



Web: www.undergroundmagnetics.com

USER'S MANUAL



Underground Magnetics
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MAG series ►

Contents of MAG series

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Product List

Warranty Cards

The MAG series (MAG5 and MAG7) are locating systems designed to assist horizontal directional drill machine operators in locating and tracking underground drill head locations and orientations. The systems consist of a transmitter, a receiver, and a remote display.

- ⦿The transmitter sends digital information of the transmitter's pitch, roll, temperature, and battery status through an FM modulated RF signal.

The receiver receives this information and uses

- ⦿RF signal to identify the transmitter's status and location.

The receiver transmits the locating information

- ⦿to a remote display through a radio telemetry system. A horizontal directional drill machine operator can use the information from the display to guide the drill head to the desired path.

The FM communication between the transmitter and the receiver provides more noise suppression than the traditional AM modulation widely used in this industry. The receiver offers a very simple and clear method to locate an underground drill head.

These locating systems also offer 5 channel license free radio telemetries between the receivers and remote displays.

The users can easily register any two receivers and displays so that communications between the “pair” will not be interfered by other “pairs”.

This manual is intended to provide information and instructions on how to use the locating systems properly. Underground Magnetics reserves the right to improve these locating systems and their user manuals anytime without notice.

1 Caution

- ⓈThe user must understand safety procedures and correct operation methods before operating the HDD and the locating system.
- ⓈHDD machines can cause property damages and personal injury upon striking underground power lines, gas lines, phone lines, television cables, fiber optic cables, or sewage lines. Make sure to confirm and mark and confirm all underground utilities before beginning operations.
- ⓈDo not use the locating system near flammable or explosive substances.
- ⓈWear proper personal protective equipment including steel-toed boots, safety gloves, helmets, reflective vests, and safety goggles.
- ⓈObey all the local safety regulations.
- ⓈThis locating system is only a tool to assist the operator to locate the drill head. It is the operator not the Mag series locating system that is responsible for identifying the drill head location. Underground Magnetics is not responsible for any loss caused by using the Mag series. Users should operate the Mag series according to the manual. If you have any questions, please contact Underground Magnetics.

2 Product Highlights

- 1.High precision and high anti-interference Faraday shield 3d antenna structure.
- 2.Industrial rated gold-plated industrial rated electronic modules.
- 3.High-performance DSP.
- 4.2 in 1 locating system, functioning as two locators independently tracking to provide better accuracy and reliability.
- 5.Up to 50m depth range and up to 200 hours continuous usage.



3 Receiver

3.1 Specifications

Mag7

- System frequency: 4kHz, 19kHz, 30kHz
- Depth up to 50 meters (164 feet)
 - Compatible with Echo S, Echo 1, Echo 2, and Echo 3 transmitters
- Water proof: IP65
- Telemetry: 4 radio channels with range up to 1.2km (3900 feet)
- Rechargeable lithium battery:
 - Voltage: 12.5V
 - Battery life: 50 hours
- Size: 68.5cm*13cm*30cm (27 inches* 5 inches* 11.8 inches)
- Weight: 3kg (6.6 pounds)








Mag5

- System frequency: 4kHz, 19kHz, 30kHz
- Depth up to 40 meters (131 feet)
 - Compatible with Echo S and Echo 1 transmitters
- Water proof: IP65
- Telemetry: 4 radio channels with range up to 1.2km (3900 feet)
- Rechargeable lithium battery:
 - Voltage: 12.5V
 - Battery life: 50 hours
- Size: 68.5cm*13cm*30cm (27 inches* 5 inches* 11.8 inches)
- Weight: 3kg (6.6 pounds)

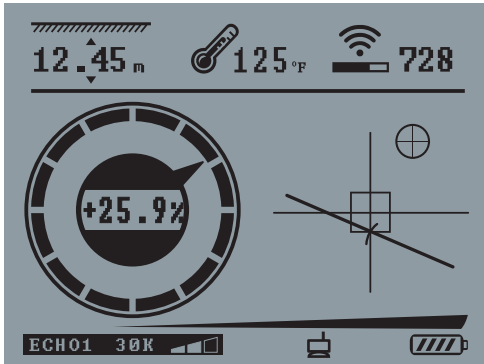


3.2 Receiver Operation

-  Power key: Press and hold to turn on or off. Tap to turn back light on or off.
-  Up key: Move to previous cursor selection.
-  Down key: Move to next cursor selection.
-  Confirm key: Tap to confirm cursor selection. Press and hold to enter secondary page.
-  Setup key: Tap to enter calibration page/return to main page; Press and hold to enter setup page.

