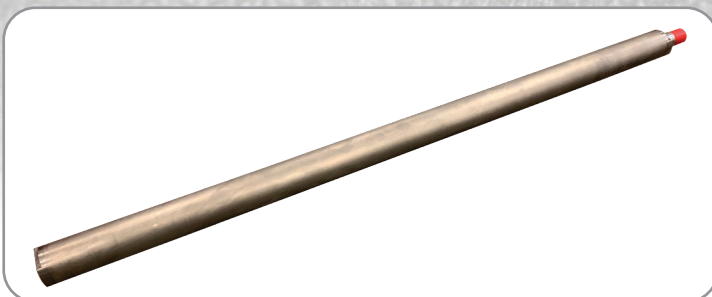




MUL

MAGNETIC UNDERWATER LOCATOR
User Manual



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

ENGLISH

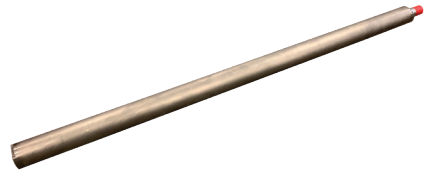
ITEM CHECK LIST

This is a list of all the parts included with your purchase of the Magnetic Underground Locator, 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 MUL Sensor

1.625" x 34.875" long magnetic sensor,
Secon 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

TABLE OF CONTENT

A.	INCLUDED ACCESSORIES	2
B.	TABLE OF CONTENT	3
C.	FUNCTION	4
D.	FRONT PANEL CONNECTORS	5
E.	DISPLAY DESCRIPTION	6
F.	KEYPAD CONTROL PANEL	7
G.	OPERATION	8 - 9
H.	FEATURES	10
I.	MAINTENANCE	11
J.	SPECIFICATIONS	12
K.	RS-232 INTERFACE	13
L.	CABLE CONNECTOR WIRING	14
M.	WARRANTY STATEMENT	15
N.	CONTACT US INFO	16

FUNCTION

The Magnetic Underwater Locator (MUL) 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 MUL 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

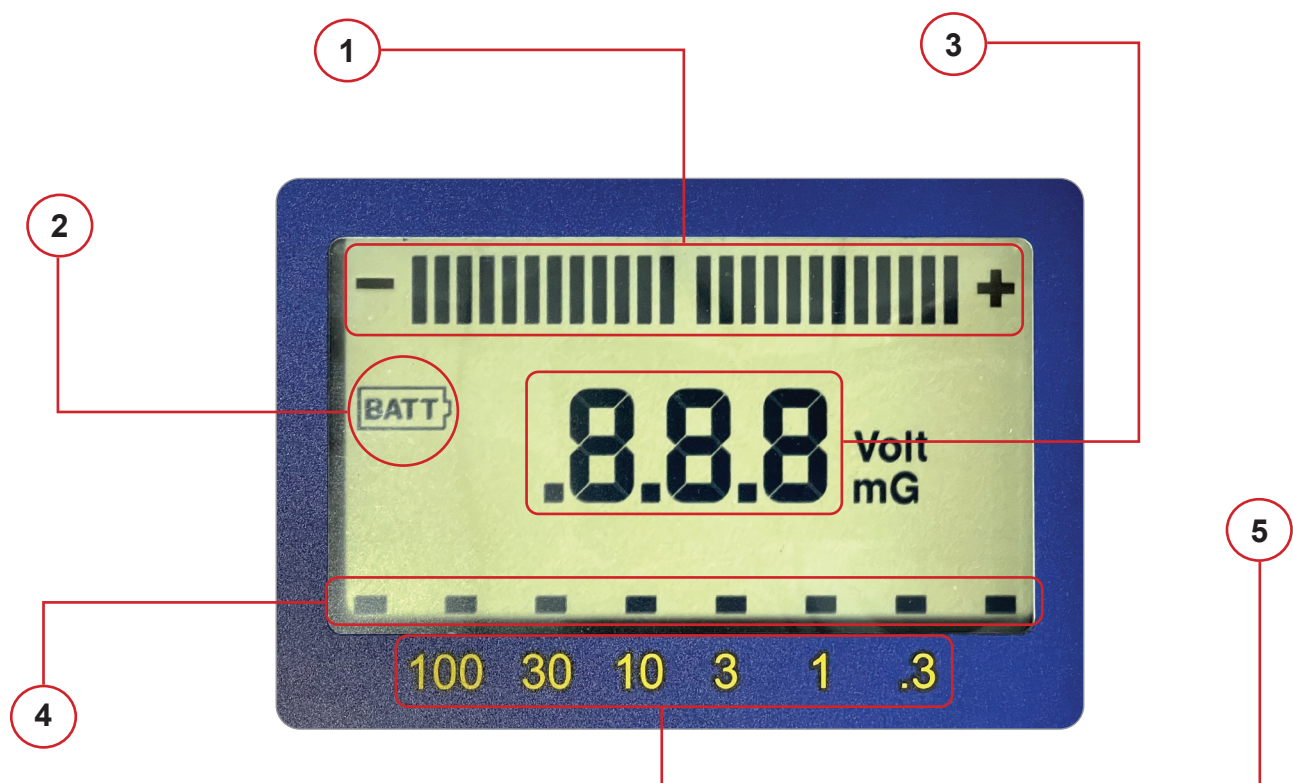
To run on external power or to charge the battery in the field, connect the external DC power cable to the POWER connector. Connect the other end clips to a 12 to 15 Volt DC power source. Red to positive and Black to negative.

