Underground Magnetics

simple. powerful. affordable.

MAG X GEO MANUAL

UMAGHDD.COM | 515.505.0960

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Revision: 8.26.2025

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MAG X GEO SYSTEM

This locating system also offers four-channel license-free radio telemetry between the Locator and Display. The user can easily “pair” any two Locators 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 this locating system properly. Underground Magnetics Inc. (UM) reserves the right to improve the locating system and the Operator’s Manual at any time without notice.

1: Introduction

TRANSMITTER

The Transmitter (sometimes referred to as a Sonde or Beacon) sends digital information on the Transmitter's pitch, roll, temperature, and battery status through an FM modulated RF signal.

LOCATOR

The Locator receives this information and uses RF Signal to identify the Transmitter's status and location.

DISPLAY

The Locator transmits the locating information to the Display through a radio telemetry system.

A horizontal directional drilling machine operator can use the information from the Display to guide the drill head to the desired location.

2: Caution

The operator must understand safety procedures and correct operation methods before operating the HDD and the locating system.

HDD machines can cause property damage and personal injury upon striking underground power lines, gas lines, phone lines, television cables, fiber optic cables, or sewage lines. Make sure to confirm by uncovering and marking all underground utilities before crossing.

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 local safety regulations.

This locating system is only a tool to assist the operator in locating the drill head. It is the operator, not the Mag locating system that is responsible for identifying the drill head location. UM is not responsible for any damage or loss caused by using the Mag system. Operators should operate the Mag system according to the manual.

If there are any questions, please contact UM at support@undergroundmagnetics.com or call customer service at (515) 505-0960

3: FCC and CE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Underground Magnetics Inc. will void the user's authority to operate equipment.

Note: This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the Locator.
- Connect the equipment into an outlet on a circuit different from that to which the Locator is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This system is classified as Class 2 radio equipment per the R & TTE Directive and may not be legal to operate or require a license to operate in some countries. The list of restrictions and the required declarations of conformity are available in the "resources" section of the UM website.

4: Manual Tips

Here are some points to keep in mind as you read through the Mag X Operator's Manual.

Page References

This question mark and textbox will tell you the page in the Operator's Manual where you can find more detailed information on the corresponding topic.

Page X

- The following two pages contain a short preface. This will be a quick introduction to the steps in which you will most likely use your Mag System. It will also contain page references for the later sections of the manual that contain more detailed information for the corresponding steps.
- The rest of the manual will contain detailed sections that follow the order of the Mag X Locator and the Mag X menu screens.
- It is recommended to read the entire Operator's Manual before use.
- Throughout this manual there will be scannable QR codes that link to our training videos.
  Be sure to check those out for additional details!

SCAN ME

5: Quick Start

1. Turn on Locator by holding power button until Underground Magnetics logo is visible on screen.

2. Walk bore path and use depth prediction to check for interference and select frequency.

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3. Install batteries into Transmitter. Install battery cap with provided battery cap tool.

4. Turn on Display by holding power button until Underground Magnetics logo is visible on the screen.

5. Install the Transmitter into the housing.

6. Check Calibration by placing Locator 10ft (3m) away from housing, measured from inside edge of Locator to the center of the housing.

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5: Quick Start

7 If distance on Locator's screen reads anything other than 10ft (3m) perform calibration.

8 Locate FNP (Front Null Point).

? Page 65

9 Locate RNP (Rear Null Point).

? Page 66

10 Locate LL (Locate Line).

Repeat steps 8 through 10 as you continue to guide the drill.

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6: System Highlights

Mag X GEO System

- Solid Core 3D Antenna Cluster
- High-performance DSP
- Dual locating system, functioning as two Locators independently tracking to provide better accuracy and reliability
- Display and Locator features 7” color touch screen
- Features a Built-in GPS Data Logging System

Locator : Mag X GEO

Display : Mag X

Compatible Transmitters:

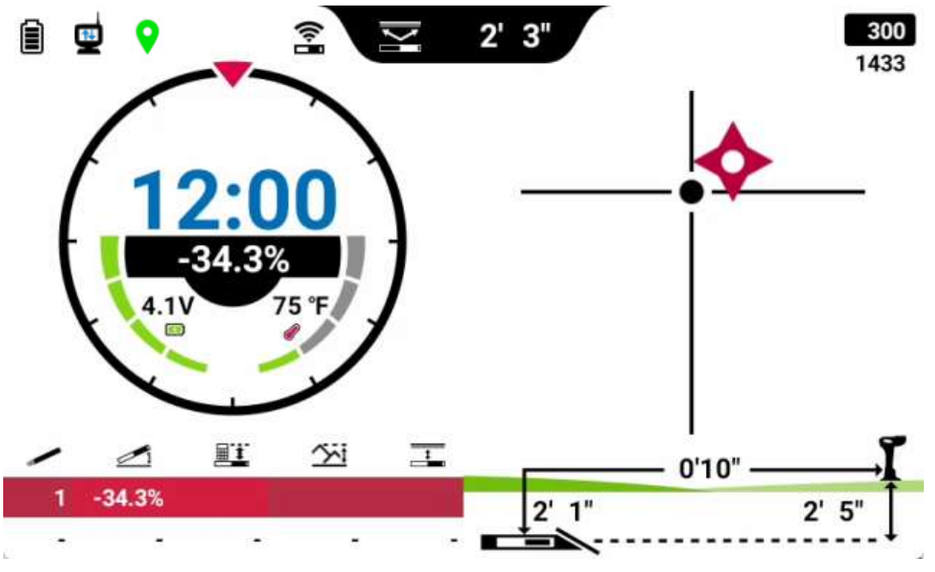
ECHO 50XF	ECHO 70
ECHO 75XF	ECHO 90
ECHO ST	ECHO 110
ECHO XMINI	

7: Getting Started

7.1: System Setup

7.1.1: Display + GPS Antenna Setup

1. With the drill set in place, secure the Display.
2. Mount the GPS Antenna on top of the drill or to a tripod with clear view of the sky.
3. Hold the ⏻ to turn on the Display.
4. Once the Display has connected to the network and correction service, a green GPS icon will appear.
5. Continue to **Locator Setup** on the next page.



GPS ANTENNA LOCATION

The location of the GPS Antenna will serve as an RTK (Real-Time Kinematic) station. Relocating will affect the data captured by the Locator.

If you plan to move the drill during the project, place the GPS Antenna on a Tripod near the drill and connect to the Display.

Mark the GPS Antenna's location to re-align in the event that you need to setup multiple times.

7: Getting Started

7.1: System Setup

7.1.2: Locator Setup

1. Hold the ⏻ to turn on the Locator.
2. Tap **OK** on the Lock Status pop-up

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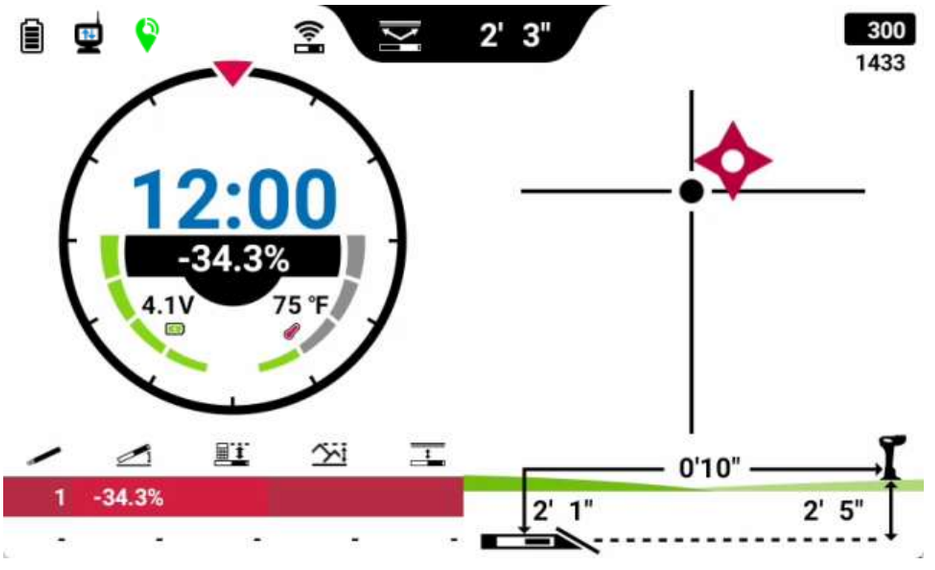
3. A green GPS icon will appear once the Locator has connected to the Display RTK Station, and established GPS location.



4. Continue to **Display Pairing** on the next page.

LOCK STATUS

The “Lock Status” indicates the remaining days set by the factory.

The “User Lock” indicates the remaining days set by the user.

See the Lock Status page for more information.

7: Getting Started

7.1: System Setup

7.1.3: Display Telemetry — Display Pairing

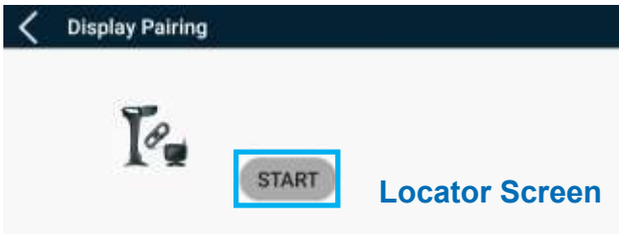
This process should be mirrored on both the **Locator** and the **Display**.

Locator

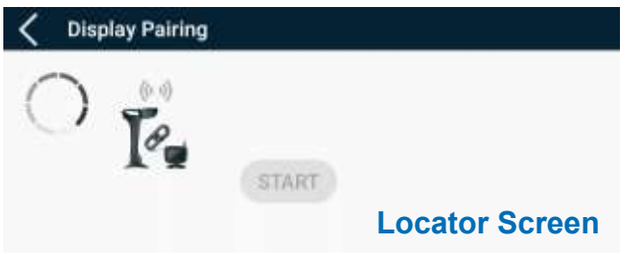
1. Hold
2. Tap **Display Telemetry**

3. Tap **Display Pairing**

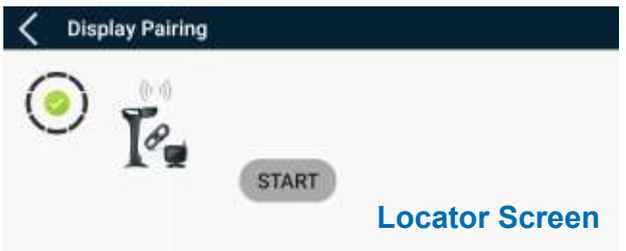
4. Tap **Start**



Locator Screen



Locator Screen



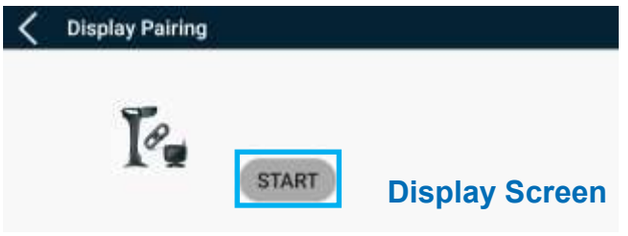
Locator Screen

Display

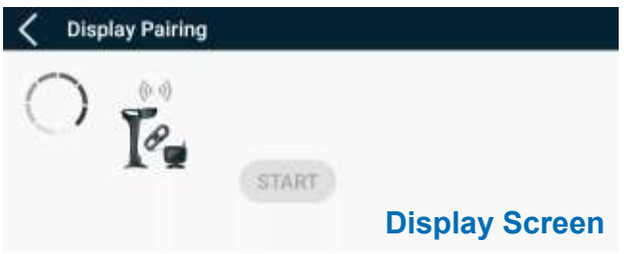
1. Hold on the
2. Tap **Display Telemetry**

3. Tap **Display Pairing**

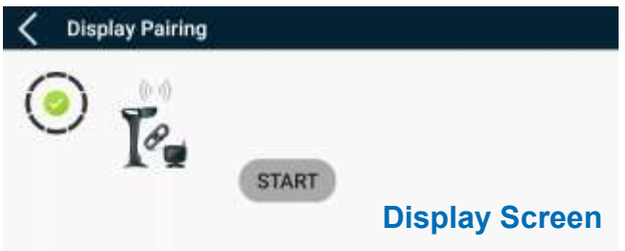
4. Tap **Start**



Display Screen



Display Screen



Display Screen

NOTICE

Pairing the **Locator** and **Display** will set the **Radio Channel** to 3 by default. If you require a different channel follow the steps listed on the next page to change.

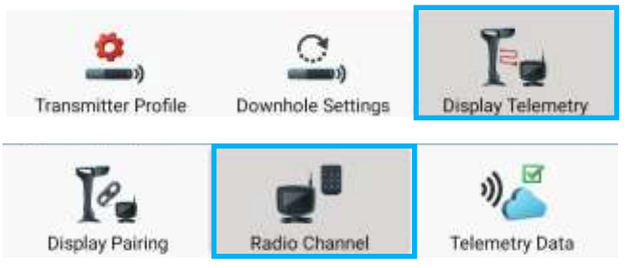
The **Locator** and **Display** are set to **Radio Channel** 3 from the factory.

7: Getting Started

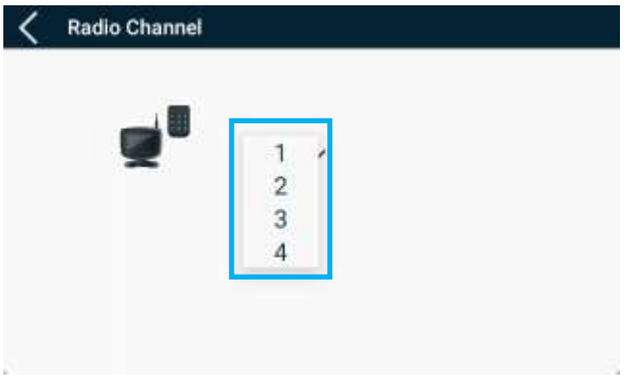
7.1: System Setup

7.1.3: Display Telemetry — Radio Channel

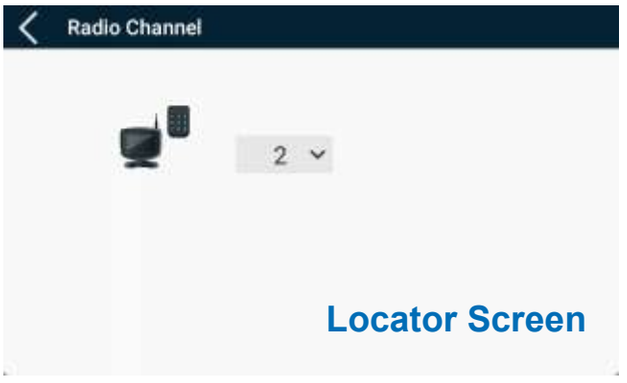
Complete this process on the **Locator**, the **Display** will change automatically.



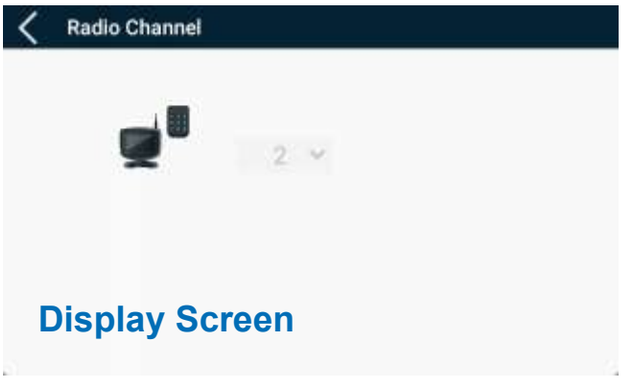
1. Hold ⚙ on the
2. Tap **Display Telemetry**
3. Tap **Radio Channel**



4. Tap and Select a **Channel** from the dropdown menu.
5. The **Display Channel** will be updated automatically.



Locator Screen



Display Screen

NOTICE

If you are experiencing connectivity issues between your Display and Locator, changing the Radio Channel may be necessary.

Changing the Radio Channel on the Locator automatically updates the Display.

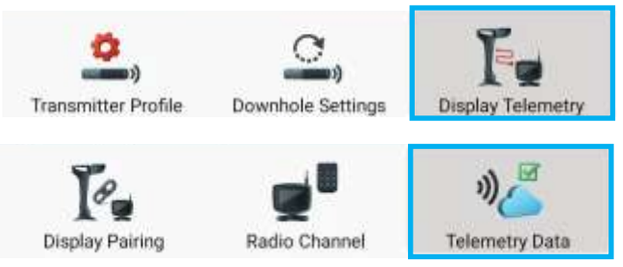
7: Getting Started

7.1: System Setup

7.1.3: Display Telemetry — Telemetry Data

Duplicate Data Over Network connects the **Locator** and **Display** over a network connection giving the user unlimited range.

Enable from the **Locator**

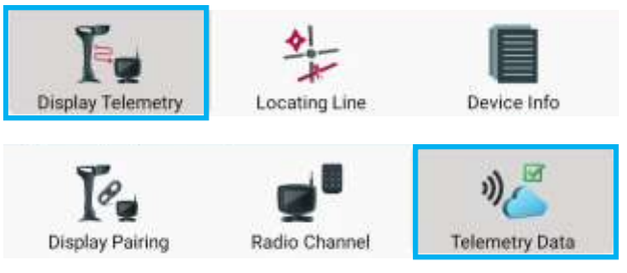


1. Hold ⚙ on the
2. Tap **Display Telemetry**
3. Tap **Telemetry Data**

4. Set the toggle to **On** or **Off**

Send RTK Data Over RF sends RTK correction data from the **Display** to the **Locator** improving accuracy when **CORS (Continuously Operating Reference Station)** is unavailable.