3.3 Icons

3.3.1 Main Page Icon




ECH01 30K

Transmitter model , frequency and power mode

 125°F

Transmitter temperature(Flashing indicates transmitter is over heating)

 12.45m

Distance between transmitter and receiver

+25.9%

Transmitter pitch



Transmitter battery status



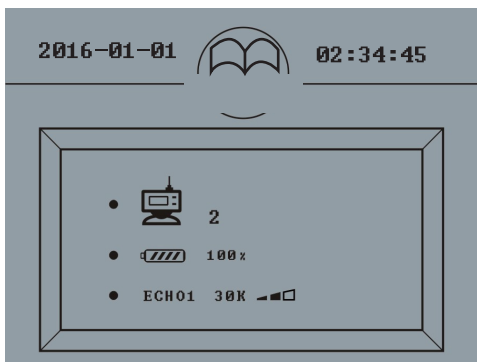
Receiver and display connection status





Transmitter signal strength

3.3.2 Secondary Page Icons

To enter secondary page , press and hold 



 ECH01 30K 

Transmitter model , frequency and power

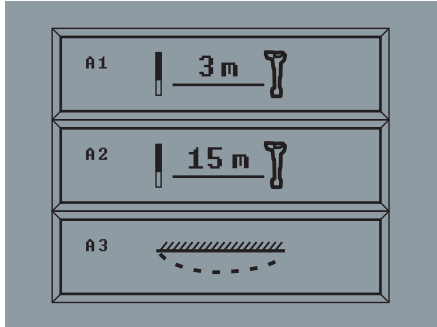


Receiver battery status



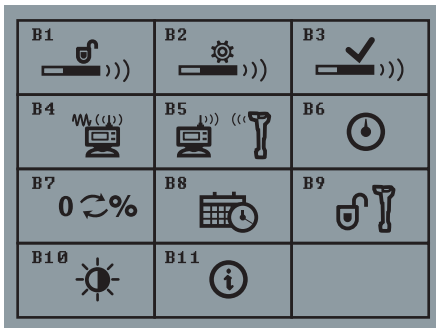
Telemetry channel

3.3.3 Calibration and Depth Forecast Page Icons



- A1: 3m calibration
- A2: 15m calibration
- A3: Depth prediction

3.3.4 Setup Page Icons



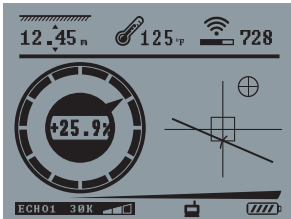
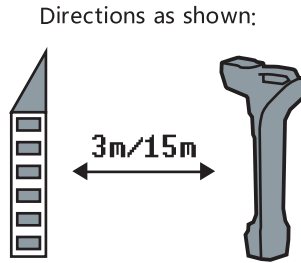
- B1: Transmitter activation
- B2: Transmitter settings
- B3: Receiver settings
- B4: Telemetry selection
- B5: Receiver and display pairing
- B6: Roll calibration
- B7: Pitch unit selection
- B8: Time setting
- B9: System lock/unlock
- B10: Visibility control
- B11: System info


3.4 Calibration

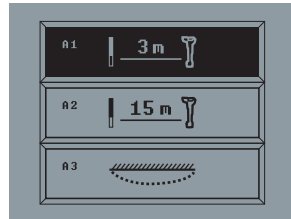
3.4.1 Depth Calibration (3m and 15m)




Warning: Even if the transmitter's roll, pitch, battery status and temperature are displayed correctly, calibration may not be reliable due to a distorted magnetic field.

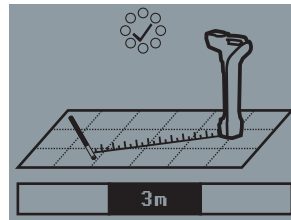
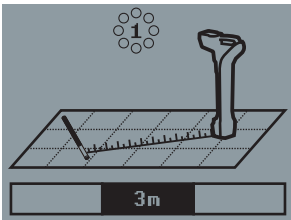
1. Make sure that the transmitter is working properly. Place it in the housing.
2. Place housing containing the transmitter in a location away from interference.
3. Set transmitter 3m/15m apart as shown:
Directions as shown:




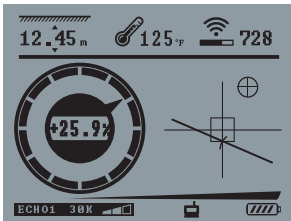
4. Tap  to enter calibration page.



5. Tap  or  to select 3m or 15m calibration and tap  to confirm.



6. Tap  two times to start 3m or 15m calibration and wait for calibration to complete.
7. Calibration complete.

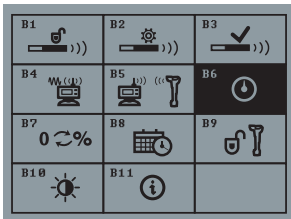




8. Tap  to return to main page.

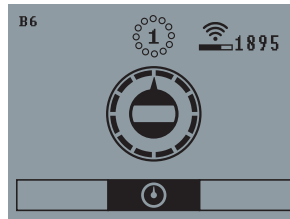
3.4.2 Roll Calibration




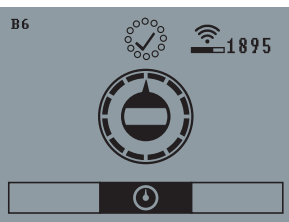
1. Place transmitter housing in a 12 o'clock position.