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.

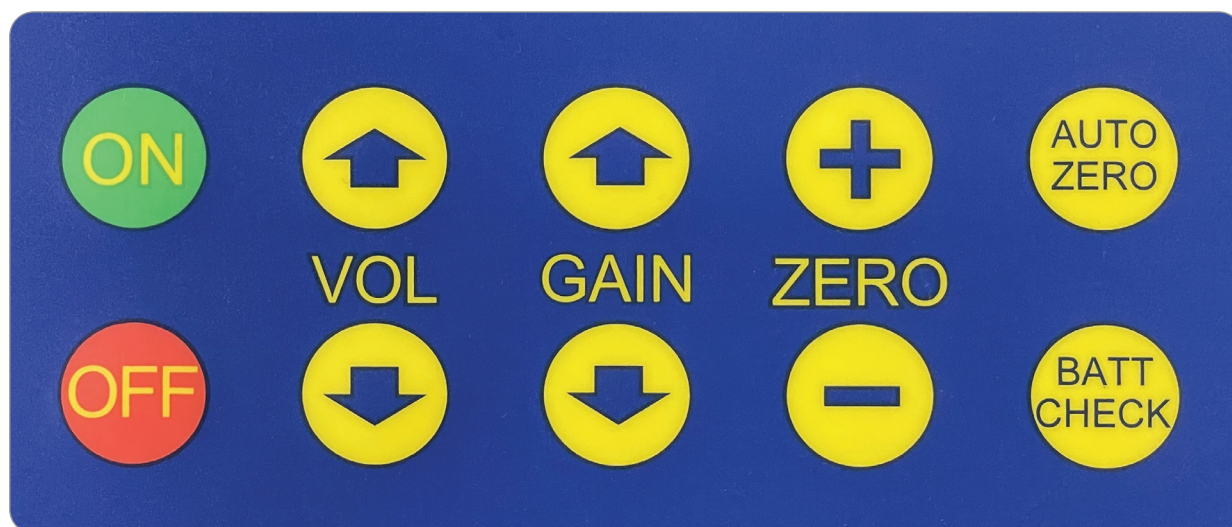








DISPLAY DESCRIPTION



	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

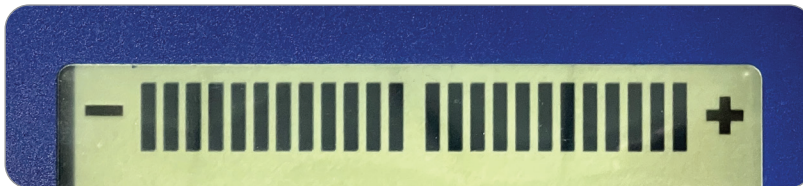
Connect the sensor to the electronics, using the sensor cable before turning the system on. Press the green ON button to turn on the MUL . To turn OFF press the red OFF button. The RS-232 interface cannot be used to turn the MUL ON or OFF.



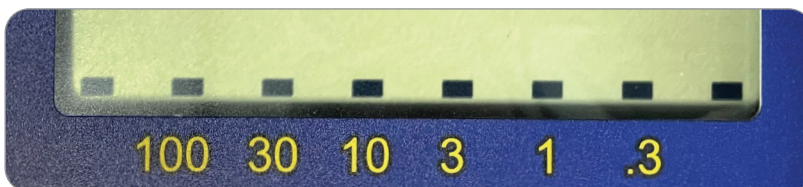
To check battery condition press the BATT CHECK button and the battery voltage will display on the LCD.

Place the sensor in the water using your towing arrangement.

As the sensor is towed across a 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.

