



DUAL 10w

QUICK START GUIDE



Underground Magnetics

simplicity meets versatility

1. About this Guide

⚠ ATTENTION

This alert indicates attention to a particular feature, setting, or consideration including recommended uses.

⚠ CAUTION

This alert indicates a hazardous situation that could result in minor or moderate injury if not avoided.

⚠ WARNING

This alert indicates a hazardous situation that could result in major injury or death if not avoided.

Congratulations on your purchase of an Underground Magnetics Utility Locating System!

Please read this guide in its entirety before attempting to use the Utility Locating System, it applies to all Utility Locating System equipment:

- UM Dual Receiver, a handheld portable, ergonomic and lightweight design.
- UM 10w Transmitter, a powerful 10W multi frequency signal transmitter.
- Universal signal clamp, for use with both the Receiver and Transmitter
- Li-ion battery chargers, for use with both the Receiver and Transmitter.
- Alkaline battery trays, for use where preferred.
- Insulated Connection leads, for safe direct connection to utility lines or tracer wires.
- Ground stake and cable reel, for remote earth connection.
- Equipment bag, weatherproof, secure and durable.

Service and Support

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

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Operating Instructions: UM Utility Locating Systems

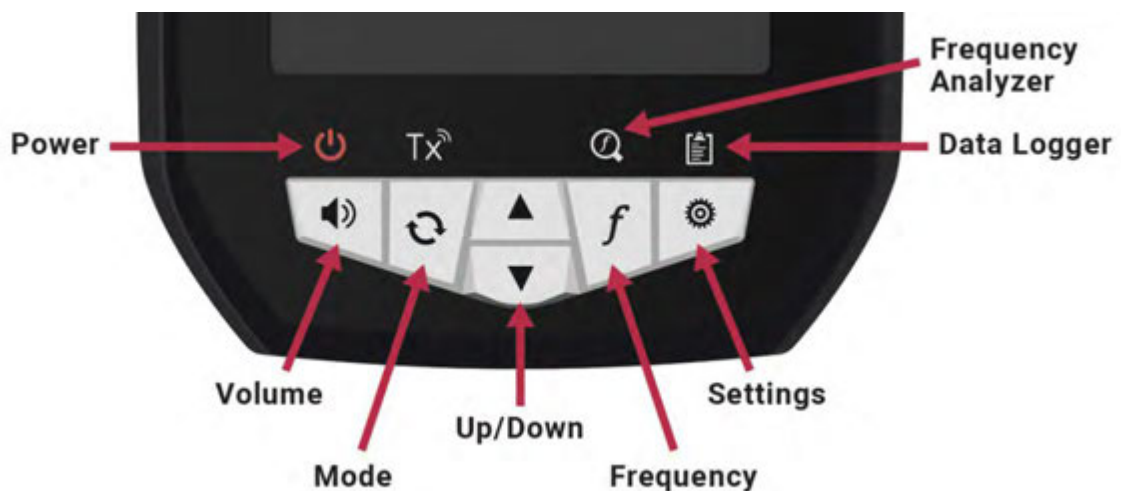
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3. UM Dual Receiver



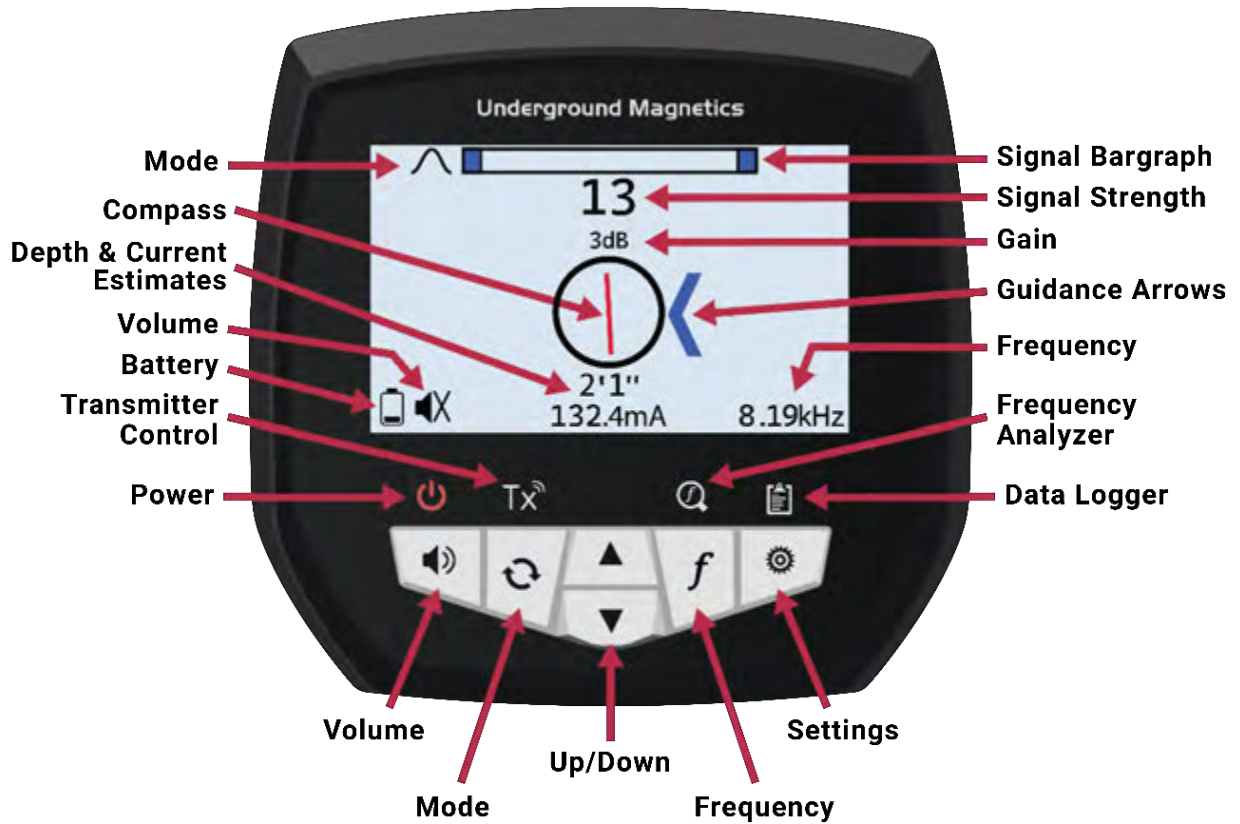
3.1 Quick Start

1. Press and hold the **Power** key to turn on the Receiver.
2. Press the **Frequency** key to change the operating frequency.
3. Gain **Up** or **Down**
4. Press the **Settings** key to enter the menu.
5. Press the **Settings** key to enter the menu.
 - Press **Up** and **Down** to navigate.
 - **Frequency** to change a setting or enter a submenu.
 - Press **Mode** to exit.



Each key can be operated with either a short or long press.

3.2 User Interface



There are two main contexts for the Transmitter: Locate Screens and Menu Screens.

Screen Information







Mode	Select Trace Modes Twin Peak or Single Peak, Sweep Modes, Twin Sweep or Single Sweep
Signal Strength & Bar graph	Detected signal level
Gain	Receiver gain level
Guidance Arrows	Graphics pointing the user toward the target conductor
Frequency	Operating frequency
Depth & Current Estimates	Estimated depth and the Transmitter signal current of the target conductor
Volume	Audio volume level
Battery	Battery level
Compass	Indicates orientation of the target conductor

3.3 Key Functions







The keys can have different functions depending on context.

Short Press	Long Press
<ul style="list-style-type: none"> • 0.5 seconds or less 	<ul style="list-style-type: none"> • 0.5 seconds or longer
<ul style="list-style-type: none"> • The key function will be executed on release of the key. 	<ul style="list-style-type: none"> • The key function will be executed when the key has been held for 0.5 seconds. • Continuing to hold the key has no effect.
<ul style="list-style-type: none"> • Functions are printed directly on the keys. 	<ul style="list-style-type: none"> • Functions are printed above the keys.






