



Tracker Pro

operations manual

Thank you for purchasing Springbok Instrument's Tracker Pro. Our goal is to provide you with a high quality troubleshooting tool which is both powerful and easy to use. We all share a commitment to quality and excellence and will do our best to continue to provide you with test equipment to meet your needs. Please read the operator's manual throughly to ensure the best results from your TDR.



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Introduction

The Tracker Pro is a multipurpose metallic time domain reflectometer (TDR). It is a cable fault locator designed to quickly and easily diagnose metallic cable. The Tracker Pro combines the latest in technology and user-friendly operation, creating a versatile and accurate TDR.

Using time domain reflectometry, or cable radar, the TDR transmits a signal down the cable. Impedance discontinuities along the length of the cable reflect some or all of the signal energy back to the instrument. These reflections are measured and displayed as both a waveform and a numeric distance to the fault.

The Tracker Pro will test all types of metallic paired cables for opens, shorts and impedance mismatch.

Safety Information

Warnings:

Review all safety precautions before using.

Do not operate this instrument near flammable gases or fumes.

Do not modify any part or accessory of this instrument. If the unit is damaged, do not use.

To avoid electric shock, do not remove covers or any parts of the enclosure.

Caution: As with most electronic equipment, care should be taken not to expose the equipment to extreme temperatures or humidity. Store the instrument indoors during extreme hot or extreme cold temperatures to insure that your Tracker Pro will be ready to use. If the instrument is stored overnight in a service vehicle, be certain the instrument is brought to specified operating temperatures before using.

Features

Locates cable and connector faults in all types of paired metallic cables.

Tests both twisted pair and coaxial cables.

Fast rising pulse widths locate small faults that can plague high bandwidth systems.

Rugged packaging for testing in all types of weather conditions.

Pre-set ranges for quick testing.

Touch and jump cursor movement for quick measurement.

Exclusive TRACKER-STORE waveform storage places all pulse widths into a single file for remote diagnosis.

Auto search functionality to quickly locate and zoom to the end of the cable.

Compact, lightweight, portable.

USB 2.0 Communication.

Theory of Operation

A Time Domain Reflectometer (TDR) works on the same basic principle as a radar. Pulses of energy are transmitted down the cable under test. If the cable has a constant impedance and is properly terminated, all of the energy will be absorbed.

If the pulse reaches an impedance discontinuity, part or all of the pulse energy is reflected back to the instrument. If the cable is an open circuit, the reflected pulse will be in-phase (upward reflection) with the output pulse. If the cable is a short circuit, the reflected pulse will be out-of-phase (downward reflection) with the output pulse.

In either case, a substantial amount of energy will be reflected. If it were possible to have a cable with no loss, all of the signal energy would be reflected. The incident and the reflected signals would look identical.

Inductive faults and reflections from an impedance higher than the characteristic impedance will be in-phase, or upward. Capacitive faults and reflections from a lower impedance are out-of-phase, or downward.

The Tracker Pro displays the cable under test as a digitized waveform with a numeric distance readout on the touchscreen display.

The digitized waveform enables the operator to view the signature of the cable in great detail. An impedance mismatch (opens, shorts or faults of less severity) can be identified and distances to the faults determined.