Enable from the **Display**



1. Hold ⚙ on the
2. Tap **Display Telemetry**
3. Tap **Telemetry Data**

4. Set the toggle to **On** or **Off**

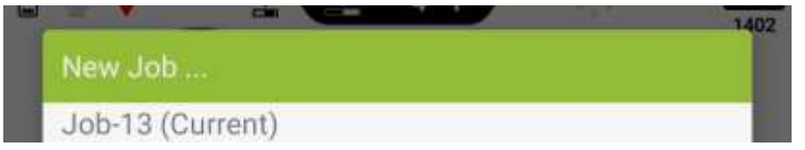
7: Getting Started

7.1: System Setup

7.1.4: Job Setup

1. To create a new job, Press
2. Press or tap Job on the screen.

3. Tap **New Job …** in the Green Bar



4. Enter the Job Name, Location, and Default Rod Length
5. Tap **Complete**

6. Continue to **Transmitter Pairing** on the next page.

PROJECT LOCATION

If the Project Location **does not** change, and the Display RTK station is placed back in the same location, no alert will be given, the current job may continue.

If the Project Location **does** change, the Locator will require a New Job.

7: Getting Started

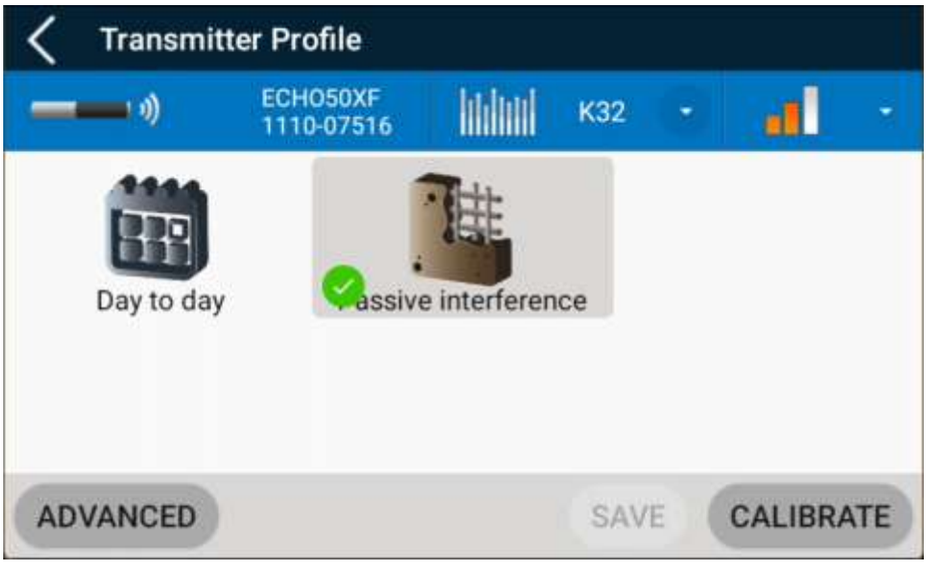
7.1: System Setup

7.1.5: Transmitter Pairing

1. To initiate **Pairing**, install fresh batteries in the Transmitter
2. Hold
3. Tap **Transmitter Profile**

4. Tap the Transmitter in the pop-up box

5. Once paired, the Transmitter information, including current frequency and power level, will appear.



6. Continue to **Transmitter Settings** on the next page.

PAIRING TIMEOUT

Pairing must occur within 60 minutes of the Transmitter being powered on.

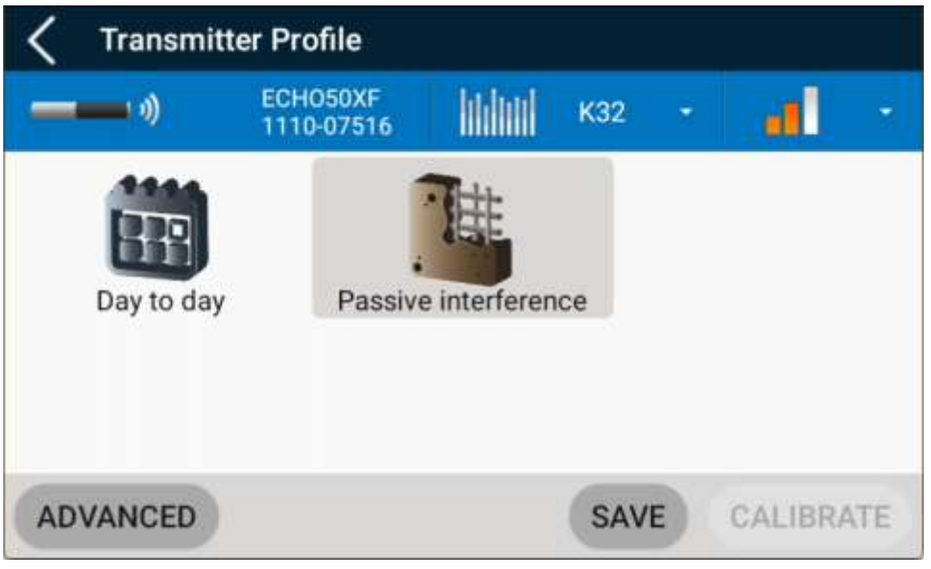
Past 60 minutes, removal and reinsertion of batteries is required to pair.

7: Getting Started

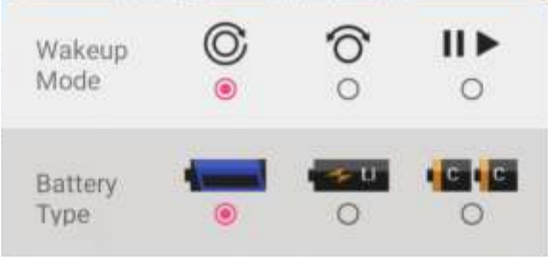
7.1: System Setup

7.1.6: Transmitter Settings

1. Tap the corresponding white arrow to set the **Frequency** and **Power Level** or select from one of the **Presets**



2. Tap **Save** once the **Frequency** and **Power Level** are set
3. Tap **Advanced** to set the **Wakeup Mode** and **Battery Type**



4. Continue to **Transmitter Calibration** on the next page.

BATTERY INFORMATION

Instant: Rotate the Transmitter 4 degrees or a 1% pitch change

360 degrees: Rotate the Transmitter 360° several times

Always on

Once the battery type is set, the battery life indicator will display by the clock.

Disposable Lithium batteries display **Full** or **Empty** only

Rechargeable Lithium batteries display **Full (4.2V)** to **Empty (3.0V)**

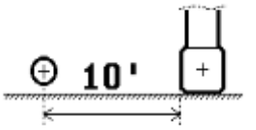
Disposable C Cell batteries display **Full (3.0V)** to **Empty (2.0V)**

7: Getting Started

7.1: System Setup

7.1.7: Transmitter Depth Calibration

SCAN ME



1. Hold ⚙
2. Tap **Depth Calibration**

3. Place Transmitter inside the housing flat on the ground.
4. Measure 10 feet from the center of the housing to the inside edge of the Locator.
5. Tap **Calibrate**
6. Tap **Yes** to save calibration.

7. A check mark will show when calibration is successful.
8. Continue to **Roll Calibration** on the next page.

Calibrating		**Signal Error**	
Calibration Successful		**No Transmitter Data**	
Calibration Failed		**TX Data on**	

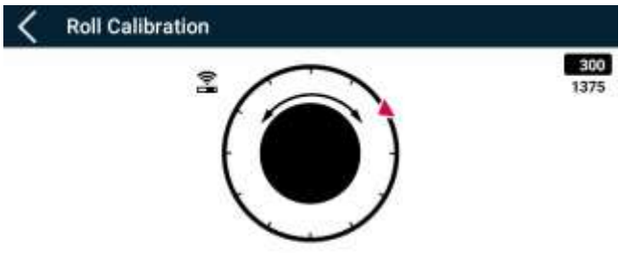
CALIBRATION ENVIRONMENT

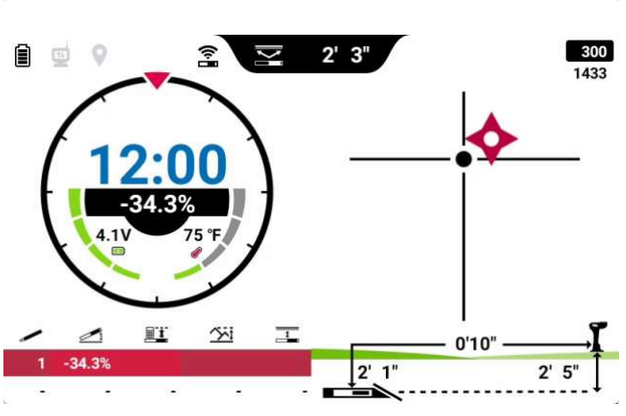
Do not calibrate around strong active or passive interference. For example, don't calibrate around an electrical transformer (active), or on concrete with rebar and/or wire mesh (passive). These types of areas can affect the depth calibration and accuracy significantly.

7: Getting Started

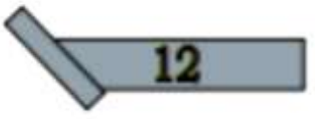
7.1: System Setup

7.1.8: Transmitter Roll Calibration





1. Hold ⚙
2. Tap **Roll Calibration**



3. Roll the Transmitter housing to 12:00
4. Tap or Press ▲ or ▼ to align the clock indicator at 12:00
5. Tap **Save** or Press ↵

6. Tap **Yes** or Press ↵ to confirm
7. **Roll Calibration** is complete!
8. Press ⚙ 2x to return to the Locate screen

8: UM Maps Setup

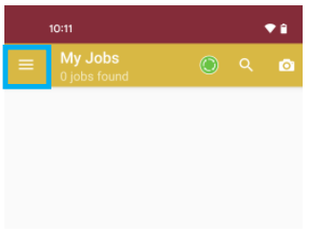
8.1: System Binding

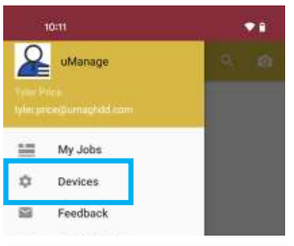
1. Hold ⚙
2. Tap **Device Info**

3. Tap the **Bind** button or the **Serial Number**

4. **Download** and **Open** the **UM Maps** app on an Android Device

SCAN ME

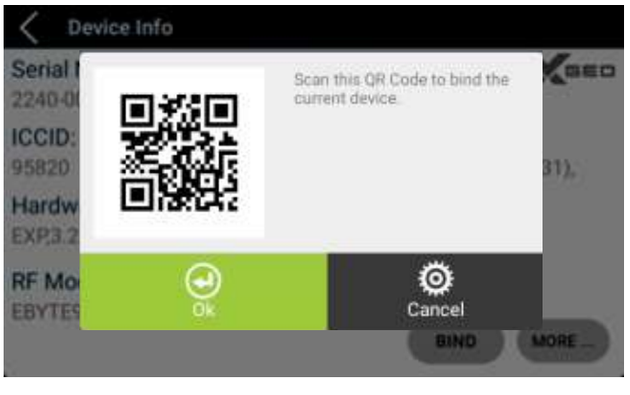




5. Tap the menu icon ☰
6. Tap **Devices** ⚙ Devices

7. Tap **Scan to Bind** SCAN TO BIND

8. Scan the **QR Code** on the screen of the Locator
9. The Device should be added to your list of **Devices**



10. Tap **Ok** or Press ↵ to confirm
11. Press ⚙ 2x to return to the Locate screen

9: Features

9.1: Data Logging

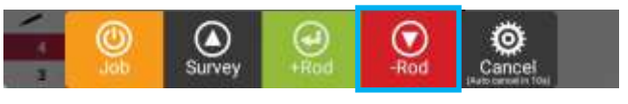
9.1.1: Recording a Rod

1. Drill down the Rod 1
2. Locate the drill head with the Locator
3. The distance indicator will flip to green and display the depth above the head
4. Press ↵ to show the **Log Menu**
5. Press ↵ again to record Rod 1

6. With Rod 1 recorded, the depth data is shown in the log table, located in the bottom left corner of the screen.

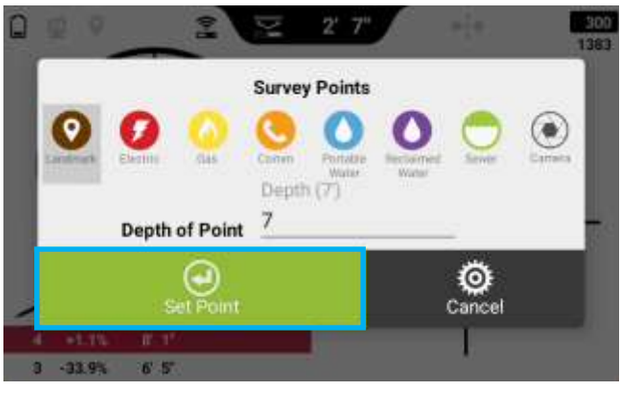
   This will be the start of the job. Elevation, Latitude, and Longitude are set to zero.
7. Repeat the process for Rod 2

9.1.2: Removing a Rod



1. Press ↵ to show the **Log Menu**
2. Press ▼ to Delete the last Rod

9.1.3: Recording a Survey Point (Utility)



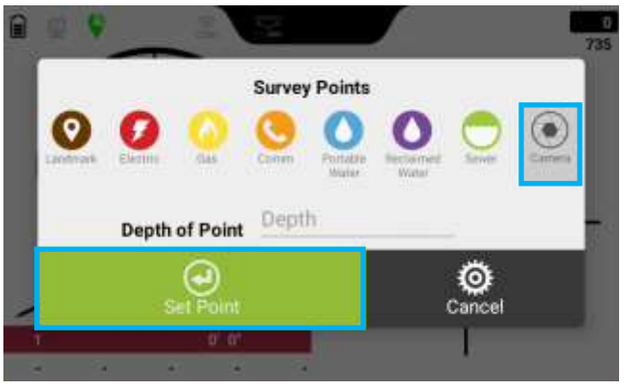
1. Press ↵ to show the **Log Menu**
2. Press ▲ to enter a **Survey Point**
3. Select **Type** & Set **Depth**
4. Press ↵ to **Set Point**

> **NOTICE**
>
> Any depth entered for a utility along the bore path, is the responsibility of the operator to visually inspect and physically measure the utility.

9: Features

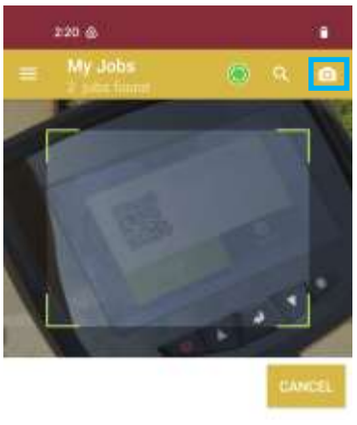
9.1: Data Logging

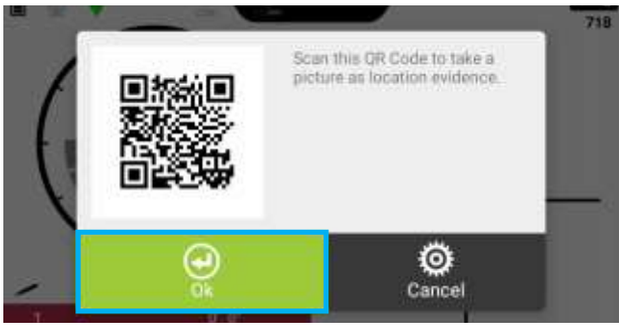
9.1.4: Recording a Survey Point (Camera)



1. Press to show the **Log Menu**
2. Press to enter a **Survey Point**
3. Select **Camera** & Set **Depth**
4. Press to **Set Point**

5. Open the **UM Maps app**
6. Tap the **Camera Icon**
7. **Capture** the picture of the object
8. **Confirm** the picture.
9. Open the **Map**
10. Tap the Camera Point to reveals



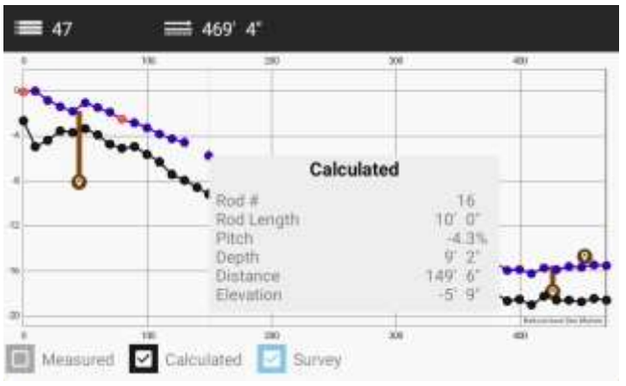


11. Tap **Ok** to finish the process.

9: Features

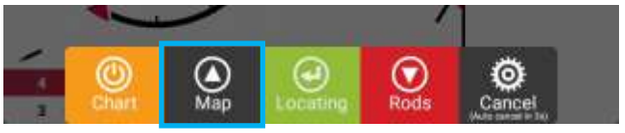
9.2: Views

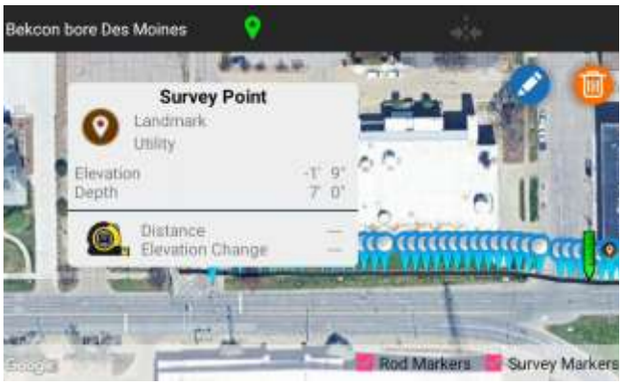
9.2.1: Chart View



1. Press ▲ to show the **View Menu**
2. Press ⏻ to enter the **Chart View**
3. Tap any Rod or Survey Point to view more information
4. Show/Hide with the Checkbox
5. Press ◎ to Exit or ▲ to show the View Menu to change Views