Main Screen Key Functions (Long Press)

	Power	Press or press and hold to power off
	Transmitter Control	<i>N/A on this model</i>
	Frequency Analyzer	Determines best frequency options based on environmental interference.
	Data Logger	<i>N/A on this model</i>
	Up	Increase gain repeatedly
	Down	Decrease gain repeatedly

Main Screen Key Functions (Short Press)

	Volume	Change the audio volume. (3 levels + mute)
	Mode	Change the mode of the receiver. There are 5 modes that correspond to antenna signals used.
	Up	Increase gain
	Down	Decrease gain
	Frequency	Change the operating frequency
	Settings	Opens the settings

Menu Key Press Functions (Short Press)

	Volume	Exits to the locate screen
	Mode	Exit the menu or submenu
	Up	Move the selection up
	Down	Move the selection down
	Frequency	Change a setting or enter a submenu

3.4 Frequencies

Active Frequencies

- Shown as xxxHz or x.xxkHz, where xxx is the target frequency.
- Factory Standard Frequencies: 256Hz, 263 Hz, 440 Hz, 512 Hz, 560 Hz, 577 Hz, 640 Hz, 815 Hz, 870 Hz, 940 Hz, 1.02kHz, 1.17kHz, 3.14kHz, 4.09kHz, 8.01kHz, 8.19kHz, 9.82kHz, 29.4kHz, 32.8kHz, 44.5kHz, 66.0kHz, 88.8kHz. And 99.9kHz.

Grouped Power

- Shown as Power 60 (Power 50 for 50Hz power grid)
- The receiver measures the signal at the target frequency and relevant odd power harmonics.
- Audio output reflects the spectral content of the received signal.

Single Power

- Shown as PWR xx, where xx is the target frequency.
- The receiver measures the signal at the target frequency.
- Factory Standard Single Power Frequencies: 60Hz, 180Hz, and 540Hz. (50Hz, 150Hz, and 450Hz for 50Hz power grid)

Radio

- Shown as Radio
- The receiver measures signal in a frequency band from approximately 12kHz to 25kHz.
- Audio output reflects the spectral content of the received signal.

3.5 Clamp Accessory

The clamp accessory can be used with the receiver to measure signal. To use the clamp, simply connect it to the receiver's accessory port. The operating frequency and gain operate the same as for regular locating.

3.6 Receiver Features

One Touch Gain

**One Touch Gain will ATTEMPT to set receiver signal to APPROXIMATELY 50%.
(Receiver should be held still when doing this)**

If signal ≤ 20 , UP key will set signal to 50.

If signal ≥ 80 , DOWN key will set to 50.

Auto Depth / Current

There are two depth and current display settings: ON – Displays depth and current when depth is positive and less than 19' 8" (6m).

Auto – Displays depth and current when compass angle is in range, Guidance arrows are centered, and the receiver is being held still in addition to the ON conditions above.

3.7 Menu Selection

» indicates that there is a submenu

Frequency key will enter a submenu if present

Frequency key changes setting otherwise

System Information

Information about the receiver

Metrics

Usage statistics

Guidance Arrows

Select NULL Guidance Arrow Style(s). Guidance Arrows are used along with Peak Numeric and Bar Graph to help direct user to target location and field distortion, locate accuracy.

Depth & Current

Selects how depth and current estimates are displayed.

Audio

Change the audio modulation and waveform.

- Modulation options: AM and FM
- Sound options: Changes waveform output to speaker:
 - Rough = triangle waveform,
 - Smooth = Sine waveform

Backlight

Changes the backlight intensity: LOW, MEDIUM, HIGH (Note, higher intensity will reduce battery life.)

Modes

Selects Modes, Locate (Twin Peak, Single Peak, or Null), or Sweep (Twin Omni Directional or Single Omni Directional)

Frequencies

Selects which frequencies to choose from when the user presses the **Frequency** key.

Units

Selects the measurement units for the depth estimate.

Auto Shutdown

Selects the time before the receiver shuts down if no keys are pressed.

Regulatory Info

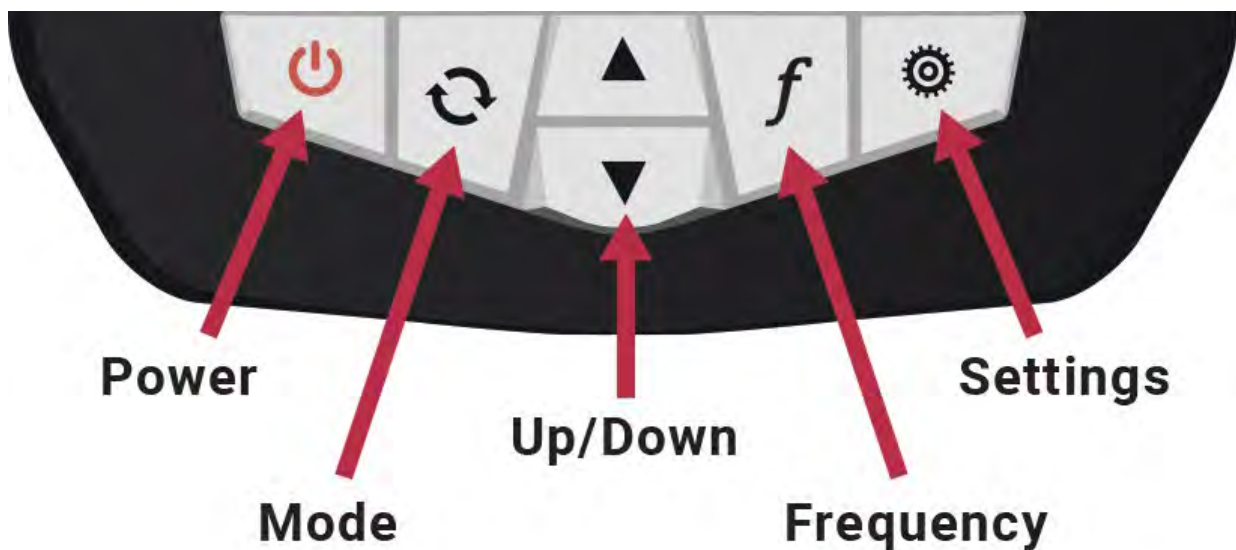
Information on RF modules in the receiver

