

# Geophex GEM-2 quick start guide

## About GEM-2

It is an instrument which measures an apparent electrical conductivity and magnetic susceptibility of ground, detects metals and voids in ground.

The GEM-2 consists of the ski that contains all sensing elements, an electronics enclosure with full featured and survey ready control panel that plugs onto the ski, a detachable android phone for GEM configuration and optional display, a GPS unit, and a shoulder strap.



## GEM-2 features

- field battery pack replacement
- go/no-go performance indicators
- external GPS connector
- dead-reckoning survey option
- external USB memory stick storage
- frequency range 30Hz-93kHz
- android control and data display

## Unpacking GEM system



Once the ski is pulled out of the transport container tube, insert recharged battery with terminals on indicated side into console and close the battery cover. Before starting the system, insert memory stick into console's USB port. At this point the system is ready for survey using default C4 frequency set (1530Hz, 5310Hz, 18330Hz, 63030Hz).

## Basic GEM console operation



Figure 1: GEM Console

**To power on**, press and hold the Power button for two seconds - until the red Power light illuminates. The yellow survey light will tick every second – this is the PPS-system heartbeat. If a GPS signal with PPS is detected, this heartbeat tick will move to the green GPS light.

**To power off**, press and hold the Power button for 3 sec or until the Power light deactivates. To force an unresponsive system to power off, hold the Power button for 15s.

**To start/stop the EMI emitter** while not in Survey mode(file open in memory stick), press the EM button. Note that if the system is in Survey mode, the EM button will have a different function. To start **Survey mode** (opening a storage file in USB memory stick), press the Survey button, the Survey light will illuminate. To start logging data, press the Log button. The Log light will illuminate and the system will increment and start a Survey line. **To end survey**, first turn Log off, then Survey off. Any time during logging, pressing Mark will increment mark number in logged file, if not logging, will resume logging without line increment. Log-pause-resume is used in dead-reckoning survey.

**A solid light** indicates operation, a **blinking light** means there is an Error. To exit survey mode data logging must be paused by pressing the Log button, causing the Log light to deactivate.

## Basic GEM phone operation

Power on the GEM before starting the GEMex app. The available app home screen commands:

- **“Power Off/Exit”** – to shutdown the GEM Console and exit the GEMex app.
- **“More Settings”** – enter this menu to activate Alt (C5), Factory (C4) or Cal (C7) settings. Once activated, the chosen settings will become the boot configuration which will be used the next time the GEM Console powers on.
- **“Active Settings”** – to view active frequencies and modify the sampling rate.
- **“Survey”** – to get to the survey control panel.



Figure 2: Home Screen

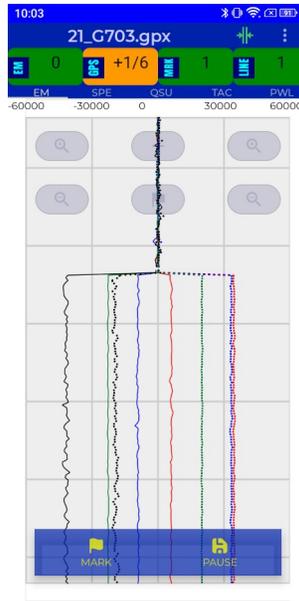


Figure 3: Survey Control Panel



Figure 4: Frequency Spectrum

The Survey control panel shown in Figure 3 provides commands to start/stop EM and manage logging. The Status bar near the top indicates the performance of (from left to right) EM, GPS, and Logging. A green color indicates running/OK, red indicates ERROR, yellow indicates waiting/warnings. Mark and Line count is recorded in the file for use in a dead-reckoning survey.

The top bar provides has a button (🔊) to graphically null the incoming data, the effect of which can be seen in Figure 3. The Menu button (☰) contains the option to End Survey which will finish the survey (close the file, and leave Survey Mode). Note that EM cannot be turned off while in Survey Mode. Swiping the graph left/right will change the data display format. The data display modes are: EM, SPE, QSU, TAC, PWL (EM ip/qd, Frequency Spectrum,  $|Q\text{-sum}|$  signal, Total Apparent Conductivity/Susceptibility, Environmental/Power-line signal strength, respectively)

### Steps to perform a Survey utilizing the GPS

Insert a recharged battery, plug in the GPS and a USB memory stick. Power on the GEM Console, start EM and run for 5min to warm up the system. Wait until the GPS light is solid with a heartbeat. Press the Survey button to enter Survey Mode. Press the Log button to start logging to the file. Start walking your survey lines with the attached strap on your shoulder so the unit is held approximately 1 meter above the ground. A good GPS signal is indicated by the green GPS light being illuminated with a heartbeat on the GEM console and/or a Green status

button with +2/9 (PPS, Fix, Satellites) on the phone app. When the Survey is completed, press the Survey button to exit Survey Mode.

