

GEM Version 7.0 – The “Efficiency” Release

With the resurgence in mineral exploration coupled with continuing demands on time, geologists and geophysicists are seeking tools that will enable them to achieve greater efficiencies in both the field and office.

The new version 7.0 release of GEM’s magnetometers and gradiometers is designed to enhance efficiency in key areas, such as field work; data input and output, and preparation of data for advanced post-processing as required to deliver exploration products, such as models and maps.

Specific v7.0 capabilities include:

- Standard Line Format for Data Import
- Picket Marking / Annotation
- GPS Elevation for Enhanced Magnetic Data Modeling
- <1.5m Internal GPS Capability
- Enhanced Positioning Resolution for GPS Surveys
- USB-RS232 Adapter for Easy Data Transfer from Non RS232 PCs
- Programmable Export Format

Additional Enhancements

- Improved Signal Processing for Magnetic Field Readings
- Multi-Sensor Capability
- Ergonomic Backpack Option (Effective for “extreme” geophysics in difficult terrains and made for everyday performance as well)
- All Terrain Vehicle Mode Option
- Support of Multiple GPS Engines

Upgrade Pathway and Free Diagnostic Check-Up

GEM v5.0 and v6.0 magnetometers and gradiometers owners can take advantage of key v7.0 features through an upgrade process. The upgrade includes a *free diagnostic check-up and evaluation of all major components*. An upgrade is a great way to acquire new features AND ensure that you continue to operate your system at its operational peak! Book your upgrade now as appointments will be filling up quickly!

Standard Line Format for Data Import

With the current generations of GEM systems, the field operator or geophysicist may be required to spend time editing the data to input line numbers.

One of the industry standard formats for geophysical data (Encom-, Geosoft-, and Intrepid-compatible) is the line-oriented format. Here, individual lines of data are marked by a simple line number (for example, Line 34) and blocks of data follow until the next line number is encountered, and the process repeats.

GEM has now implemented Standard Line Format for Data Import in its v7.0 series instruments to eliminate non-productive data manipulation tasks.

Picket Marking / Annotation

One of the main roles of magnetic surveys is to provide positioning information that can be used to georeference magnetic maps with maps obtained from different sources, such as electromagnetic or other ground surveys.

GEM now provides a special Picket Marking function that enables the operator to mark a

picket position in the field for future reference. This versatile capability also enables the user to mark the location of hazards, cultural objects (such as fences), or rivers, streams, etc. Another useful application is text marking of topographic highs and lows for target modeling purposes.

Lane Guidance

Lane guidance is a feature that enables users of GPS-configured systems to proceed in a survey with on-screen notification when the operator has exceeded the survey tolerance (i.e. deviation from line). Version 7.0 provides a larger arrow for guidance purposes which enables the operator to more tightly control survey "wander".

Programmable Output

Often an instrument manufacturer's format is fixed – creating challenges in post-processing data as records may require manipulation to convert them to a format suitable for today's standard software packages.

GEM's v7.0 solution is to implement Programmable Output. Customers have a choice of a default output format or selecting up to 10 data fields. Each field can, in turn, be allocated to a set of 10 pre-defined variables, including X, Y, Elev, Time / GPS Time Total Field1, Corrected Total Field, Grad, SQ (Signal Quality), Number of Satellites, Marker1 and Marker2.

Note: Marker fields relate to the v7.0 Picket Marking / Annotation capability.

USB-RS232 Adapter for Data Transfer

Today's personal computers are frequently equipped with Universal Serial Bus ports. USB is a standard port for connecting external devices (such as magnetometers, etc.) to Windows and Macintosh computers.

To enable customers to take advantage of the USB ports now provided on many PCs, including laptops, GEM has implemented a standard USB cable for use with its systems. This cable can be purchased as an accessory for a nominal charge.

GPS Elevation for Enhanced Magnetic Data Modeling

As technologies advance, many end users of magnetic data are seeking to employ modeling routines for enhanced interpretation, integration of results, and risk reduction.

GEM has recognized this need through discussion with key customers and has integrated GPS elevation data as a standard input / output item in Version 7.0. This provides key data required by modeling routines and helps to ensure that magnetic modeling results reflect "true" geology and are not distorted through lack of elevation data.

