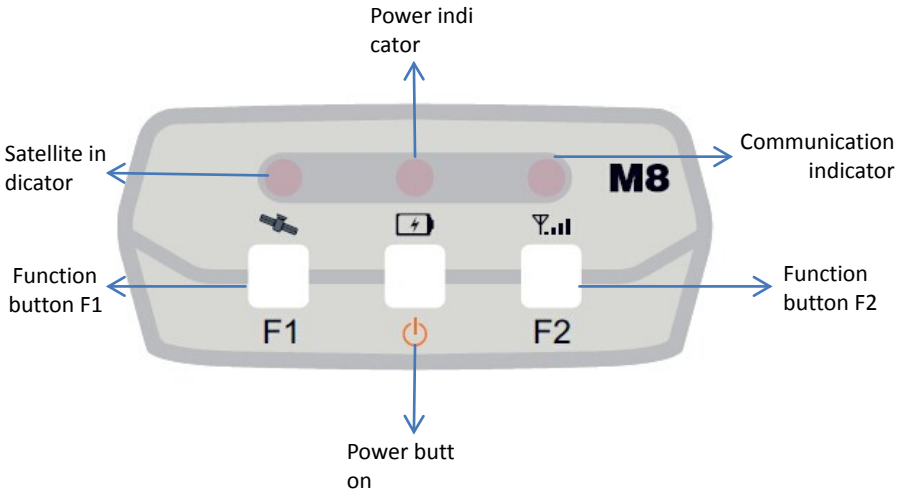
- This equipment contains ESDS (Electrostatic Discharge Sensitive Device), with level C of electrostatic anti-interference test. To touch, move, or plug the equipment please follow the ESD (electro-static discharge) instructions.
- Must be used and preserved in the stipulated temperature range. For details, please refer to the previous chapter: **Technical Specifications。**

M8 Introduction

CHAPTER 2

- Control Panel
- Lower Cover
- Radio Module
- Battery
- M8 Base Standard Configuration List
- M8 Rover Standard Configuration List

Control Panel



Indicator

Indicator	Explanation
Power indicator	**Flash in red**: in charging **Slow flash in green**: low battery **Green**: normal status, full battery
Communication indicator	**On in yellow**: GPRS connected/waiting for data from server **Flash in red/green**: Receive or send data **Off**: no data transmission in procedure
Satellite indicator	**On**: satellites tracked **Flash** (in static collection mode): the flashing times stands for the tracked satellites number **Off**: no satellites tracked

Button

Button name	Operation	Explanation
Power button	Long press for 3 seconds	Long press for 3 seconds in turned-off status to turn on the receiver; long press for 3 seconds in turned-on

		status to turn off the receiver.
	Single click	Confirm setting
Function button F1	Single click F1	Select working mode, or check current working mode
	Double click F1	Enter working mode configuring
	Long press F1	Set selecting built-in radio channel in clockwise or counterclockwise way
Function button F2	Single click F2	Working parameters configuring, or check current working mod
	Double click F2	Enter working parameters configuring
	Long press F2	One-key setup base

Note: single click time is 100ms ~ 1000ms, double click means two single clicks whose interval is 100-200ms, long press time is about 5s.

Working mode configuring

- **Button operation flow**

  Double click F1 -------> single click F1 -------> single click power button

- **Audio broadcast process**

Double click F1:

"Please select working mode"

Single click F1:

"GPRS base"
"External radio base"
"Internal radio base"
"GPRS rover"
"External radio rover"
"Internal radio rover"
"Static"

Single click power button:

"Configure successfully" or "Configure failed"

Working parameters configuring

- **Button operation flow**

  Double click F2 -------> single click F2 -------> single click F1 -------> single click power button

- **Audio broadcast process (in accordance with the current working mode)**

Double click F2:

"Working parameter configuration"

Single click F2:

"Channel configuration" (in internal radio base/rover mode)
"Radio power configuration" (in internal radio base mode)
"Elevation angle configuration" (in static mode)
"Collection interval configuration" (in static mode)

Single click F1:

When select the radio channel: "Channel 1", "Channel 2", "Channel 3", "Channel 4", "Channel 5", "Channel 6", "Channel 7", "Channel 8"

When set radio power: "High", "Low"
When set elevation angle: "5 degrees", "10 degrees", "15 degrees"
When set collection interval: "1 second", "5 seconds, "10 seconds", "15 seconds"

Single click power button:

When set the radio channel:
"Radio channel configured" or "Radio channel configuration failed"
When set radio power:
"Radio power configured" or "Radio power configuration failed"
When set elevation angle:
"Elevation angle configured" or "Elevation angle configuration failed"
When set collection interval:
"Collection interval configured" or "Collection interval configuration failed"