4. UM 10w Transmitter

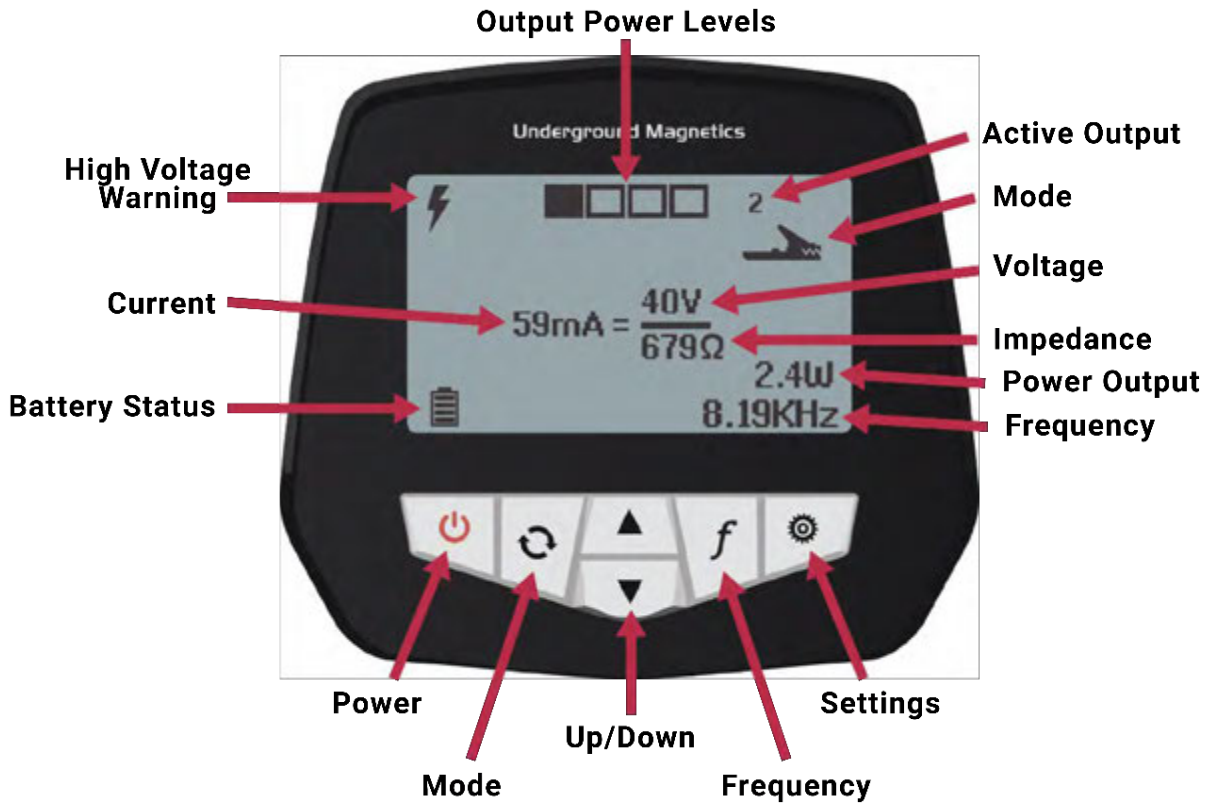


4.1 Quick Start

6. Press and hold the **Power** key to turn on the transmitter.
7. Press the **Frequency** key to change the operating frequency.
8. Press the **Up** or **Down** keys to change the output power level.
9. Press the **Settings** key to enter the menu.
 - Press **Up** and **Down** to navigate.
 - **Frequency** to change a setting or enter a submenu.
 - Press **Mode** to exit.



4.2 User Interface



There are two main contexts for the Transmitter: Main Screen and Menu Screen. The keys can have different functions depending on context. The keypad is used to control the transmitter.







Screen Information

Mode	The current operating mode
Power Output	Transmitter output power (W)
Active Output	Indicates which Output Port is active
Frequency	Operating Frequency
Battery	Battery Level
High Voltage Indication	Direct Connect ONLY: Indicates that a high voltage has been detected.
Current	Measured Output Current (mA)
Voltage	Measured Output Voltage (V)
Impedance	Measured Output Impedance (Ω)







4.3 Key Functions

Following is a description of the key functions:

Main Screen Key Functions

	Power	Press or press and hold to power off
	Mode	Change the mode of the transmitter. Mode will cycle between connected accessories and Induction mode
	Up	Increase output power
	Down	Decrease output power
	Frequency	Change the operating frequency
	Settings	Opens the settings

Menu Key Press Functions

	Power	Press exits to Main screen
	Mode	Exit the menu or submenu
	Up	Move the selection up
	Down	Move the selection down
	Frequency	Change a setting or enter a submenu
	Settings	Opens the settings

4.4 Voltage Isolator

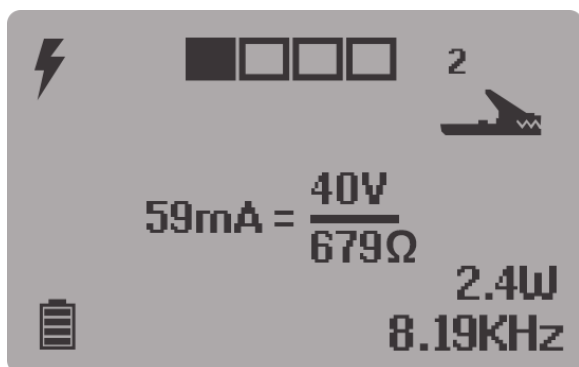
The UM 10w Transmitter can isolate high voltages from reaching the user. To implement this, use the following procedure:

1. Connect the **BLACK** Direct Connect Clip to **GROUND**
2. Connect the **RED** Direct Connect Clip to the **TARGET LINE**
3. Power the 10w Transmitter **ON**

4.4.1 Direct Connect Operation with High Voltages

The transmitter will check for the presence of high voltage on the Direct Connect leads at Power Up. There are two detection levels: **HIGH VOLTAGE** and **Dangerous VOLTAGE**:

High Voltage



If a **High Voltage** is detected (Approximately 95V or more), the transmitter will display a **flashing High Voltage icon** in the top left corner of the screen.

The transmitter may resume function and will protect itself as well as the operator.

The transmitter will run in safe mode which will decrease performance for low frequencies.

⚠ ATTENTION

Exercise caution when disconnecting the leads as there is a high voltage present!

Dangerous Voltage



If a **Dangerous Voltage** is detected (Approximately 220V or more), the Transmitter will display a **flashing Dangerous Voltage icon**.

The transmitter will take all possible measures to protect the user and itself from a **Dangerous Voltage**.

Voltages above 220V are dangerous to the user and may damage the transmitter. When **Dangerous Voltage** has been detected, only the **Power Off** key will function.

⚠ CAUTION

Exercise extreme caution.

DO NOT TOUCH THE TRANSMITTER OR THE LEADS!

MOVE AWAY TO A SAFE DISTANCE AND FOLLOW YOUR COMPANY SAFETY PROCEDURES

The power source should be de-energized and confirmed before disconnecting the equipment.

4.5 Frequencies

Frequencies are selected with the **Frequency** button.

f

Lower frequencies perform better in the direct connect mode.

Higher frequencies perform better in the Induction mode.

Standard Frequencies

256Hz, 263Hz, 440Hz, 512Hz, 560Hz, 577Hz, 640Hz, 815Hz, 870Hz, 940Hz, 1.02kHz, 1.17kHz, 3.14kHz, 4.1kHz, 8.01kHz, 8.19kHz, 9.82kHz, 12.1kHz, 16.3kHz, 22.5kHz, 29.4kHz, 32.8kHz, 44.5kHz, 66.1kHz, 88.8kHz, 99kHz, 132kHz, 200kHz

4.6 Output Ports

The 10w has 2 output ports. Any combination of accessories can be connected to the output ports.



4.7 Modes

The transmitter has 3 operating Modes: Direct Connect, Clamp, and Induction.

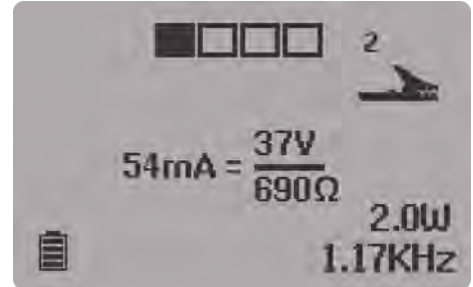
- When powered up with no accessories connected, the transmitter will default to Induction.
- When an accessory is connected, the transmitter will switch to that accessory.
- When an accessory is disconnected, the transmitter will switch to the other connected accessory. If no other accessory is connected it will switch to Induction.

The **Mode** button can be used to change the active accessory. It will cycle between connected accessories and Induction.

Direct Connect

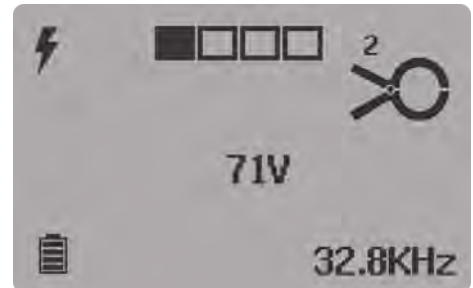
Uses the output connectors to connect to a cable or pipe.

Generally, the best method of locating a cable.