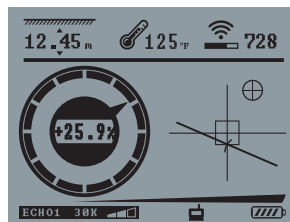
2. Press and hold  to enter setup page.
Tap  to select B6 icon.




3. Tap  3 times to start roll calibration and wait for calibration to complete.

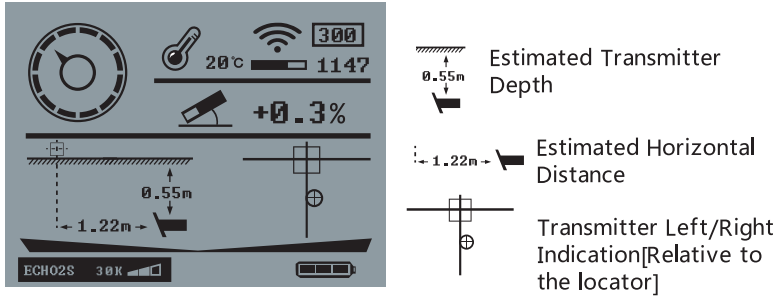


4. Calibration complete.



5. Tap  to return to main page.

3.4.3 Bore to the locator (BTL) function



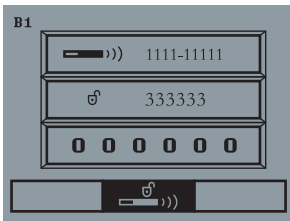
1.To toggle between BTL and locating mode:
Point locator's bottom upward as shown in picture, hold for 2 seconds, put the locator back to normal position.



2.To use BTL function:
①Put the locator ahead of the transmitter along the drill path in the direction indicated in the picture.
②Using pitch, depth and left/right information to put the ball in the box"



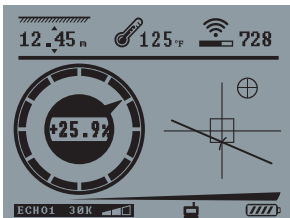
3. Tap to enter B1 page.



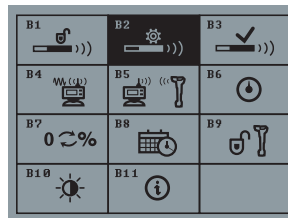
4. 1111-1111 is the transmitter identification number and 3333-3333 is the prompt code in the diagram. Send the transmitter identification number and the prompt code to the dealer. The dealer will give you an activation password. Use and to input password, tap to confirm activation.

3.5.3 Transmitter Setting

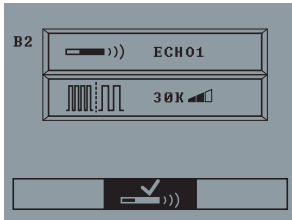
(Must be started within 10 minutes after batteries have been placed in the transmitter.)



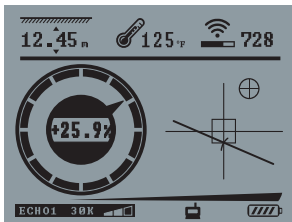
1. Press and hold to enter setup page.



2. Tap to select B2 icon.

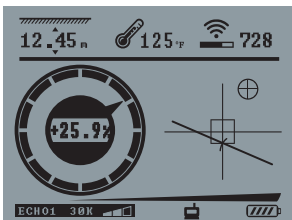


3. Tap to enter transmitter settings page. The receiver and Echo transmitter will automatically pair. Then tap or and to select frequency and power mode.
(power mode not available with Echo1).

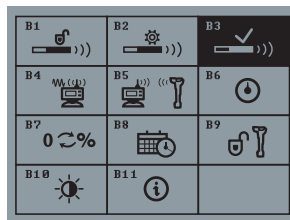


4. Tap to return to main page.

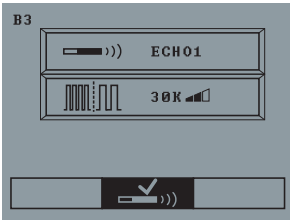
3.5.4 Transmitter Selection






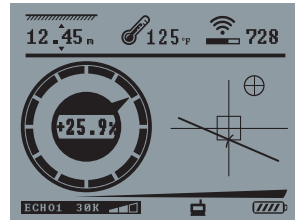
1. Press and hold to enter setup page.