One-key setup base

- **Button operation flow**

  Super-long press F2

- **Audio broadcast process**

  "One-key setup base"
  "One key setup base successful"
  "One key setup base failed"

Working status audio broadcast

- **Button operation flow**

  Single click F1 or F2

- **Audio broadcast process**

  In CORS working mode through GPRS:
  "GPRS rover"
  In base working mode through GPRS:

"GPRS base"

In rover working mode through GPRS:

"GPRS rover"

In base working mode through built-in radio:

"Internal radio base"

"High radio transmission power" or "Low radio transmission power"

Radio channel: 1 ~ 8,

In rover working mode through built-in radio:

"Internal radio rover"

Radio channel: 1 ~ 8,

In base working mode through external radio:

"External radio base"

In rover working mode through external radio:

"External radio rover"

In static mode:

"Static"

Elevation angle: "5 degrees", "10 degrees", or "15 degrees"

Collection interval: "1 second", "5 seconds", "10 seconds", or "15 seconds"

Satellites number: 1 ~ 22

- **Automatical audio broadcast process**

"Satellite locked" or "Satellite losing-lock"

"Remote server connected" or "Remote server disconnected" (in GPRS base/rover working mode)

Lower Cover

- Radio module slot: for radio module installation
- Radio module connector: connecting point between radio module and

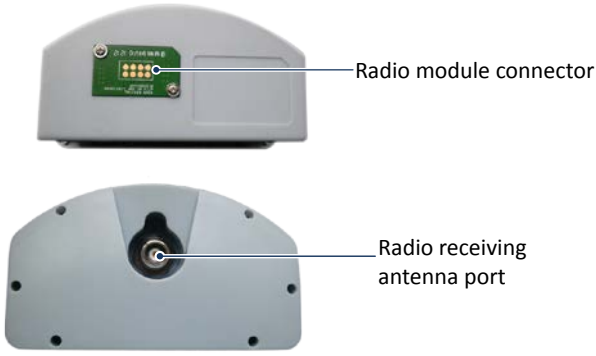
Radio module slot'er mainframe

- Speaker: audio broadcasting receiver working mode, working status, etc.
- Connecting screw hole: for fixing receiver to the pole or tri-branch
- Seven-hole port: for power supply cable, USB connection cable, or user's serial port connection
- USB Port: Support U disc storage extension
- Battery slot: for battery installation
- SIM card slot: for SIM card inserted
- Battery fixing slot: for fixing battery well when installing battery

Radio Module

Built-in radio module

M8 is designed with built-in GSM modem, and with internal radio module in standard package shown as below figure. The transmission power of internal radio module is 0.5W/1W adjustable and air baudrate is 9600, 19200bps, whose working rang can be as good as 3km.



External radio

For even longer working range, users can use the external radio for M8. Using the transmitting radio with 35W/1Wtransmission power for M8 base while the receiving radio with 1W/0.5W transmission power for M8 rover, both of which are already packed in the standard M8 RTK set package (base and rover), the working distance can be as good as 10km or more.

For more details of external radio, please look into thechapter Appendix: **External Radio Instructions**

Battery

M8Base Standard Configuration List

Product name	Quantity
M8 receiver	1
Built-in radio module (transmitting-receiving)	1
Charger adapter	1
Data cable (power port + USB + D-sub9 female serial port)	1
Extension pole for Tribrach	1
Battery	2
Battery charger	1
Stud connector	1
high-power transmitting radio	1
transmitting radio antenna	1
Transmitting radio connecting cable (for communication link between transmitting radio and M8 base)	1
Transmitting radio power charging cable (for power supply for transmitting radio)	1
Transmitting radio antenna telescopic pole	1
Transmitting radio antenna round bracket	1
Fuse (installed in transmitting radio power cable)	5
Tape (3m)	1
Carry case	1

M8 Rover Standard Configuration List

Product name	Quantity
M8 receiver	1
Built-in radio module (transmitting-receiving)	1
Battery	2
Data cable (power port + USB + D-sub9 female serial port)	1
Battery charger	1
Charger adapter	1
Radio receiving antenna	1
K8 handheld GPS as controller	1
K8controller bracket	1
K8battery	2
K8 charger	1
Adapter for K8 charger	1
K8 USB data cable	1
Micro SD card (2G)	1
Touch pen	1
K8 bag	1
Stud connector	1
Centering pole	1
Centering Pole Bag	1
Tape (3m)	1
KQ GEO CD	1
Carry case	1

M8Operations

CHAPTER 3

- Power On and Power Off
- Power Management
- Radio Module Installing
- SIM Card Installing
- Audio Broadcast
- Register

Power On and Power Off

Operation	Description
Power on	In power-off status (no indicator on), long press power button for 3 seconds. Then the receiver will be turned on, with power indicator on.
Power off	In power-on status (power indicator on), long press power button for 3 seconds. Then the receiver will be turned off, with all indicators off.