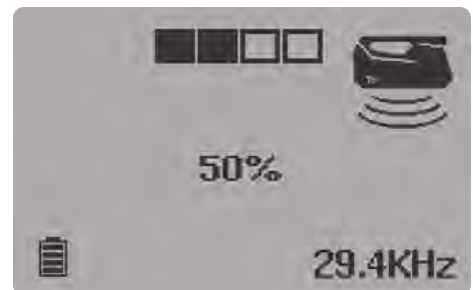
Clamp

Used when a particular cable within a group of cables needs to be isolated.



Induction (3.14kHz and up)

When access to a cable is restricted, or no physical connection can be found, the Induction method may be used.

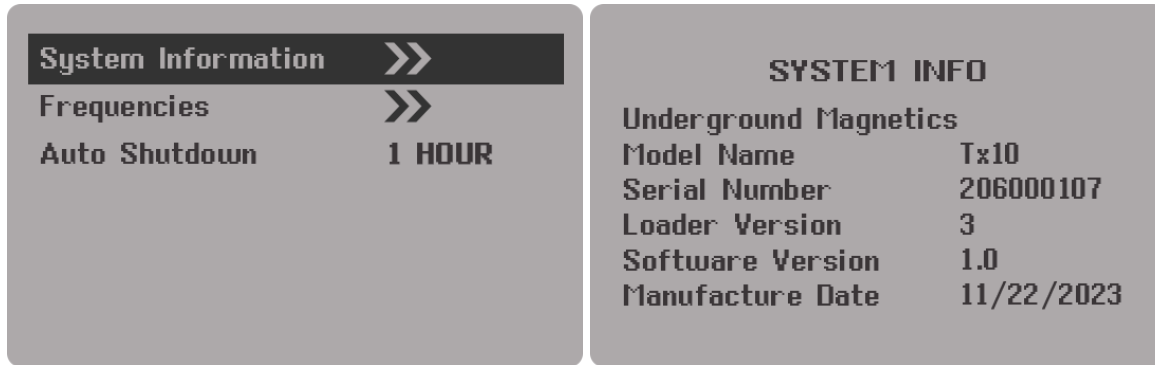


⚠ ATTENTION

Induction Mode is only available for frequencies 3.14kHz and higher.

4.8 Menu Selection

» indicates that there is a submenu



System Information

Information about the transmitter.

Frequencies

Selects which frequencies will be cycled through when the user presses the Frequency Key.

Auto Shutdown

Selects the time interval before the transmitter automatically shuts down if no keys are pressed.

4.9 Technical Data Table

4.9.1 Receiver Specifications

Dimensions	26.7in x 5.8in x 12.7in (679mm x 148mm x 324mm)	Frequency Range	50Hz - 200kHz
Weight	4.8lbs (2.2kg)	Max Automatic Depth³	19.7 ft (6m)
Operating Temperature	-4°F to 122°F (-20° to 50°C)	Max Pushbutton Depth³	36 ft (11m)
Storage Temperature	-40°F to 160°F (-40° to 70°C)	Accuracy (Locate)	+/- 5% of depth
Batteries	Lithium ion battery pack, 35.5Wh 6x AA (LR6) with Alkaline battery pack Automatic battery type detection	Accuracy (Depth)³ - Line - Sonde - Passive	+/- 5% to 9.8ft (3m) +/- 5% to 9.8ft (3m) +/- 10% to 9.8ft (3m)
Battery Life (Hours)	Lithium: 15 continuous (30 intermittent) Alkaline: 5 continuous (10 intermittent)	Sensitivity:	1x10 ⁻¹⁵ Tesla (1uA @ 1m, 32.8kHz)
Locate Modes	Single, Twin, Null Sweep (Omnidirectional) Twin Sweep (Omnidirectional)	Automatic overload protection	Up to 60dB
Display	High-Visibility Color Transflective Display, 4.3"	Locate Direction	TBD
Gain Control	Manual with One Touch	Frequency Analyzer	Scans area for noise Recommends the best frequencies
Active Locate Frequencies	Standard Frequencies: 256Hz, 263Hz, 440Hz, 512Hz, 560Hz, 577Hz, 640Hz, 815Hz, 870Hz, 940Hz, 1.02kHz, 1.17kHz, 3.14kHz, 4.1kHz, 8.01kHz, 8.19kHz, 9.82kHz, 12.1kHz, 16.3kHz, 22.5kHz, 29.4kHz, 32.8kHz, 44.5kHz, 66.1kHz, 88.8kHz, 99kHz, 132kHz, 200kHz	Passive Frequencies	Power - 50Hz, 150Hz, 450Hz for 50Hz grid - 60Hz, 180Hz, 540Hz for 60Hz grid Grouped Power: - Detects power frequencies and harmonics simultaneously Cathodic Protection (CP) - CP120 for 60Hz grid - CP100 for 50Hz grid Radio: 13kHz to 28kHz
Sonde Frequencies	4 Frequencies: 512Hz, 640Hz, 8.19kHz, 32.8kHz	Custom Frequencies	Available by request
Data Logging	TBD	Wireless Connections	TBD
Environmental	IP65 ¹	Accessories	Ring Clamp

4.9.2 Transmitter Specifications

Dimensions	8.3in x 7.6in x 15in (210mm x 193mm x 381mm)	Frequency Range	256Hz - 200kHz
Weight	7.9lbs (3.6kg)	Max Power Output	10w (1w above 45kHz)
Operating Temperature	-4°F to 122°F (-20° to 50°C)	Max Current Output	1000mA (500mA above 45kHz)
Storage Temperature	-40°F to 160°F (-40° to 70°C)	Max Voltage Output	90Vrms
Environmental	IP65 ¹	Output Power Levels	4 levels + Standby ²
Batteries	Lithium ion battery pack, 94.7Wh 8x D-Cell (LR20) with Alkaline Pack Automatic battery type detection	Active Locate Frequencies	Standard Frequencies: 256Hz, 263Hz, 440Hz, 512Hz, 560Hz, 577Hz, 640Hz, 815Hz, 870Hz, 940Hz, 1.02kHz, 1.17kHz, 3.14kHz, 4.1kHz, 8.01kHz, 8.19kHz, 9.82kHz, 12.1kHz, 16.3kHz, 22.5kHz, 29.4kHz, 32.8kHz, 44.5kHz, 66.1kHz, 88.8kHz, 99kHz, 132kHz, 200kHz
Battery Life (Hours)	Lithium: 17 hours continuous (34 intermittent) Alkaline: 10 hours continuous (20 intermittent)	Custom Frequencies	Available by request
Display	High Contrast Graphical LCD	Induction Frequencies	3.14kHz and above
Locate Direction	TBD	Dual Output Ports	Connect any two accessories Select the active accessory with Mode key
		Accessories	Direct Connect Leads Ring Clamp

4.9.3 System Specifications

Regulatory Compliance	FCC, CE.	Language Support	22 user-selectable languages:		
Data Transfer	USB-C 2.0	English	Dutch	Norwegian	Hungarian
PC based Setup	User configurable Product Firmware Updates with UM Setup	Spanish	Portuguese	Latvian	Romanian
		French	Russian	Lithuanian	Chinese
		German	Swedish	Czech	Korean
		Italian	Danish	Finnish	
		Polish	Estonian	Greek	

5. Locating Overview

Responsibilities

It is the contractor's responsibility ahead of digging, drilling or breaking ground to assess the site for known or suspected below ground utility hazards and to use correct methods to reduce the risk of accidental damage.

In the US and Canada most States have a One Call or Dial Before You Dig system for work in public areas. This should be always used.

In all other countries or on private client sites contact local utility companies or site owners to obtain available underground utilities records and maps, have these utilities positively identified, located and marked.

Utility Avoidance

Where Utilities have been located by 3rd parties there may still be a risk of utility damage during site operations if the accuracy of the marking is poor or incomplete. Contractors may incur delays additional expenses due to delay, repairs or project shutdown id there is any utility damage

This system can be used to verify 3rd party information and as an independent means of managing site and operations safety. Passive and Active signal methods should be used in all situations. Use Active signal methods first and then repeat using Passive signal methods to verify each Locate and maximize the potential to discover abandoned or other undocumented utilities.

