



BHG

BORE HOLE GRADIOMETER
User Manual



To ensure the best performance from your magnetic locator, please read this user manual before operating your unit.

ENGLISH

ITEM CHECK LIST

This is a list of all the parts included with your purchase of the Bore Hole Gradiometer, the magnetic sensor used for the locating process is sold separately, as well as the cables, which are available in custom lengths.



Carrying Case

The electronics are built inside of a Water proof, shock proof, hard case.
Dimensions 16.9" x 10" x 6.5"



Titanium BHG Sensor

1.625" x 17.5" bull-nosed magnetic sensor,
Seacon connector, 100% waterproof.



Red & Black Power Leads

To run the unit from an external battery source.



USB to RS232 Converter

To convert the RS232 plug and connect the unit to a computer's USB port.



RS232 Cable

To transfer data from the unit to a computer with an RS232 connection.



Power Cord

Used to recharge the internal battery with AC power.



User's Manual

Includes technical information, warranty and parts list. General operation instructions.



Internal Battery

Rechargeable sealed non-spillable battery.
Installed inside of the carrying case.
Dura12-8F2 12V 8Ah AGM

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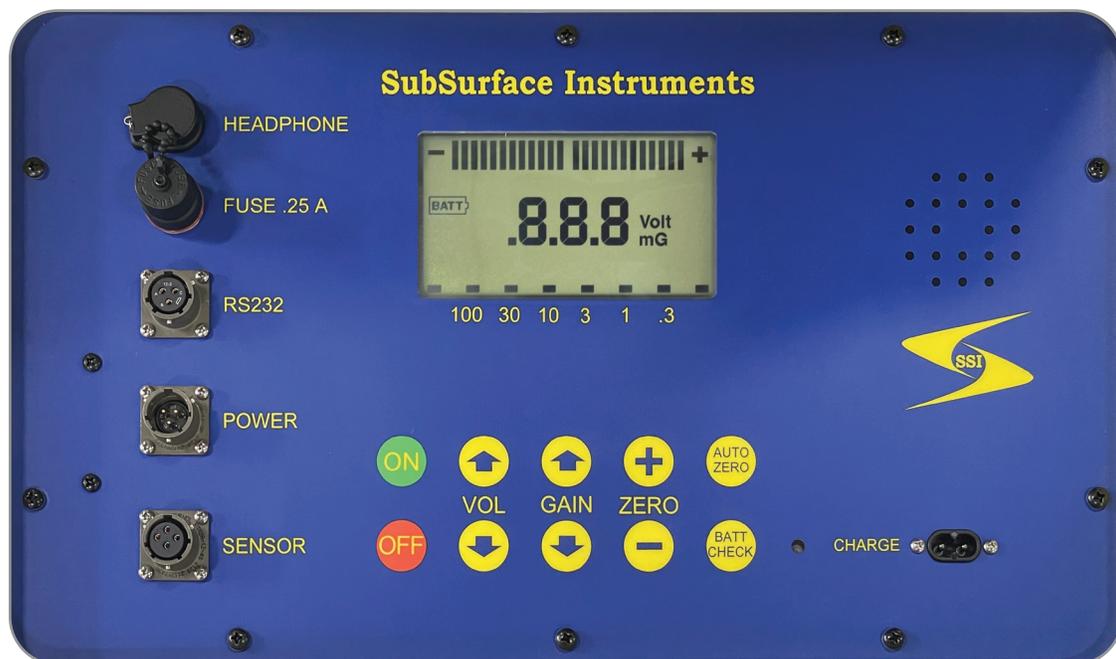
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FUNCTION

The Bore Hole Gradiometer (BHG) responds when the magnetic field strength measured at the two sensor elements in-side the Sensor housing are different. This difference is measured in “Differential Milligauss” and is reported to the user via the LCD display and the audio speaker.

A headset may be used in noisy environments and will disable the internal speaker when connected. The RS-232 interface allows control and recording using a personal computer with a serial COM port. To use this connection is required to have a HyperTerminal Emulator installed in the computer, you can download a free version from the Internet, as well as some paid versions of the program.

The LCD Bar graph at the top of the screen, shows bars to the left or the right side of the display depending on signal polarity. Left is Negative and right is Positive. As the signal increases in strength, the audio pitch increases in frequency.