2. Tap to select B3 icon.

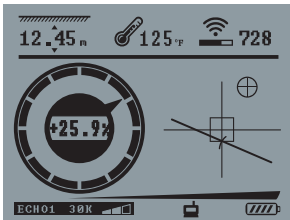



3. Tap  to enter receiver setting page. Tap  or  to select transmitter model, frequency and power.

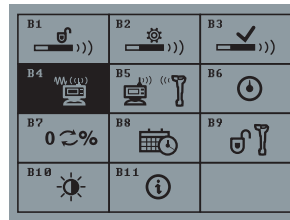



4. Tap  to return to main page.

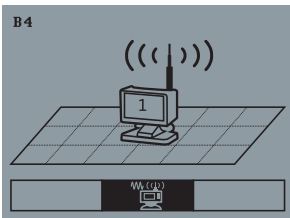
3.5.5 Radio Channel Selection






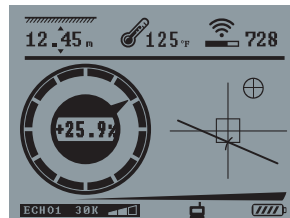
1. Press and hold  to enter setup page.




2. Tap  to select B4 icon.

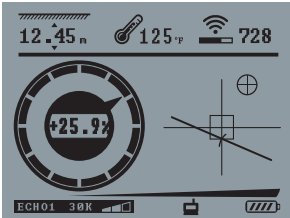



3. Tap  to enter radio channel page, and use  or  to select radio channel.

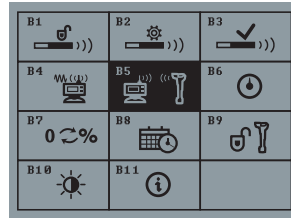



4. Tap  to return to main page.

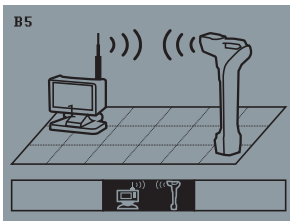
3.5.6 Radio Registration




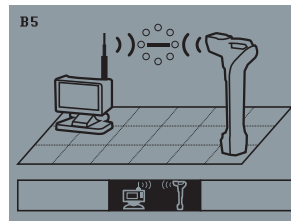
1. Press and hold  to enter setup page.




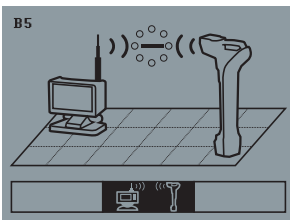
2. Tap  to select B5 icon.



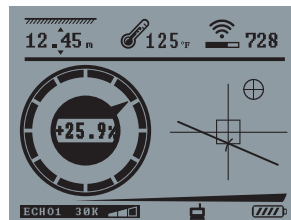
3. Tap  to enter radio registration page.




4. Tap  to start radio registration. (It is required these last two steps are performed on the display at the same time).

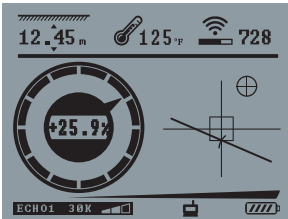



5. Radio registration complete.

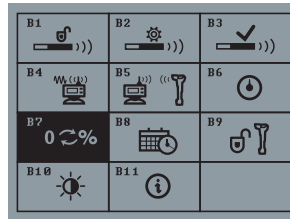


6. Tap  to return to main page.

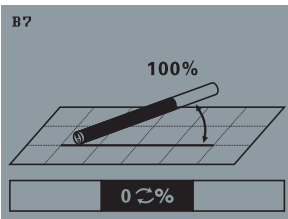
3.5.7 Pitch Unit Selection




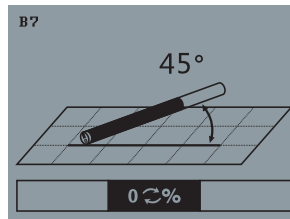
1. Press and hold  to enter the setup page.




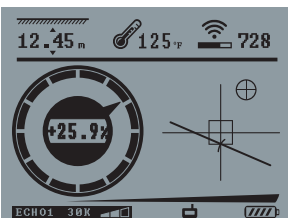
2. Tap  to select B7 icon.




3. Tap  to enter pitch unit selection page.

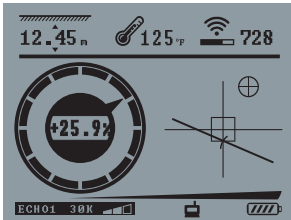



4. Tap  to switch pitch mode.

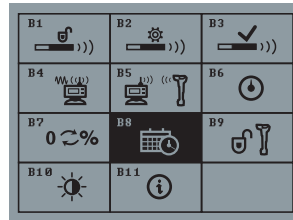



5. Tap  to return to main page.

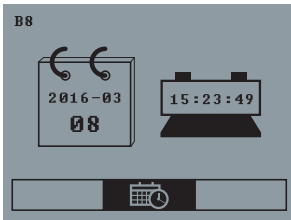
3.5.8 Time Setting






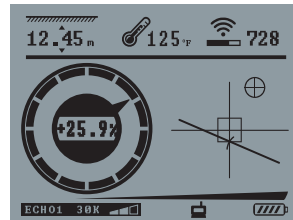
1. Press and hold  to enter setup page.