Using UM Dual + 10w Locating System

The UM Dual + 10w Locating System can be used to verify 3rd party information and as an independent means of managing site and operations safety. Passive and Active signal methods should be used in all situations. Use Active signal methods first and then repeat using Passive signal methods to verify each Locate and maximize the potential to discover abandoned or other undocumented utilities.

Best Practice

It is recommended that both Passive and Active signal methods should be used in all situations.

Use Active signal methods first and then repeat using passive signal methods to verify each Locate and maximize the potential to discover abandoned or other undocumented utilities.

5.1 Best Practice for Getting Started

Step One: Perform a "FA" (Frequency Analysis) along the path of the intended are to be surveyed/located. Ideally choice the lowest frequency available with a pass (thumbs up). Note, lowest frequency is not a guarantee the signal will successfully carry the length of the pipe/cable. The operator may have to adjust to a higher frequency. Important, ensure the Transmitter is not turned on while a "FA" is being done. Frequency Analys stated purpose is to scan the given locate area and determine which if any available frequencies are subject to local interference.

Step Two: Direct Connection Method (Preferred). Take the Black direct connection lead and connect it to the ground stake provided. Next, connect the Red direct connection lead to the pipe/cable. Next turn the Transmitter on.

CAUTION

If the transmitter LCD displays a SMALL lightning bolt in the top left corner, be aware the line connected has a high level of voltage (up to 110v) that could be harmful to the user.

Consult with your employer's safety compliance practice.

WARNING

If the transmitter LCD displays a LARGE lightning bolt in the center of the LCD, be aware that the line connected has dangerously high level of voltage (>250v) that could be life threatening to the user.

DO NOT TOUCH any part(s) of the locating equipment.

Move away to a safe distance and follow your employer's safety compliance practice(s).

Step Three: Select the lowest Frequency recommended by "FA".

Step Four: Turn Transmitter on. Note the line Impedance (ohms). Rule of thumb is the higher the Line (pipe/cable) Impedance, the lower the Current Output. Guideline suggestion, a single line (pipe/cable) should exhibit a low impedance providing the line is grounded at both ends, user is encouraged to seek parameters from his/her employer. In the example of a wire or cable, again single line, a reasonable threshold might be >5,000 ohms exercise caution as the line might not be grounded at the far end. If that is the case, use the supplied second ground stake and wire spool to ground the far end. Next, return the Transmitter and verify the line impedance as shown on the Transmitter LCD. If the impedance is less, you have likely ensured the best possible outcome. Note, once the Transmitter is turned on , it defaults to a "standby mode" user is required to increase the output level off the standby mode". To improve the signal output (current/mA), increase or max out the power output to levels 1-4.

Step Five: **SWEEP** (360 degrees) Either in the "Twin Peak Mode", or the "SWEEP Mode" with the Receiver on, selected Frequency matching the transmitter, initial Gain Setting (90dB-100dB range) circle the Utility Connection Point. All Peak (maximum) responses should be dotted with paint or marked with a Flag. Next using Prints/As-builts, Landmarks, Passive Modes (Power & Radio), Current Measurement, Depth, Peak and Null Responses. Choose the most likely Line (pipe/cable) path that matches up to the Utility you are trying to trace out.

Operating Instructions: UM Utility Locating Systems

Step Six: **Verify, Peak and Null Responses.** If the Peak and Null (optional left/right arrows, null) do not match up that would be an indication of Electromagnetic Field Distortion. The greater the separation the more likely the locate position has been compromised. Verify Utility identity by Employers Best Practice. Providing the Peak and Null do match up follow and “dot out” the line to the end point (verify). Most practices require the user to revise direction and “mark out” the line back towards the Transmitter connection point.

ATTENTION

Users of this system should always follow their employer’s best practice and safety compliance procedures.

6. Utility Locating

Information

All plans and maps of buried utilities should be sought from Operations Managers, Project Engineers or utility owners. Information should be checked on site to confirm understanding, decide on any risk reduction steps and identify if there is any information that is uncertain or potentially incorrect. If necessary, subcontract a specialist Utility Survey to more thoroughly locate all utilities, flag or spray mark and if necessary, digitally document all detected buried utilities.

Inspection

Inspect the site for signs of buried utilities such as:

- Recent trenching
- Buried cable markers
- Overhead utilities that run down pole and underground
- Gas meters
- Valve sites
- Drains or manhole covers

This information should be cross checked with supplied information, operations planning and Engineering designers to ensure utility clearances are achievable, operations and design planning adjusted so that key identified risks can be mitigated or completely avoided.

Locating

The Contractor should use available mapping information to carefully and accurately Locate each known utilities in turn and minimize the potential of utility damage during operations. This process provides highest reliability of locating both known and importantly can detect unknown or abandoned utilities.

Best practice

Contractors should use all available information and use one or more applications techniques to Locate all utilities depending on the site conditions, their area of operations and responsibilities. Many companies have Standard Operating Procedures (SOP's) or use Specialist Technicians to carry out Utility Locating. Where possible use all established procedures and resources.

Best Practice locating methods using Direct Connected low and then high frequency Active Signal tracing and Passive Detection modes will result in verification and Locates of each known Utility. Potential detection of any additional unknown or abandoned utilities will minimize the risk of utility damage during groundwork or boring operations.

WARNING

The absence of a positive indications does not guarantee nonexistence of a service
Nonmetallic or other abandoned services without a signal may be present
Always excavate with care

CAUTION

Investigate further with the information provider, utility owner or site Supervisor if any information seems incorrect or is not clear

6.1 Locate Applications Overview

Contractors should consider using one or more applications techniques to Locate all utilities depending on the site conditions, their area of operations and responsibilities. Many companies have Standard Operating Procedures (SOP's) or use Specialist Technicians to carry out Utility Locating. Where possible use all established procedures and resources.

Best Practice locating methods using Direct Connected low and then high frequency Active Signal tracing and Passive Detection modes will result in verification and Locates of each known Utility. Potential detection of any additional unknown or abandoned utilities will minimize the risk of utility damage during groundwork or boring operations.

⚠ ATTENTION

The Contractor should use available mapping information to carefully and accurately Locate each known utilities in turn and minimize the potential of utility damage during operations. This process provides highest reliability of locating both known and importantly can detect unknown or abandoned utilities.

6.1.1 Active Locating

Direct connection

The Transmitter can be used to apply a signal to any known utility lines that can be Located. This is particularly effective for best accuracy and is the preferred method where possible

Clamp Connection

The Transmitter Clamp is an ideal solution where a contractor has no authority to access to connect or isolate a cable or is electrically live or where user danger could result.

Induction

Where there is no access to a utility line or position is unknown, the Transmitter Induction Null Mode is an effective solution. This is particularly effective to Trace a known Utility from a convenient access point, hand hole pit or equipment cabinet and can also be detect presence of unknown Utilities in a local area.

6.1.2 Passive Locating

Passive signal locating provides the easiest and most efficient means of locating both known and unknown utilities but do not identify a specific utility. Investigate any indications and consider using Active Signal Induction to better understand the underground situation.

Mark detected Utilities in accordance with site or company regulations, contact a supervisor, client or take damage prevention actions as necessary.