9.2.2: Map View





1. Press ▲ to show the **View Menu**
2. Press ▲ to enter the **Map View**
3. Tap any point for more information
4. Show/Hide with the Checkbox
5. Press ◎ to Exit or ▲ to show the View Menu to change Views

9.2.3: Rod View (Table)

47	+1.6%	18' 7"	-15' 6"	3' 1"
46	+0.9%	18' 5"	-15' 5"	3' 0"
45	-0.1%	18' 9"	-15' 8"	3' 1"
44	-2.9%	18' 7"	-15' 7"	3' 0"
43	+0.5%	18' 7"	-15'10"	2' 9"
42	+2.8%	18' 3"	-15' 9"	2' 6"
41	+0.6%	19' 0"	-16' 3"	2'10"
40	-4.0%	18' 6"	-15'10"	2' 8"

1. Press ▲ to show the **Views Menu**
2. Press ▼ to enter **Rod Table View**
3. Touch and Drag to scroll Table
4. Press ◎ to Exit or ▲ to show the View Menu to change Views

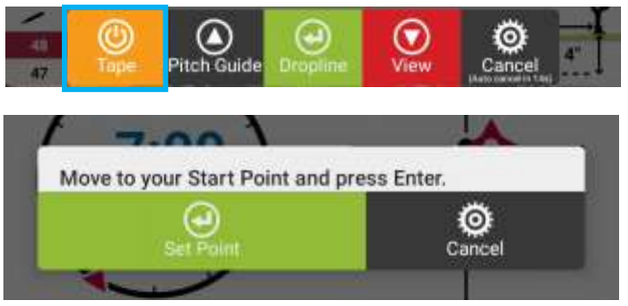
NOTICE

Three drill rods are necessary to view the Chart and GPS views

9: Features

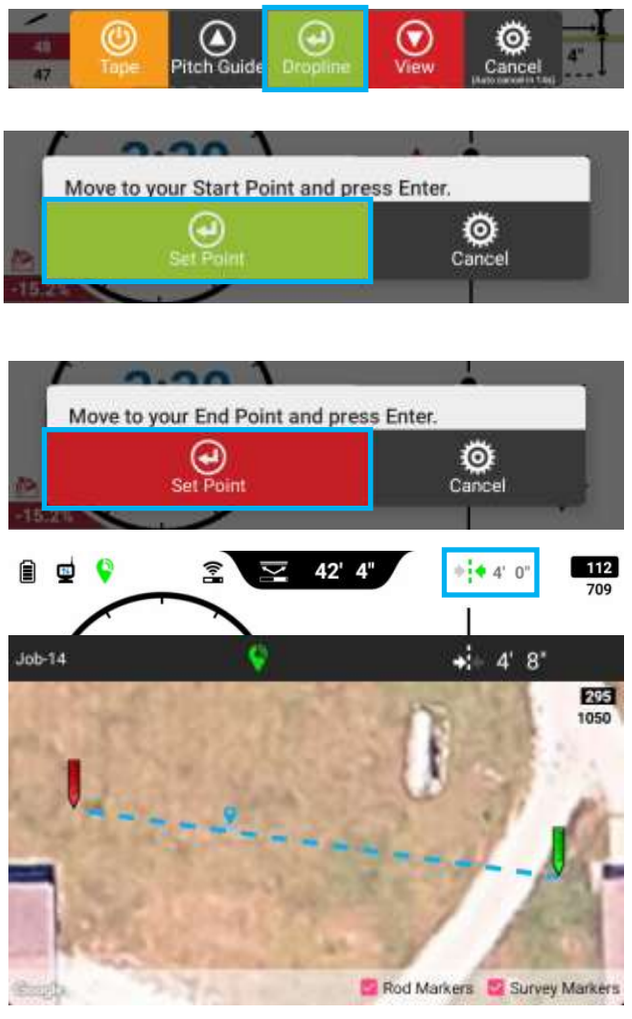
9.3: Tools

9.3.1: Tape Measure



1. Press to show the **Tool Menu**
2. Press to use the **Tape Measure**
3. Move to your **Start Point**
4. Press to **Set Point**
5. The **Distance** and **Elevation Change** from the **Start Set Point** will display in the **Tape Measure** box
6. Press to Exit

9.3.2: Dropline



1. Press to show the **Tool Menu**
2. Press to set a **Dropline**
3. Move to your **Start Point**
4. Press to **Set Start Point**
5. Move to your **End Point**
6. Press to **Set End Point**
7. The **Dropline** has been set!
8. The **Dropline** left/right indicator will appear above the crosshairs
9. The **Dropline** will also appear in the **Map View** and **Report**
10. Press to Exit and Return to the **Locate Screen**.

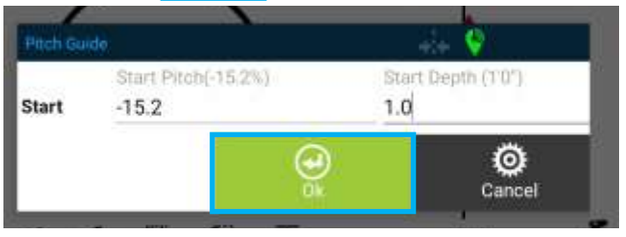
When your endpoint is not visible, the **Dropline** will keep the bore path on track and heading toward your target.

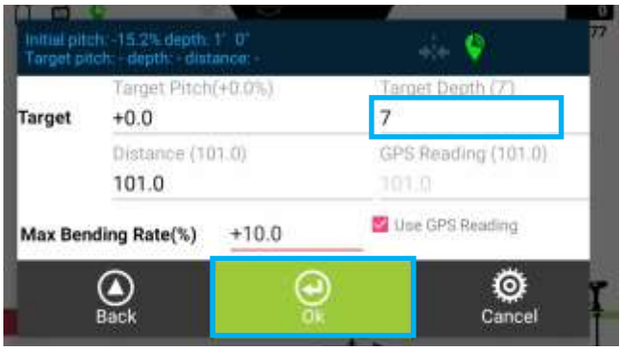
4' 0"	**Right of the Dropline 4' 0"**		**On the Dropline**
4' 0"	**Left of the Dropline 4' 0"**		**Dropline Inactive**

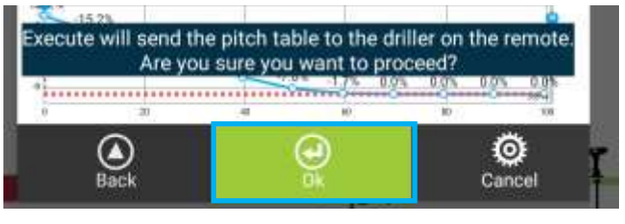
9: Features

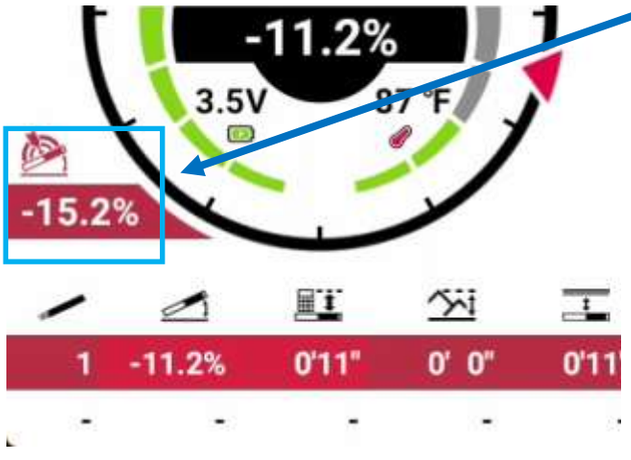
9.3: Tools

9.3.3: Pitch Guide (Add)









1. Press ▼ to show the **Tool Menu**
2. Press ▲ to set a **Pitch Guide**
3. The current **Pitch** and **Depth** will appear in the fields
4. Press ↵ and move to where you want to set the **Target Depth**
5. Specify the **Target Pitch** and the **Target Depth**
6. By Default, the **Distance** is set to **Use GPS Reading**
7. Press ↵ to run the **Pitch Guide**
8. Verify the **Pitch Guide** on the chart
9. Press ↵ to set the **Pitch Guide**
10. Press ↵ again to send the **Pitch Guide** data to the Display
11. The rod-by-rod **Target Pitch** will appear in the bottom left section of the screen near the Clock.
12. The **Target Pitch** will advance as you locate and log each rod.

NOTICE
Pitch Guide is a reference guide only, depths and Transmitter positioning should be verified by the Locator to avoid damage.

9: Features

9.3: Tools

9.3.3: Pitch Guide (Edit)

1. Press ▼ to show the **Tool Menu**
2. Press ▲ to open **Pitch Guide**
3. Here you can **View**, **Remove**, or create a **New Pitch Guide**
4. Press ↵ to create a **New Pitch Guide**

9.3.3: Pitch Guide (Remove)

1. Press ▼ to show the **Tool Menu**
2. Press ▲ to open **Pitch Guide**
3. Press ▲ to **Remove** a Pitch Guide

4. Press ▲ again to **Confirm** ▲ the **Pitch Guide Removal**

5. The **Target Pitch** indicator should be cleared from the locate screen
6. To add a new **Pitch Guide** repeat the process on the previous page.

NOTICE
Pitch Guide is a reference guide only, depths and Transmitter positioning should be verified by the Locator to avoid damage.

9: Features

9.3: Tools

9.3.4: Bore-To

To switch to **Bore-To Mode**

1. Press ▼ to show the **Tool Menu**
2. Press ▼ to use the **Bore-To**

The Display screen on both the Locator and the Display will look the same.

To switch to **Walkover Mode**

1. Press ▼ to show the **Tool Menu**
2. Press ▼ to exit **Bore-To**

NOTICE

It is important to note that the depth is only a reference.

As distance between the Transmitter and Locator decreases, the accuracy increases.

Never cross existing utilities while in Bore-To mode without exposing and verifying visually their location.

10: Locator

10.1: Specifications

System Frequency	16 Frequencies 325kHz - 41kHz
GPS	Integrated GPS + RTK
Data Log	Built-in Data Logging
Compatible Transmitter	Echo X-Mini / Echo 50XF / Echo 60 / Echo 75XF / Echo 70 / Echo 90 / Echo 110
Temp Range	-4°F to 140°F (-20°C to 60°C)
Communication	RF 915 MHz or Cellular
Telemetry Range	4 Radio Channels with range up to 6,000 ft (1800m)
Power (12V)	Rechargeable Lithium Battery
Battery Life	Up to 15 hours
Waterproof	IP65

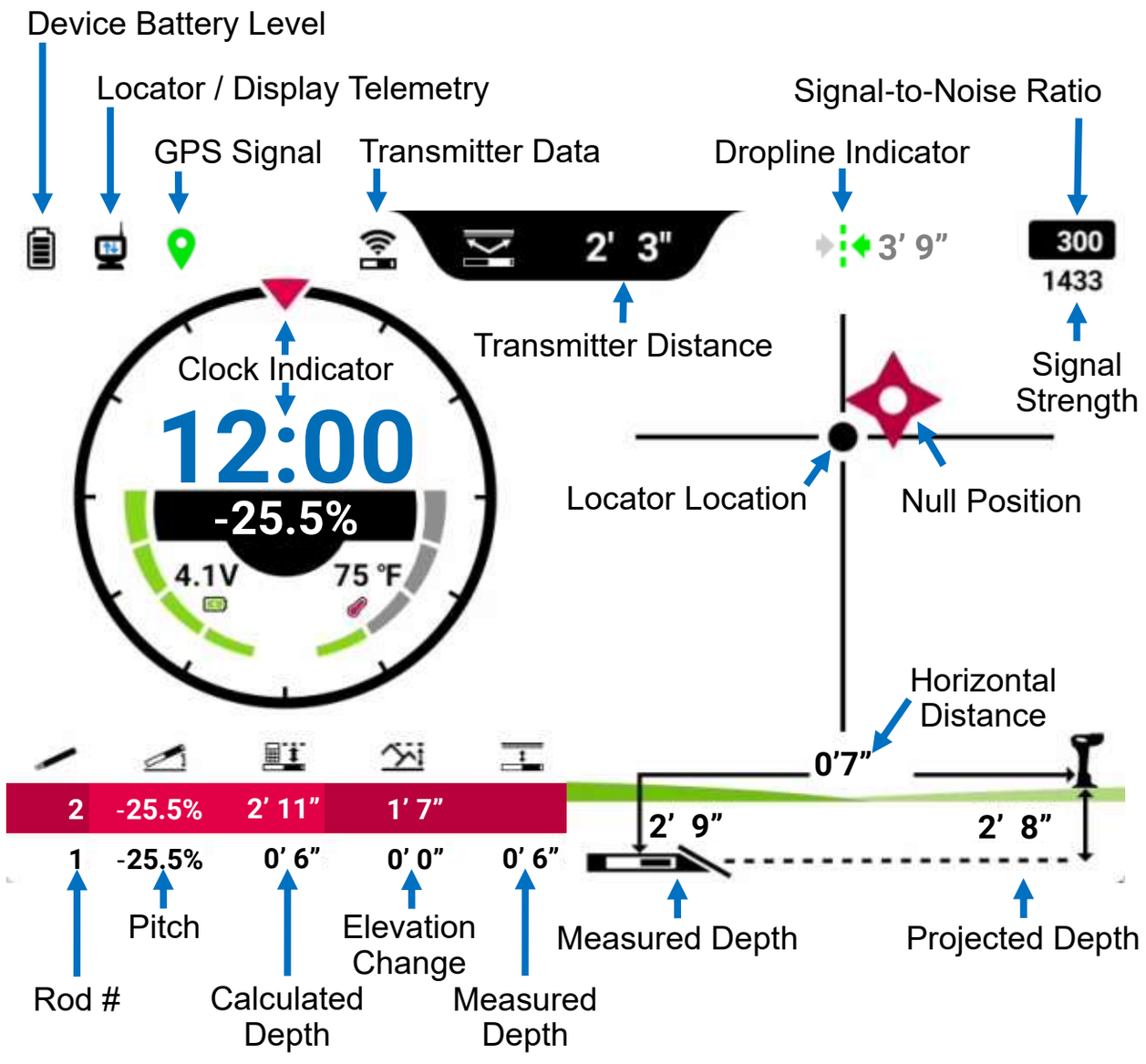
10.2: Button Operation

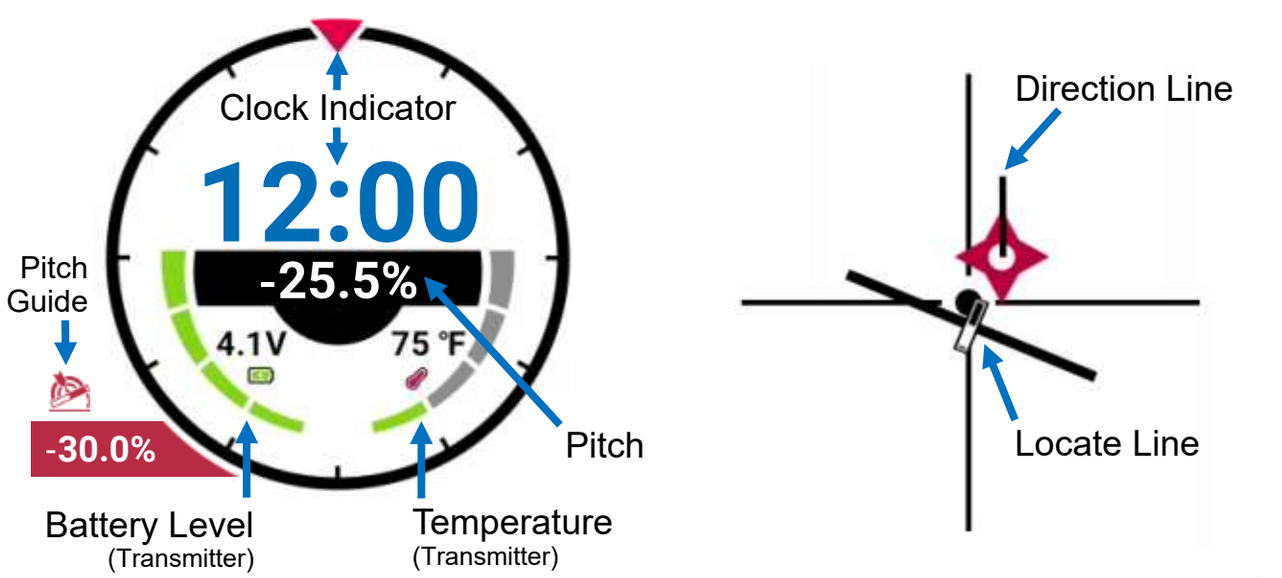
Power	* Hold to turn on or off. * From the main page, tap to open or close status info.
Up	* In the menu, move to previous cursor selection. * From main page, tap to open Views Fly-Up Menu.
Down	* In the menu, move to next cursor selection. * From main page, tap to open Tools Fly-Up Menu.
Confirm	* In the menu, move to confirm cursor selection. * From main page, tap to open Logging Fly-Up Menu.
Setup	* Hold to enter the Settings.