2. Tap  to select B8 icon.

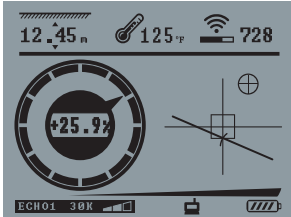



3. Tap  to select year, month, day, hour or minute. Tap  or  to set time.

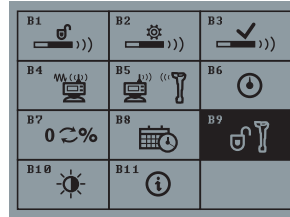


4. Tap  to return to main page.

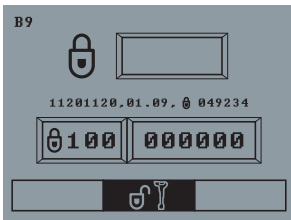
3.5.9 System Unlock




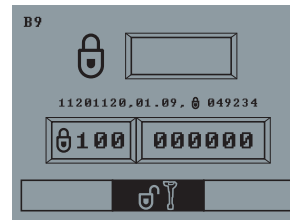
1. Press and hold  to enter setup page.






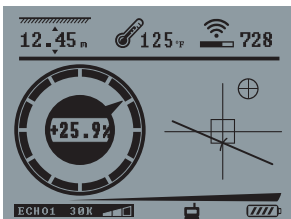
2. Tap  to select B9 icon.




3. Tap  to enter system unlock page.

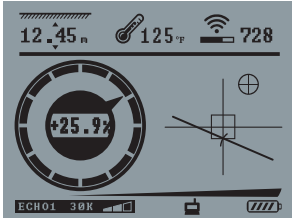



4. Tap  or  and  to input password. (To get the password please contact your dealer.)

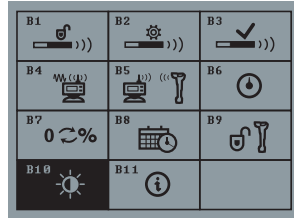


5. Tap  to return to main page.

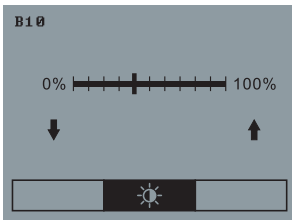
3.5.10 Visibility Control






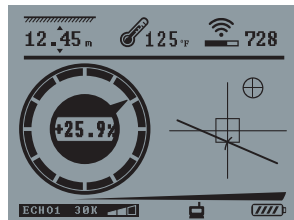
1. Press and hold  to enter setup page.




2. Tap  to select B10 icon.



3. Tap  to enter visibility control page and tap  and  to adjust visibility.



4. Tap  to return to main page.

3.6 Receiver Maintenance

- a) The receiver uses rechargeable lithium batteries. The receiver will automatically shutoff if no key is pressed for over a period of 20 minutes or if there is no information received from the transmitter. It is strongly recommended that the batteries are taken out of the receiver if it is not being used for a long period of time to avoid potential corrosion from a leaking battery.

- b) The receiver is an electronic measurement device. Severe shock and impact can damage the housing and the electronics inside the housing.
- c) Keep the receiver away from excessive heat to avoid damages to the plastic housing and electronics inside the housing.
- d) Do not soak the receiver in excessive amounts of water.

4.Display

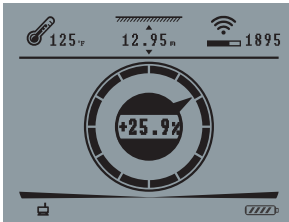
4.1 Display Specifications


- Radio frequency: 2.4GHz
- Power: Lithium rechargeable batteries
 - 12.5V
- Battery life: up to 50 hours
- Screen: Industrial rated LCD graphic screen
- Telemetry: 4 radio channels with range up to 1.2km (.75 miles)
- Temperature: Under 85°C (185°F)
- Dimensions: 19cm*13cm*19cm
(7.5 inches*5 inches* 7.5 inches)
- Weight: 1.5kg (3.3 pounds)
- Water proof: IP65

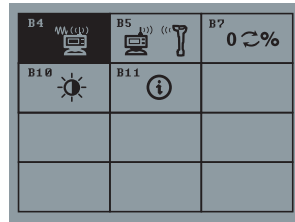



4.2 Operation

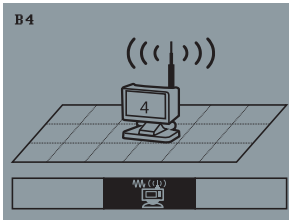
4.2.1 Display telemetry selection




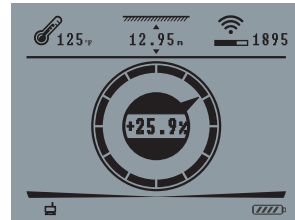
1. Press and hold  to enter setup page.




