



GQ GMC-800 Geiger Counter User Guide



GQ Electronics LLC

Revision 1.02

Feb-2024

Document Revision History:

Re.1.00 ,Oct-2023 GQ Electronics LLC. Initial release for firmware 1.00

Re.1.01 ,Oct-2023 GQ Electronics LLC. Menu section content update.

Re.1.02 ,Feb-2023 GQ Electronics LLC. Menu section content update.

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ACKNOWLEDGEMENTS

[TO BE FILLED]

Overview

The GQ GMC-800 digital Geiger Muller Counter is specially designed to be a U.S. NRC compliant, portable and convenient device. It can be used in industrial, commercial maintenance, research, evaluation, simulation and other analytical or scientific applications in areas such as industrial plants, public utilities, hospitals, universities, laboratories, and electronic repair shops. The device comes with built in audible and visual signals for the level of radiation detected. It can be used for radiation detection and monitoring for both indoor and outdoor environments. It features automatic data recording, continually monitoring the radiation level and logging the data into internal memory every second. Users can check and analyze this data by connecting the GMC-800 to a computer and downloading with provided software. The GQ GMC-800 also comes with a high-quality color LCD Module, the friendly designed graphic user interface is fully utilized the color LCD. The device has one front LED indicator.

The device is equipped with a Type-C USB port, utilized for communication and external power supply/charging of the internal rechargeable Li-Ion 3.6V/3.7V battery.

The GQ GMC-800 rechargeable battery can be charged with a standard wall adapter. Using the adapters, continuous data monitoring is possible. The GMC-800 can run on only the wall adapter, giving users freedom from the limitations of a battery and guaranteeing consistent and accurate measurements.

The main board also has a real time clock on board for time related data logging purposes.

The USB port communicates with the **GQ Geiger Counter Data Viewer** software.

The **GQ Geiger Counter Data Viewer** software can download the time stamped radiation (history) data from the unit and save it on a computer for future references and analysis.

Specifications:

Range of dose rate indications, $\mu\text{Sv/h}$	0.00 to 2000
Range of exposure dose rate indications, mRem/h	0.00 to 200
Range of registered beta radiation energy MeV	0.25 to 3.5
Range of gamma radiation energy, MeV	0.1 to 1.25
Range of registered X-ray radiation energy MeV	0.03 to 3.0
Reproducibility of indication	20%
Gamma Sensitivity Co^{60} (cps/mR/hr)	22
Alarm levels by CPM	0 to 999999 (continuously)
Alarm levels by $\mu\text{Sv/h}$	0.00 to 9999 (continuously)
Alarm levels by mRm/h	0.00 to 999 (continuously)
Date indication	YYYY-MM-DD (continuously)
Time indication	HH-MM-SS (continuously)
Elapsed time indication	99 years(maximum)
Radiation detection:	β, γ, x
Detectable Radiation Range:	0.1 ~ 3 MeV
Instrument Background:	0-2 pulses/s
Working Voltage:	3.6-3.7V
Display:	Color LCD dot matrix, back lighted
On board Memory:	2M Bytes flash memory for data storage
Power: Consumption	25mW – 125mW (count rate dependent)
Power: Supply	3.7V Li-Ion battery / USB power

This device is calibrated to GQ Electronics' strict QA standard and eligible to be calibrated to U.S. Nuclear Regulatory Commission (NRC) regulation 10-CFR-34, 10-CFR-35, ANSI/NCSL Z540.3-2006(R2013), ISO/IEC 17025:2017(E), MIL-I-45208A, and traceable to the National Institute of Standards and Technology.

Packing List:

1. GMC-800 main unit.
2. USB cable
3. Quick start guide

How it works?

The GQ-800 Geiger Counter installed a Geiger tube to detect radiation.

When the radiation passes through the Geiger tube, it triggers electrical pulses for the CPU to register as count. The basic count rate unit is CPM (Count Per Minute). The CPM count rate indicates the radiation level and it can be converted to other traditional radiation units, such as uSv/h or mR/h.

After GMC-800 is turned on, it will show the background radiation reading. The background radiation reading (in CPM) indicates the nature radiation detected at that minute. This reading may change from time to time and location to location. To get an accurate reading, user may need to get an average value over a longer time period.

Caution

1. Avoid doing measurements when the battery is low.
2. Do not get the Geiger counter wet. Use a sealed plastic bag to avoid moisture.
2. Avoid doing measurements in direct sunlight.
3. Avoid directly contact with the radioactive material. Use a sealed plastic bag if needed.
4. Turn off the unit when not in use.
5. Keep it in a protective pouch after use.

Background Safe Levels

Suggested background readings levels:

1. **Safe level.** Less than 50CPM or 0.25uSv/h. Nothing to worry about
2. **Attention level.** 51CPM – 99CPM. OR 0.26uSv/h – 0.39uSv/h. Unnaturally high, time to figure out what is wrong
3. **Warning level.** More than 100CPM or more than 0.40uSv/h. Dangerous to stay in this area for long.

Hardware setup

There are four buttons on the front of the unit: **Key1, Key2, Key3 and Key4 (from left to right)**

1. Power up the unit. Pressing the Key4 (power) key for 3 seconds will turn on the unit. Check the battery level. Charge the battery fully for first time use. It may take a few hours to get the battery fully charged. Check the battery icon on the display, a fully charged battery icon will be filled with solid color, without flashing.
2. Set date/time. Press the Key4 key to enter the menu and set the date and time. This is very important for time stamping the recorded data. Do not skip this step. Most of the recorded data are related to the date and time.
3. Set the backlight timeout in second, in order to minimize the power consumption. Set the power savings mode. If the power savings mode is ON, then the LCD display will be turned off after 30 second if no key is being pressed during this period.
4. Now the unit is ready to use. You should see the background CPM rate in absence of a radioactive source.

Software set up (optional)

Before connecting the GMC-800 Geiger Counter to a computer, download the application software and install the USB driver. Download these from: <http://www.gqelectronicsllc.com>.

1. For the Win 10/11, NO USB driver is needed to install. Other earlier Windows version may need an USB driver in order to communicate with the application software. Running **GQGMCGeigerCounterUSBDriverV4.exe** will install the USB driver.
2. GMCDataViewer.exe is for viewing the data on a computer.

For technical questions and support, please use the forum at the following link:

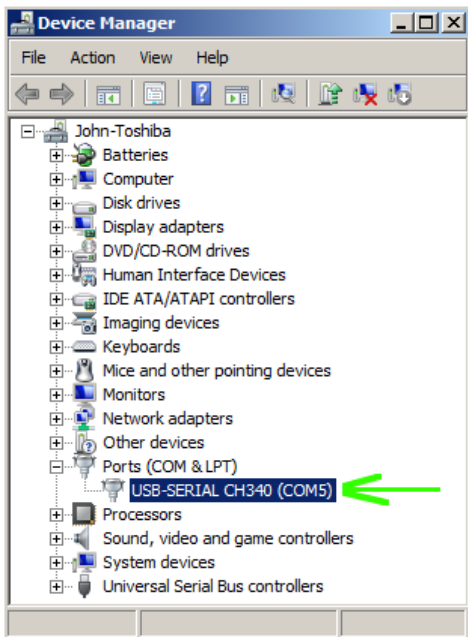
<http://www.GQElectronicsLLC.com/forum>

For the latest software, please visit our software download page:

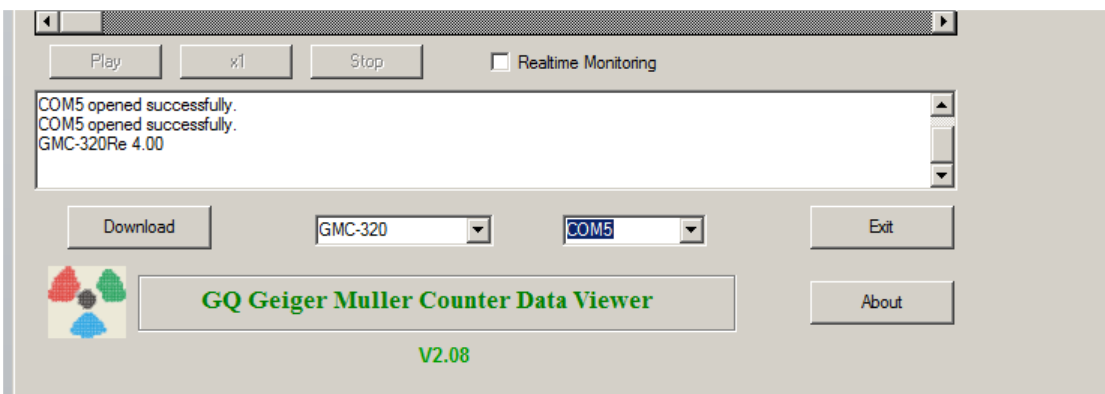
<http://www.gqelectronicsllc.com/comersus/store/download.asp>

Verify USB driver installation in Windows (Optional)

Once the GMC-800 is connected to a computer, from the device manager, you should see which COM port is assigned to the GMC-800. See the example below. Windows assigned COM5 to the GMC-800 unit in this example.

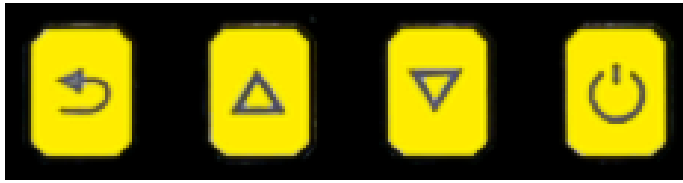


For the data viewer or the data logger software, selecting COM5 will establish the connection to the GMC-800 Geiger counter for the above example



GQ GMC Geiger Counter Multi-Function Keys

The multi-function keys, Key1, Key2, Key3 and Key4 explained:



Key1 Key2 Key3 Key4

These key's function will be reassigned dynamically based on the context of the current (sub-) menu being displayed.

Key1

1. There are four display modes: Does Rate, Graphic, Dosimeter, History and Menu mode. Pressing the Key1 toggles between these modes.
2. In the menu screen, pressing the Key1 will exit the current menu and will return back one menu level.
3. In the data input mode, pressing the Key1 will delete the last character entered.
4. Listen to the voice reading. Hold this key for two seconds will read the current value in Dose Rate mode.

Key2

1. In Does Rate and Graphic mode, pressing the Key2 will change the reading unit.
2. In menu mode, the Key2 acts as the UP key to move the highlight menu item upwards.
3. In history mode, the Key2 changes the reading unit.
4. In the menu mode, while a popup message box is opened, the Key3 changes the value by cycling through the predefined values.

Key3

1. In Does Rate and Graphic mode, pressing the Key2 will change the reading unit.
2. In menu mode, the Key3 acts as the DOWN key to move the highlight menu item downwards.
3. In history mode, the Key3 changes the reading unit.
4. In the menu mode, while a popup message box is opened, the Key3 changes the value by cycling through the predefined values.
5. Key3 is a shortcut key to menu mode. Hold the Key3 for two seconds will change the display mode to menu mode.

Key4

1. In power off state, only the Key4 acts as the power switch. Holding it for 3 seconds will power up the unit.
2. In Graphic mode, press Key4 will switch between Total, Max and average readings.
2. In power on state, holding Key4 for 3 seconds will switch the unit off.
3. In menu mode, Key4 is the "Confirm", "Select", "Enter" key

Power saving mode

The unit's factory default power saving mode is ON. In this mode, the unit will dim the LCD backlight to minimum after 30 seconds of idle time. It will back to normal backlight when any key is pressed.

Popup Windows

The Popup Windows will show the current status/value of selected features. The current status/value can be changed only when it is displayed in the Popup Window and the currently displayed status/value will be stored when the Popup Window has timed out after 3 seconds if no key has been pressed.



Graphic User Interface (GUI)

Graphic Icons:



Battery Status.

90%

Battery Level



Data saving enabled / (History data)



Alarm enabled



Speaker Enabled



Vibration Enabled



USB Connected



Special function icon indicators.



Current display mode highlighted position.
Next display mode in a normal background.



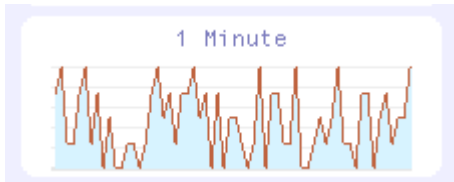
Current reading unit indicator area.



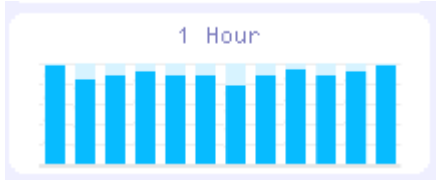
Color safety alarm level indicator. Green is more safe than red color.



Current date and time



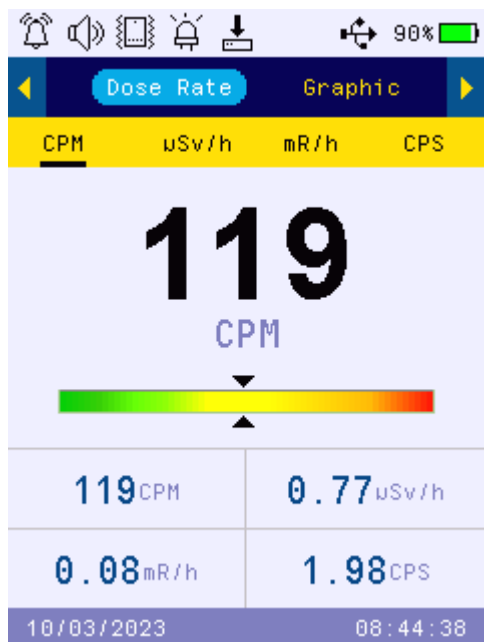
Graph in past 60 seconds.



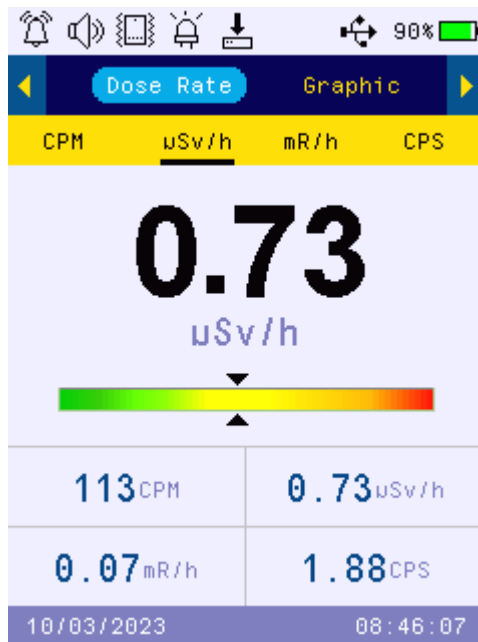
Graph in past 60 minutes

There are four display modes, Dose Rate, Graphic, Dosimeter, History Mode and Menu Mode