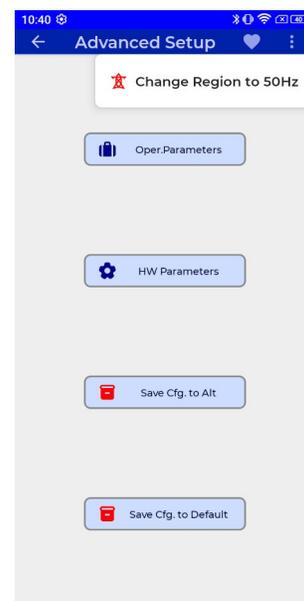
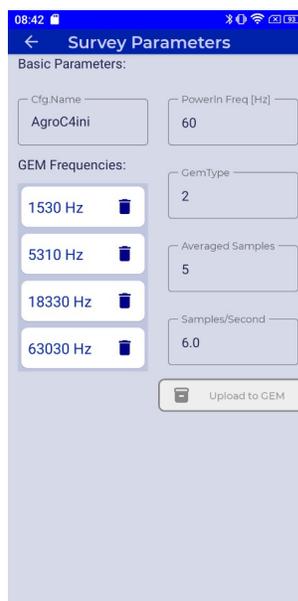
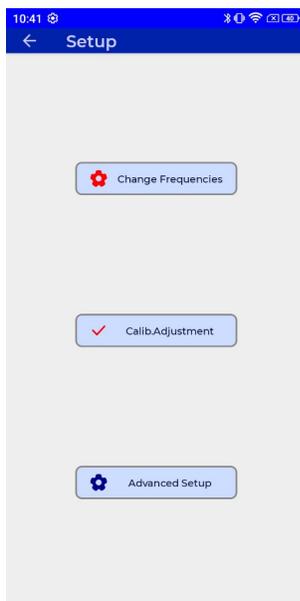
### Steps to perform a Dead-reckoning Survey

Insert a recharged battery and plug in a USB memory stick. Power on the GEM Console, start EM and run for 5min to warm up GEM. Press the Survey button to enter Survey Mode and start writing to the file. Get on the first Survey line and press the Log button to start logging. Walk steadily to the end of the line. As center of ski is crossing the end of the line, press the Log button to pause. Get on the next line and press the Log button to start a new incremented line, logging and walking toward the end of that line. Once all lines are finished, press Survey to exit Survey Mode. Pressing EM while in Survey Mode will either increment the marker number in the logged database (when on-line) or resumes logging without line increment (when off-line/paused).

---

### Customization - Changing Frequencies

From the home screen in Figure 2, select “**More Settings**” for predefined custom and factory recommended configurations or use the menu (☰) to “**Customize...**” the active configuration. Select “**Change Frequencies**” and follow the dialog instructions. After uploading new changes, Run the “**Calib. Adjustment**” to finalize the change. This procedure will require leaving the ski in stable horizontal or vertical position away from any conductors (the best if receiver end is at least 1m above the ground), preferably in a location away from industrial noise. Once finished, select “**Save Cfg. to Alt**” – for easy recall or “**Save Cfg. to Default**” – done automatically, from “**Advanced settings**”. Note that Default Cfg. is loaded on system power on.



### Cable or Bluetooth connection to GEM

After you power on the console, connection can be established via Bluetooth or via the wired computer port – whichever comes first. If the first command comes from wired PC, the Bluetooth may be powered off and unavailable for connection. If console EM command is issued before a Bluetooth connection is established, the Bluetooth is powered off and therefore unavailable for connection. If you need to switch connections, the unit must be re-powered first.

### Direct serial link text operations

It is possible to operate GEM via ASCII text commands directly from your PC terminal program by sending text-commands: “GEMS”, “GEMB”, “GEME”, or “GEMC” (get status, begin EM, end EM, begin EM with el. conductivities, respectively)

---

### After the Survey

Once the survey is closed (survey light off), USB stick can be unplugged from console and taken to a PC for exporting. Geophex provides a Windows application GEM2Export for this purpose, located on USB stick or downloadable from the Geophex Downloads website:

<http://geophex.com/Downloads/GemExporter.zip>

Select appropriate options based on Survey type. If non-GPS survey type is selected, dead-reckoning options become available. If inversion layering or el. conductivities, and mag. susceptibilities are desired, more options will become available. “Open File” let you select database to export.