Enhanced resolution for GPS surveys

GPS-based surveying is only as precise as the resolution to which the system can resolve distances. Previously, GEM's Universal Transverse Mercator (UTM) resolution was 1m; now it has been enhanced to 0.01m. This eliminates a previous scenario in which it was possible to have two or more readings occur at the "same" location.

Customers can now resolve positioning data to their full two decimal precision (ex. 1.20 and 1.25). This very high resolution eliminates one source of error (i.e. GPS positioning) and ensures that data locations can be fully resolved for subsequent follow-up (i.e. drilling, excavation, etc.) as required.

<1.5m Internal GPS Capability

GEM is the only major manufacturer to focus on integrating GPS electronics inside its magnetometers and gradiometers – a significant advantage for users in terms of cost, “clean” readings (i.e. minimal noise in contrast to some externally mounted GPS systems), and complexity.

With Version 7.0, GEM supports an internal board with specifications to <1.5m resolution via WAAS and EGNOS. And for customers who are operating outside of these systems, GEM also designed an external GPS for use with OmniStar or Thales services.

OTHER ENHANCEMENTS

GEM’s Research and Development team is continuously developing new capabilities that will enhance data quality and survey effectiveness. Some of these include:

- **Improved Signal Processing for Magnetic Field Readings**

This capability is based on a) de-spiking (for example, when a user brushes against a tree branch, the magnetometer will automatically handle this type of artificial noise), and on b) optimized measurement period. Here, GEM engineers have extended the measurement period to maximize signal without adding noise.

- **Multi-Sensor Capability**

Both the Overhauser and K-Mag (optically pumped Potassium) series of magnetometers are capable of handling up to four channels of magnetometer readings. This is effective for productivity (i.e. configuration of horizontal sensor installations) as well as for gradient-

type readings between sensors arrayed in customer-defined configurations.

- **Ergonomic Backpack**

For geophysical operators facing the daily challenge of performing high efficiency surveys in sometimes formidable field conditions, it is essential that systems are designed around ergonomic principles. Now, a new ergonomic backpack from a major supplier of outdoor equipment has been added to GEM’s line of accessories. The main benefit is that operators can function more efficiently and acquire more data in a typical day than with heavier alternatives from other suppliers. This capability is especially valuable in extreme temperature conditions; in terrain that is difficult to traverse; or high productivity surveys.

- **Support of Multiple GPS Systems**

GEM remains a leader in implementation of GPS systems for its high performance line of Overhauser, K-Mag (Potassium) and Proton Precession magnetometers. This position has been enhanced through additional support of more GPS systems from major suppliers. For more information, contact GEM or one of its agents / representatives.

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MODIFICATIONS TO GEM GSM-19 SERIES (Version 7)

Version 7 changes provide additional data values (including "line" information for compatibility with Geosoft, Encom and other similar earth science software packages) and output flexibility.

Data Values

New data values available for the first time include line numbers (preceding data blocks), elevation, satellites (number of), picket-x and picket-y. Following is a definition of each new value:

- Line numbers – standard numbers (ex. line 100) that can be added to the front of data records. This enables both easier direct import into software packages and easier manual manipulation of files as it is easier to detect where different blocks of data start and end.
- Elevation – elevation (height above sea level) values derived from GPS.
- Satellites – number of satellites visible (for GPS or DGPS corrections) for each reading. This value can give a measure of survey positioning quality.
- Picket-x – an "X" positioning value that is assigned to a specific reading location. This value can be used for geo-referencing maps to specific pickets or in re-establishing positions on the ground for drilling or other follow up.
- Picket-y – a "Y" positioning value that is assigned to a specific reading location. This value can be used for geo-referencing maps to specific pickets or in re-establishing positions on the ground for drilling or other follow up.

Programmable Output

Now when you use the Send function (1-Send in the Main menu) to transfer data from the magnetometer console to a computer, you see two options – Default and Custom.

Default values change according to the survey mode (ex. Base, Mobile, Grade, Walkmag, Walkgrad). For example, if you are working with a Walkgrad with GPS, selecting Default sends values in the following order:

- X (UTM, Lat/Long, X, Line)
- Y (UTM, Lat/Long, Y, Station)
- Elevation (m)
- Mag in nT
- Grad in nT/m
- Signal Quality (sq)
- Corrected Mag (cor-nT)
- Satellite (sat)
- Time (time)

- Picket-x (picket-x)
- Picket-y (picket-y)

Selecting Custom provides you with the option of changing the Default order to any ordering of values you would like as well of duplication of values, if required for any reason.