2. Tap  to enter the B4 radio channel page.



3. Use  to select radio channel.

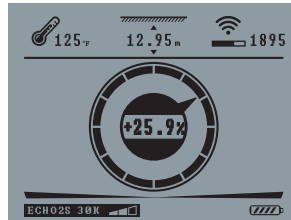



4. Tap  to return to the main page.

4.2.4 Change transmitter frequency or power in the ground at the Hdd machine

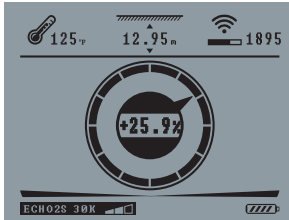


7. At receiver, go to locator frequency selection page and select the changed transmitter state selection.

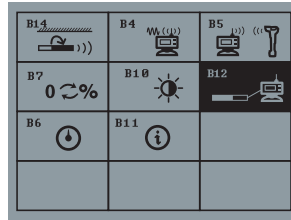


8. Tap  to return to the main page.

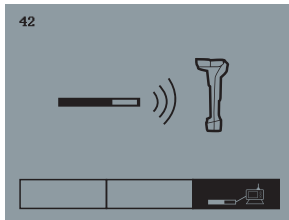
4.2.5 Select wireless mode and wireline mode on the remote display



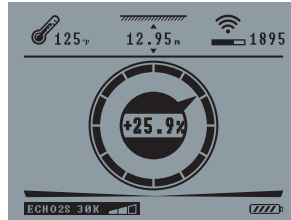
1. Press and hold to enter the setup page.



2. Tap to select B12.



3. Tap to enter the page for selecting wireless/wireline mode. Tap or to select wireless mode or wireline mode.



4. Tap to return to the main page.

4.3 Display Maintenance

- a) The display uses rechargeable lithium batteries. The display will automatically shut off if there is no key is pressed for over a time period of 20 minutes or if there is no information received from the receiver. It is strongly recommended that the batteries are taken out of the display if it is not to be used for a long period of time to avoid potential corrosion from a leaking battery.
- b) The display is an electronic measurement device. Severe shock and impact can damage the housing and the electronics inside the housing. Treat the receiver as a measurement device.
- c) Keep the display away from excessive heat to avoid damages to the plastic housing and electronics inside the housing.
- d) Do not immerse the display in excessive amounts of water.

5. Transmitter

5.1 Introduction

The transmitter provides drill head temperature, clock position, pitch, battery status and locating signal. The transmitter transmits signals at 4KHz, 19KHz or 30KHz. The transmitter will enter a "sleep" mode after 15 minutes without rotation. It takes about 10 seconds to "wake up" when the transmitter is rotated.



5.2 Specifications

Echo 1-30K:

Frequency: 30KHz

Depth range: 40m

Power: 261020 battery or rechargeable lithium battery

- 261020 battery

- oVoltage: 3V

- oBattery life: 60 hours

- Rechargeable lithium battery

- oVoltage: 3V

- oBattery life: 20 hours

Roll: 1-12 clock position with half hour resolution

Pitch: 0.1%resolution

Dimensions: 3.2cm in diameter *38cm in length

Echo2S:

Frequency: 4KHz、 19KHz、 30KHz

Depth range: 40m、 50m

Power: 261020 battery or rechargeable lithium battery

- 261020 battery

- oVoltage: 3V

- Normal power mode: 40m*60 hours

- High power mode: 50m*15 hours

- Rechargeable lithium battery

- oVoltage: 3V

- Normal power mode: 40m*20 hours

- High power mode: 50m*5 hours

Roll: 1-12 clock position with half hour resolution

Pitch: 0.1%resolution

Dimensions: 3.2cm in diameter *38cm in length

Echo3 :

Frequency: 4KHz、 19KHz、 30KHz

Depth range: 40m、 60m

Power: 261020 batteries or rechargeable lithium batteries

- 261020 batteries

- oVoltage: 6V

- Normal power mode: 40m*160 hours

- High power+ mode: 60m*40 hours

- Rechargeable lithium batteries

- oVoltage: 6V

- Normal power mode: 40m*50 hours

- High power+ mode: 60m*12 hours

Roll: 1-12 clock position with half hour resolution

Pitch: 0.1%resolution

Dimensions: 3.2cm in diameter *48cm in length

- Pitch: 0.1% resolution
- Temperature allowed: Under 85°C (185°F)
- Dimensions: 3.4cm (1.33 inches) in diameter *48cm (19 inches) in length
- Weight: 0.88kg (1.94 pounds)

5.3 Digital Information

- Pitch: From -106% to +106% with 0.1% resolution
- Roll: 1-12 clock position with half hour resolution
- Battery: Battery full, 2/3 full, 1/3 full and flash warning
- Temperature: When the transmitter is overheating, temperature indication in the receivers display flashes. If temperature reaches over 85°C, transmitter may be permanently damaged. If this happens, the dot temperature indicator on the front of transmitter will turn black.