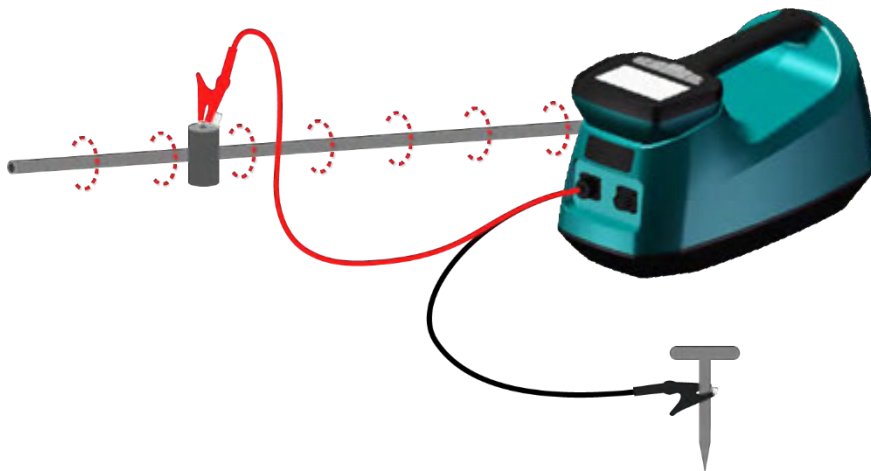
6.2 Active Locating

The Transmitter can be used to apply a signal to any known utility lines that can be Located. This is particularly helpful in the area of the bore, crossing or running parallel.

6.2.1 Direct Connection Mode

For the most reliable results, a direct connection of the Transmitter signal to a known Utility is preferred.

1. Connected the supplied Direct Connection Leads to either Transmitter Output Port (Mode will auto select)
2. Connect the Return Signal (Black Lead) through one of the following:
 - a. Dirt/ground
 - b. Common ground connected utilities
 - c. Induced into adjacent utilities
3. Connect the Transmitter Output Signal (Red Lead) directly to the utility
4. Select an Output Frequency (less than 10 kHz for precision locate)
5. Use the Receiver to pinpoint
6. Mark the path of each utility line with spray paint, marker pegs or flags.



⚠ ATTENTION

The lowest signal frequency reduces induced signal returns, increases ability to trace and identify a single utility, trace that utility further and for most common locating application is the preferred method to deliver the best locate results. The lowest Output Frequency is preferred as this reduces signal coupling to adjacent utilities

⚠ WARNING

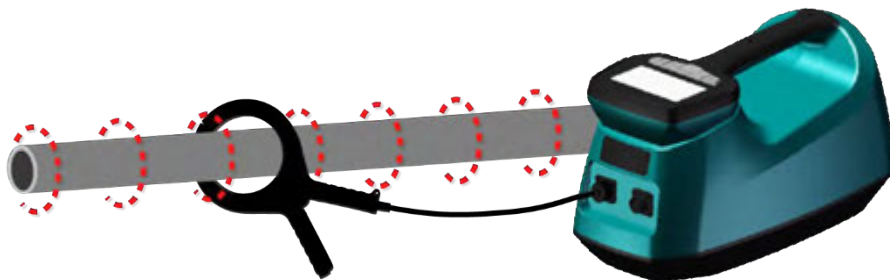
For Safety, the Black lead should be connected to a convenient ground point or using the supplied Ground Stake pushed into the ground and followed by connecting the Red lead to the Utility or tracer wire.

6.2.2 Transmitter Clamp

The Transmitter Clamp is an ideal solution where there is no authority to isolate a cable, is electrically live or where user danger could result.

For safety connect the Clamp to the Transmitter and then clamp the cable.

1. Inspect Equipment
 - a. Transmitter should be off
 - b. Clamp contact points and hinge should be clean and clear of debris
Note: Any dirt or corrosion at the open or hinge ends will reduce the performance.
2. Connect the supplied Clamp to either Transmitter Output Port (Mode will auto select)
3. Position the Clamp around the cable/utility you are locating
4. Verify the Clamp is correctly fitted and closed around the utility.
5. Power on the Transmitter
6. Select power output level
7. Select an Output Frequency (less than 10 kHz for precision locate)
8. Use the Receiver to pinpoint
9. Mark the path of each utility line with spray paint, marker pegs or flags.



⚠ ATTENTION

The Lowest signal frequency reduces induced signal returns, increases the ability to trace a single utility, trace further and provide the best Locate accuracy.

The best results will be obtained by using the Lowest effective Transmitter Output Signal Frequency. If necessary, compare results using different Transmitter Frequencies or repeat Locates in a wider area.

⚠ WARNING

For safety connect the Clamp to the Transmitter and then clamp the cable.

6.2.3 Induction Mode

Where there is no access to any utility lines or their position is unknown, the Transmitter Induction Null Mode can be used. This is particularly effective to search the entry and exit pit areas to locate the presence of unknown Utilities

6.2.3.1 Tracing a known line

1. Disconnect all Accessories from the Transmitter Output Ports
2. Remove Grounding Rod or any other conductive objects from the locate area
3. Place the Transmitter parallel and directly over a buried utility as shown
4. Power on the Transmitter
5. Select an Output Frequency greater than 3.14 kHz
6. Adjust the Power Mode
7. Use the Receiver to pinpoint
8. Mark the path of each utility line with spray paint, marker pegs or flags



⚠ ATTENTION

Select an Output Frequency for the Transmitter and Receiver greater than 3 kHz. The highest Output Frequency couples to the Utility best but may also couple to adjacent lines

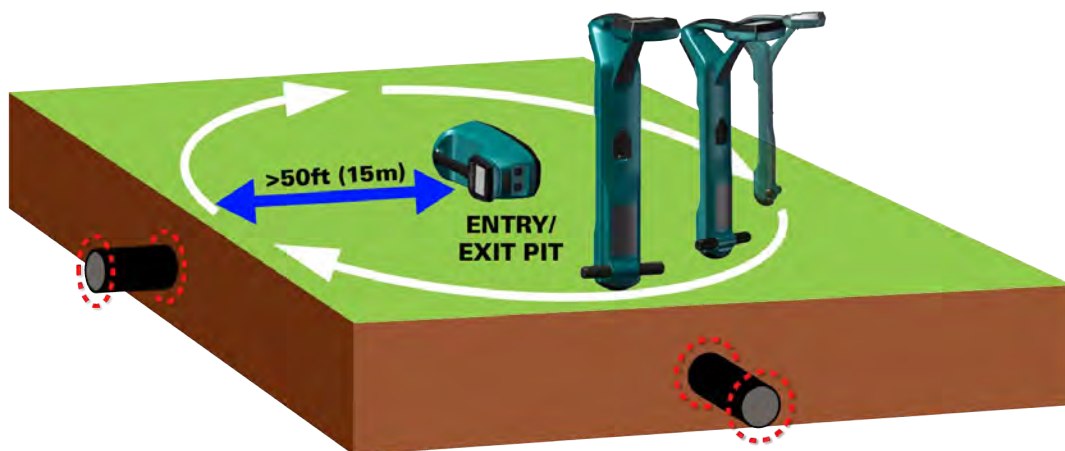
⚠ WARNING

To avoid the Receiver locating the Transmitter induction signal directly through the air, also known as an Air Lock of signal, the distance between the Receiver and Transmitter must be at least 20ft (6m)

Operating Instructions: UM Utility Locating Systems

6.2.3.2 Area Avoidance

1. Place the Transmitter on the ground and on its side within the pit area
2. Select the Twin Peak Mode
3. Select a Transmitter Output Frequency greater than 3 kHz
Note: Recommended frequencies from 45kHz to 88kHz
4. Perform a 360-Degree Perimeter Search
 - a. This should be at least 20ft / 6m larger than the pit area
5. Adjust the Receiver gain until 10-50% display of background signal noise
6. Walk slowly around the perimeter
Note: Any increase in signal that indicates the possible presence of a buried utility
7. The Transmitter position should be moved to each corner of the pit (A, B, C and D) to maximize utility detection reliability.
8. Repeat this process at each position