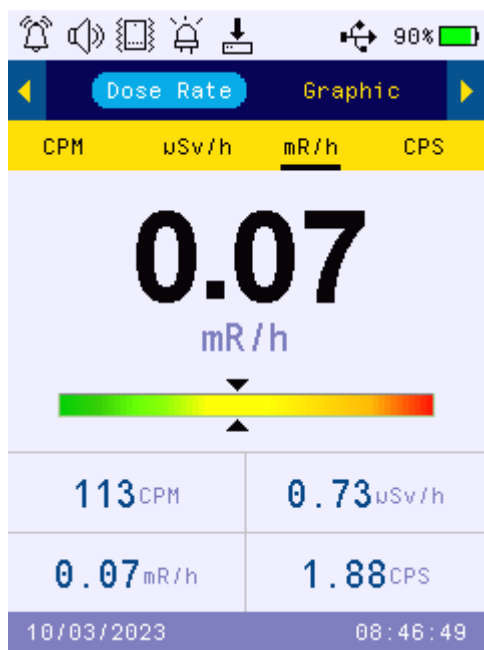
Dose Rate Mode:



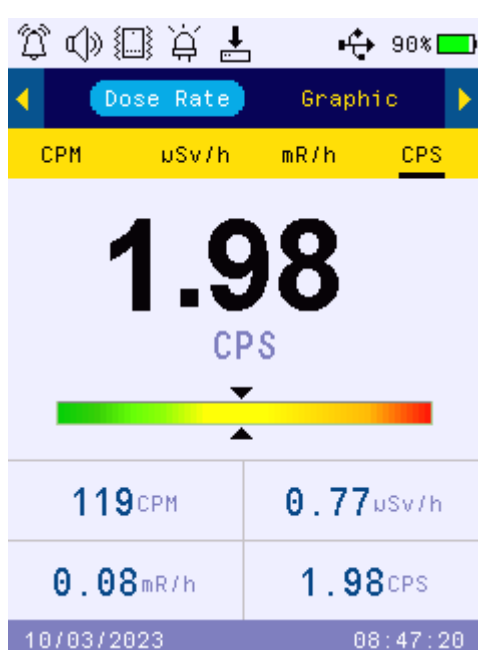
Dose Rate in CPM



Dose Rate in $\mu\text{Sv/h}$



Dose Rate in mR/h



Dose Rate in average CPS per minute

Key2 and Key3 toggles between CPM, $\mu\text{Sv/h}$, mR/h and CPS units

Navigation keys:

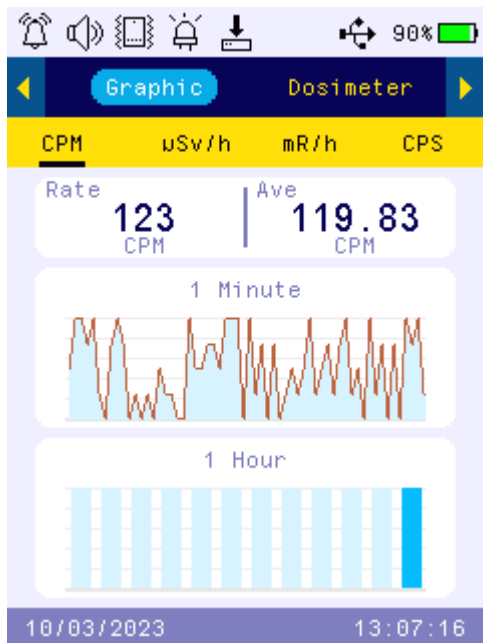
Key1: Dose Rate/Graphic/Dosimeter/History Mode Selection

Key2: CPM, $\mu\text{Sv/h}$, mR/h, CPS selection

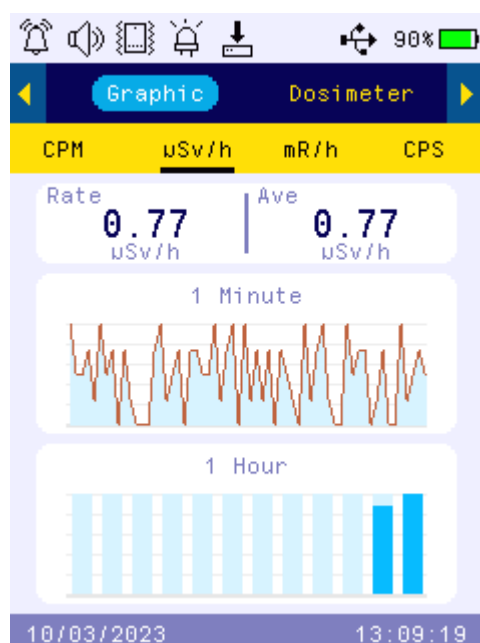
Key3: CPM, $\mu\text{Sv/h}$, mR/h, CPS selection. Or hold for 2 seconds to enter menu mode.

Key4: Power Off (when hold for 3s)

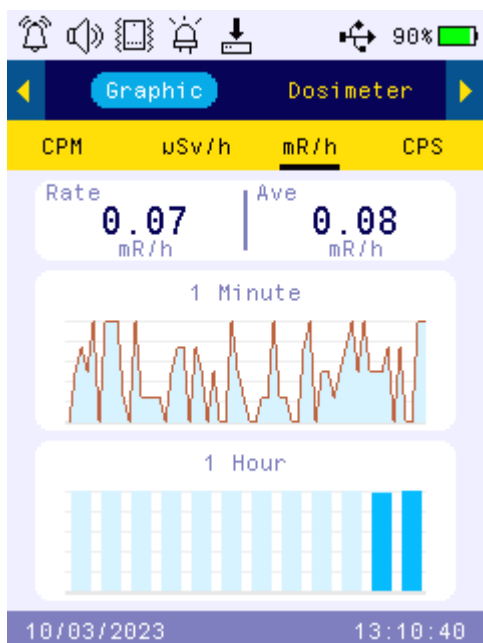
Graphic Mode:



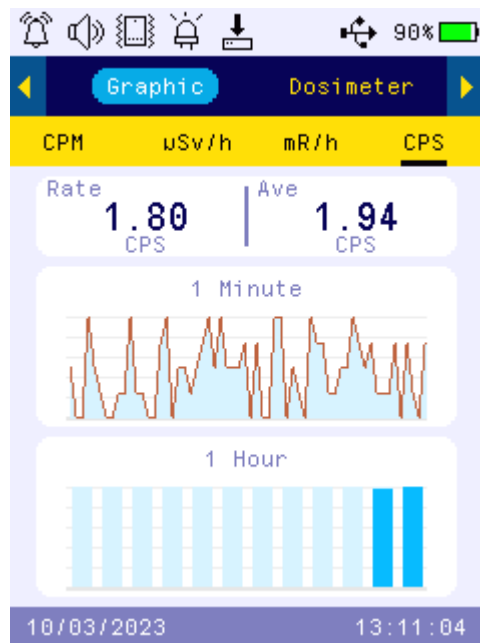
Dose Rate in CPM



Dose Rate in µSv/h



Dose Rate in mR/h



Dose Rate in average CPS per minute

Key2 and Key3 toggles between CPM, µSv/h, mR/h and CPS units

Navigation keys:

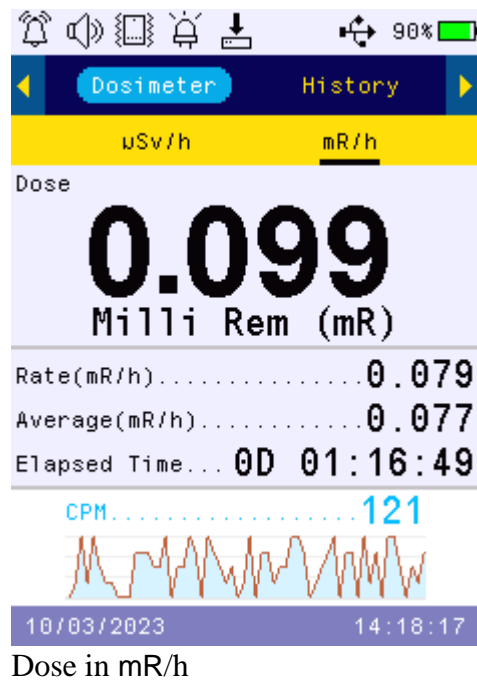
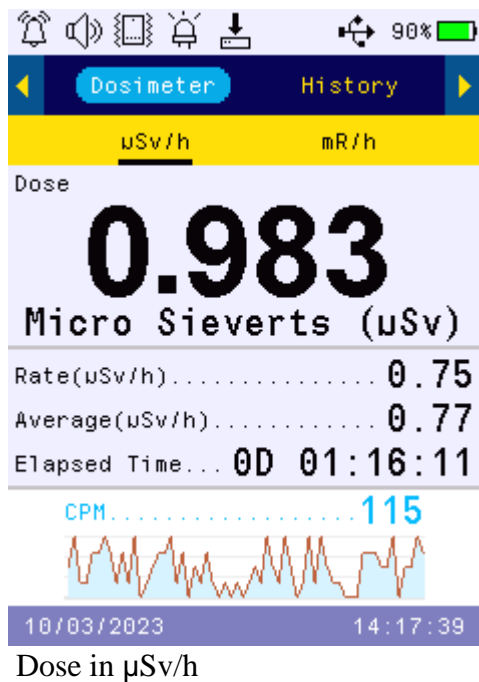
Key1: Dose Rate/Graphic/Dosimeter/History Mode Selection

Key2: CPM,µ, Sv/h, mR/h, CPS selection

Key3: CPM,µ, Sv/h, mR/h, CPM selection. Or hold for 2 seconds to enter menu mode.

Key4: switch between Total, Max and average readings. Power Off (when hold for 3s)

Graphic Mode:



Current level in CPM

Navigation keys for both modes:

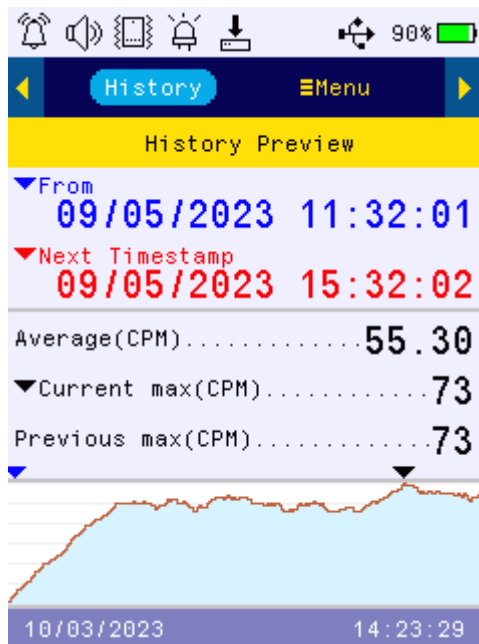
Key1: Dose Rate/Graphic/Dosimeter/History Mode Selection

Key2: $\mu\text{Sv/h}$, mR/h

Key3: $\mu\text{Sv/h}$, mR/h selection. Or hold for 2 seconds to enter menu mode.

Key4: Power Off (when hold for 3s)

History Mode:



In History mode, the device displays historical data stored in internal flash memory. It starts from the first timestamp detected and 4 minutes of data thereafter.

Navigation keys for both modes:

Key1: Dose Rate/Graphic/Dosimeter/History Mode Selection

Key2: Next timestamp or next four minutes of data whichever first occurs.

Key3: Previous timestamp or previous four minutes of data whichever first occurs.

Or hold for 2 seconds to enter menu mode.

Key4: Power Off (when held for 3s)

Menu Mode

The menu screen shows special function menu items user can select.

The left side list is the main menu list and the right-side list is a submenu list corresponding to the main menu highlighted item.

Press Key4 to confirm a main menu item first. Then the high-lighted cursor will move to submenu section to let you select.



Navigation keys:

Key1: Back Key2: Up Key3: Down Key4: Select/Enter

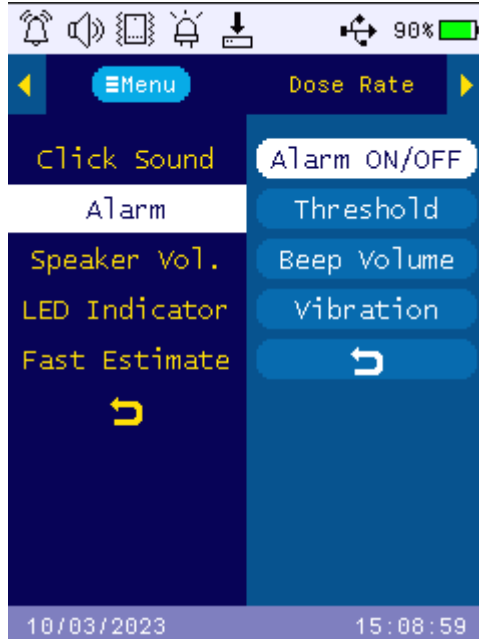
Click sound



Navigation keys:

Key1: Back Key2: Up Key3: Down Key4: Select/Enter

Alarm



Turn's alarm audio On/Off

Alarm Threshold



The audio alarm will be triggered once the radiation level reaches the preset alarm threshold in CPM.

Navigation keys:

Key1: Back

Key2: Change the digit value in highlighted position.

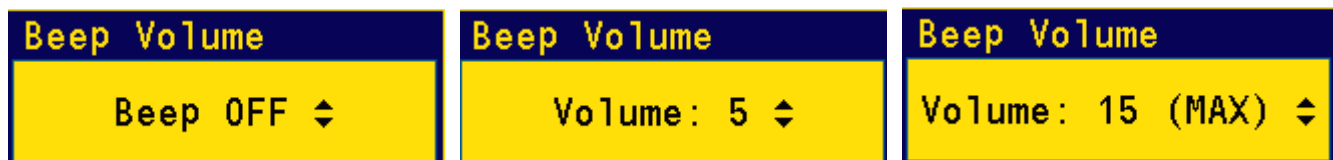
Key3: Change the digit value in highlighted position.

Key4: Confirm and move to next digit.

Beep Volume (Alarm)



Press Key4 to enter and Beep Volume setting mode.

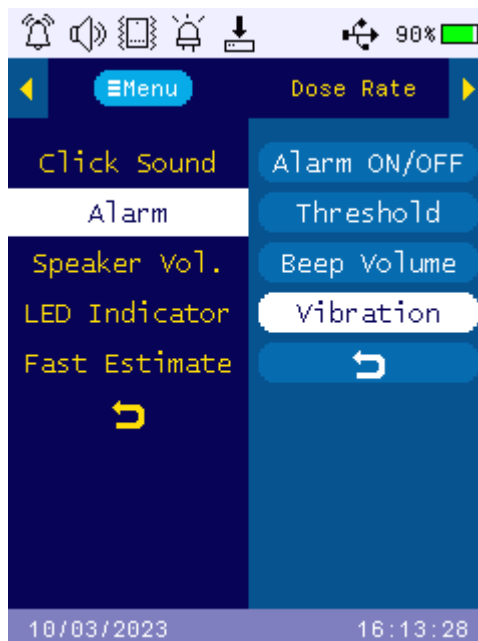


Navigation keys:

Key1: Back Key2: Up Key3: Down

Final volum will be saved when pop up Window close on 6 seconds times out.