Power Management

M8is adopted with dual-battery design, which is the largest battery capability in GPS receiver market, one 6800 mAh Li-ion battery as the main battery and while with one internal 650 mAh Li-ion battery as the assistant battery to support uninterruptable hot plug when changing battery. Before the main battery is used up, the assistant internal battery is in stand-by status; only when the main battery has been used up or disconnected from the receiver, the assistant one will automatically supplying the power without any interruption. Furthermore, there are two main batteries in the standard package to guarantee the whole day continuous fieldwork.

Battery cover installing

- **Installing:** insert the battery cover matching the two cover slots as above figure until the cover is totally fill the slot, then press it to make sure it covers well. Finally turn the metal buckle 90 degrees counterclockwise to lock the cover well.
- **Uninstalling:** lift up the metal buckle on the battery cover and turn it 90 degrees clockwise, then the cover can be easily taken off.

Battery installing

- **Installing:** put the battery into the battery slot with the “Close” end pointing to the inserting holes, and then push it towards the inserting hole to lock the battery well. Finally install the battery cover.

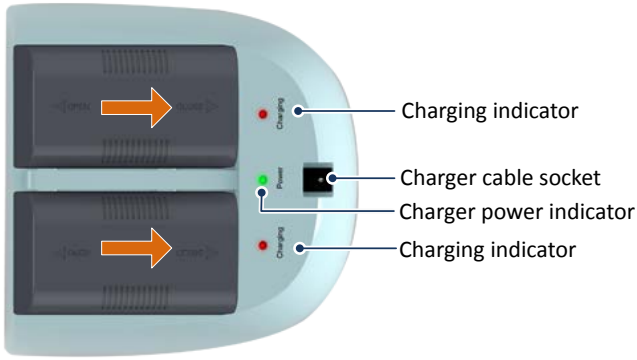
- **Uninstalling:** take off the battery cover first, push the battery towards to “Open” direction, and then take it out.

Charging

Please use the special charger in the M8 standard package to charge the battery in the allowed certain temperature range 0℃～40℃. For the first time using, please do not charge the battery until using up the remained power in it. And then charge it 12 hours each time for the first three times. After the first three times, the charging time should be enough as long as 8 hours every time normally. And make sure only charge the battery after it has been used up. Furthermore, if the battery is not used for a long time, it should be charged once every month to keep it active.

The M8 charger can charge two batteries at the same time. Please put the battery onto the charger with the “Close” pointing to the indicator led of the charger as below figure, and then push it until it is locked well.

When the “Charging” indicator is on in red, it means the battery is being charged; when green, it means the battery is charged full. But now please keep charging the battery for more 1~1.5 hours, then take the battery off.



Warning:

- Don't put battery in fire or use metal short-circuit electrode. Please use the special battery and charger from manufacturer only.
- Stop using the battery once you find it heated abnormally, distorted, leaked, or smelly. Please replace it by a new one.
- If the battery life significantly shortened, please stop using and change a new one as the battery has aging.

Check the Remaining Power

Users can check the remaining power ofM8 receiver by its power indicator on the control panel.

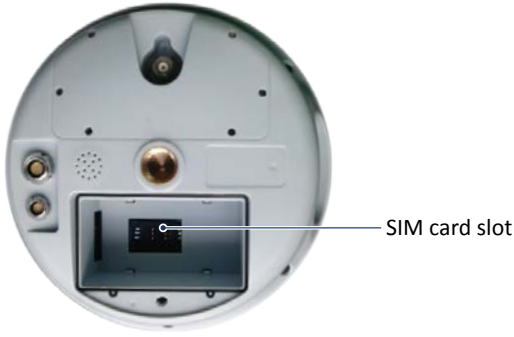
- Power indicator is on: the power is supplied by the main battery. And the left power of the main battery is above 24%.
- Power indicator is flashing slowly: the power is supplied by the main battery. But the left power of the main battery is less than 24%.
- Power indicator is flashing fast: the power is supplied by the internal assistant battery, which can only last about 0.5 hour. Please change the main battery in time.

Radio Module Installing

1. Put the radio module gently into the radio module slot as the above figure
2. Screw up the 6 screws into the 6 screw hole on the radio module well in clockwise direction with screwdriver.
3. For uninstalling the radio module, screw out the 6 screws counterclockwise with screwdriver, and then take the radio module out.

SIM Card Installing

SIM card slot is inside the battery slot as below figure:



For inserting SIM card, please pull up the holder of the slot, insert the SIM card with the metal side downward, then put down the holder and gently push it to lock well.