6.2 DATA TRANSFER

Data transfer is enabled via RS-232 downloading from the magnetometer to computer. This section describes how to access this functionality and set download parameters such as baud rates.

6.2.1 Setting the RS-232 format

Before transferring data, you have to set the **RS-232** format. Once set, the RS-232 format is saved in the memory.

From the **Main Menu**, press **C-info**

SCREEN 65

F-time	B-RS232	D-dir	
C-review			
A-remote	0-datum		E-
channel			
2-buzzer			
3-info			

Press **B-RS-232** to access the RS-232 setting for the SEND (data dump) function

SCREEN 66

RS-232	115200 bps	
[send]		
8 data bits		
1 stop bit		
no parity		
		F-ok
C-change		

Press **F-ok** if selection is correct

Press **C-change** if you need to change the transfer rate

SCREEN 67

50	110	300	600	1200	24000	48000
9600	14400	19200	28800	38400		
57600		152000				
A-select		←	BF	→		

Scroll backward with **B** or forward with **F** and highlight the desired transmission rate (keep pressed for a continuous scroll).

Press **A-select** to save your option. The unit returns to screen 66.

Pressing **F-ok** leads you to the selection of RS-232 parameters for Real-time Transmission (RTT). When RTT is enabled, the unit outputs the readings (tagged with their time stamp) to the RS-232 6 pin connector in real time as they are taken.

SCREEN 68

real time	RS-232	transmission
	yes	
F-ok	C-change	

C-change toggles between yes and no.

If you do not intend to use the RTT function, select **no** and press **F-ok** to return to the **Info Menu**. Then press **1C** to return to **main menu**.

Otherwise select **yes** and press **F-ok**. The **RTT** setting screen is displayed.

SCREEN 69

19200	28800	38400	57600	115200
A-select				← BF →

Press **A-select** to save your option. If finished press **F-ok** to return to the **Info Menu**, and then press **1C** to return to **main menu**.

IMPORTANT NOTES:

The data bits, stop bits and parity are not programmable for either SEND or RTT but the default values are displayed for your reference.

You MUST set the receiving device to these parameters
8 data bits
1 stop bit
no parity

The slowest transmission rate for RTT is 19200 bps

If RTT is not enabled, the external triggering of the unit by the RS-232 line may not work properly or at all since the transmission rate is not initialized (see end of section 4.3)

6.2.2 Transferring the Data

For proper data transfer, you **MUST** match the RS-232 settings of the magnetometer and those of the receiving device (PC, data logger, etc). Remember that you can program the transmission rate for SEND and RTT on the unit. However, the data bits, stop bits and parity are not programmable for either SEND or RTT, but the default values are displayed on the setting screens for your reference.

NOTES

You MUST set the receiving device to these parameters
8 data bits
1 stop bit
no parity

You will need an RS-232 cable (6-pin to 9-pinD cable). Please contact GEM Systems to order one.

To start the transfer:

1. Connect the 9-pinD connector to an available serial port on the receiving device, and the 6pin connector to the unit.
1. Then, from the **Main Menu** press **1-Send** to dump or transfer the data. The system displays Screen 70.

SCREEN 70

	2
file	
F-ok	C-change-number

- If there is only a single file in the memory, the system automatically shows screen 71.
- If there is more than one file in the memory, you are prompted to select the file you want to transfer. If the file number shown in the screen (ex. 2 above) is not the file you want to transfer, select C-change-number. The system displays a file entry screen. Enter the file number and then select E-Enter. The system then returns to Screen 70 where you now select F-ok. The system displays Screen 71.

SCREEN 71

Select SEND format

D-Default
F-Custom

Screen 71 is new functionality developed for Version 7. This screen allows you to either select a default file format or your own format. See Appendix H for a description of data values for each format.

When you select D-Default, the system automatically starts sending data. When you select F-Custom, the system displays Screen 72.

SCREEN 72

SEND format is:

X Y elevation nT nT/m sq cor-nT sat
time
picket-x picket-y *

A-send C-Change

1. To alter the order of data values, position the cursor on the field that you want to change and press C. The system scrolls through a series of values.
2. Choose the one that you want and either move to the next field or select A-send to start transmitting the data.