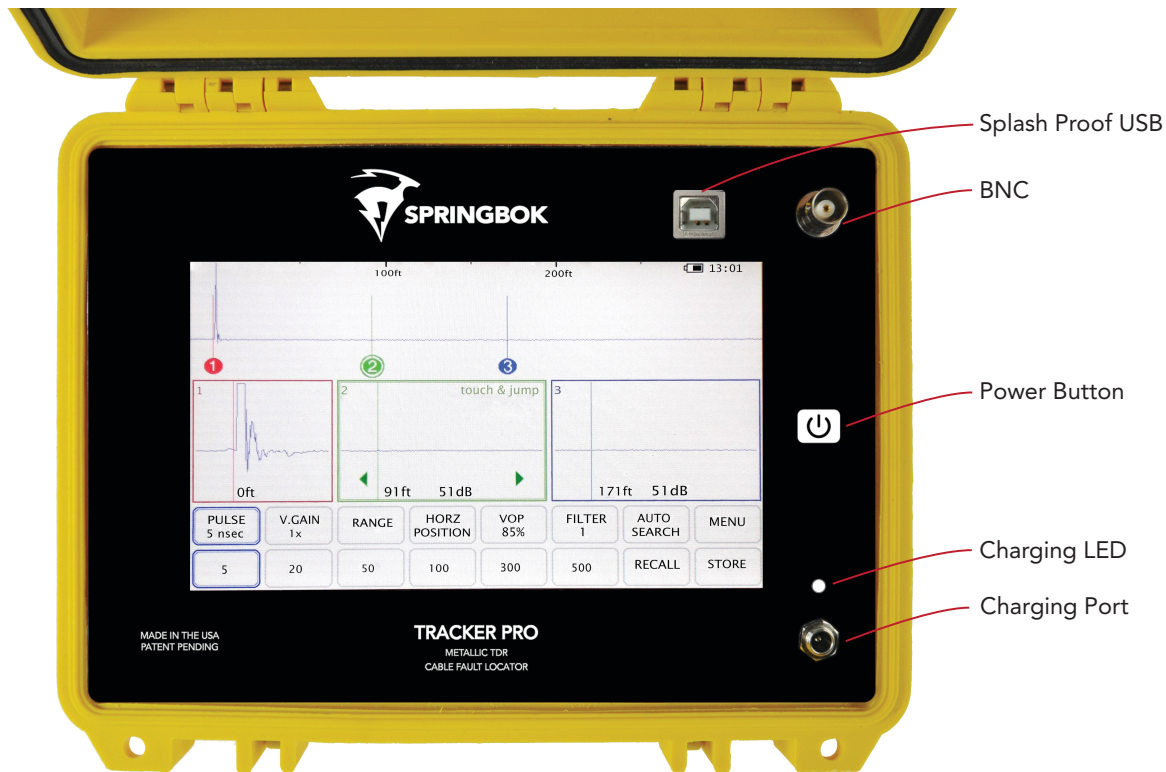
Description

Square Pulse Widths

The Tracker Pro uses square pulse widths with very fast rising and falling edges. This unique capability creates high frequencies that allow for the most accurate reading of small faults in the cable.

Touch and Jump

1. Select a cursor to adjust by touching anywhere inside the zoom window
2. Touch along the main waveform to move the cursor to the desired location
3. Fine tune the location of the cursor by touching the arrows inside the zoom window to move the cursor left and right.



Front Panel Description

Pulse

1. Press PULSE.
2. Try each pulse in order to locate the fault.

Many TDRs have selectable pulse widths settings. The pulse width allows the TDR signal to travel down a cable at different levels of energy and distances. The wider the pulse width, the more energy transmitted, and therefore, the further the signal will travel down the cable.

NOTE: Always start the fault finding procedure in the shortest pulse width available, as the fault may be only a short distance away. Use the range (zoom) and gain controls to locate fault. If the fault is not located, adjust to the next larger pulse width and retest. Keep adjusting to the next larger pulse until the fault is located.

5 nsec, 20 nsec, 50 nsec, 100 nsec, 300 nsec and 500nsec

Vertical Gains

The Vertical Gain control increases or decreases the vertical amplitude or gain of the waveform display. Increasing the vertical gain of the waveform display allows the user to see smaller reflections or minor faults on the cable signature.

1x, 2x, 4x and 8x

Range

Range, or horizontal zoom, expands and contracts the waveform from the left side. There are six different preset range levels with 1 being the small, seeing several hundred feet, and 6 the largest, seeing several thousand feet. Once the proper range has been selected the cursor zoom windows can be used to see specific areas in the cable with finer detail.

1, 2, 3, 4, 5 and 6

Horizontal Position

The horizontal position arrows can be used to scan to the left and right on the cable without changing the range level. The arrows can be held down to continuously scan along the cable to the desired location.

Velocity of Propagation (VOP)

Determine VOP

The VOP number of a cable is determined by the dielectric material that separates the two conductors. In a coaxial cable, the foam separating the center conductor and the outer sheath is the material determining the VOP. In twisted pair, the VOP number is determined by the spacing between conductors and the insulation that separates them.

The VOP of a cable can change with temperature, age and humidity. It can also vary from one manufacturer and/or cable family and from one run to another. Even new cable can vary as much as +/-3%.

There are several ways to determine the correct VOP. The first is to simply refer to the VOP card provided with the instrument. Second, consult the manufacturer for the correct VOP of that specific cable. A third way is to actually determine the VOP from a known cable length.