Note: Please do not insert or take out SIM card when the receiver is still power on, or the receiver will not detect the SIM card.

Audio Broadcast

M8will automatically broadcast the current operations and working mode of the receiver with the internal speaker so as to assist users with every operation.

Register

Note:Please do register the M8 receiver in time. If any economic loss caused by receiver registration expired, KQ GEO assumes no responsibility for it.

Controller connecting (standard K8)

CHAPTER 4

- K8 Controller Connecting

K8 Controller Connecting

K8

K8GPS receiver is used as the controller for M8. Based on Windows CE 6.0 operation system, with 1GHz industry-grade processor and meeting IP 67 standard, it supports large-size raster image data (up to 10GB) loading and 100 M) level vector data loading, providing comprehensive GPS/GIS software application solutions.

The operation steps for connecting M8 receiver with K8 controller are as below:

1. Turn on M8 receiver
2. Turn on K8 and run GeoPacsoftware installed inside.

3. Enter “COMM”function part, click “Connect” and enter “Bluetooth Tools”.

4. Click “Bluetooth Power”, go into “Communication Mode Setup”, and select Bluetooth option to power on Bluetooth.

5. In “Bluetooth Tools”, select “Search”. The K8 will search nearby bluetooth devices and display in a list, which will be automatically saved for next time convenient fast connect, or users can manually delete it.

6. Select the M8 receiver among the list, and click “Connect”, the K8 controller will connect with the M8 while the software will back to the “COMM” interface from the “Bluetooth Tools” interface. The detailed information of M8 will be showed in “Status”, such as satellites signal, skyplot, etc.

7. M8 receiver will remember the settings before last turning-off. After the connection successful, users can change the settings for M8 in GeoPac software in K8 easily to carry out different survey fieldwork such as RTK survey, static control survey, SBAS, etc. For more details of GeoPac, please refer to the GeoPac software operation manual.

Common Troubleshooting

CHAPTER 5

- M8Common Troubleshooting

M8Common Troubleshooting

Issue	Cause	Solution
Can't turn on	Very low battery.	Recharge the battery.
	Working temperature is beyond the allowed range-45℃～65℃	Bring the handheld into the environment where the temperature is in the allowed range.
Cannot charge the battery	The internal parts of the receiver mainframe has risen above65℃	Temporarily turn off the receiver, recharging when the temperature drops to the allowed range.
		Keep far away from the heat source, such as sunshine. The receiver will charge automatically when the temperature drops into the allowed range.
	The internal temperature has fallen below-45℃	Put the receiver mainframe indoor to make its temperature back to above -45℃. Then it can be charged again.
Satellite signal is poor.	Located in tunnel, under viaduct or near large area waters which affects the satellite signal.	Change location to improve receiving signals.
The GPRS dial-up fails or the network is abnormal.	SIM card has not been inserted properly.	Carefully take out the card, and then insert it into the card slot gently.
	The SIM card needs to be topped up or the GPRS internet service has not been ready.	Contact the GPRS operator to top up.
	The local network signal is weak.	Go to other places with strong signal to re-establish the communication.
		Change into radio communication method where the GPRS signal is very weak.
	Electromagnetic interference exists around, such as television tower, microwave station, high voltage transmission line, etc.	Be away from the area with strong electromagnetic interference.

If any question, please feel free to contact the local distributor or find us KQ GEO.

Appendix: Built-in Radio Instructions

APPENDIX 1

- Built-in Radio Introduction
- Factory Default Frequency Table

Built-in RadioModule Introduction

Please use the standard packaged built-in transmitting-receiving radio module for the M8, which is with 1W/0.5W adjustable transmission power while 0.5W as the default one.

Factory Default Frequency List (Built-in radio module)

Channel	Transmitting Frequency (MHz)	Receiving Frequency (MHz)
1	464.5000	464.5000
2	464.6000	464.6000
3	464.4500	464.4500
4	464.6500	464.6500
5	464.4000	464.4000
6	464.7000	464.7000
7	464.3500	464.3500
8	464.7500	464.7500

Note: Make sure the transmitting radio and the receiving radio are in the same channel. Please change the channel to ensure optimal data transmission quality in areas of severe electromagnetic interference

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-- Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver.
-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 26 cm

RF radiation safety warnings and the following:

Antenna	Safe Distance, R_{safe}, (cm)
	FCC Part 2.1091
	Controlled RF Exposure
	26

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TECHNOLOGIES

Contact Us

Thank you for using our M8 series. We will do our best to provide you the best pre-sales and after-sales service. Please feel free to contact us for any usage condition or advices about M8 series.

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