10: Locator

10.3: User Interface

10.3.1: Locate Screen



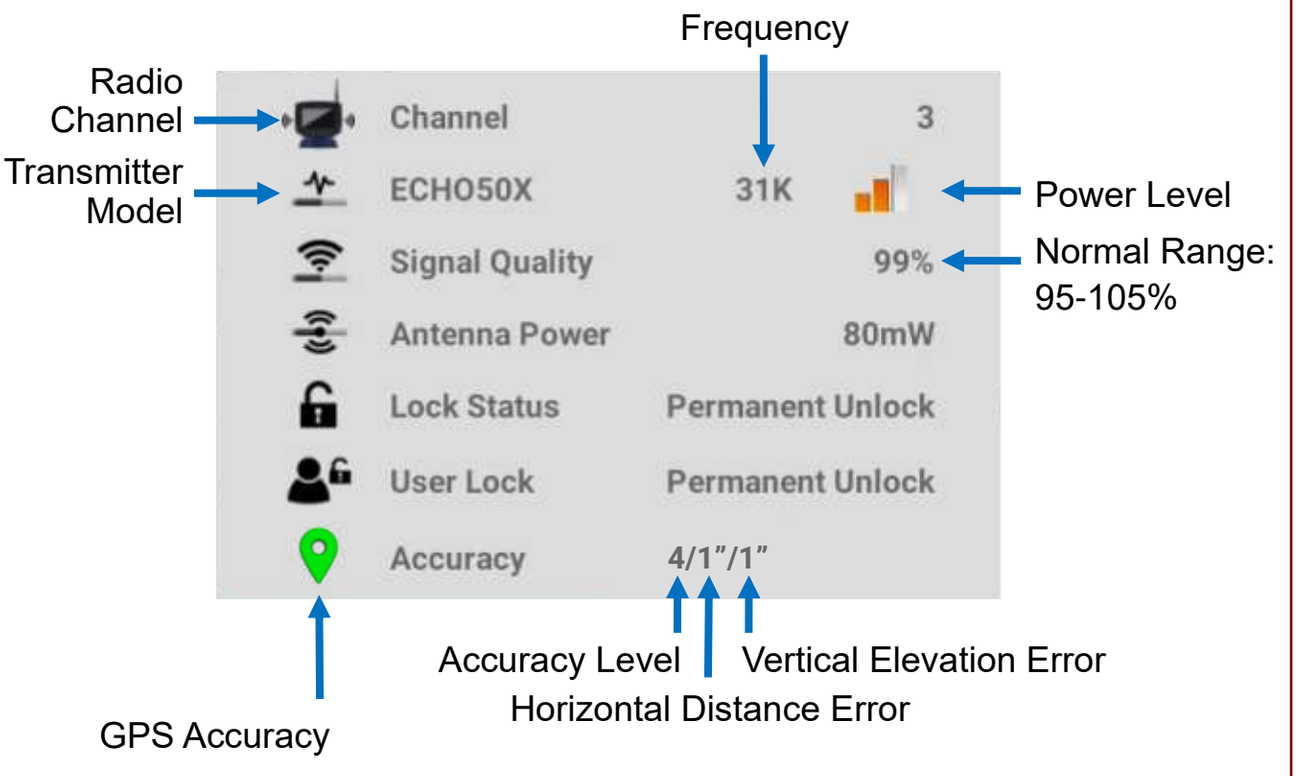


10: Locator

10.3: User Interface

10.3.2: System Status

1. Tap the to access the Status Screen
2. Press any key or tap the screen to exit



Accuracy States

- <4in (10cm)
- 4-12in (10-30cm)
- >12in (>30cm)
- GPS Inactive
- <4in (10cm) + RTK Correction
- 4-12in (10-30cm) + RTK Correction
- >12in (>30cm) + RTK Correction

10: Locator

10.3: User Interface

10.3.3: Settings Menu

1. Hold to access the Settings Menu
2. Touch and drag on the screen to Navigate, or press or
3. Tap the menu item you want to select, or press

10: Locator

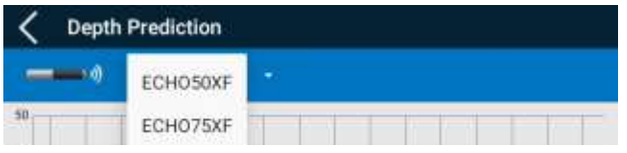
10.4: Operation

10.4.1: Depth Prediction during Pre-Bore Walk

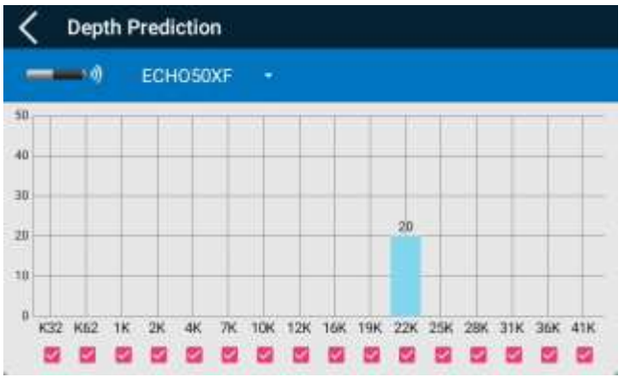
SCAN ME

Depth Prediction scans the local environment and helps select the best frequency to drill.

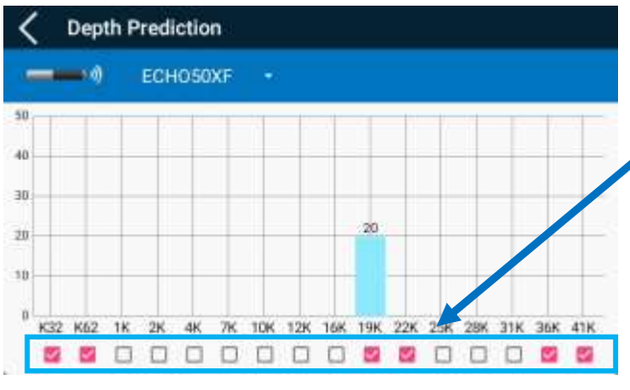
1. Power off all Transmitter
2. Hold ⚙
3. Tap **Depth Prediction**



4. Select your Transmitter from the dropdown list



5. Press ▼ or ▲ to check the range of each frequency
6. A line and number indicating **Predicted Range** will appear for the selected frequency in that area.
7. Press ▼ or ▲ to check each selected frequency.



8. Tap the checkbox under each frequency you want to check to narrow the frequency selection
9. Press ▼ or ▲ to check through the selected frequencies.

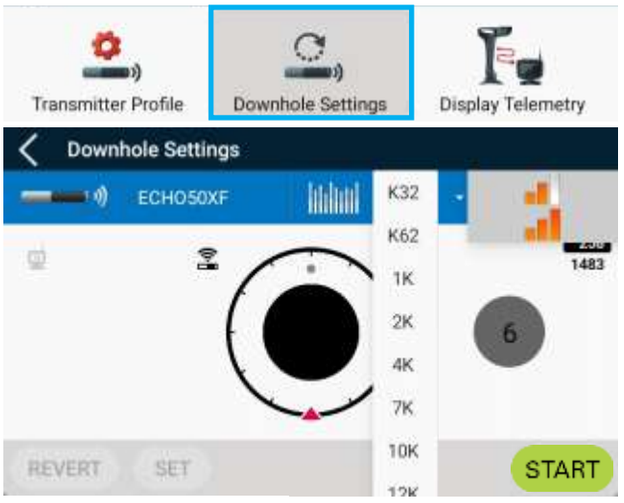
10. Press ⚙ 2x to return to the Locate screen

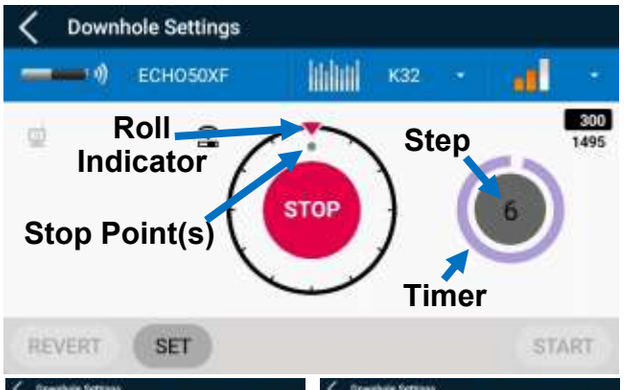
10: Locator

10.4: Operation

10.4.2: Downhole Change: Locator and Transmitter

SCAN ME





1. Hold ⚙
2. Tap **Downhole Settings**
3. Tap to select a **Frequency**
4. Tap to select a **Power Level**
5. Tap **Start** to initiate the **Roll Guide Sequence**, a 6 step sequence of timed clock positions that takes 3 minutes to complete.
6. Rotate the drill head clockwise until the **Roll Indicator** is on the **Stop Point(s)**. The inner black circle will flip to red with **STOP.** A **Timer** will start. (The first step timer is the longest.)
7. Once the timer reaches 0, rotate the drill head clockwise until the **Roll Indicator** is within the next set of **Stop Points**. A **Timer** will activate again.
8. **Before the Timer reaches 0**, rotate the drill head clockwise until the **Roll Indicator** is within the next set of **Stop Points**.
9. Repeat this process for all 6 steps of the sequence.
10. A green **Check Mark** will appear if done correctly.
11. Press ⚙ 2x to exit.

NOTICE

If the **Timer** reaches 0 before the **Roll Indicator** is on the designated **Stop Point(s)**, the sequence will fail.

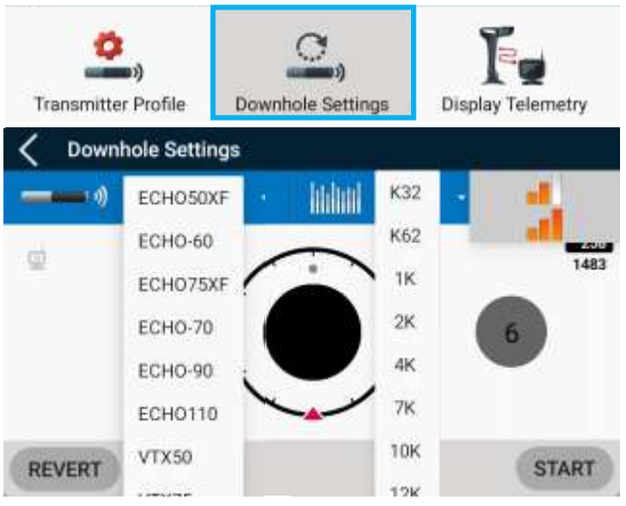
If the **Stop Point(s)** do not move, rotate the drill head one full rotation until the **Roll Indicator** points towards the **Stop Point(s)**

10: Locator

10.4: Operation

10.4.3: Downhole Change: Locator Only

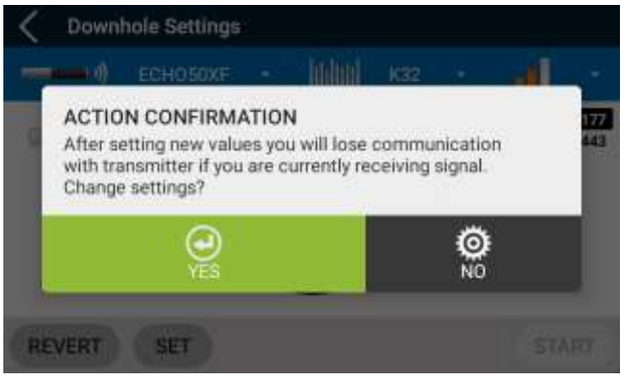
SCAN ME



1. Hold ⚙
2. Tap **Downhole Settings**

3. Tap to select a **Transmitter**
4. Tap to select a **Frequency**
5. Tap to select a **Power Level**

6. Tap **Set**



7. Tap **Yes** to Confirm the Locator Settings.
8. Press ⚙ 2X to exit.

NOTICE

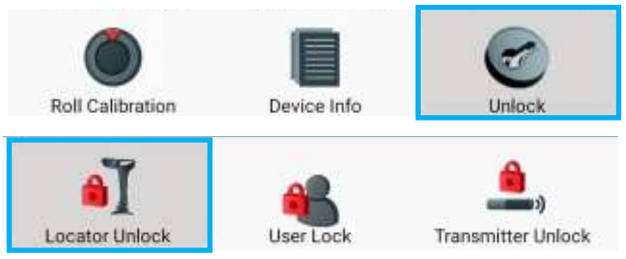
Changing the Locator settings will cause you to lose communication with any Transmitter that is currently receiving signal.

This procedure should be used to match the known settings of a Transmitter that you are unable to pair with.

10: Locator

10.5: Lock/Unlock

10.5.1: Locator Unlock



1. Hold ⚙
2. Tap **Unlock**
3. Tap **Locator Unlock**

Unlock Over the Internet

1. Tap **Unlock over the internet**

2. Tap **OK**

3. Your system is now **Unlocked**

Unlock manually

1. Tap **Unlock manually**

2. Call (515) 505-0960 and provide them with the **Serial Number** and the **Serial Code**
3. Enter the **Unlock Code** they provide to you over the phone
4. Tap **OK**
5. Your system is now **Unlocked**

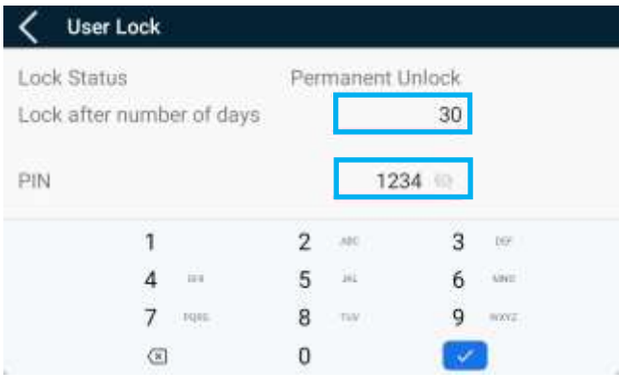
10: Locator

10.5: Lock/Unlock

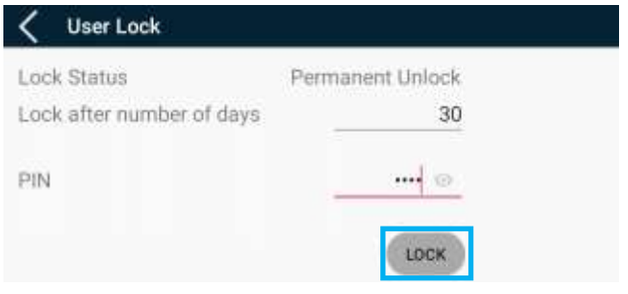
10.5.2: User Lock

1. Hold ⚙
2. Tap **Unlock**

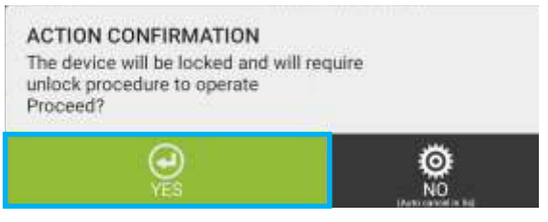
3. Tap **User Lock**



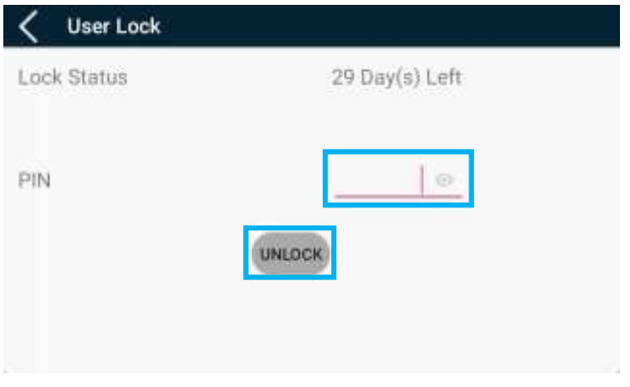
4. Enter the number of **Days** you want the system to stay unlocked for.
5. Set a **PIN**



6. Tap **Lock**



7. Tap **Yes** to confirm

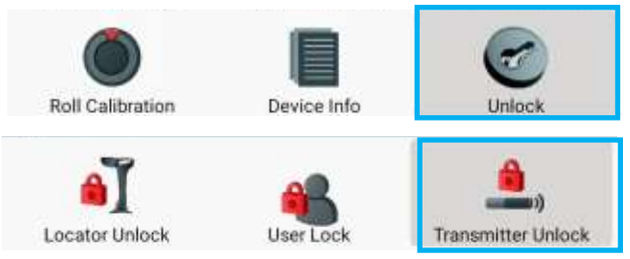


8. To Unlock the User Lock, Enter the **PIN**
9. Tap **Unlock**
10. Press ⚙ 3x to exit.

10: Locator

10.5: Lock/Unlock

10.5.3: Transmitter Unlock



1. Hold ⚙
2. Tap **Downhole Settings**
3. Tap **Transmitter Unlock**

4. Tap to connect to the Transmitter

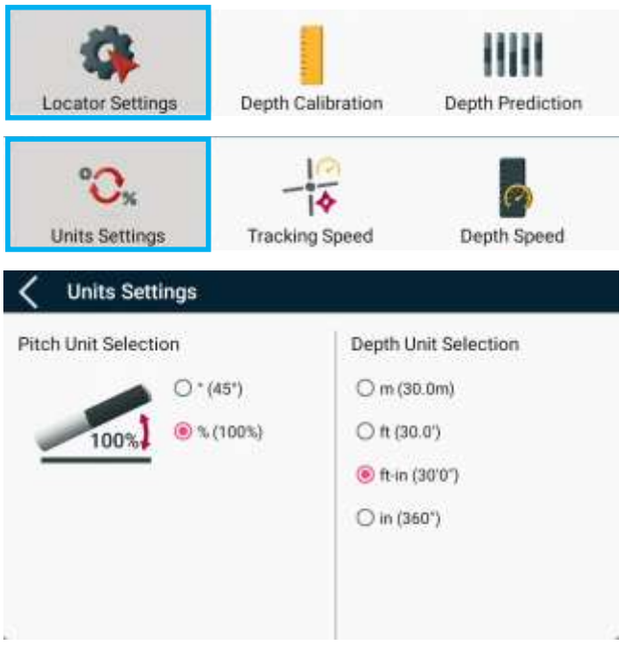
5. Tap to **Unlock**

6. Press ⚙ 3x to exit.

10: Locator

10.6: Locator Settings

10.6.1: Unit Selection

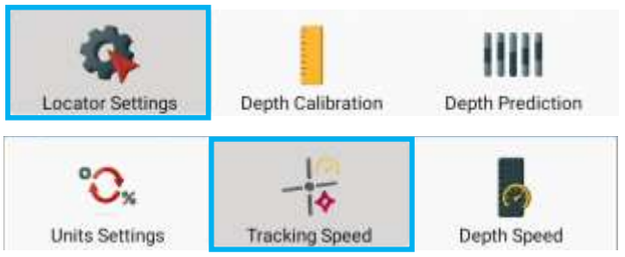


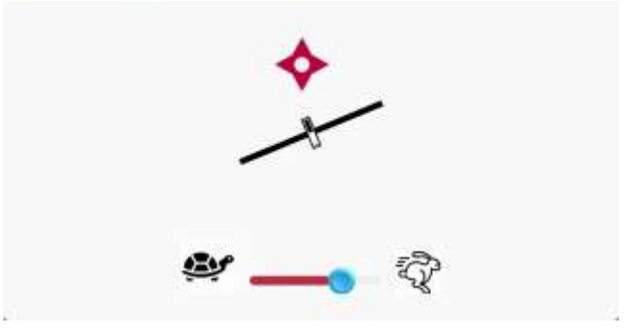
1. Hold ⊙
2. Tap **Locator Settings**
3. Tap **Unit Settings**
4. For **Pitch,** select between **Degrees** or **Percent**
5. For **Depth**, select between meters, feet, feet and inches, or inches
6. Press ⊙ 3x to exit.