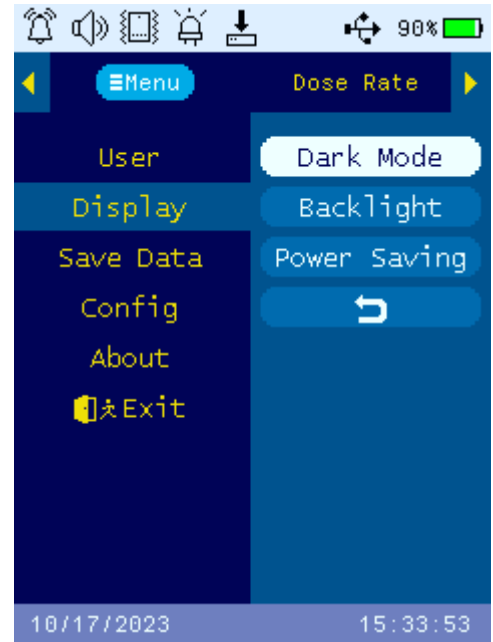
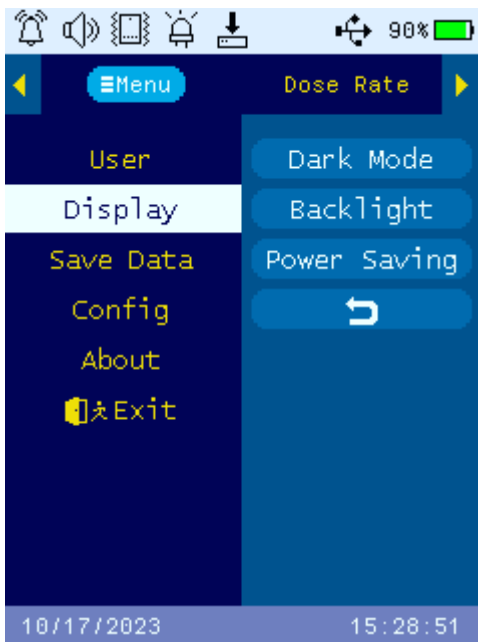
Vibration



Navigation keys:

Key1: Back
Key2, Toggle the On/Off selection
Key3: Toggle the On/Off selection

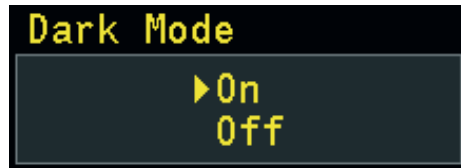
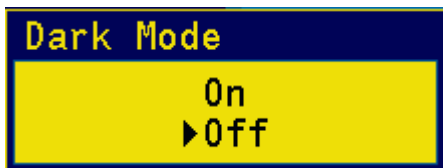
Display (in main menu)



Press Key4 to enter submenu

Dark Mode

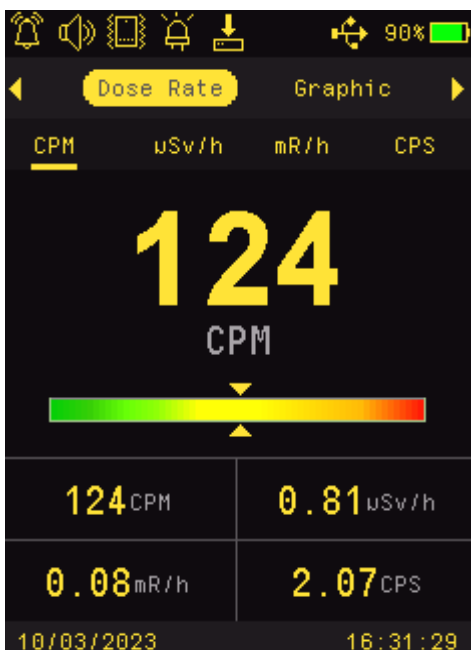
Press select button (Key4) to turn dark mode on/off.

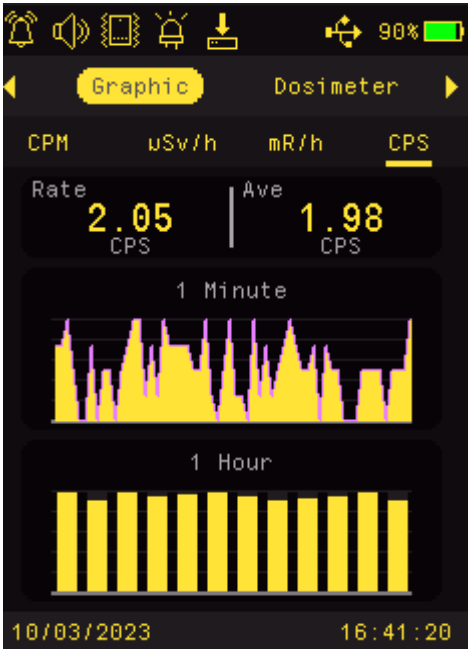


Navigation keys:

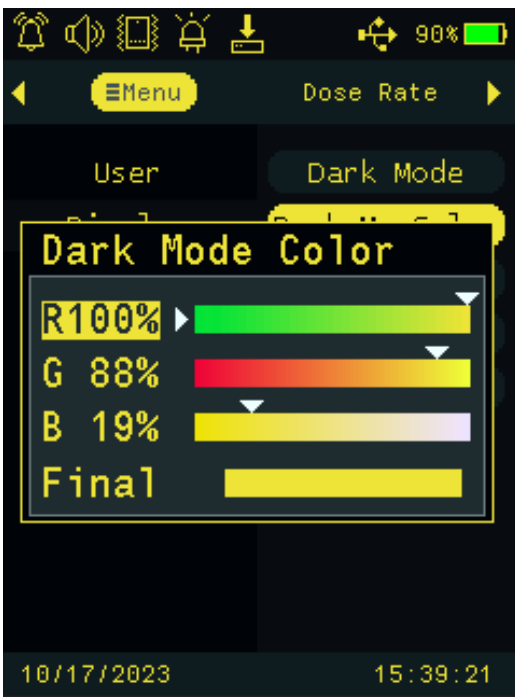
Key1: Back Key2 and Key3 Toggle between On and Off.

The system default them is in LIGHT mode. Once user select the DARK mode, all displays will switch to DARK mode. Here are the examples:





Dark Mode Color



Dark Mode Color provides a function to let user set a preferred font color and graphic color.

Press Key4 to select Dark Mode in menu to enter Dark Mode color selection mode.

There are total 65.5K colors can be set from this setting.

There are R (red) , G (green) and B (blue) original colors to be combined into a Final new color.

Navigation keys:

Key1: Back/Exit

Key2: Increase value

Key3: Decrease value

Key4: Change/Select an original color to change between R G B.

Tips:

Select and Moving the white triangle indicator to the color you desired in the color bar.

Backlight



The backlight is to set the LCD brightness.

Navigation keys:

Key1: Back/Exit

Key2: Increase value

Key3: Decrease value



Power Saving



If power saving mode enabled, then the device will deem the LCD backlight and set CPU into power saving mode after 30 seconds idle mode.

Navigation keys:

Key1: Back/Exit

Key2: Change the setting

Key3: Change the setting



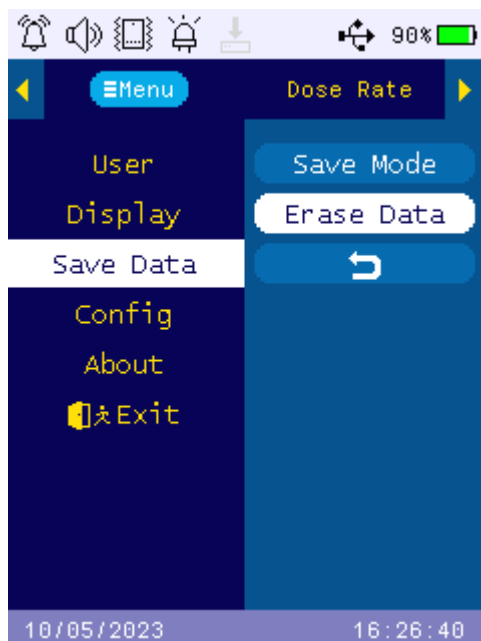
Save Data



Save Data uses to set the frequency of saving data. User can select data saving mode between every second, every minute, every hour and turn off the data saving function.