5.4 Transmitter Maintenance

- Do not place the transmitter near excessive temperature (over 85°C/185°F).
- Do not apply excessive pressure, shock or vibration on the transmitter.
- Take the battery out of the transmitter after use.
- Clean the spring and cap on the battery compartment when necessary.
- Regularly check the sealing ring on the battery cover. Replace it when necessary.

6. Battery and Charger

- Mag locators use alkaline C-cell batteries or lithium rechargeable batteries.
- This lithium rechargeable battery comes with a special charger. Any use of other lithium rechargeable battery or charger for the receiver may cause fire, explosion, leaking or other damages. Keep the battery at the normal temperature of 15-25 degrees Celsius (59-77°F). Extreme high or low temperatures will short the battery life. Do not soak the battery in water or any other liquids.
- Do not throw the battery into fire. Do not disassemble the battery. Avoid any kind of damage to the battery. Do not discard the battery as normal trash. Please dispose of it properly.
- When charging the battery, red light of the charger is on.
- When charging is complete, a green light will be on.
- Please place the battery properly as shown in the diagram.

7. Warranty

Underground Magnetics offers standard warranty on parts and labor of the Mag series locating system under normal usage. The warranty period is one year for the receiver and display and six months for the transmitter. Warranty time is from the date of transaction.



Underground Magnetics

PRODUCT LIST

No.	Description	Quantity
1	Case	
2	Receiver	
3	Display	
4	Transmitter	
5	Handle	
6	Seals	
7	Rechargeable Lithium Batteries	
8	Charger	
9	Warranty Card	
10	Manual	

NOTE :

WARRANTY CARD

Customer

Product Model : _____

Receiver S/N : _____

Display S/N : _____

Transmitter S/N : _____

Purchase Date : _____

Distributor : _____

Customer Name : _____

Customer Add : _____

Customer Tel : _____

Distributor Signature:

WARRANTY CARD

Manufacturer

Product Model : _____

Receiver S/N : _____

Display S/N : _____

Transmitter S/N : _____

Purchase Date : _____

Distributor : _____

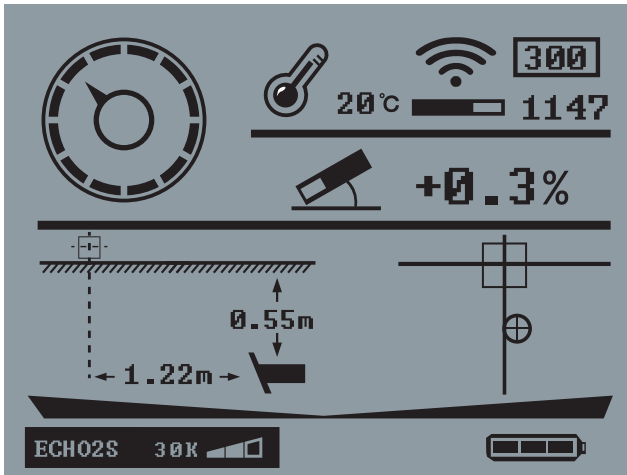
Customer Name : _____

Customer Add : _____

Customer Tel : _____

Distributor Signature:

3.4.4 Signal to noise ratio function (Communication distance warning)

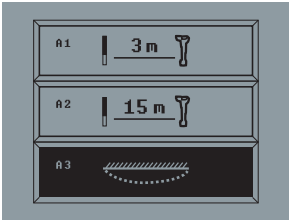




300 SNR icon

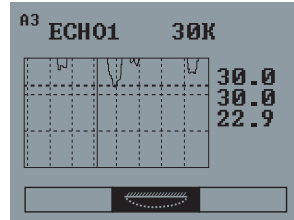
SNR is a number to indicate signal to noise ratio. When SNR is at 40, it indicates that the noise is very strong and the communication between the transmitter and the locator is weak. The higher the number, the stronger is the communication between the transmitter and the locator. 40 is about the point of no communication between the locator and the transmitter.


3.5 Operation

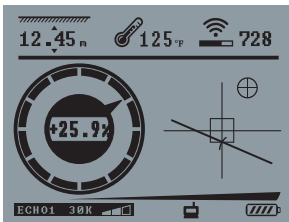
3.5.1 Depth Forecast



1. Tap  to enter calibration page, Tap  to select A3 icon.



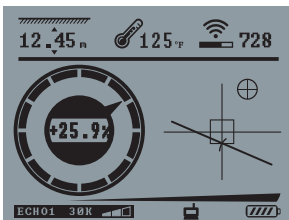
2. Tap  to enter depth prediction page. (After frequency selection and calibration, the middle value is the depth forecast at the site) 30.0m is the depth shown in the following diagram.




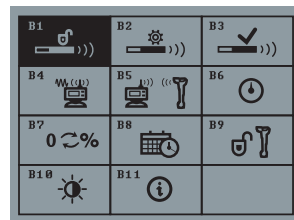
3. Tap  to return to main page.


3.5.2 Transmitter Activation

(Must be started within 10 minutes after batteries have been placed in the transmitter.)