FRONT PANEL CONNECTORS

HEADPHONE

The headphone jack has a water resistant cover. Lift open to plug in a stereo phone plug to listen with a headset in noisy environments, the internal speaker will be disabled automatically when the headphone jack is connected.

FUSE .25A

Replace a blown fuse with a 1/4 amp fast blow.

RS232

Use the included RS-232 cable to connect the BHG to a computer. With computers that do not have a RS-232 Serial port, the connection is made through the USB port using the USB converter included with the unit. A HyperTerminal Emulator is required to establish a connection between the two.

POWER

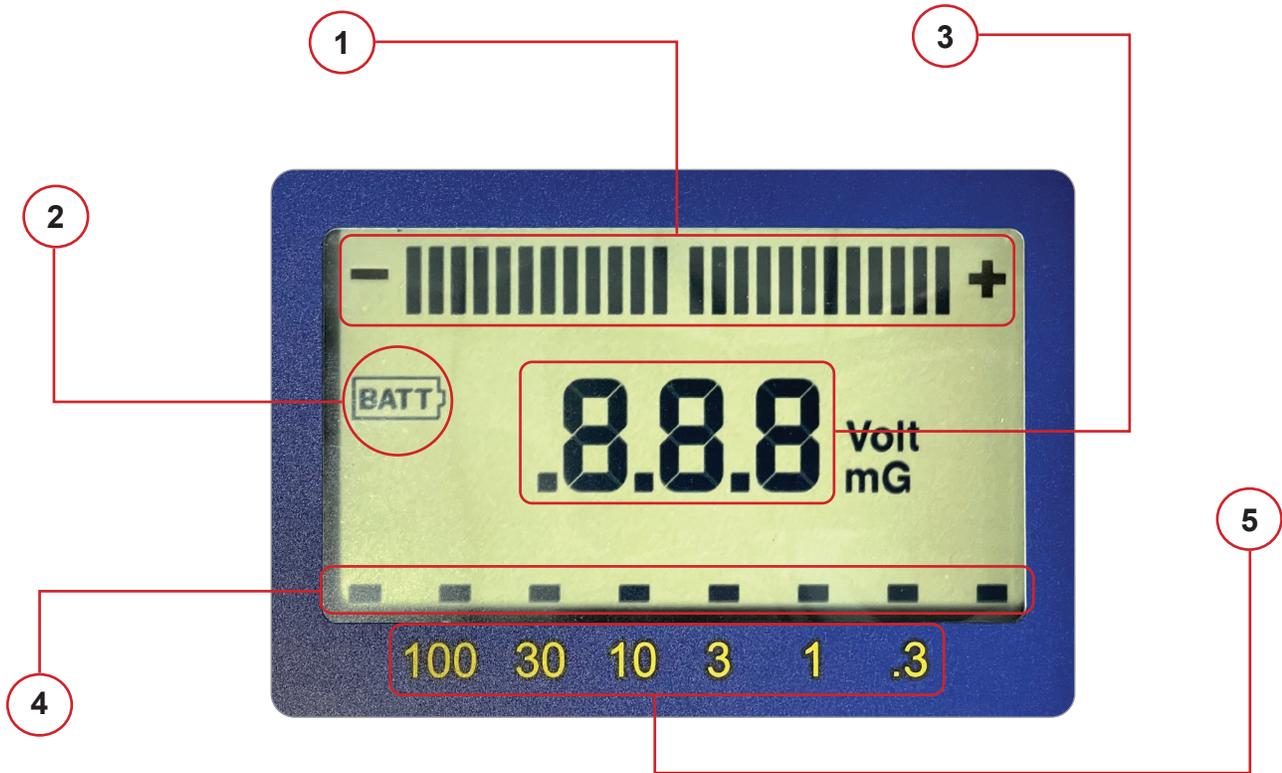
To run on external power or to charge the battery in the field, connect the external DC power cable to the POWER connector. Connect the other end clips to a 12 to 15 Volt DC power source. Red to positive and Black to negative.

SENSOR

The sensor cable is connected to the SENSOR connector. A cable is purchase separately from the electronics and can be acquired on custom lengths.