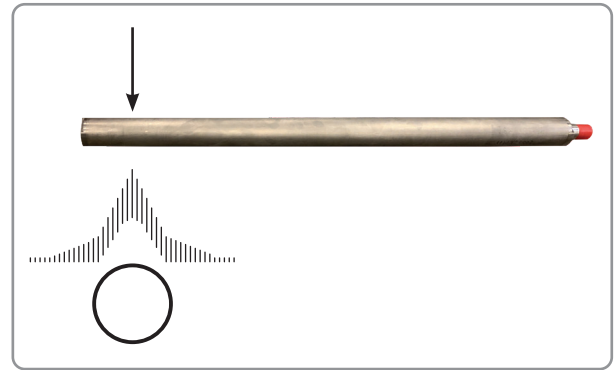
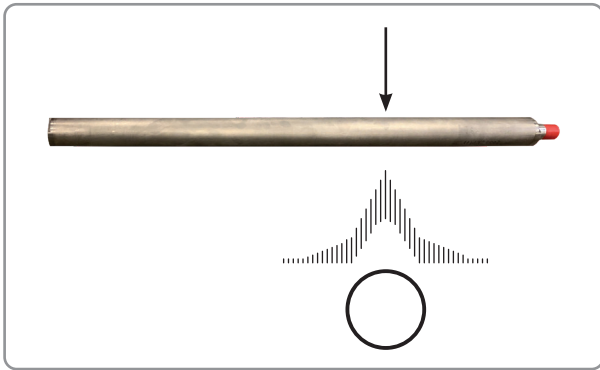


Adjust the GAIN up or down as needed to maintain proper sensitivity.

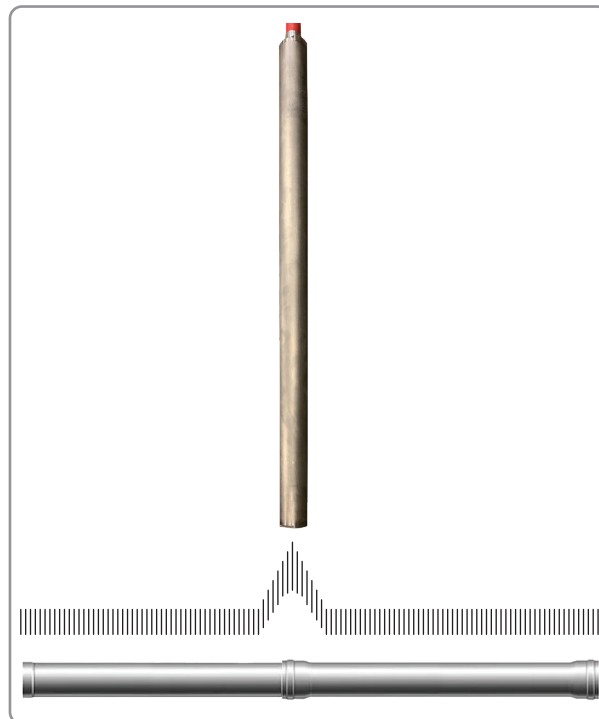


OPERATION (continuation)

Towing the sensor horizontally will produce two peaks as the sensor passes over a target.



Towing vertically will produce one peak over the same target.



When attaching the sensor to a tow rig, keep the sensor away from ferrous metals. Although the sensor cable can be used to tow the sensor, it is not recommended using it to tow a sled rig.

The sensor can be held by a diver to locate objects but will need communication between the diver and the topside operator. 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: <ul style="list-style-type: none">• 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 Sensor
	Waterproof optional cables available: 30', 50', 100' Other lengths by special order
	Commonly used for deep water search up to 1,000 feet or more by towing on sleds detecting pipelines, ordnance, steel/ironclad ships, chests cannon, anchors, etc.
	Can be used in shallow water, streams, and ponds searching for discarded weapons, cannon, ships, anchors, and other forms of ferrous metal objects.
	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)
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DIMENSIONS

Electronics case	16.9" X 10" X 6.5" (42.92cm x 25.4cm x 16.51cm)
Titanium sensor	1.625" X 34.375" (4.13cm X 87.3cm)

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
I	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= _±XXE-X, _GAIN= _X, _BAT= _XXE-1, _VOL= _X, _Z= _XXX, _A= _X!

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

\$SIG= _±XXE-X, _GAIN= _X

Underscore in string represents a SPACE character.

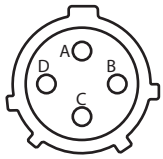
It is not output as an underscore but as a space.

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

CABLE CONNECTORS WIRING

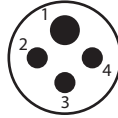
Sensor connector

Electronics' end - PT06A-12-4P



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

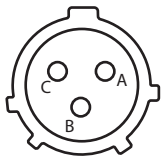
Sensor's end - SEACON MSXJJ-4-BCR



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

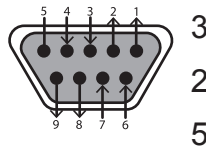
RS-232 Connector

Electronics' end - PT06A-12-3P



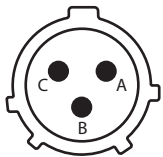
- A
- B
- C - Power Ground

Cable's end - DB-9

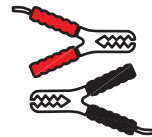


Power Connector

Electronics' end - PT06A-12-3S



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



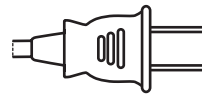
- Red Clip
- Black Clip

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 MUL-1 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.

DISCLAIMER

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Repairs

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MUL

MAGNETIC UNDERWATER LOCATOR
Long Sensor for underwater sled or diver

Rev.-B



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