10: Locator

10.6: Locator Settings

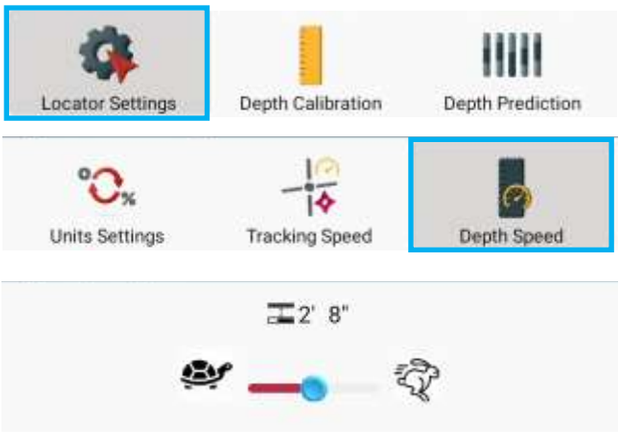
10.6.2: Tracking Speed





1. Hold ⊙
2. Tap **Locator Settings**
3. Tap **Tracking Speed**
4. Adjust the blue dial ● to adjust your **Tracking Speed**
5. Use the preview window to fine tune to your preference.
6. Press ⊙ 3x to exit.

10.6.3: Depth Speed



1. Hold ⊙
2. Tap **Locator Settings**
3. Tap **Depth Speed**
4. Adjust the blue dial ● to adjust your **Depth Speed**
5. Use the preview window to fine tune to your preference.
6. Press ⊙ 3x to exit.

NOTICE

Adjusting the **Tracking Speed** enables operators to more easily fine tune the left-right target and bore indicator when drilling at extreme depths.

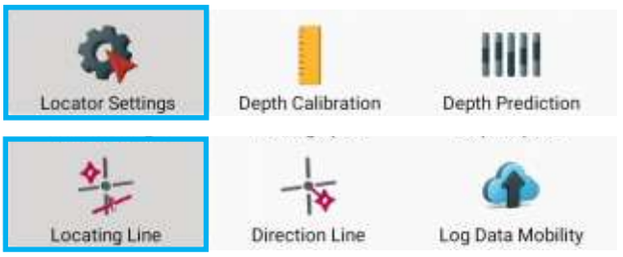
Adjusting **Depth Speed** allows the operator to control the depth readout when at extreme depths or in high interference areas.

In these situations, depth readout can become erratic or bounce up and down making it difficult to pinpoint depth. Reducing **Depth Speed** readout will improve accuracy.

10: Locator

10.6: Locator Settings

10.6.4: Locate Line

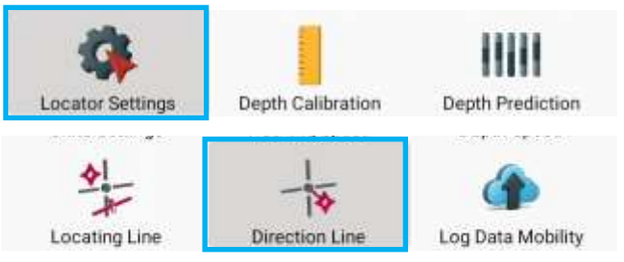


1. Hold ⚙
2. Tap **Locator Settings**
3. Tap **Locating Line**

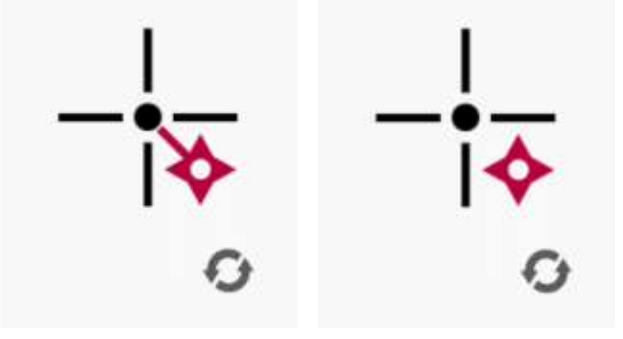
4. Tap ↻ to Enable or Disable the **Locating Line**
5. Press ⚙ 3x to exit.

Enabled **Disabled**

10.6.5: Direction Line



1. Hold ⚙
2. Tap **Direction Settings**
3. Tap **Direction Line**



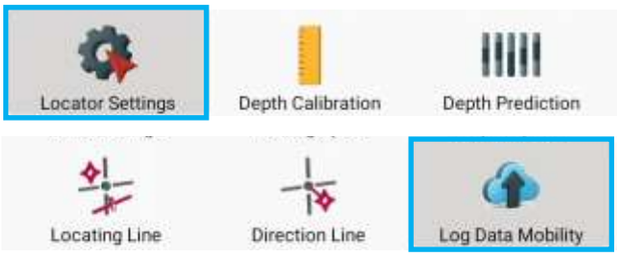
4. Tap ↻ to Enable or Disable the **Direction Line**
5. Press ⚙ 3x to exit.

Enabled **Disabled**

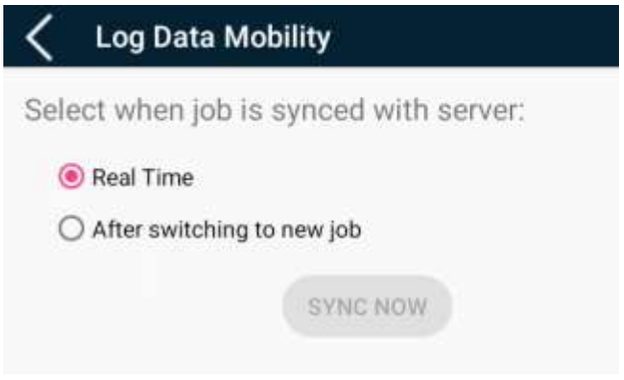
10: Locator

10.6: Locator Settings

10.6.6: Log Data Mobility

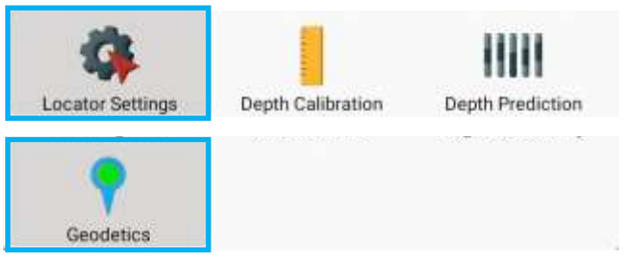


1. Hold
2. Tap **Locator Settings**
3. Tap **Log Data Mobility**

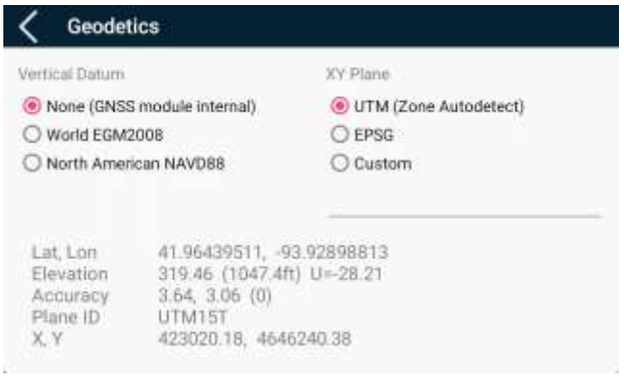


4. Select between **Real Time** and **After switching to new job**
5. You may also press **Sync Now** to manually sync the job data if **Real Time** is not set
6. Press 3x to exit.

10.6.7: Geodetics



1. Hold
2. Tap **Locator Settings**
3. Tap **Geodetics**



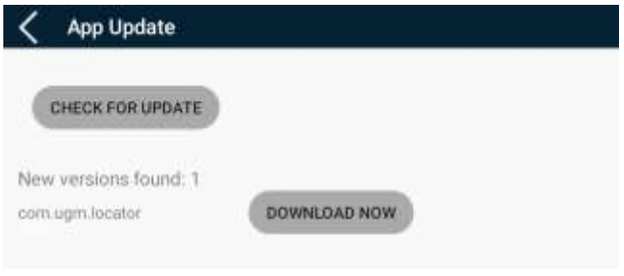
4. Select a **Vertical Datum**
5. Select an **XY Plane**
6. Select Press 3x to exit.

10: Locator

10.6: Locator Settings

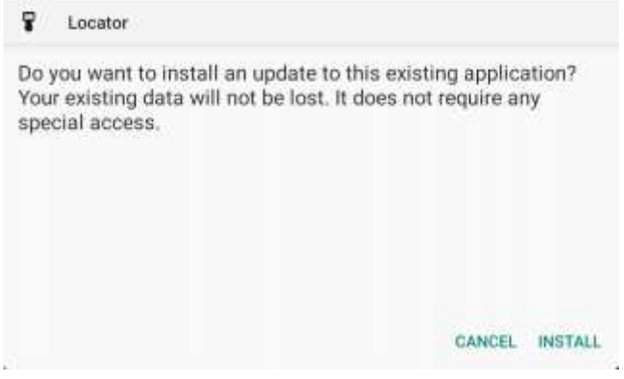
10.6.8: App Update

1. Hold ⚙
2. Tap **App Update**

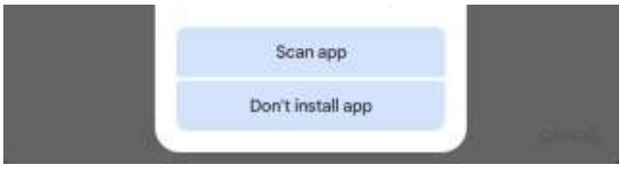


3. Tap **Check for Update**

4. Tap **Download Now** if a new version is available.

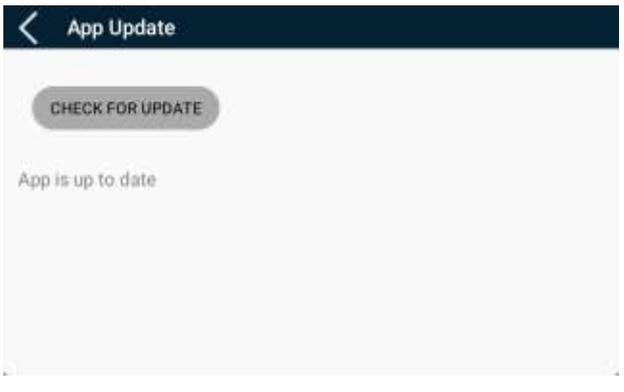


5. Tap **Install**



6. Tap **Scan app**

7. Tap **Install**



8. The application should restart and your system is up-to-date!

10: Locator

10.6: Locator Settings

10.6.9: Device Info

1. Hold ⊙
2. Tap **Device Info**

3. View **Device Info**

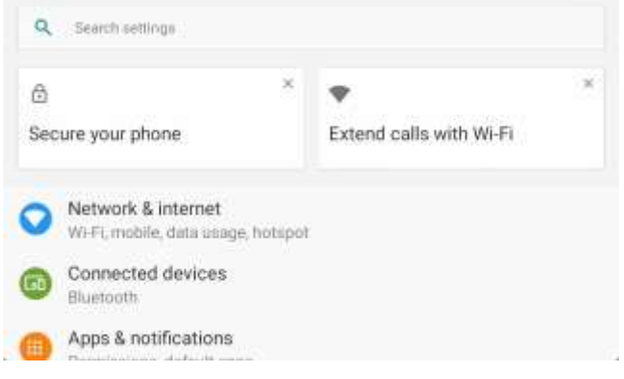
4. Tap **More** to see more **Device Info**

5. Tap **More** under **Licenses** to see more **Device Info**

6. Press ⊙ 3x to exit.

10.6.10: Android Settings

1. Hold ⊙
2. Tap **Settings**



3. Search or scroll through the Setting options to change what's needed.

4. Press ⊙ 3x to exit.

10: Locator

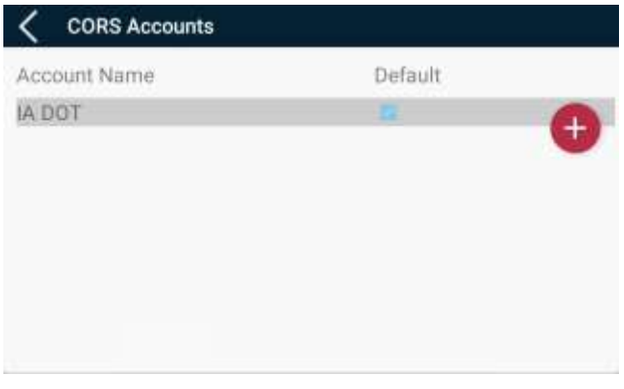
10.6: Locator Settings

10.6.11: CORS Accounts

1. Hold ⚙
2. Tap **CORS Accounts**

3. Tap ⊕ to add a **CORS Account.**

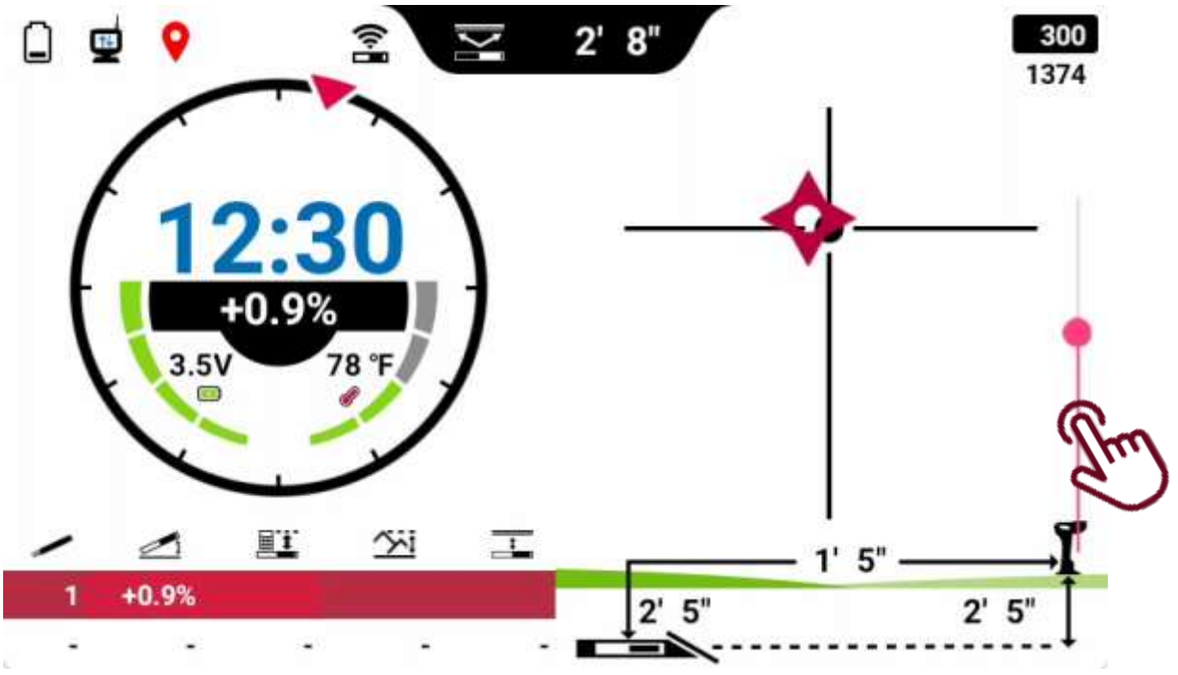
4. Type in the account information
5. Tap **Save**



6. The **CORS Account** will appear in the account list.
7. Press ⚙ 2x to exit.

10: Locator

10.7: Screen Brightness



From the Main Display Page, with your finger tap on the right side of the screen as shown above. A slider will appear. Hold your finger on the indicator to adjust the brightness level of the Display.

10.8: Locator Maintenance

- The Locator uses rechargeable lithium batteries. The Locator will automatically shut off 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 Locator if it is not being used for a long period of time to avoid potential corrosion.
- The Locator is an electronic measurement device. Severe shock and impact can damage the housing and the electronics inside the housing.
- Keep the Locator away from excessive heat to avoid damages to the plastic housing and the electronics inside the housing.
- Do not soak the Locator in excessive amounts of water.