Erase Data



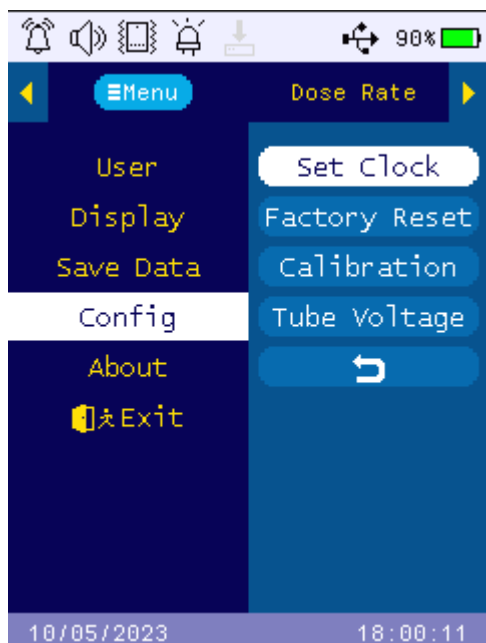
Erase Data will completely delete all history data in flash memory. The erasure is permanent, and no way to recovery back.



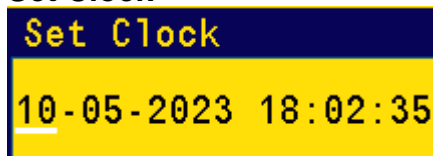
Select Yes and press Key4 to confirm.



Set Clock



Set Clock



Navigation keys:

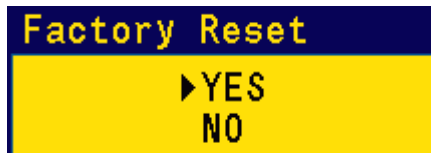
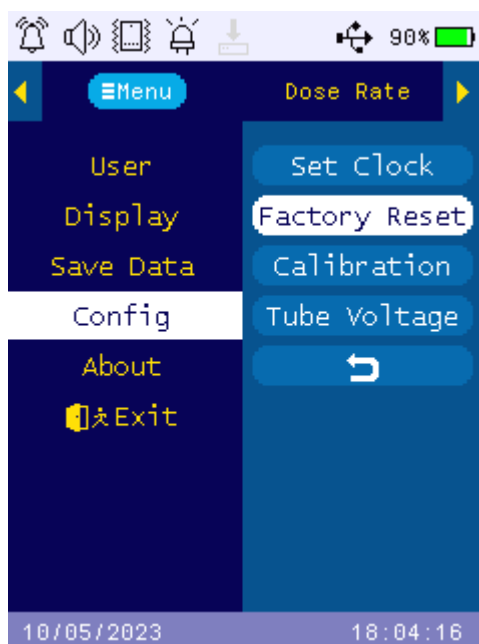
Key1: Back

Key2: Change the digit value in highlighted position.

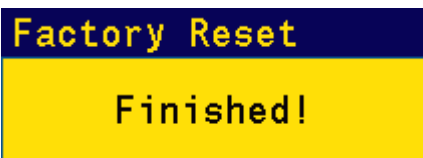
Key3: Change the digit value in highlighted position.

Key4: Confirm and move to next digit.

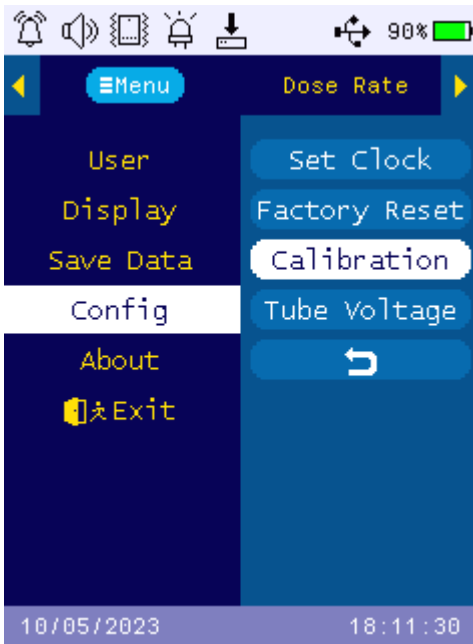
Factory Reset



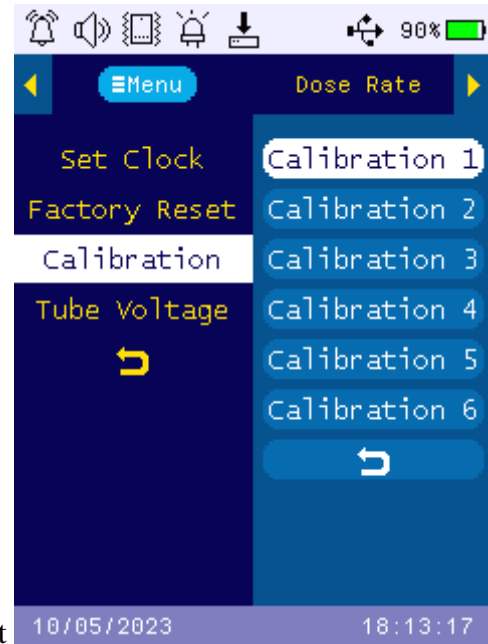
Select Key2 and Key3 to select Yes. Press Key4 to confirm.



Calibration



Press Key 4 to select



This menu mainly for qualified calibration facility. User may change the value when needed. Press Key4 to enter each calibration item.

Calibration 1	Calibration 2	Calibration 3
CPM 001538	CPM 015380	CPM 030760
µSv/h 0010.00	µSv/h 0100.00	µSv/h 0200.00
mR/h 001.000	mR/h 010.000	mR/h 020.000
Calibration 4	Calibration 5	Calibration 6
CPM 076900	CPM 153800	CPM 307600
µSv/h 0500.00	µSv/h 1000.00	µSv/h 2000.00
mR/h 050.000	mR/h 100.000	mR/h 200.000

Navigation keys:

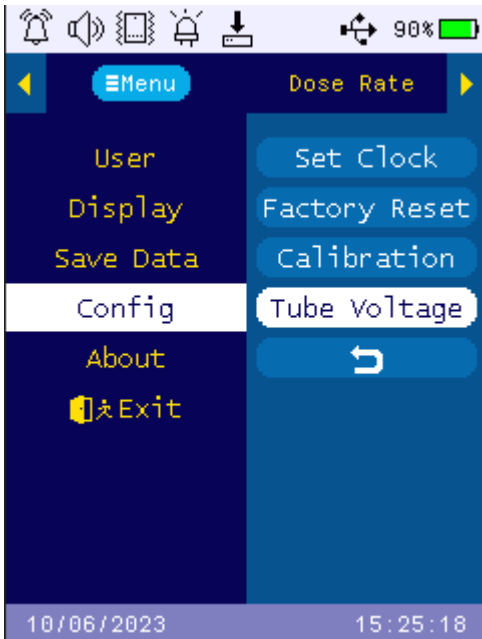
Key1: Back

Key2: Change the digit value in highlighted position.

Key3: Change the digit value in highlighted position.

Key4: Confirm and move to next digit.