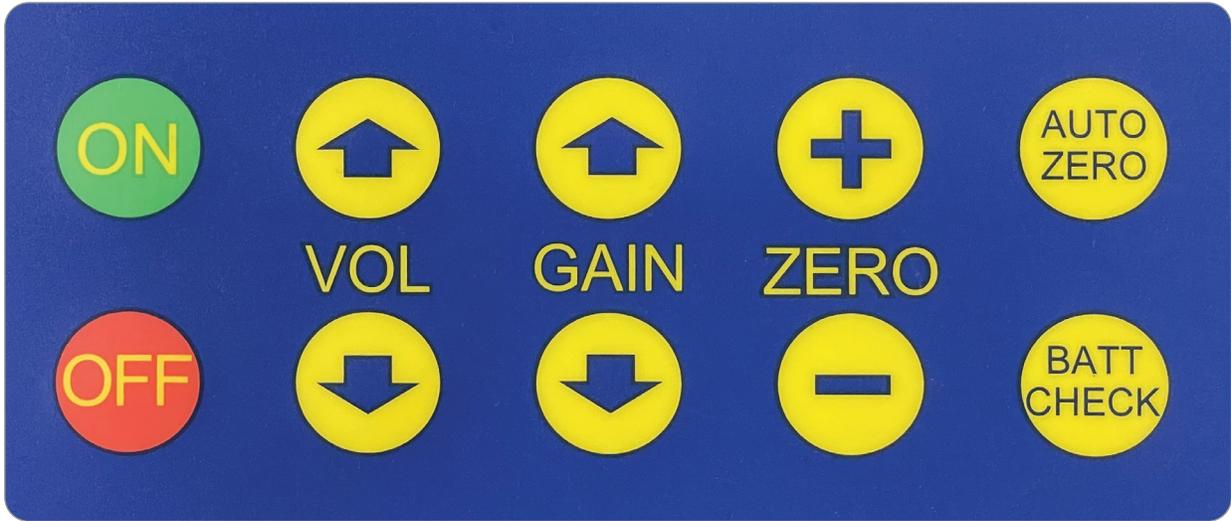


DISPLAY DESCRIPTION



	NAME	DESCRIPTION
1	Bar Graph	Shows signal strength and polarity
2	BATT Icon	Flashes when battery needs charging
3	Numeric output	Indicates signal value in Milligauss dependent upon range setting, or battery voltage when BATT CHECK button is pressed.
4	Bar Graph	Indicates current Range selected by the GAIN buttons.
5	Numbers across bottom	100, 30, 10, 3, 1, .3 are ranges in Milligauss.

KEYPAD CONTROL PANEL



ICON	NAME	DESCRIPTION
	ON	Power ON
	OFF	Power OFF
	VOL	Raise or lower the volume
	GAIN	Increase or decrease gain from .3mG to 100mG
	ZERO	Manual adjustment of ZERO offset
	AUTO ZERO	Automatic adjustment to "NULL" output
	BATT CHECK	Press to check battery voltage

OPERATION

Connect the sensor to the electronics, using the sensor cable before turning the system on. Press the green ON button to turn ON the BHG . To turn OFF press the red OFF button. The RS-232 interface cannot be used to turn the BHG ON or OFF.



To check battery condition press the BATT CHECK button and the battery voltage will display on the LCD.

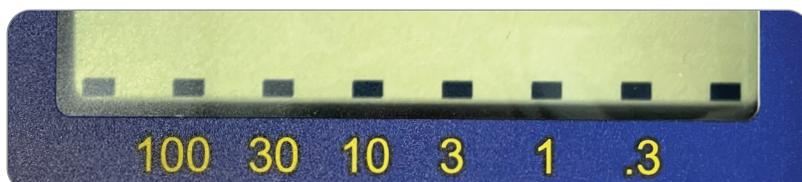
Although the sensor cable can be used to lower the sensor into the bore hole, it is not recommended to put tension to the sensor cable, rather secure the sensor to the cable by attaching wrapped around wire rope to a section of the cable and clip it to the two teather holes screwed into the titanium sensor cap.



As the sensor is lowered passed a magnetic target the audio output will increase in pitch relative to the strength of the target. The bar graph at the top of the display will also darken the bars to the left for a negative polarity and to the right for a positive polarity.