11: Display

11.1: Display Specifications

Display	7-inch Color Touch Screen Android Operating System
Data-Log	Built-in
Temp Range	-4°F to 140°F (-20°C to 60°C)
Radio Frequency	915 MHz
Telemetry	4-channel radio with range Up to 3,000ft. (900m)*
Power (12.5V)	Rechargeable Lithium Battery
Battery Life	Up to 50 hours
Dimensions	7.5” x 5.1” x 7.5” (19cm x 13.9cm x 19cm)
Weight	3.3 lbs. (1.5 kg)
Water resistant	IP65

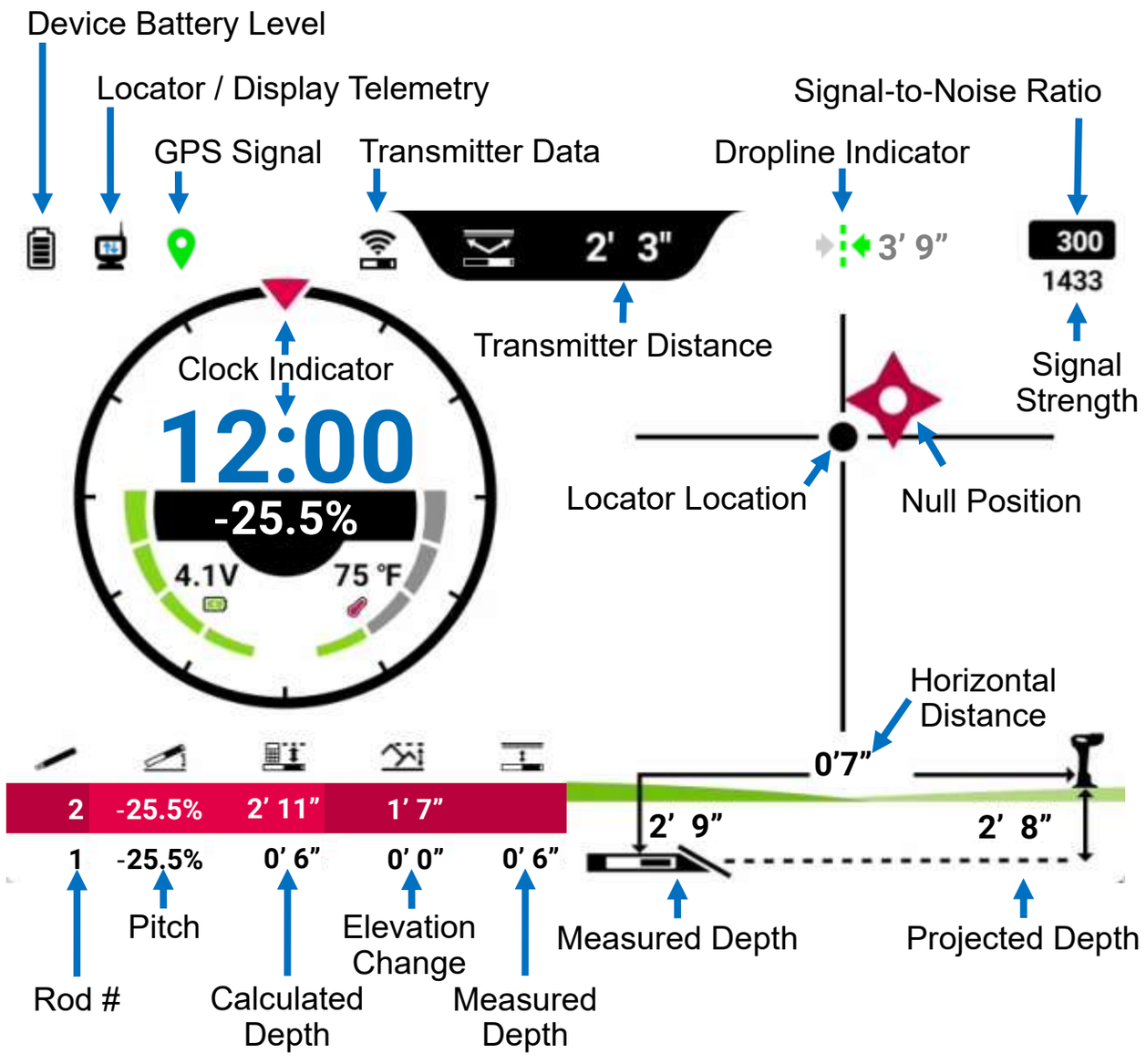
11.2: Button Operation

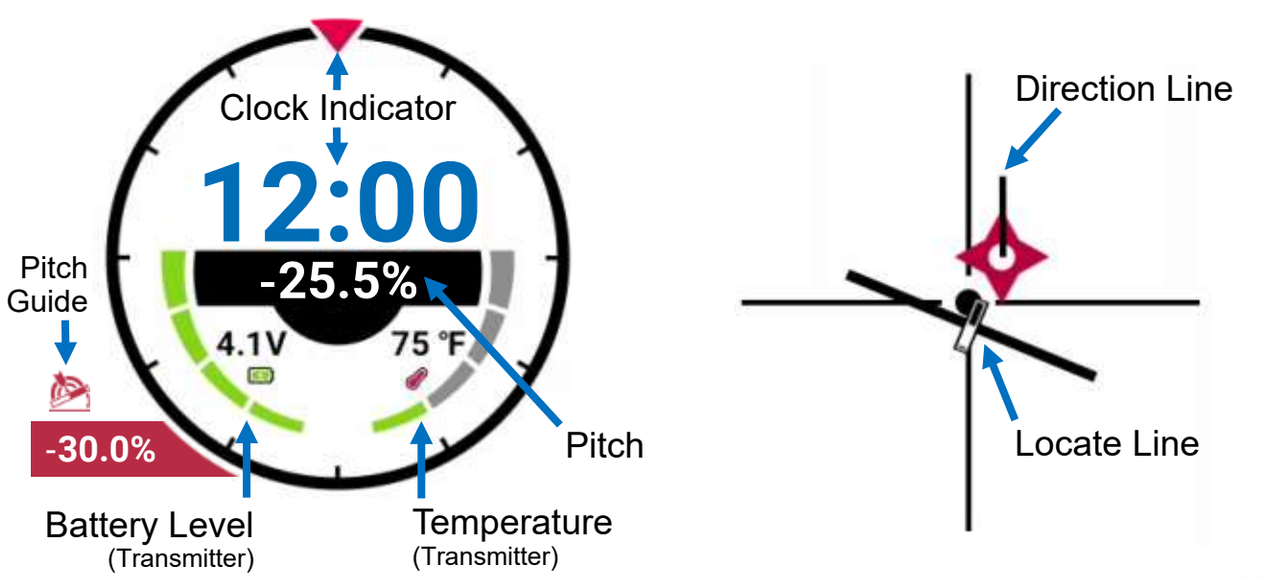
Power key	* Hold to turn on or off
Up key	* Move to previous cursor selection. * Tap to enter Data page for Bore-Log
Down key	* Move to next cursor selection * Tap to view Bore Profile
Confirm key	* Tap to confirm cursor selection * Tap on main page to record Bore data
Setup key	* Tap to return to main page. * Hold to enter Configuration page

11: Display

11.3: User Interface

11.3.1: Locate Screen



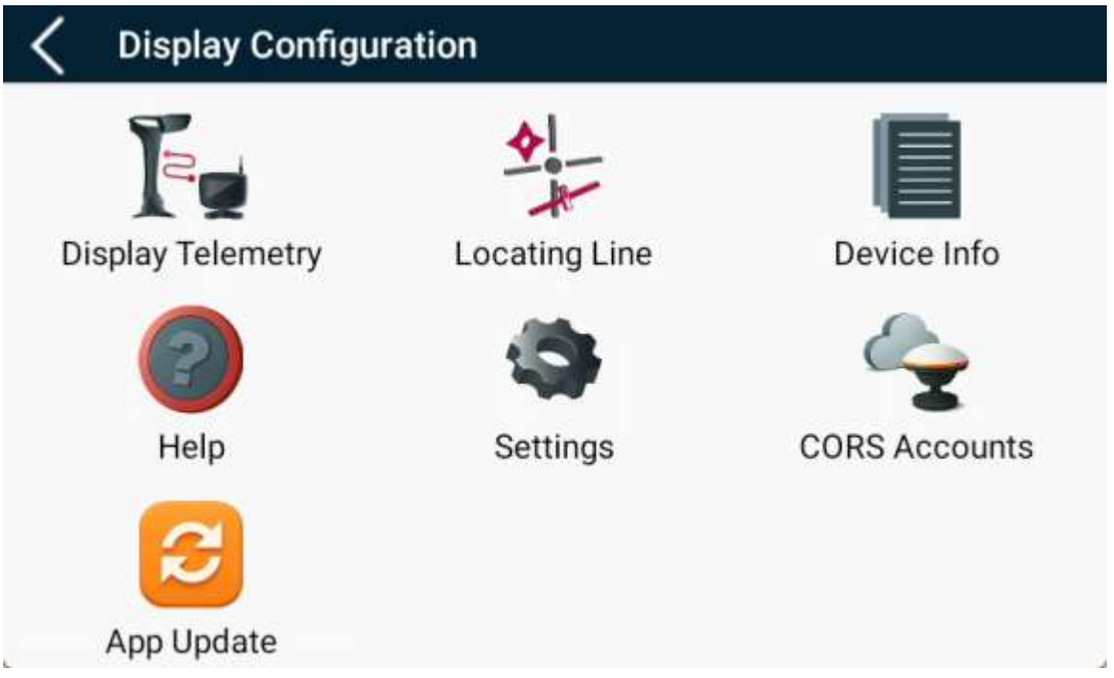


11: Display

11.3: User Interface

11.3.2: Settings Menu

1. Hold to access the Settings Menu
2. Touch and drag on the screen to Navigate, or press or
3. Tap the menu item you want to select, or press

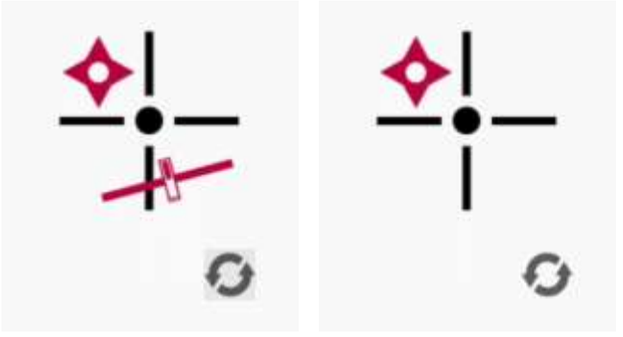


11: Display

11.4: Display Settings

11.4.1: Locate Line

1. Hold ⚙
2. Tap **Locating Line**



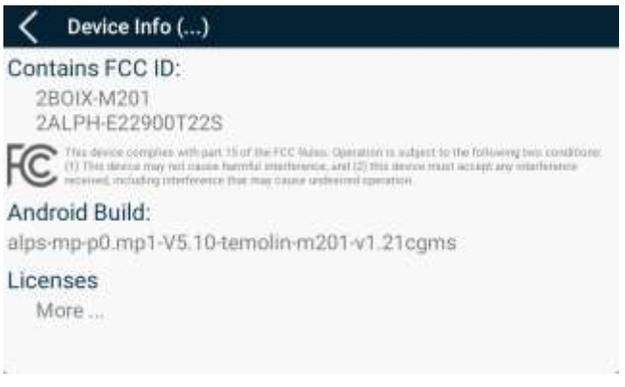
3. Tap ↻ to Enable or Disable the **Locating Line**
4. Press ⚙ 2x to exit.

Enabled **Disabled**

11.4.2: Device Info

1. Hold ⚙
2. Tap **Device Info**

3. View **Device Info**
4. Tap **More** to see more **Device Info**



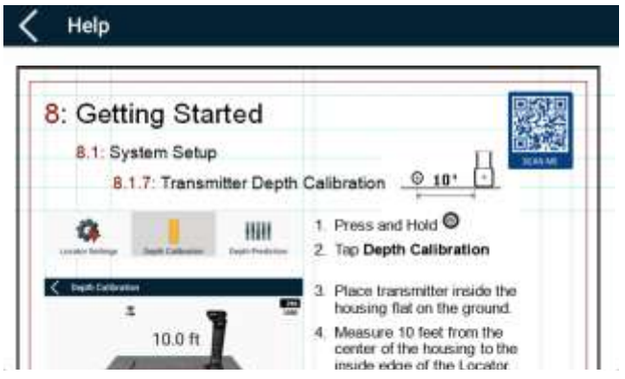
5. Tap **More** under **Licenses** to see more **Device Info**
6. Press ⚙ 3x to exit.

11: Display

11.4: Display Settings

11.4.3: Help

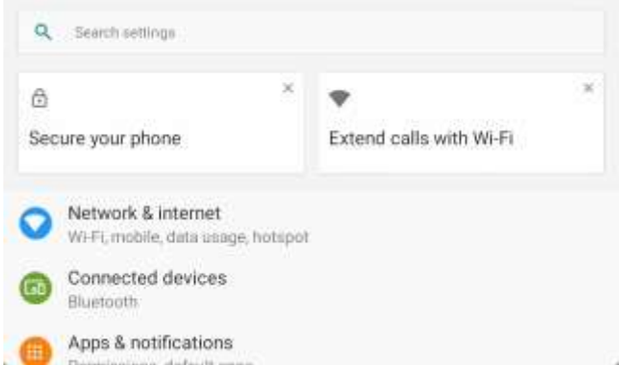
1. Hold ⊙
2. Tap **Help**



3. From here you may view useful topics from this Manual.
4. Press ⊙ 2x to exit.

11.4.4: Android Settings

1. Hold ⊙
2. Tap **Settings**



3. Search or scroll through the Setting options to change what's needed.
4. Press ⊙ 2x to exit.

11: Display

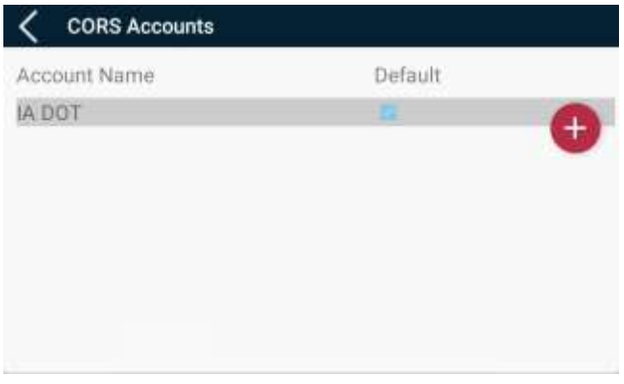
11.4: Display Settings

11.4.5: CORS Accounts

1. Hold ⚙
2. Tap **CORS Accounts**

3. Tap ⊕ to add a **CORS Account.**

4. Type in the account information
5. Tap **Save**



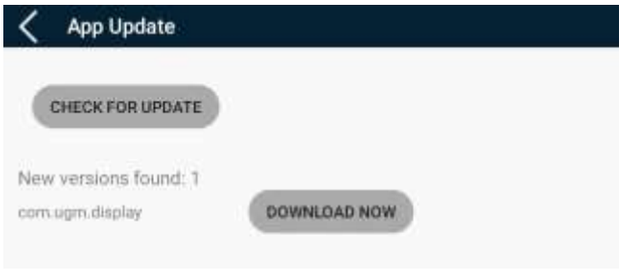
6. The **CORS Accounts** will appear in the account list.
7. Press ⚙ 2x to exit.