1. Measure a known cable length, the longer the cable, the more accurate the VOP will be.
2. Correctly place the cursors of the TDR on the output pulse and the reflected pulse (end) of the cable.
3. Change the VOP setting until the "Distance Between Cursors" displays the known length.

Reducing VOP Error

When trying to pinpoint a fault, the most common technique used to reduce VOP error is to test the faulty cable from both ends.

1. Determine the path of the cable and, therefore, its length
2. Test both ends of the cable to a common point on the cable (fault) with VOP readings
 - *If the sum of the two readings is more than the known cable length, reduce the VOP setting and retest
 - *If the sum of the two readings is less than the known cable length, increase the VOP setting and retest
3. Continue this method until the sum of the two readings equal the known length of the cable
4. The result will be the correct length readings.

Filter

The filtering option is used for various types of interference.

1. Press FILTER
2. The 8x filter will be the most accurate as it takes the average of the most waveforms.

Signals such as power (50 to 400 Hz), audio (100 Hz to 20,000 Hz), data (50 Hz to 10MHz), and RF (500 kHz to 1 GHz) can all affect a TDR differently. Therefore, a TDR with only one type of filtering system may work well in one application but not in another.

1, 4, 8 and 16

Auto Search

1. Press AUTO SEARCH.
2. Cursor 3 moves to the largest impedance mismatch.

When the end of the cable is disconnected from the cable plant, the largest reflection will be the end of the cable and therefore cursor three will move to the end. If not disconnected cursor three will move to the largest impedance mismatch on the cable line.

Menu

Adjusting the Time and Date

1. Press MENU
2. In the menu window, press TIME
3. Using the number keypad enter the current time & date (NOTE: This device uses military time format)
4. Use the arrows to move left and right
5. When the desired time and date is entered press SET
6. Press EXIT to close the menu window

Updating Tracker Pro Firmware

1. Press MENU
2. Connect Tracker Pro to PC using a USB cable
3. On your PC, open the Tracker View application
4. Select "Update Instrument Firmware"
5. Select the latest firmware update in the pop up window

Store

Storing Waveforms

1. Connect the cable under test to Tracker Pro
2. Press STORE
3. Wait approximately 20 seconds, when the icon returns to the word STORE, for Tracker Pro to save the cable at all pulse widths.

When storing, the button will show the progress with black dots along the bottom. When finished storing the button will return to showing the word store. After storing you can disconnect the cable and work remotely or download to your PC.

The Tracker Pro is able to store up to 30 waveforms. Once 30 waveforms have been stored the Tracker Pro will start replacing the oldest waveform with the newest.

Recall

Recall allows you to work remotely with stored waveforms. You can view full waveforms at all the pulse widths regardless of the instruments screen settings. The files can be recalled, displayed and studied on the instrument's screen or downloaded (via USB) to a PC.

Viewing Saved Waveforms

1. Press RECALL
2. Select the desired waveform

At this time you can change the pulse width, vertical gain, range, horizontal position and VOP. Move cursors and measure to multiple events on the cable.

Downloading Saved Waveforms

1. Press RECALL
2. Select the desired waveform for download
3. Press USB
4. Connect Tracker Pro to your PC using a USB cable
5. On your PC, open the Tracker View application
6. Select download from Instrument
7. A progress bar will close when the download is complete and the file has been moved to your track view display utility.

Charging the Batteries

The Tracker Pro is powered by a rechargeable battery pack contained within the instrument.

When the battery supply has been depleted and the batteries need to be recharged, plug the external battery charger into the front panel charger socket and into any common AC outlet. The front panel green LED will light to indicate the batteries are being charged. The LED indicator will stay illuminated while the charger is plugged in.

The Tracker Pro will operate while being charged as long as the battery level indicator is above a quarter charge. Allow at least 5 hours charging time for the batteries to cycle from a completely discharged state to a fully charged state.

