

Borehole & Towable Gradiometers (BHG & MUL)

MUL Locator/Gradiometer

The MUL can also be used in shallow water, streams, and ponds, searching for discarded weapons, cannon, ships, anchors, and other ferrous metal objects, however:

The MUL is more commonly used for deeper water towing up to 1000 feet, used by underwater sleds and divers, searching for ordnance, steel/ironclad ships, chests, cannon, and anchor, etc.; and is capable of detecting objects buried deep in the ocean floor.

(See the BHG for borehole / downhole and shallow water use.)



Theory of Operation:

The MUL Magnetic Underwater Locator responds when the magnetic field strength measured at the two sensors inside the Sensor Tube are different. This difference is measured in "Differential Milligauss" and is reported to the user via output to the LCD (including polarity) and the speaker; also to the RS-232 or Analog outputs and the headset, if in use. Use of a headset disables the speaker.

The LCD bargraph fills on the side of the polarity being measured/reported, and the sound increases in intensity as the sensors come closer to the ferrous metal object.

Towing behind a boat:

One of many uses for the MUL is towing behind a small boat in small rivers or ponds and streams.

In any case be extremely careful how you secure the cable and unit while towing. Safety is the issue; be sure to plan for what may happen if the sensor snags on a solid object while under tow... faster the tow, the greater the danger.

Maintenance:

Just keep the unit clean as possible by wiping off the sensor and cable if wet and /or muddy. There are no "user serviceable" components, and no batteries that are changeable. Salt Water intrusion may be your biggest problem, but do try to keep any water out of the electronics unit. The Battery inside the MUL does not need service or replacement for a long period of time (so long, we can't predict it). So whenever we service the unit, we will also test/replace the battery if necessary... the user should never have to. If you are careful inserting and removing the connectors for the different cables, your unit will last a long time.

The Sensors, cased in Titanium, are built for extremely harsh environments for undersea mapping down to 2,700 meters! Take care of this unit and it will last a lifetime!



BHG Sensor (short and optional) - Bull-nosed and Rounded stores in Electronics Case for boreholes and shallow water, 30 foot cable standard, sensor 17.5 inches long.

MUL Sensor (long) - Deep Water Search/Detection MUL unit is supplied with a 100 foot cable, standard. This sensor and cable will not fit in the case, sensor is 34.375 inches long.

BHG and MUL electronics are the same: Buy either unit, and add the other one by only buying the other sensor, (and cable if needed.)

Search & Detection Procedures

As the Sensor of the MUL comes near an object at least containing some ferrous metal (brought into the magnetic field of a ferrous metal object), the electronics unit will report same through an increase of the idle frequency at the speaker (or headphones), and an increase in the bar graph indicator in the direction of the polarity it has encountered. The MUL can also be use as a "Diver Handheld" unit underwater, by the diver being in radio contact with another person above using the electronics unit. (We also make a "BHG"

Downhole/Borehole unit used for lowering down a 2" or large drilled hole for detecting steel drums or UXO... the sensors for the two units are interchangeable. Be sure to keep ferrous metals away from the search/detection area while the sensor is in use, to avoid interference.

The Sensor Cable can be used as a rope if it is relatively short such as 100 foot or less.... use good common sense. If you are towing the sensor on a sled at a distance, the sensor connector cannot stand the strain to pull the sensor and sled. The Titanium Sensor Housing is not only strong, but heavy enough to avoid the need for weights to lower the sensor down a borehole... or for use in relatively shallow water.

Do Not Add steel cable, weights or attachments made of steel or iron. You can use your own cables, a pigtail to adapt, or we can use/supply second connector.



Connectors:

Sensor Cable

External Power
12VDC

RS-232 Output

Analog Output

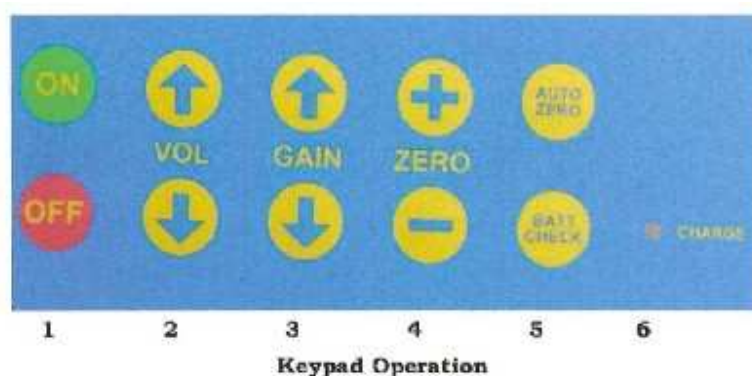
Headset 1/4" Jack

Specifications - MUL -

Controls:

- | | |
|--------------------------------------|--|
| 1 ON, OFF | - Turn the unit On or Off. |
| 2 Volume UP and Down | - Raise or Lower the sound output. |
| 3 Gain or Sensitivity setting | - Changes Milligauss range selection noted on the meter, up or down from 0.3 to 100 Milligauss. |
| 4 Zero, Plus & minus | - Manual adjustment of the Sensors to remove magnetic anomalies. |
| 5 AutoZero(top) | - Automatically steps Zero adjustment of the sensors to NULL to remove magnetic anomalies... audible. |
| 5 Battery Check(bottom) | - Push this button to read battery voltage on the LCD Meter. |
| 6 Charge | - Indicates that the Battery is charging (NOT that it needs charging), when Auxiliary Power or the Wall Charger is being used. |

NOTE: An automatic charging circuit is built into the electronics of the MUL. Anytime the Auxiliary Power is being used, the Battery is automatically being charged.



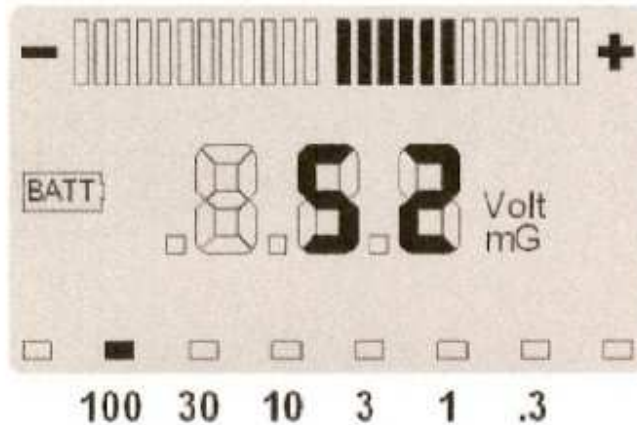
Outputs:

- Audio Frequency (Speaker & Jack for headphones)
- Visual LCD Display:
 - Bar Graph - Range GAIN setting - Milligauss
 - Analog output Jack
 - RS-232 PC Connection (cable included)
 - Control all Keypad function Data Log Range, keypad, & signal settings works with Hyper terminal or equivalent

MUL Meter

(Digital Image)

(Below displaying Battery Voltage 5.2 volts)



The above is a digital image showing all parts of the display. When in actual operation, only the relative parts are shown.

- Bar Graph (top)** - show signal intensity & polarity. Above shows near mid-range, positive.
- Batt** - icon comes on when battery needs charging.
- Numeric Output (center)** - shows Milligauss measurement of the detected signal, based on the GAIN (Sensitivity) Range. - OR- it shows voltage when the "BATT CHECK" button is pushed.
- Bar Graph (bottom)** - indicates the GAIN (Sensitivity) Range that has been selected via the "GAIN" button.
- Numbers across the bottom: 100, 30, 10, 3, 1, 0.3** - are the available Milligauss selections of GAIN (Sensitivity) settings.

MUL-1 RS-232 Commands

COM Port: 2400 baud, 8 bit, no parity, 1 stop bit.

Settings Use Hyper terminal program or similar software to communicate. Turn off echo. The unit will echo any character it receives which verifies communication.

v-	Lowers volume.
V-	Raises volume.

g-	Increase range (lower gain)
G-	Decrease range (raise gain).
b, B-	Check battery voltage
r-	Turns OFF status report.
R-	Turn ON status report.
?-	Causes a status report to be sent
l-	Specifies a short status report.
L-	Specifies a long status report.
d-	Turns off debug mode.
D-	Turns on debug mode.
z-	Zero +
Z-	Zero - , a, A-
a-	Auto Zero
A-	Auto Zero

Power Options:

Internal Battery:	7.2Ah sealed lead acid, 12VDC
Battery Life:	72 hours continuous use -medium setting greatly extended if interminttent use.
Auxillary Power Cable:	12 to 15 VDC ; Automactic charging circuit enabled when on Aux. Power.
Battery Charger:	120VAC to 15VDC wall converter battery charger include - jack in right side of case.

Operating Temperature Range:	-20F to 150F (-29C to 66C)
------------------------------	----------------------------

Dimensions:

Electronics:	16.9" x 10" x 6.5"
MUL Sensor:	1.625" x 34.375" (4.128 x 87.3 cm)
MUL Sensor Cable:	100 foot Standard, Custom available

Housing (Case):

Electronics:	ABS-Polycarbonate Resin Injection Molded
Sensors:	Titanium Tube with S.S. Connector