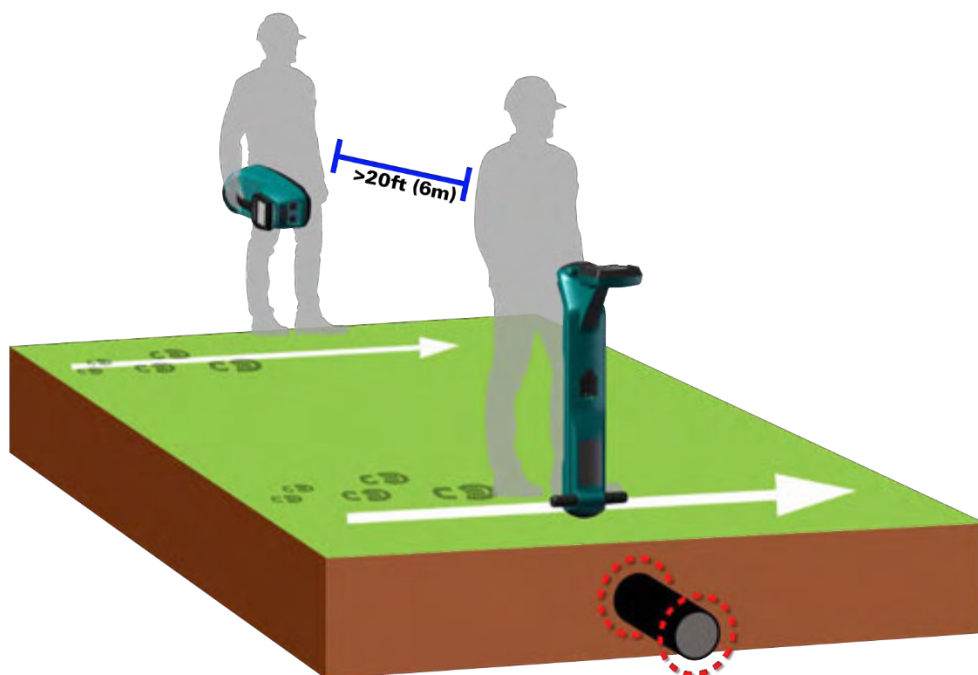
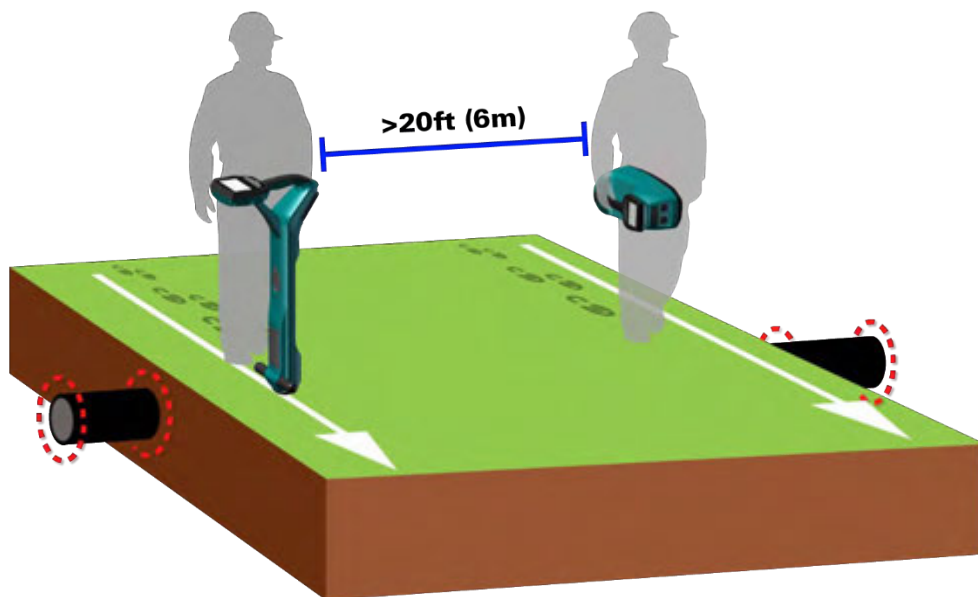


Operating Instructions: UM Utility Locating Systems

6.2.3.3 Two Man Area Sweep

The area can be searched as a 2-person operation using the Transmitter and Receiver. Locating known and unknown utilities crossing within the area.

1. While walking in parallel
2. One operator carries the Transmitter
 - a. Waist height, horizontally, and on its side
3. Another operator carries the Receiver
 - a. Rotate the Receiver 90-degrees
4. Both operators walk in tandem from pit to pit
 - a. Remain 20ft (6m) apart
 - b. Operator with the Receiver walks 3ft (1m) ahead to ensure most reliable detection.
5. Repeat this process 90-degrees to increase likelihood of detecting utilities.



6.3 Passive Avoidance

Passive signal locating provides the easiest and most efficient means of locating both known and unknown utility lines but do not identify a specific utility. Locating methods for avoidance are intended to locate known and unknown utility lines.

Investigate any indications to better understand the underground situation. In accordance with site or company regulations contact a supervisor, client or take damage prevention actions as necessary. Locate the utility and mark the path with spray paint, marker pegs or flags.

6.3.1 360 Degree Perimeter Search

Where a small area is searched, a "360 Degree Perimeter Search" should be carried out. This should be at least 3ft (1m) larger than the area.

Power Frequency

1. Select the Twin Peak or Twin Sweep Mode
2. Select Grouped Power 50/60Hz for best detection reliability
3. Adjust the Receiver gain until 20% display of background signal noise
4. Walk slowly around the perimeter
Note any increase in signal that indicates the presence of a buried utility

Radio Frequency

1. Select the Radio Frequency Mode
2. Adjust the Receiver gain until 20% display of background signal noise
3. Walk slowly around the perimeter

Note any increase in signal that indicates the presence of a buried utility



6.3.2 Large Area Search

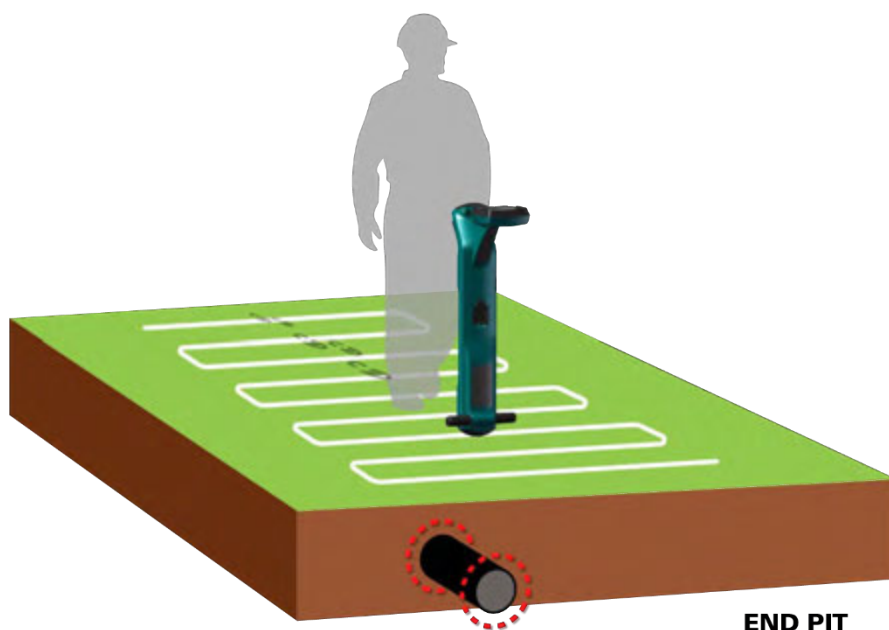
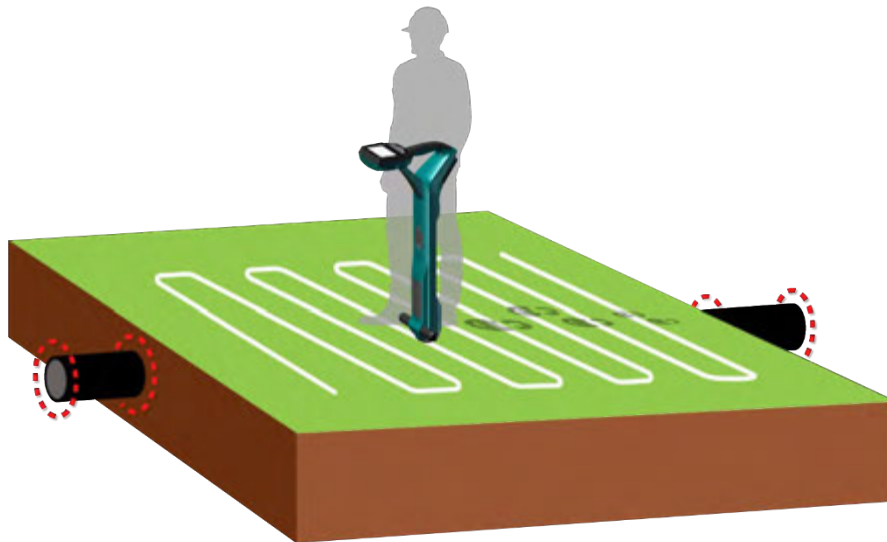
A larger area can be searched to detect and Locate utilities crossing or running parallel to the path.