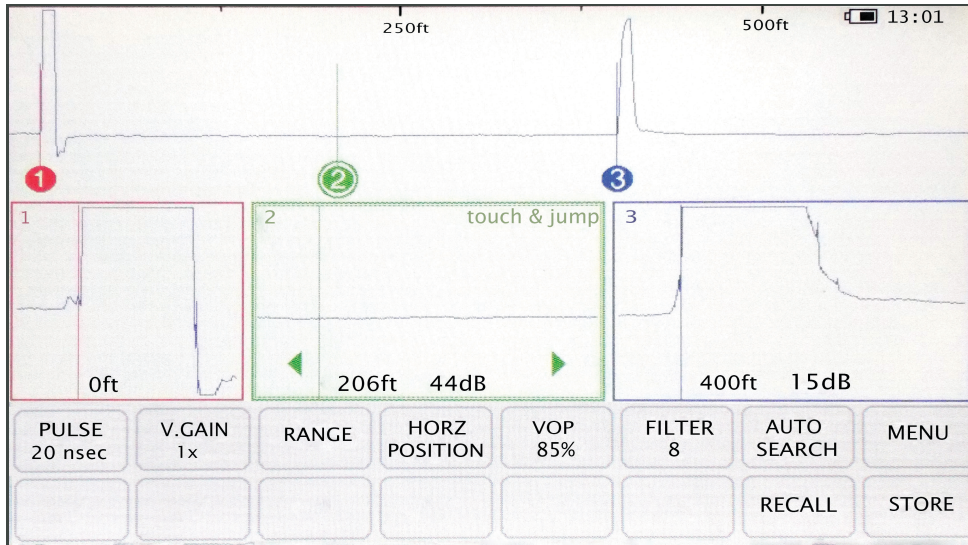
Waveform Examples

A great variety of waveforms may be encountered. This is due to the various applications and electrical and environmental characteristic differences found in the wide variety of cables that exist today.

Remember: The reflection of a fault or component will look different on a short length of cable than it will on a long length of cable.

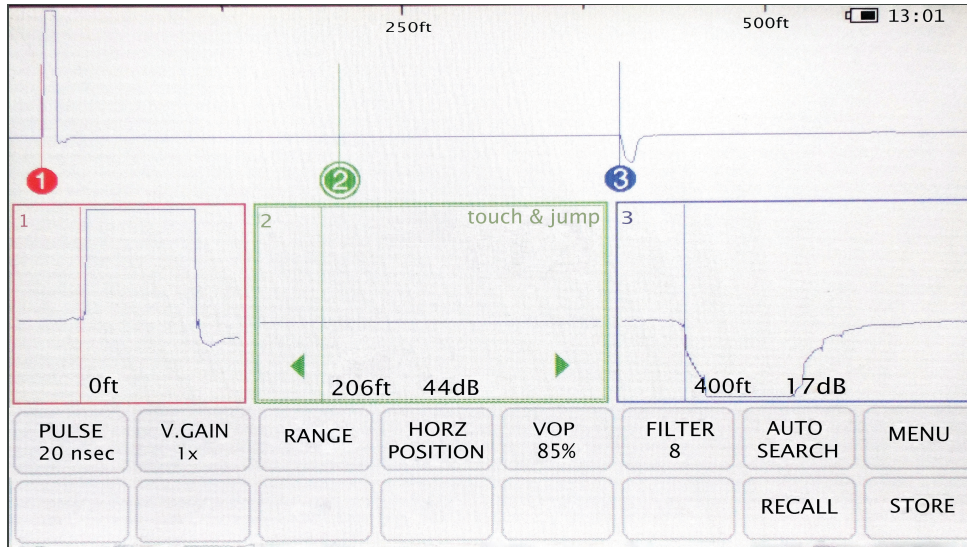
Various industries, cable types, and components produce many different waveforms. The TDR's pulse width, range, and vertical gain settings all affect how a waveform will appear.

Practice testing various known cable segments, with and without components. Become familiar with how each segment looks prior to any problem.