Tube Voltage



Tube voltage setting is for professional calibration purpose. User may not change it unless instructed by professional.

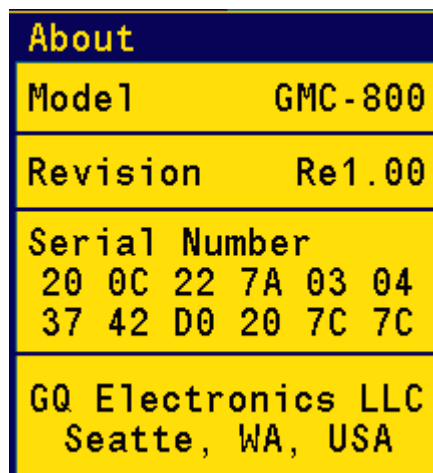


Select Key2 and Key3 to change the value.

About

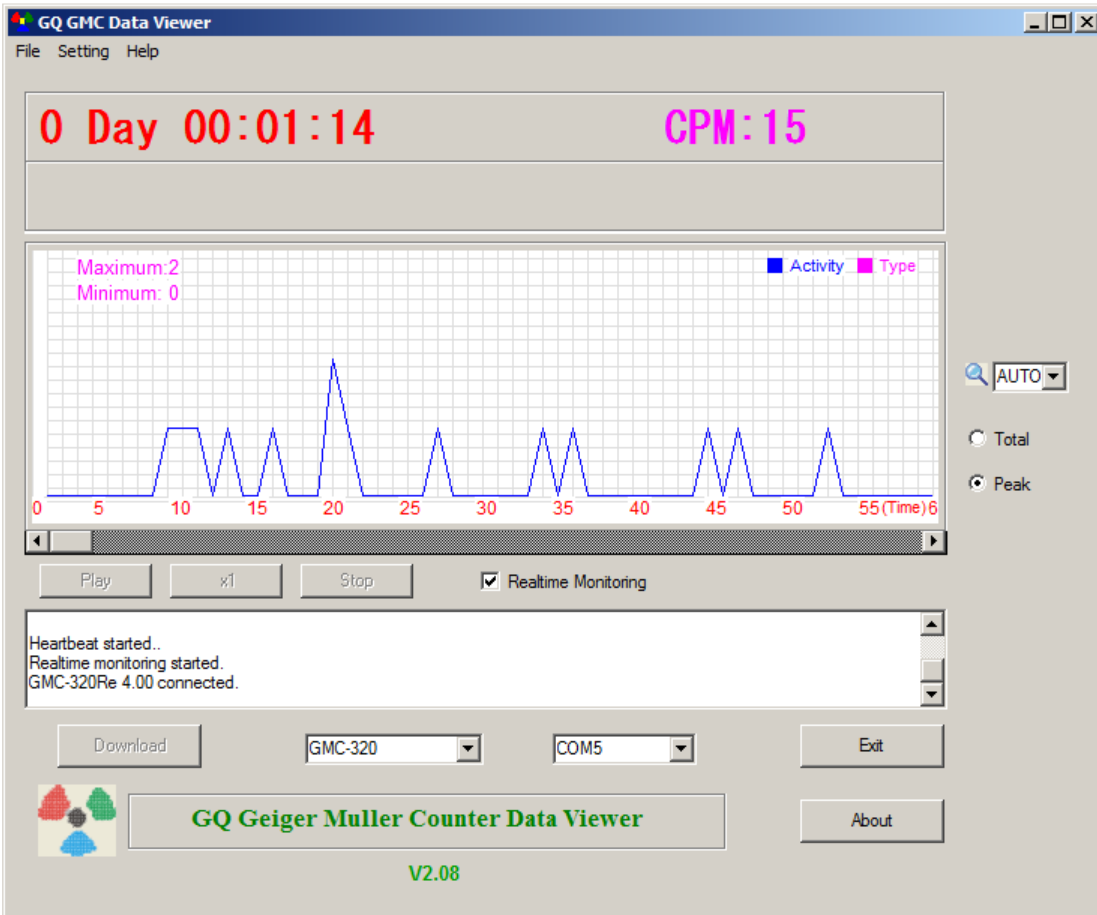


About displays device system information.



GQ GMC Data Viewer Software

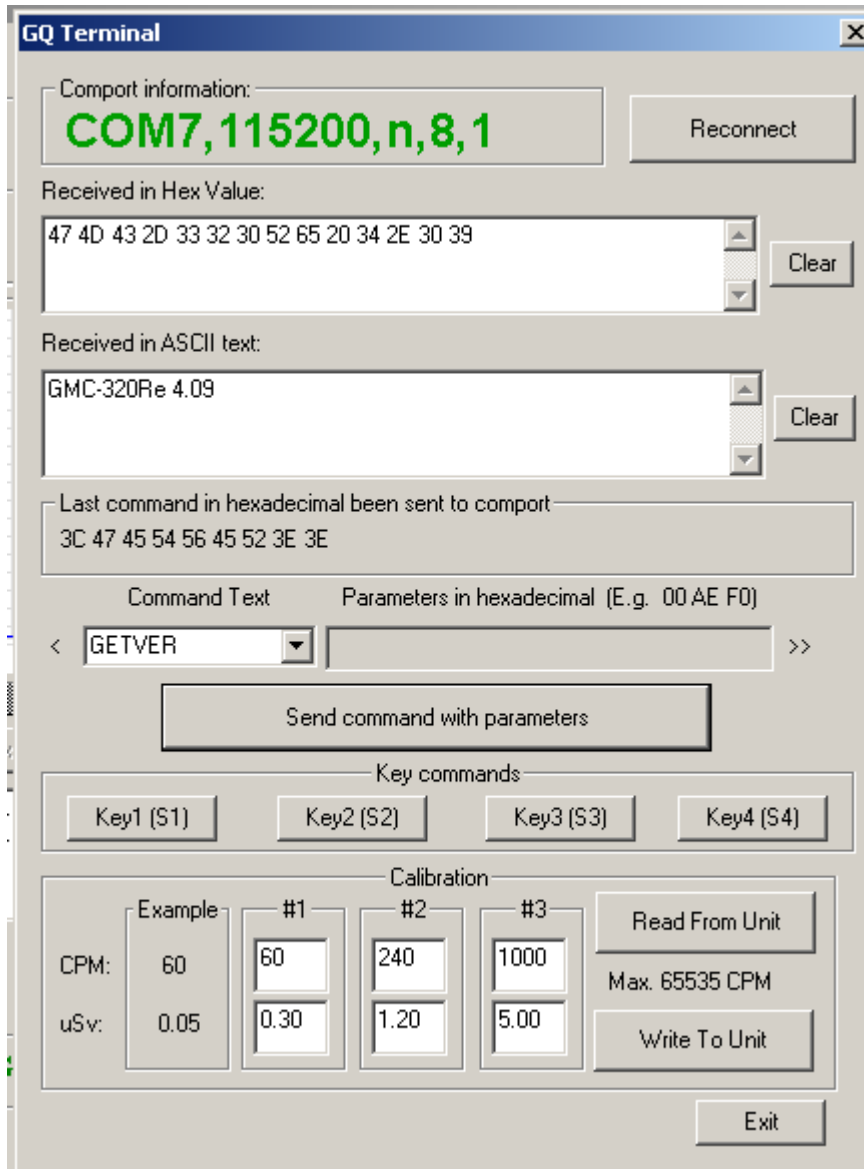
The GQ GMC Data Viewer is a free utility software. It can be downloaded from GQ website download page.



Main features:

- Download the history data from GMC-800
- Real time monitoring with graphic when it connected with GMC-800
- Save the history data in .bin OR .csv MS Excel format.
- Synchronize the data and time to GMC-800 with computer's data and time
- User defined automatic date and time synchronization period.
- GQ Terminal feature provides a detailed communication protocol exercise interface.