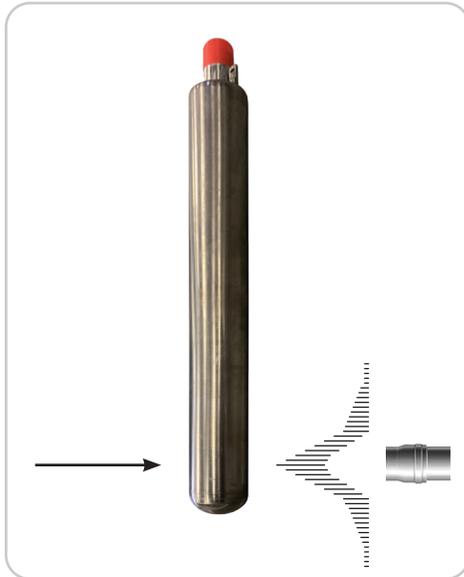


Adjust the GAIN up or down as needed to maintain proper sensitivity.

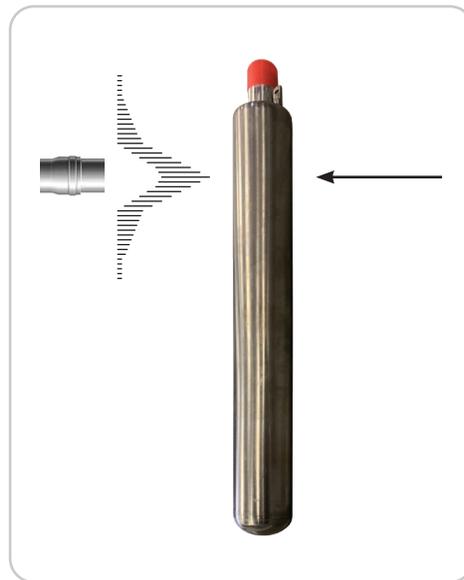


OPERATION (continuation)

When attaching the sensor to a wire rope, keep the sensor away from ferrous metals, is recommended to use Austenitic Stainless Steels.



While you lower the sensor, it will produce two peaks as the sensor passes close to a target



Although the electronics box is water-proof, it is recommended that it be kept out of the elements as much as possible. Water damage to the internal parts is not covered under warranty.

FEATURES

Magnetic Underground Locator

Standard unit with internal battery housed in a high impact ABS case.

Included accessories:

- Manual
- 120 Volt AC charging cord
- Rechargeable sealed lead acid battery (internal)
- 12 Volt auxiliary power cable
- RS-232 Cable
- RS-232 to USB Converter

Accessories store in compartment in lid

Electronic control unit

Titanium encased waterproof, bull-nosed tapered Sensor

Waterproof optional cables available: 30', 50', 100' Other lengths by special order

Specifically designed to find the presence of any ferrous metal in the ground at a radius of $\pm 8'$

Low Battery indicator on LCD display.

MAINTENANCE

Keep the unit as clean as possible, especially the Electronics key-pad panel. Do not use an abrasive cleaner on the keypad overlay or the LCD lens. Be sure to wire your cables correctly if you are not using factory supplied cabling. See Connector Wiring (page 13) in the manual for pin outs.

The Titanium encased sensor has no user serviceable parts. In the event of a failure, the sensor should be returned to the factory at the address listed at the end of this manual.

The battery and charging circuit are located inside the electronics unit and should not need servicing for quite some time. In the event that the battery weakens or fails, return the unit to the factory for replacement.

Battery Charging

Connect the AC Power cord to the CHARGE connector located on the lower right of the electronics panel. The Red LED will illuminate during charging and will extinguish when the battery is fully charged. While plugged in it will provide a trickle charge but the LED will be off.



Repair Service

Should you need to return the system to the factory for service, send it to the address listed below or on the last page of this manual. Pack the unit properly to protect it during shipping. No authorization is necessary. Please include all your company information for returning the unit and a brief explanation of the problem.

SubSurface Instruments, Inc.
Repair Department
1230 Flighway Dr
De Pere, WI 54115

SPECIFICATIONS

CONTROLS

Buttons	ON, OFF Volume UP and DOWN Range setting (Gain or Sensitivity) UP and DOWN Zero, Plus and Minus Auto Zero - Automatic self-adjusting Battery Check
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OUTPUTS

Audio frequency pitch	(Speaker & jack for headset)
Visual LCD	Displays bar graph - Range GAIN setting - Milligauss
RS-232 PC connection	Control all keypad functions Data log range, keypad & signal settings. Works with hyper terminal or equivalent (cable included)

POWER OPTIONS

Internal battery	12 volt, 7.2Ah sealed lead acid
Battery life	72 Hours continuous use Charges to full overnight
External power	12 to 15 volt, cable included Internal battery charging circuit is enabled when external power or AC charging cable is connected.