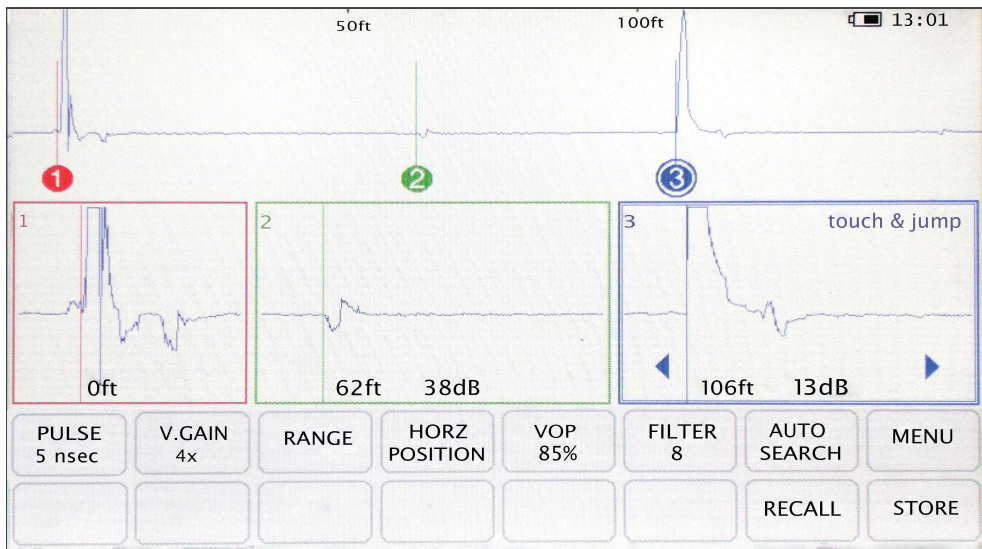
Open

A reflection with the same polarity indicates a fault with OPEN (high impedance) tendencies. The reflection shown at the 3rd cursor is a complete open.



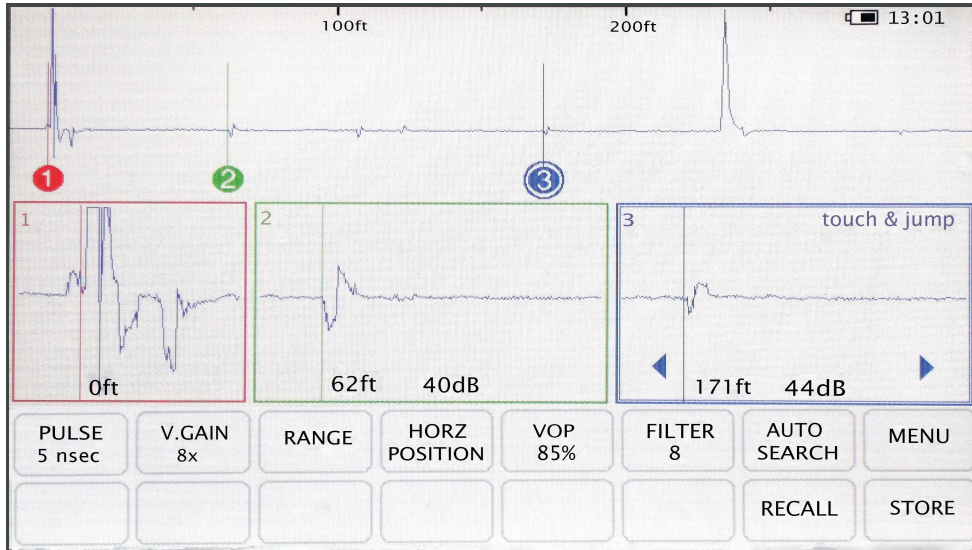
Short

A reflection with the opposite polarity indicates a fault with short (low impedance) tendencies. The reflection shown at the 3rd cursor is a dead short.