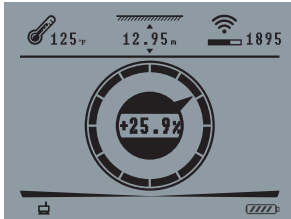


1. Press and hold  to enter setup page.

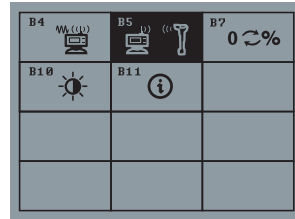


2. Tap  to select transmitter activation B1 icon.

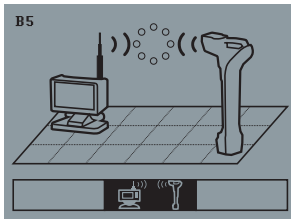
4.2.2 Radio Register



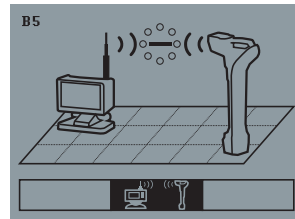
1. Press and hold to enter setup page.



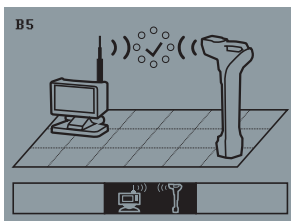
2. Tap to select B5 radio icon.



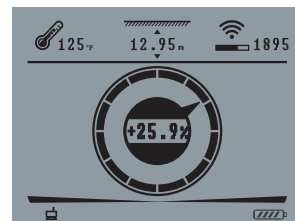
3. Tap to enter radio registration page.



4. Tap to start radio registration. (It is required that the following procedures are performed on the receiver at the same time.)

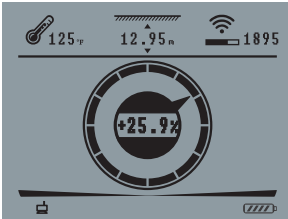



5. Radio registration complete.

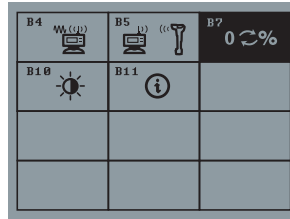


6. Tap to return to the main page.

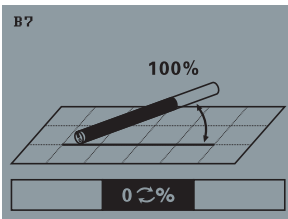
4.2.3 Pitch Unit Selection




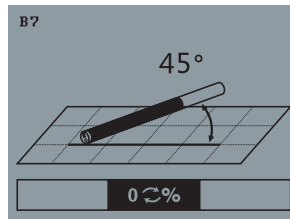
1. Press and hold  to enter setup page.




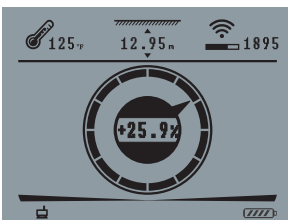
2. Tap  to select B7.




3. Tap  to enter pitch unit selection page.

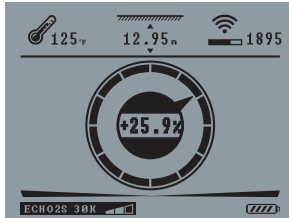


4. Tap  to switch pitch mode.

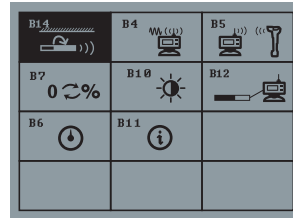


5. Tap  to return to the main page.

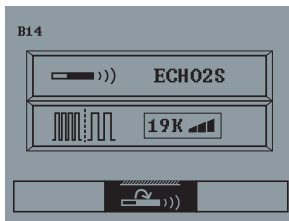
4.2.4 Change transmitter frequency or power in the ground at the Hdd machine



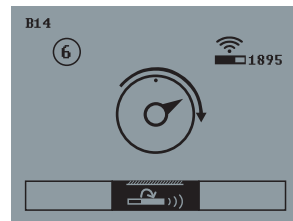
1. Hold to enter setting page on the remote display.



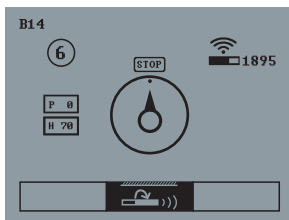
2. Tap to choose B14 (change transmitter state in the ground).



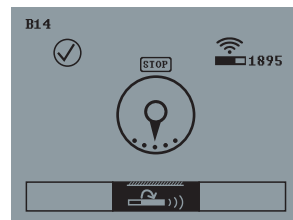
3. Tap to enter page of change transmitter state, and tap and to select the frequency and power to desired.



4. Tap to start the process, rotate transmitter to the marked roll position.



5. At marked roll position, wait for next rotation instruction.



6. Follow the rotation instructions until the process is complete.