Power Frequency

1. Select the Twin Peak or Twin Sweep Mode
2. Select Grouped Power 50/60Hz for the best detection reliability
3. Adjust the Receiver sensitivity until 20% display of background signal noise
4. Orient the Receiver to locate any utilities that may pass across the path

Radio Frequency

1. Select the Radio Frequency Mode
2. Adjust the Receiver gain until 20% display of background signal noise
3. Adjust the Receiver sensitivity until 20% display of background signal noise
4. Orient the Receiver to locate any utilities that may pass across the path
5. Walk along the path at a slow walking pace
Note any increase in signal that indicates the presence of a buried utility



7. Safety Directions

The following instructions enable the person responsible for the product and the user to anticipate and avoid hazards of use.

The person responsible for the product must ensure all users understand these hazards, the precautions and follow them.

⚠ CAUTION

This guide provides basic instructions in the use of the UM Dual Receiver and 10w Transmitter.

It should be read before operating the Receiver and Transmitter.

It contains important safety information and operating guidelines.

⚠ ATTENTION

Absence of a signal does not guarantee the non-existence of a utility.

Nonmetallic utilities will not be detected without use of an accessory or buried tracer wire

Some utilities may be present without a detectable signal

A potentially hazardous signal can be present at the transmitter output, on the accessory connector or an electrically live utility. Exercise caution when making transmitter connections

Always connect to the utility before powering the transmitter on

Use only the supplied UM lithium battery chargers for charging UM lithium batteries

Do not attempt to disassemble the lithium battery packs

7.1 Intended use

The products are intended to be used for the following applications:

- The UM 10W is intended for outdoor use as a cable locating transmitter.
- The UM 10W is a DC battery operated device. The battery may only be charged using an approved UM6400-16 charger.
- Detection and localizing of buried utilities: cables and metallic pipes.
- Transmitter signal applied to target utilities by connection, induction or accessories.
- Indication of the depth of an underground utility or accessory.
- To be operated in accordance with instructions in this Operating Manual.
- Designed in accordance with applicable standards and regulation. Equipment may only be modified at authorized repair centers.
- May only be used with Underground Magnetics approved accessories.

7.2 Adverse use

- Outside intended use and limits.
- Use of the product without instruction.
- After theft.
- Removal of hazard notices.
- Modification of the products.
- Use of the product with recognizable damages or defects.
- Opening the product using tools unless this is specifically permitted.
- Inadequate site safeguards.

CAUTION

Adverse use can lead to injury, damage or malfunction.

Precautions: The person responsible must inform the user about specific hazards and how to counter them. The product should not be operated until the user has been instructed how to use and work with it

7.3 Limits of use

Suitable for use in an environment suited for permanent human habitation. Not suitable for hazardous atmosphere, aggressive or explosive environments.

CAUTION

Working in hazardous areas, with electrical equipment or electrical railways can lead to injury.

Precautions: The person responsible for the product should contact safety authorities and safety experts before working in hazardous environments or when in close proximity to electrical equipment or similar situations.

7.4 Responsibilities

Underground Magnetics Inc, Johnston Iowa 50131, USA is responsible for supplying the product, including the operating manual and original accessories, in a completely safe condition.

The person responsible for the product has the following responsibilities:

- To understand the safety instructions on the product and the instructions in the operating manual.
- To ensure the user of the product uses it in accordance with the Operating instructions and is trained in its use.
- To be familiar with local regulations and safety codes relating to the user, 3rd party persons, environmental and property safety and accident prevention.
- To inform Underground Magnetics Inc. if the product and application becomes unsafe.
- To ensure that national laws, regulations and conditions for the operation of the product, including radio transmitters, are respected.

7.5 Hazards of use

WARNING

Connecting to a live cable can result in an electrical shock and potentially lethal.

Precautions: Never connect the output cable directly to an electrical live cable. Only authorized personnel should make connections to pipes or cables. Transmitter will display a warning when a High or Dangerous voltage is present

When using the clamp accessory a hazardous signal may be present causing personal harm

Precautions: Do not use on electrical cables that have impaired or no insulation. Contact qualified persons and follow all standards and requirements for disconnecting or grounding cables. Do not remove any safety bonding unless authorized

Hazardous voltage may be present on plug of the clamp accessory when clipped over a live cable.

Precautions: Connect the clamp to the Transmitter or Receiver before clamping around a live cable.

CAUTION

Warning Symbol Explanation (Battery)

Use only UM6400-16 Batteries.

Charge only with UMB8-16 Battery charger.

7.6 Worksite safety

CAUTION

During dynamic use there is a danger of accidents if the user does not pay attention to the working environmental conditions, obstacles, traffic or excavations.

Precautions: The person responsible for the product must ensure all users are fully aware of existing dangers. Observe working environment for environmental hazards form ground terrain, close proximity traffic or other machinery in use.

Inadequate securing of the job site can lead to dangerous situations due to traffic, building sites and industrial installations.

Precautions: Follow company or federal regulations governing safety, accident prevention and road traffic management precautions. Ensure job site is adequately secured.

Use of equipment is not intrinsically safe for use in areas where hazardous gases may be present.

Precautions: Do not use products in designated hazardous areas. Seek approval before use from authorized safety representative.

Working on or near electrically live utilities can result in electrical shock or equipment damage.

Precautions: Do not operate equipment unless properly qualified and familiar with its use. Do not exceed equipment recommended rating and instruction in use. Inspect equipment and cables for damage, do not use if faulty. Do not work on electrically live power utilities unless properly qualified. Use personal protective equipment (PPE) rated for the utility voltage and current.

7.7 Equipment safety

CAUTION

Cleaning Products whilst in use may damage or create a safety hazard.

Precautions: Turn off and isolate Product before cleaning. Do not immerse in liquid

If the product is improperly disposed of the following can happen: Polymers may burn, Poisonous gases may be produced which may impair health, Batteries can explode causing poisoning, burning corrosion or environmental contamination.

Precautions: The product must not be disposed with household waste. Always dispose of the product in accordance with Federal, company or local regulations. Always prevent access to the product by unauthorized personnel.

High mechanical stress or temperatures or immersion in fluids can cause chemical leakage, fire or explosions of the batteries.

Precautions: Protect the batteries from high mechanical influences and high ambient temperatures. Do not drop the batteries into fluids.

Unauthorized service and repair may result in a hazardous product.

Precautions: Only Underground Magnetics authorized service workshops are entitled to repair these products

7.8 Batteries and environmental safety

The batteries used by Underground Magnetics meet the required safety standards and include safety protection circuitry to prevent accidental damage in use.

Regulations regarding shipping of removable battery packs is under review. Packaging of spare battery packs **MUST** include specified warning labels. Please contact Underground Magnetics Service Support or your Dealer for more details.

ATTENTION

During shipping, transportation or disposal of batteries it is possible inappropriate mechanical influences may constitute a fire hazard.

Precautions: Remove the batteries before shipping. When transporting or shipping the product the person responsible for the product should ensure that the applicable national or international rules and regulations are observed. Before shipping or transportation contact your local passenger or freight transport company.



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