OPERATION

Operating temperature range -20F to 150F (-29C to 66C)

DIMENSIONS

Electronics case	16.9" X 10" X 6.5" (42.92cm x 25.4cm x 16.51cm)
Titanium sensor	1.625" x 17.5" (4.13cm x 44.45cm)

RS-232 INTERFACE

COM Port Settings

Baud rate	9600
Bits	8
Parity	NO
Stop bit	1
Flow Control	NONE

Program

Download a HyperTerminal for your operating system from the Internet. Turn off echo. The unit will echo any character it receives to verify communication.

Commands

v	Lowers volume
V	Raises volume
g	Increases range (lower gain)
G	Decreases range (raise gain)
b, B	Check battery voltage
r	Turns OFF status report
R	Turns ON status report
?	Causes a status report to be sent
l	Specifies short status report
L	Specifies long status report
d	Turns off debug mode
D	Turns on debug mode
z	Zero + 1 step per command
Z	Zero - 1 step per command
a, A	Initiate auto zero
s, S	Toggle sample rate

Report String Description

Long version using send character = "L", Total characters = 58

\$SIG= _±XXxE-X, _GAIN= _X, _BAT= _XXxE-1, _VOL= _X, _Z= _XXX, _A= _X!

Short version using send character "l" (lower case L), Total characters=22

\$SIG= _±XXxE-X, _GAIN= _X

Underscore in string represents a SPACE character.

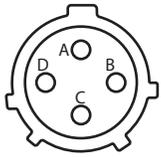
It is not output as an underscore but as a space.

Example: \$SIG= ±XXxE-X, GAIN= X, BAT= XXxE-1, VOL= X, Z= XXX, A= X!

CABLE CONNECTORS WIRING

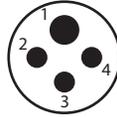
Sensor connector

Electronics' end - PT06A-12-4P



- A - 12 VDC
- B - Power ground
- C - Signal +
- D - Signal -

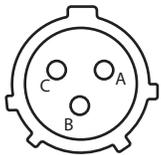
Sensor's end - SEACON MSXJJ-4-BCR



- 1 - 12 VDC (large pin)
- 2 - Power Ground
- 3 - Signal +
- 4 - Signal -

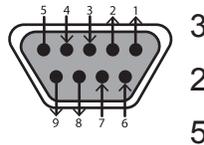
RS-232 Connector

Electronics' end - PT06A-12-3P



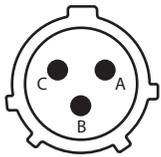
- A
- B
- C - Power Ground

Cable's end - DB-9



Power Connector

Electronics' end - PT06A-12-3S



- A - 12 VDC
- B - Power Ground
- C - NC



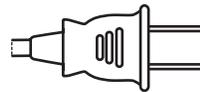
- Red Clip
- Black Clip

Charging Connector

Electronics' end - AC Power Cord



8 shaped plug



Type A outlet plug

Headphone Connector

Electronics' end - Headphone Connection



Standard 1/4 inch stereo



Stereo Headphones

WARRANTY

SubSurface Instruments, Inc. Warrants the BHG to be free from defects in material and workmanship for a period of twelve (12) months from date of shipment to original purchaser, subject to the following conditions.



Our obligation under this warranty is limited to servicing or adjusting any product returned to the factory for this purpose, and to replace any defective part thereof. Such product must be returned by the original purchaser with proof in writing, to our satisfaction, of the defect. Serial numbers must be intact. Abuse and/or battery damage is excluded from the warranty.

SubSurface Instruments, Inc. Shall not be liable for any injury to persons, or any other special or consequential damages sustained or expenses incurred by persons from the use of any product or repair.

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CUSTOMER ASSISTANCE



(920) 347.1788
(855) 422-6346



info@ssilocators.com
orders@ssilocators.com



www.ssilocators.com
www.ssilocators.com/product/bhg/



Repairs

SubSurface Instruments, Inc.
Repair Department
1230 Flightway Dr.
De Pere, WI • 54115

BHG

BORE HOLE GRADIOMETER
Short Sensor for down hole work

Rev.-B



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