GQ Terminal



The GQ Terminal provides an immediate access interface to the GMC-800 communication protocol.

Followings are “click to send” commands in software, for unlisted commands user can type into the command box of software:

GETVER, GETSERIAL, GETCPM, KEY0, Key1, Key2, Key3, SPEAKER0, SPEAKER1, ALARM0, ALARM1, GETVOLT, GETGYRO, GETCFG, GETCPS, HEARTBEAT0, HEARTBEAT1, GETDATETIME, CFGUPDATE, POWEROFF, POWERON, SETDATETIME, FACTORYRESET

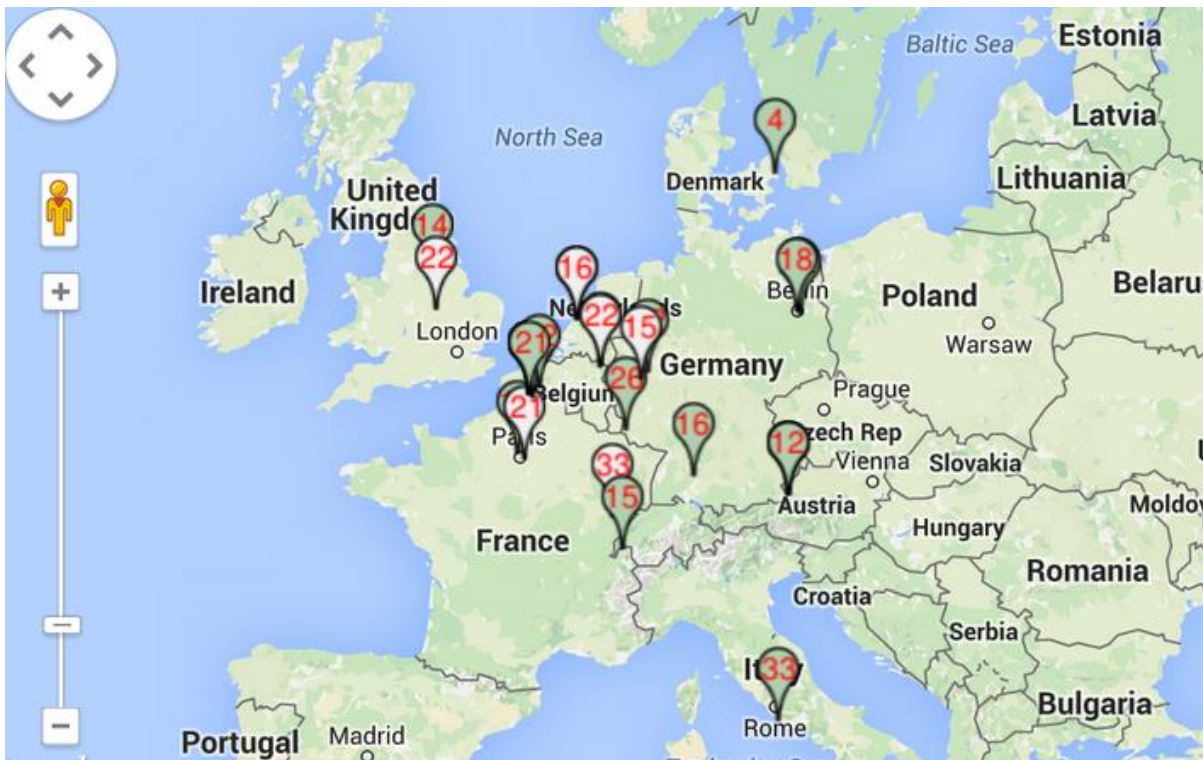
For detailed communication protocol commands, please see:

<http://www.ggelectronicsllc.com/downloads/download.asp?DownloadID=62>

An optional software is the GQ GMC Data Logger PRO. It is a generic software for different brand and model Geiger Counters. It has much more advanced features for advanced users.

See download page for the demo version.

Online Geiger Counter World Map



www.GMCmap.com

The Geiger Counter World Map is free and open protocol map. Anyone can use it for free. It provides a free space to all Geiger Counter users.

As a registered user, each user can have multiple Geiger Counters at different locations. All registered Geiger Counters have free history data storage space. User is able to retrieve their history data anytime, anywhere. Users can publish their history data to others by set the data properties.

Software

The GMCmap accepts any software automatically submitted data.

The GQ Geiger Counter Data Viewer software is a tested free software for automatic submit data feature. It can be found and downloaded from GQ Electronics LLC download page

Auto Submit Data Protocol

In order to use automatically submit data, user has to be registered on GMCmap.com, so that to get a valid user account ID and Geiger Counter ID. Each user can have multiple Geiger Counters at the different locations.

Auto submit data url format:

<http://www.GMCmap.com/log.asp?id=UserAccountID+GeigerCounterID+CPM+ACPM+uSV>

At least one reading data has to be submitted.

Here:

1. UserAccountID: user account ID. This ID is assigned once a user registration is completed.
2. GeigerCounterID: a global unique ID for each registered Geiger Counter.
3. CPM: Count Per Minute reading from this Geiger Counter .

4. ACPM: Average Count Per Minute reading from this Geiger Counter(optional).
5. uSv: uSv/h reading from this Geiger Counter(optional).

Followings are valid data submission examples:

<http://www.GMCmap.com/log2.asp?AID=0230111&GID=0034021&CPM=15&ACPM=13.2&uSV=0.075>
<http://www.GMCmap.com/log2.asp?AID=0230111&GID=0034021&CPM=15&ACPM=0&uSV=0>
<http://www.GMCmap.com/log2.asp?AID=0230111&GID=0034021&CPM=15&ACPM=0&uSV=0>
<http://www.GMCmap.com/log2.asp?AID=0230111&GID=0034021&CPM=15>
<http://www.GMCmap.com/log2.asp?AID=0230111&GID=0034021&CPM=15&ACPM=13.2>

The result will be returned immediately.

The following are the returned result examples:

1. OK.
2. Error! User is not found.
3. Error! Geiger Counter is not found.
4. Warning! The Geiger Counter location changed, please confirm the location.

If a location change warning received, the user will need to confirm the location from that Geiger Counter profile OR create another Geiger Counter from your account. In this case, you can have two locations share one Geiger Counter.

Applications

Stationary Application

The unit can be placed to almost anywhere for stationary monitoring of radiation and long-term surveillance applications. With the wall adapter, it is able to monitor the data continuously, 24/7.

Other Important Technical Details

USB Port

The USB port is the standard Type-C USB port. It is used for data communication, external power and the battery charger connection.

Data collection time

The GMC-800 radiation data is collected continuously, and every second the measured data is being transmitted to the CPU for processing.

Extend battery operating time

Turn on the Power Saving mode to extend the battery operating time. Turn off the speaker if it is not necessary. If a fully charged battery run-out in less than 3 operating hours, then the battery needs to be replaced. Use a standard 14500 (14 x 50.0 mm) 3.6V-3.7V Li battery OR 14500 (14 x 50.0 mm) 3.6V-3.7V rechargeable Li-ion battery.

The GMC-800 will operate normally when a non-rechargeable battery is installed. Select the battery type to non-rechargeable battery from the unit menu.

Third party software developers

The GMC-800 is an open application protocol product. Users are encouraged to develop their own software based on the published GQ-RFC1201 protocol. We encourage you to share your generic software with other users. Please contact support@ggelectronicllc.com if you have any questions.

You can find the GQ-RFC1201 protocol at the software download page.

<http://www.ggelectronicllc.com/comersus/store/download.asp>