11: Display

11.4: Display Settings

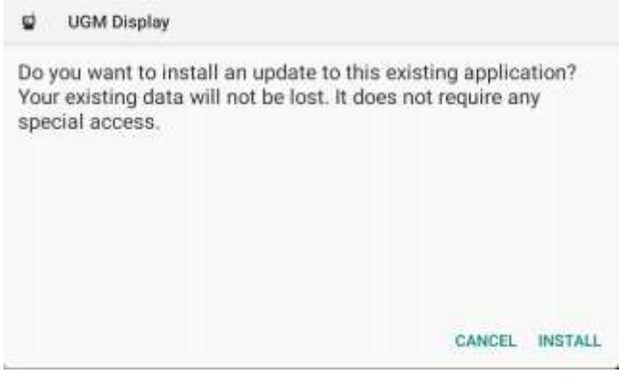
11.4.6: App Update

1. Hold ⚙
2. Tap **App Update**

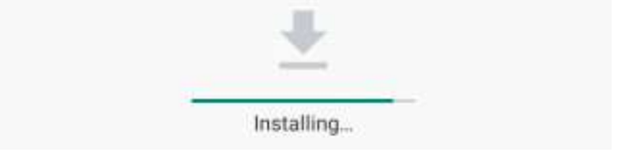


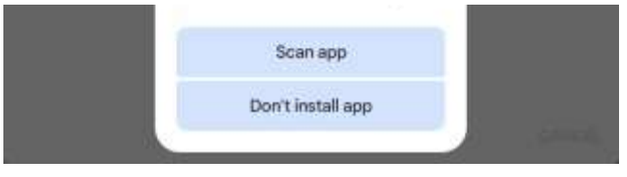
3. Tap **Check for Update**

4. Tap **Download Now** if a new version is available.



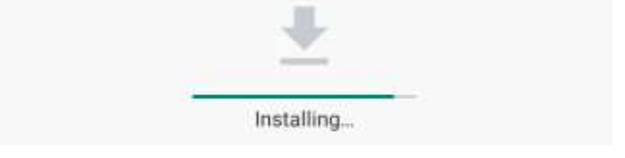
5. Tap **Install**

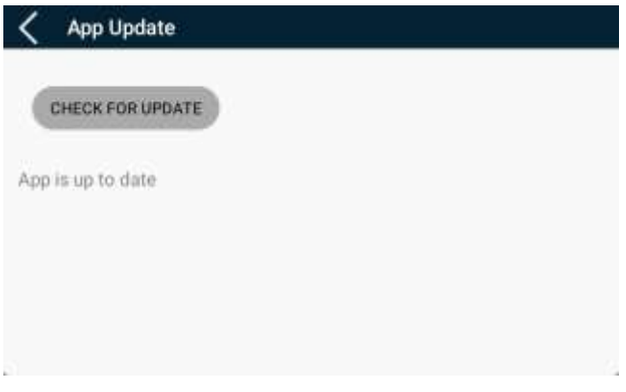




6. Tap **Scan app**

7. Tap **Install**

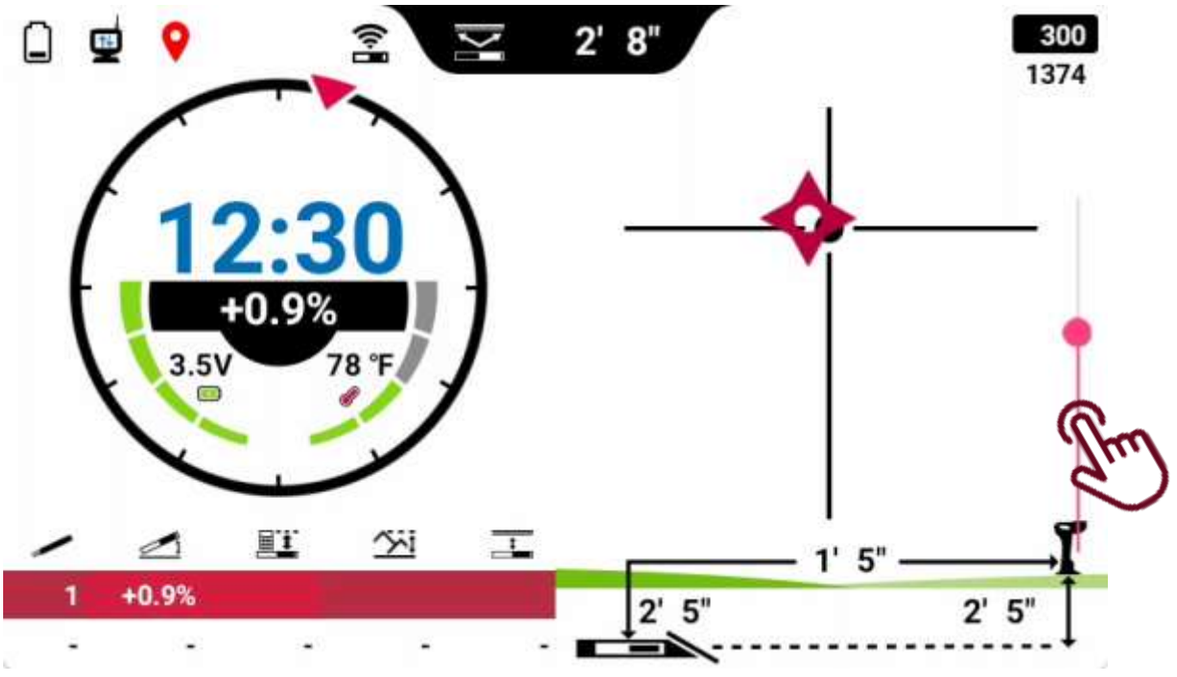




8. The application should restart and your system is up-to-date!

11: Display

11.5: Screen Brightness



From the Main Display Page, with your finger tap on the right side of the screen as shown above. A slider will appear. Hold your finger on the indicator to adjust the brightness level of the Display.

11: Display

11.6: Display Maintenance

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

12: Transmitter

12.1: Introduction

The Transmitter provides drill head temperature, clock position, pitch, battery status and locating signal.

The Transmitter transmits signals at:
.325kHz, .625kHz, 1kHz, 2kHz, 4kHz, 7kHz, 10kHz, 12kHz, 16kHz, 19kHz, 22kHz, 25kHz, 28kHz, 31kHz, 36kHz and 41kHz.

The Transmitter will enter a “sleep” mode after 60 minutes without rotation.

It takes 10 seconds to “wake up” once the Transmitter is rotated.

NOTICE

If drilling in adverse soil conditions (i.e. rock), normal C cell batteries will experience battery chatter. This can greatly reduce battery life. To prevent this, use your provided double C lithium or UM Rechargeable Echo Cell Kit.

12: Transmitter

12.2: Specifications

Echo XMINI

Dimensions	1” X 8” (2.5 cm x 20.3 cm)
Frequency	2 frequencies 19kHz and 30kHz
Depth Range	60ft (18m)
Power	(1) 18650 Rechargeable Lithium Battery
18650 (3.7V)	18 hours
Temperature	Under 190°F (87°C)
Battery Voltage	2.7V—4.2V

Echo ST

Dimensions	.78” X 6.3” (1.98 cm x 16 cm)
Frequency	31kHz
Depth Range	60ft (18m)
Power	(1) 16340 Rechargeable Lithium Battery
18650 (3.7V)	18 hours
Temperature	Under 190°F (87°C)
Battery Voltage	2.7V—4.2V

Echo 50XF

Dimensions	1.25” X 15” (3.2 cm x 38 cm)
Frequency	16 frequencies .325kHz to 41kHz
Depth Range	Normal Power: 131ft (40m) High Power: 164ft (50m)
Power	Echo Cell Kit (21700) or Lithium Battery (261020)
21700 (4.2V)	Normal Power: 50 hours High Power: 12 hours
261020 (3.7V)	Normal Power: 60 hours High Power: 15 hours
Temperature	Under 190°F (87°C)

12: Transmitter

12.2: Specifications

Echo 75XF

Dimensions	1.25” X 19” (3.2 cm x 48 cm)
Frequency	16 frequencies .325kHz to 41kHz
Depth Range	Low Power: 114ft (35m) Medium Power: 180ft (55m) High Power: 278ft (85m)
Power	(2) 26650 rechargeable lithium
26650 x 2	Low Power: 100 hours Medium Power: 60 hours High Power: 11 hours
Temperature	Under 190°F (87°C)
Battery Voltage	5.6V—8.4V

Echo 70

Dimensions	1.42” X 15.94” (3.6 cm x 40.5 cm)
Frequency	12 frequencies 4kHz to 41kHz
Depth Range	Normal Power: 164ft (50m) High Power: 230ft (70m)
Power	(3) 18650 rechargeable lithium batteries
18650 (3.7V)	Normal Power: 60 hours High Power: 15 hours
Temperature	Under 190°F (87°C)
Battery Voltage	8.4V—12.6V

12: Transmitter

12.2: Specifications

Echo 90

Dimensions	1.42” X 18” (3.6 cm x 45.7 cm)
Frequency	12 frequencies 4kHz to 41kHz
Depth Range	Normal Power: 230ft (70m) High Power: 295ft (90m)
Power	18650B2 rechargeable lithium batteries
18650B2 (3.7V)	Normal Power: 80 hours High Power: 20 hours
Temperature	Under 190°F (87°C)
Battery Voltage	5.6V—8.4V

Echo 110

Dimensions	1.42” X 24” (3.6 cm x 60.9 cm)
Frequency	12 frequencies 4kHz to 41kHz
Depth Range	Normal Power: 295ft (90m) High Power: 360ft (110m)
Power	(3) 18650B2 rechargeable lithium batteries
18650B2 (3.7V)	Normal Power: 120 hours High Power: 30 hours
Temperature	Under 190°F (87°C)
Battery Voltage	8.4V—12.6V

12: Transmitter

12.3: Digital Information

- **Pitch**: From -100% to +100% with 0.1% resolution within the range of –45% to +45% and 1.0% resolution outside of that range.
- **Roll**: 24 Transmitter roll positions.
- **Battery**: Install batteries positive side down and install battery cap with provided battery cap tool.
-
  - **Lithium**: Echo Power Cell will show full until completely dead.
  - **Echo Cell Kit**: Rechargeable Lithium Echo Cell Kit will meter battery life while discharging.

  Note: See **7.5.4** to select battery style that will be used in Transmitter.
- **Temperature**: When the Transmitter is overheating, temperature indication in the Locator's screen flashes. If temperature reaches over 190°F Transmitter may be permanently damaged if operated above this temperature.

12.4: Transmitter Maintenance

- Do not place the Transmitter near excessive temperature over 190°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 if necessary.

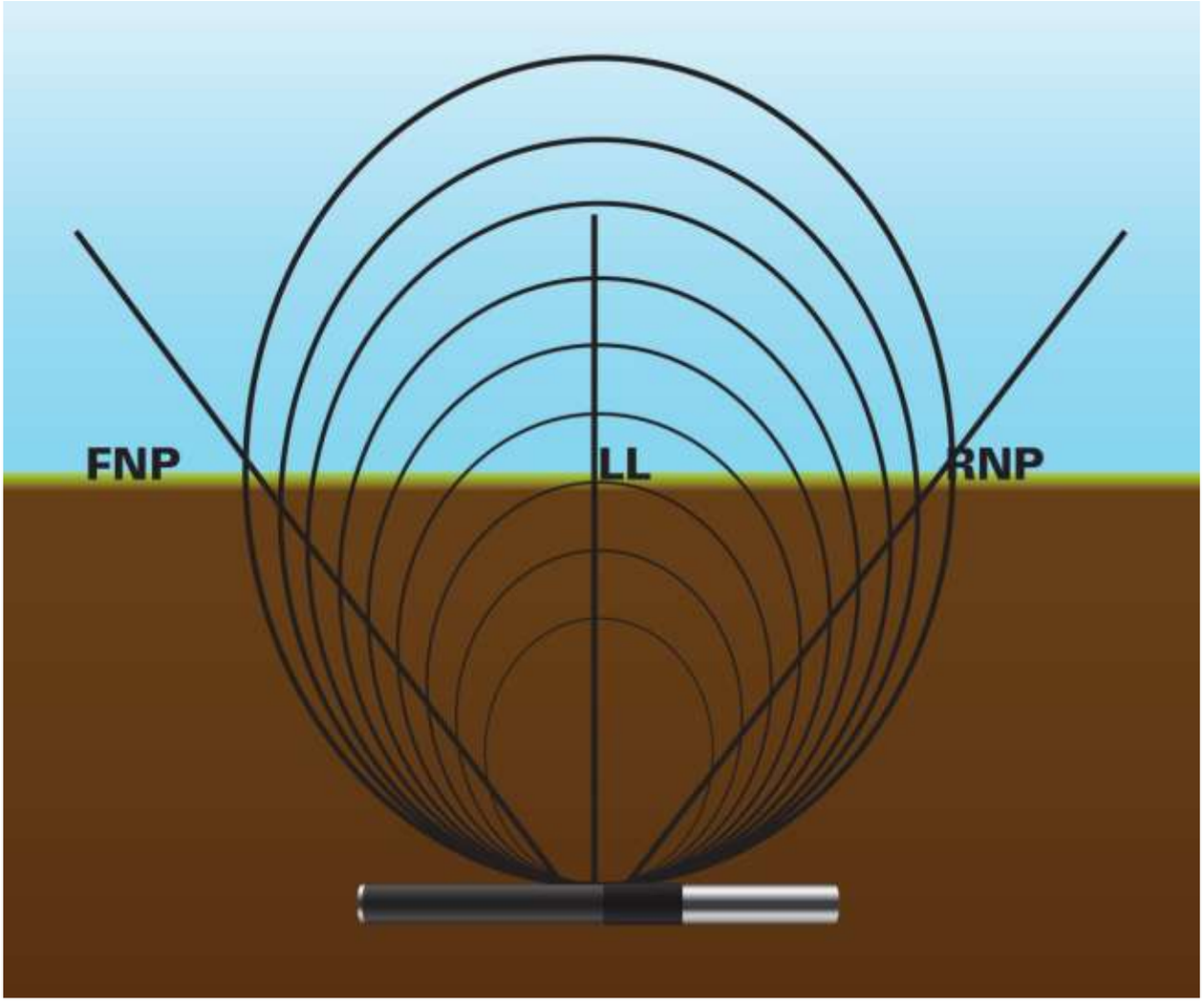
13: Locating Methods

13.1: Three Point Locating

13.1.1: The Basics

One major advantage of the Mag system is its simplicity. Once the Locator and the Transmitter are paired, the operator is not required to push any buttons to pinpoint the location, direction or depth of the Transmitter.

The Mag Locator locates the Transmitter by pinpointing three specific locations along the Transmitter's magnetics field. The front null point (FNP) ahead of the Transmitter, the rear null point (RNP) behind the Transmitter and the locate line (LL) above the Transmitter.

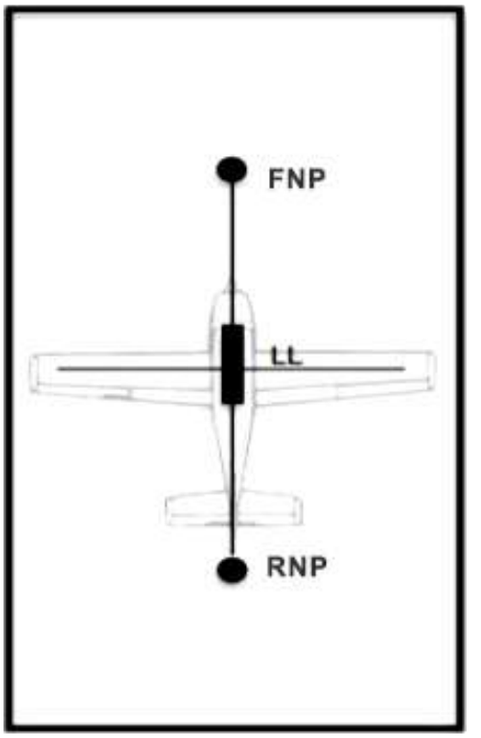


13: Locating Methods

13.1: Three Point Locating

13.1.2: Locate the Transmitter

The Locate Line (LL) extends left and right of the Transmitters center. Because of the physics of the Locators magnetic field, the LL can look the same several feet to the right or left of the Transmitters actual location. This is why it is important to at least locate the front null point (FNP) first before moving back to locate the head. For pinpoint location, find both the FNP and RNP before moving over the head. Draw a string line between the FNP and the RNP and your head will be directly in line and in between these points.

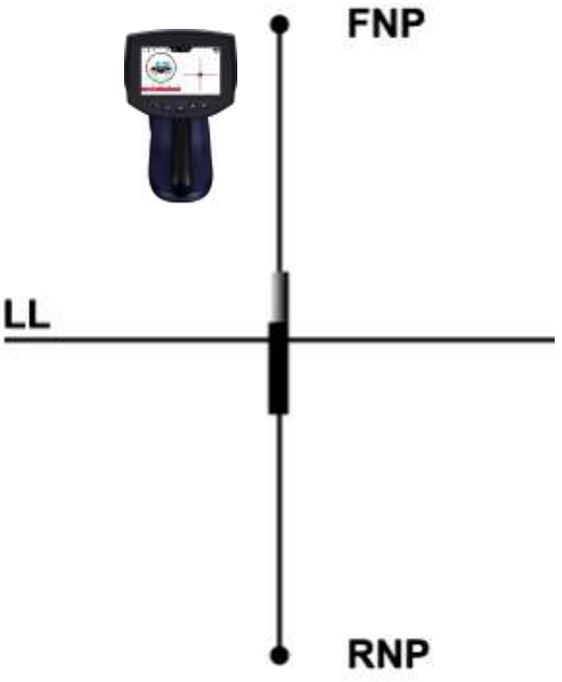


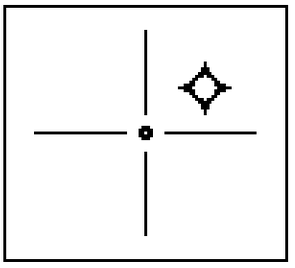
Think of the Transmitter as the shape of an airplane. The FNP is the nose and the RNP the tail. Find the FNP and the RNP and the center of the Transmitter is centered over the wings.

13: Locating Methods

13.1: Three Point Locating

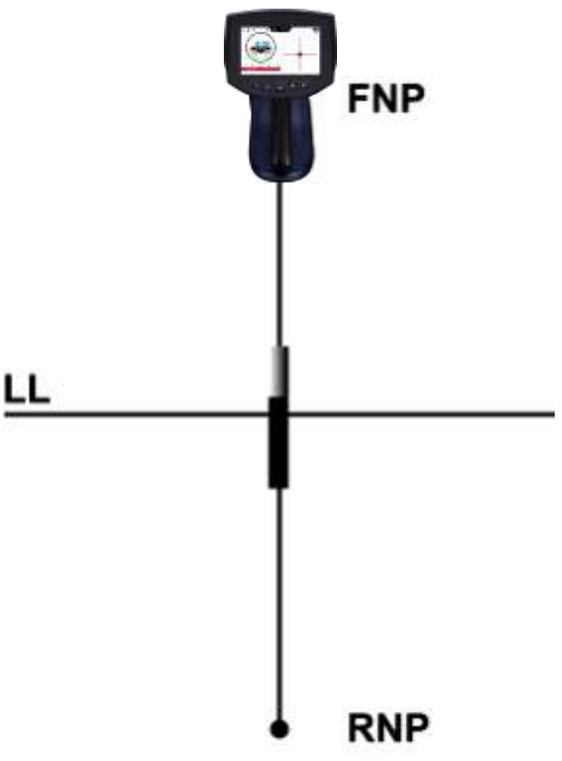
13.1.3: Locate the Front Null Point

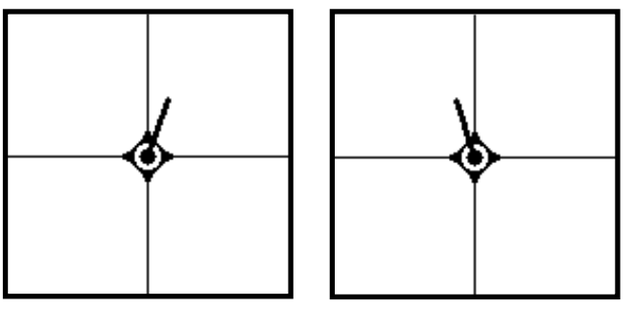




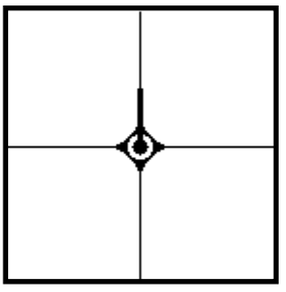
In this scenario the Transmitter is behind you and you are walking toward the Front Null Point (FNP.)