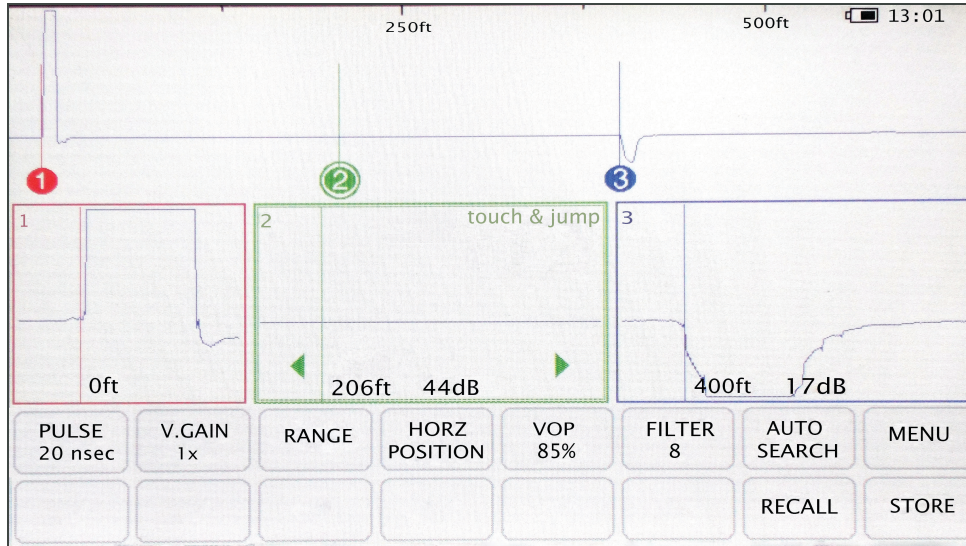
One Extender

An extender will show a signature with a low impedance with a high impedance immediately following.



Multiple Extenders

The Tracker Pro has the capability to see more than one extender on a coaxial cable. The farther away the extender the higher the dB level.



Shooting From Both Ends

When using two TDRs (one at each end of the same cable) the cable is displayed as a short.

Maintenance

Cleaning

Remove dust from the outside of the instrument and connectors with a lint free cloth. Clean the instrument with a damp cloth, making sure the instrument is turned off and unplugged from the battery charger. Make sure the cloth is only damp to avoid getting water in the instrument.

Do not use harsh chemicals or abrasive cleaners. Damage to the front panel overlay may result.

Periodic Inspection

The instrument and accessories are to be periodically inspected to make sure there is no damage, worn or missing parts or deformations in the enclosure. If the unit is regularly operated in harsh, dusty or wet environments, inspect after every use.

The instrument should be inspected and cleaned periodically. Inspect the front panel connectors for dirt, broken or deformed insulation and contacts. Clean or replace as necessary.

Inspect cable accessories for damaged insulation, bent or broken clips. Replace as necessary.

Warning: To avoid risk of electric shock, do not perform service of any type to the instrument or any accessory.

Service

There are no user serviceable parts on or in this instrument. It is recommended that service of any type, to the instrument or any accessories, be referred to Springbok Instruments or another authorized repair facility.

Instrument Disposal

This instrument is equipped with non-user serviceable Nickel Metal Hydride batteries. Should this instrument need to be disposed of, please consult your local regulations as to the standard disposal procedures.

Specifications

Physical Instrument:

Height: 9.12 inches
Width: 7.56 inches
Depth: 5 inches
Weight: 3.75 pounds

Environmental:

Operating Temperature: 0°C - 50°C (32°F - 122°F)
Storage Temperature: -20°C - 60°C (-4°F - 140°F)
Humidity: 95% maximum relative, non-condensing

Distance Accuracy:

.44 feet @ 99% VOP (max cable length 7,982.59 feet)
.38 feet @ 85% VOP (max cable length 6,853.74 feet)
.18 feet @ 40% VOP (max cable length 3,225.29 feet)

Display:

7" LCD color touchscreen display (800 x 480)

Output Signal:

5 nsec, 20 nsec, 50 nsec, 100 nsec, 300 nsec and 500 nsec

Power:

Battery: Internal, rechargeable, 8.2 V Nickel Metal Hydride

Charging Source: External 12 VAC transformer, 1000mA

Operating Time: greater than 9 hours, continuous in standard brightness display mode

Horizontal Resolution:

0.1 feet

Vertical Resolution:

14 bits at 193 pixels

Waveform Storage:

30 multi-pulse waveforms

Input Protection:

400 V (AC+DC) from DC to 400 Hz, decreasing to 10 V at 1 MHz

Specifications Continued

Software Noise Filters:

1, 4, 8 and 16

Velocity of Propagation:

40% - 99%

Standard Accessories:

75 Ohm BNC - 50 Ohm F adapter

Warranty

Springbok Instruments provides a full one year warranty with all Tracker Pros from the date it was shipped to the customer. The warranty covers repairs to the existing Tracker Pro. The warranty will be void if there is obvious abuse or tampering to the instrument.

Repairs

If any repairs should be needed, call Springbok Instruments at (402) 505-8793. After receiving a return material authorization (RMA) number, ship your Tracker Pro to Springbok Instruments where it will undergo an inspection, diagnosis and repair. The user is responsible for shipping their Tracker Pro. The Tracker Pro will be sent back in five or less business days. Additional standard shipping time will apply.



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