To locate the FNP in this scenario, move forward and to your right until the Target centers on the crosshair. You are now at the FNP.





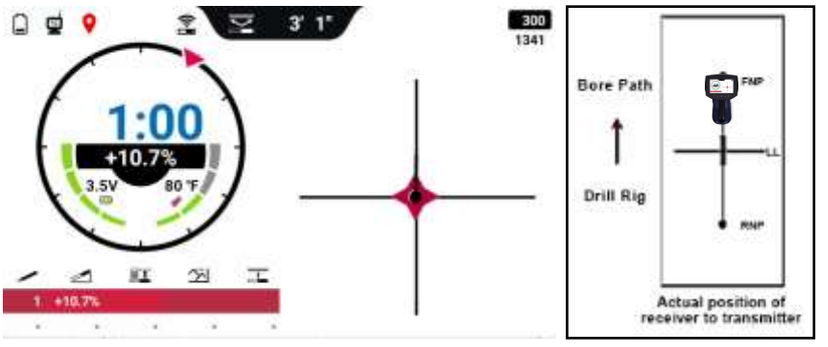
At the FNP, rotate the Locator in hand left or right until the Directional Line is centered, indicating the Transmitter is directly in line behind you.



13: Locating Methods

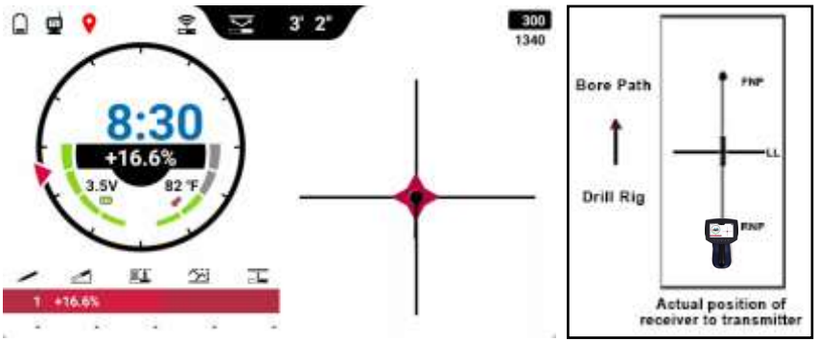
13.1: Three Point Locating

13.1.4: Locate the FNP, RNP, and LL



Front Null Point (FNP)

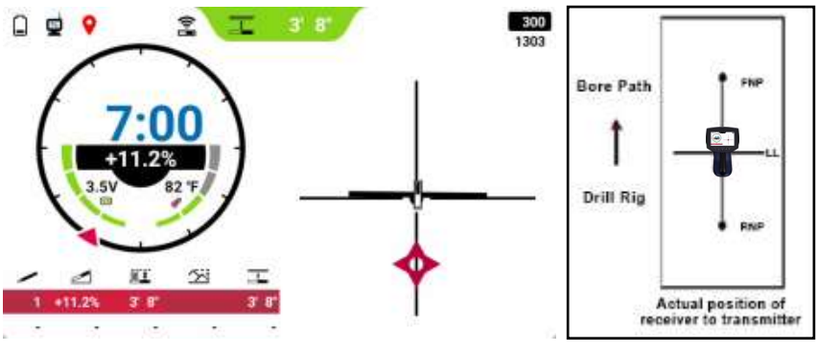
The FNP is a point in front of the Transmitter. (Think of it as the sight at the end of a rifle.) This is the direction of the Transmitter.
Locate it by putting the **Target** in the center.



Rear Null Point (RNP)

The RNP is a point behind the Transmitter and will look just like the FNP.

Locate it the same way by moving back until the **Target** appears in the center.



Locate Line (LL)

Imagine a line that runs through the FNP and RNP.

Locate the LL by walking along that line until the **LL Indicator** on the Locator screen enters the center. You are now above the LL, or head.

13: Locating Methods

13.1: Three Point Locating

13.1.5: Tracking on the Fly

Tracking on the Fly is a simple process that will increase the speed at which the bore can be completed. The Display and Locator screens are mirrored in both modes, minimizing communication between operators.

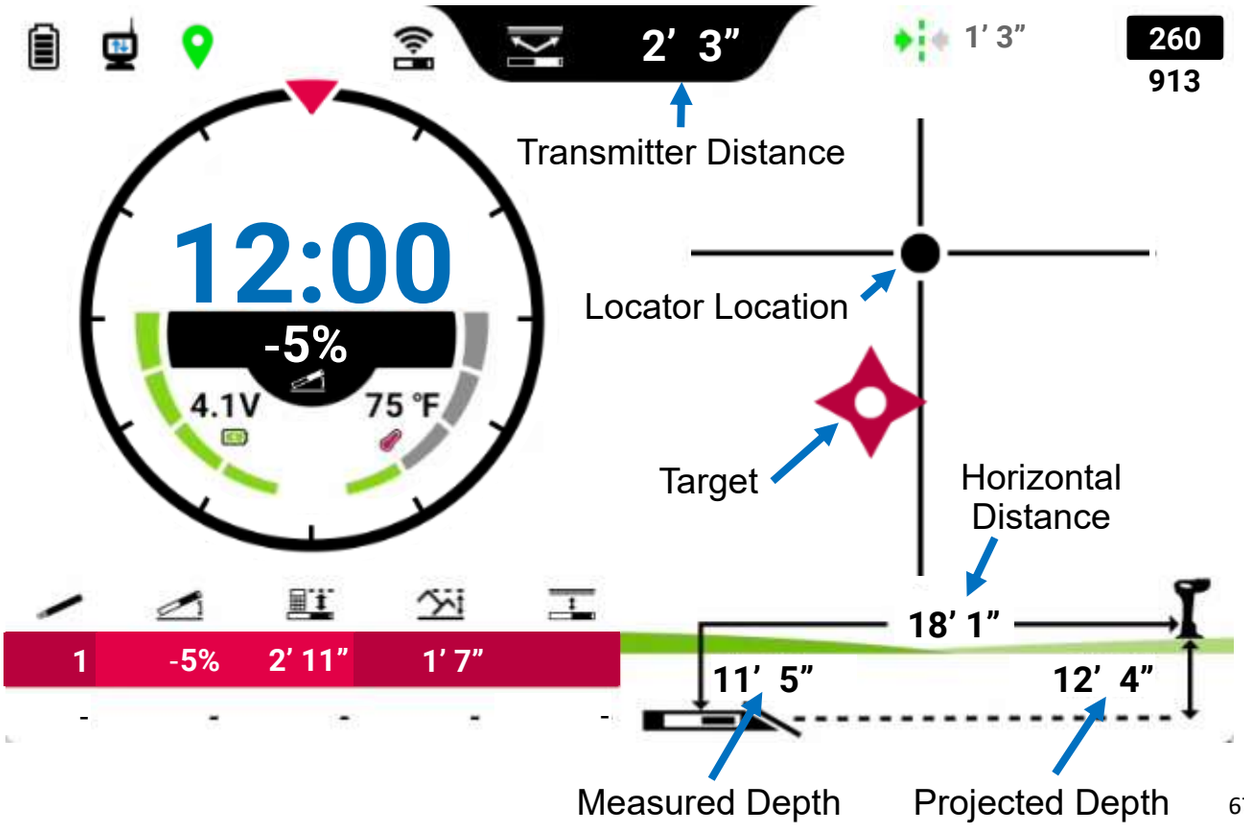
1. Drill the first few rods to establish line and pitch.
2. Walk past the FNP by 10ft, or one full length of rod.
   Stay out in front of the FNP for more accurate left/right sensitivity in Bore-To mode.
3. Place the Locator on the desired bore path, pointing in the direction you want to go.
4. Press ▼ to show the **Tool Menu** then Press ▼ again to enable the **Bore-To mode**, (Repeat to return to **Walkover mode**)
5. If the Transmitter is pointing directly at your Locator, you will see the **Horizontal Distance** and the **Target** directly on the **Vertical Line** indicating you're heading directly to the Locator.
6. Maintain pitch to show the correct **Projected Depth** and **Measured Depth**.
7. Keep the Target centered and you're on track to the Locator.

Depth is displayed in real time correcting for pitch changes giving both operators the ability to see the **Predicted Depth** of the head if drilled all the way to the Locator.

In the figure below, the pitch is minus 5% meaning the calculated depth will be 12'4" when the Transmitter arrives.

The head is 18' 1" behind the Locator and headed slightly left of center.

To correct for the deviation, stop drilling and instruct the drill operator to rotate the drill rod to the appropriate clock and push until the Target is back on track with the vertical line.

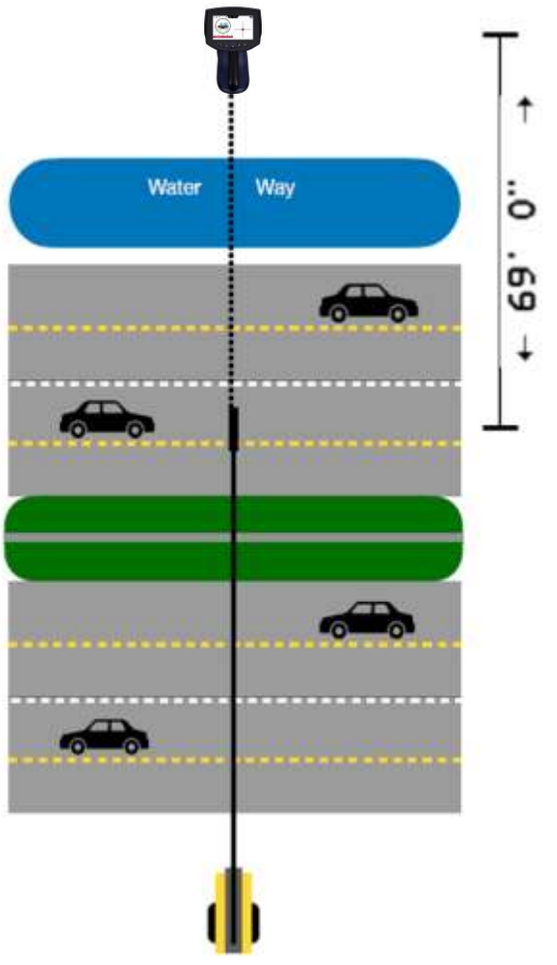


13: Locating Methods

13.1: Three Point Locating

13.1.6: Bore-To

The Bore-To Mode on Mag systems is very powerful. Good right-left steering, pitch and roll data can be expected as far out as 100ft.



> **NOTICE**
>
> It is important to note that the depth is only a reference.
>
> As distance between the Transmitter and Locator decreases, the accuracy increases.
>
> Never cross existing utilities while in Bore-To mode without exposing and verifying visually their location.

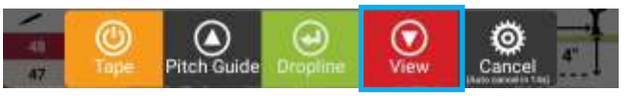
To switch to **Bore-To Mode**

1. Press ▼ to show the **Tool Menu**
2. Press ▼ to use the **Bore-To**

The display screen on both the Locator and the Display will look the same.

To switch to **Walkover Mode**

1. Press ▼ to show the **Tool Menu**
2. Press ▼ to exit **Bore-To**



14: Battery and Charger

- Mag Locators use rechargeable lithium batteries.
- This lithium rechargeable battery comes with a special charger. Any use of other lithium rechargeable battery or charger for the Locator may cause fire, explosion, leaking or other damages.
- Store the battery at the room temperatures; 59-77°F (15-25°C). Extreme high or low temperatures will shorten the battery life.
  - Do not submerge 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.
  - Please dispose of lithium properly.
- When charging the battery, the red light will shine. When charging is complete, a green light will shine.

15: Warranty Policy

Underground Magnetics (UM) warrants that it will repair or replace any product that fails to operate according to UM's published specifications at the time of shipment, if the failure is due to a defect in materials or workmanship. This warranty applies only during the warranty period specified below and is subject to the stated terms and exclusions.

Warranty Periods

One Year

- **Transmitters**, **Locators, Displays, Receiver/Display Batteries/ Chargers, and Software**

90 Days

- **Other Accessories**
- **Service/Repair**

For software products, UM warrants that it will update any defective software to bring it into material compliance with UM's specifications.

This warranty applies only to new products purchased directly from UM or an authorized UM dealer. The final determination of whether a product qualifies for warranty replacement is at UM's sole discretion.

Exclusions

This warranty does not cover:

- Transmitters that have exceeded maximum operating temperature (as recorded by the system)
- Misuse, abuse, improper installation, storage, transport, or neglect
- Damage caused by accident, fire, flood, contact with high voltages, or hazardous substances
- Use of incorrect fuses or non-UM components
- Failure to follow the Operator's Manual
- Use of the product for purposes other than intended
- Use of a transmitter with an improper housing, or damage from improper installation or retrieval
- Damage during shipment to UM
- Any modification, unauthorized opening, repair, or attempted repair
- Tampering with or removal of serial numbers, labels, or product identification

15: Warranty Policy

Data Accuracy Disclaimer

UM does not warrant or guarantee the accuracy or completeness of data generated by HDD locating systems. Data may be affected by factors including (but not limited to): active or passive interference, environmental conditions, and failure to properly calibrate or operate the device.

UM also disclaims liability for the accuracy or completeness of data received from external sources displayed on UM devices (such as data from drill rigs).

Product Improvements

UM may make design changes and product improvements at any time. There is no obligation to update or retrofit previously manufactured products.

Warranty Limitations

This warranty is the **sole warranty** for UM products.
UM expressly disclaims all other warranties, whether:

- **Express or implied**, including but not limited to: implied warranty of merchantability, implied warranty of fitness for a particular purpose, and implied warranty of non-infringement
- **Any implied warranty arising** from the course of performance, course of dealing, or usage of trade

Limitation of Liability

In no event shall Underground Magnetics (UM), or anyone involved in the creation, production, sale, or delivery of UM products, be liable for:

- Indirect, special, incidental, or consequential damages
- Loss of information, profit, revenue, or use
- Claims based on breach of warranty, breach of contract, negligence, strict liability, or any other legal theory Even if UM has been advised of the possibility of such damages, liability shall not exceed the **purchase price of the product**.

16: Glossary

Bore-To Mode: A locating method that allows the Locator to guide the drill head directly toward a set target location.

CORS (Continuously Operating Reference Station): A network of permanent GPS reference stations that provide correction data to improve positional accuracy.

Depth Calibration: The process of measuring the signal strength from your transmitter at a set distance (commonly 10 ft or 3 m) to ensure accurate depth readings.

Depth Prediction: A pre-bore check that scans the environment to provide the best operating frequency for accurate locating.

Digital Signal Processing (DSP): The onboard technology that processes radio signals to improve accuracy and reduce interference.

Display (Remote Display): The device that receives data from the Locator and presents information to the drill operator.

Dropline: A GPS tool within the system that indicates a left/right distance from a line that the operator set with a start and end point, keeping the bore path aligned.

FM Modulated RF Signal: A radio frequency signal carrying transmitter data to the Locator using frequency modulation.

Front Null Point (FNP): The point in front of the transmitter where the magnetic field aligns vertically. Used as a directional reference to establish the drill head's forward path.

GPS (Global Positioning System): A satellite-based navigation system that provides positioning and timing data.

GPS Antenna: An external antenna that connects to the Display, serving as a reference point for GPS/RTK corrections.

Horizontal Directional Drilling (HDD): A trenchless method of installing underground utilities by steering a drill head along a planned bore path.

Locate Line (LL): The point directly above the transmitter, established by drawing a line between the FNP and RNP. Indicates the transmitter's exact position along the bore path.

Locator (Receiver/Tracker): The handheld unit that receives and interprets signals from the transmitter, showing drill head position, depth, and orientation.

16: Glossary

Lock Status: A security feature showing the remaining number of days before the system requires an unlock code.

Null Point: A location along the transmitter's magnetic field where the signal angle is vertical. The Front Null Point (FNP) and Rear Null Point (RNP) are used as reference points to establish transmitter alignment and position.

Pitch: The angle of the drill head, displayed as a percentage grade or in degrees.

Pitch Guide: A tool that provides target depth and pitch values for each rod to help maintain a planned bore path.

Radio Frequency (RF) Channel: The communication channel used between Locator and Display to avoid interference with other systems.

Rear Null Point (RNP): The point behind the transmitter where the magnetic field aligns vertically. Used together with the FNP to confirm transmitter alignment and center location.

Roll Calibration: The process of rolling the transmitter housing to the 12:00 and aligning the system's displayed roll orientation.

RTK (Real-Time Kinematic): A GPS correction method that uses a fixed base station and satellite data to deliver highly accurate, real-time positioning for the Locator and Display.

Telemetry: Wireless communication that transmits data between the Locator and Display.

Tracking on the Fly: A simple process that will increase the speed at which the bore can be completed.

Transmitter (Sonde/Beacon): A downhole device installed in the drill housing that provides real-time location and orientation data by transmitting pitch, roll, temperature, and depth information to the Locator.

User Lock: A user-set lock period requiring a PIN code to unlock system operation.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