Seeker X

Digital Leakage Detection System

User's Guide

Notice

Every effort was made to ensure that the information in this manual was accurate at the time of printing. However, information is subject to change without notice, and VIAVI reserves the right to provide an addendum to this manual with information not available at the time that this manual was created.

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Copyright release

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This guide is a product of the VIAVI Technical Publications Department, issued as part of the product. The catalog number for a published guide is Catalog Number - printed. The catalog number for an electronic guide on USB is Catalog Number - electronic.

Terms and conditions

Specifications, terms, and conditions are subject to change without notice. The provision of hardware, services, and/or software are subject to VIAVI standard terms and conditions, available at **www.viavisolutions.com/en/terms-and-conditions**.

Federal Communications Commission (FCC) Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by VIAVI could void the user's authority to operate the equipment.

CAUTION:

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The End user must follow the specific operating instructions for satisfying RF exposure compliance.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Requirements

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Device operation in the band 5150–5250 MHz is only for indoor use.

Dans la bande de fréquence 5150-5250 Mhz, l’utilisation du produit doit être uniquement en intérieur.

Japan Radio Law

The GITEKI mark can be found on the label on the back of the meter.

EU WEEE and Battery Directives

This product, and the batteries used to power the product, should not be disposed of as unsorted municipal waste and should be collected separately and disposed of according to your national regulations.

VIAVI has established a take-back process in compliance with the EU Waste Electrical and Electronic Equipment (WEEE) Directive, 2012/19/EU, and the EU Battery Directive, 2006/66/EC.

Instructions for returning waste equipment and batteries to VIAVI can be found in the WEEE section of the VIAVI Standards and Policies web page.

If you have questions concerning disposal of your equipment or batteries, contact the VIAVI WEEE Program Management team at **WEEE.EMEA@ViaviSolutions.com**.

EU REACH

Article 33 of EU REACH regulation (EC) No 1907/2006 requires article suppliers to provide information if a listed Substance of Very High Concern (SVHC) is present in an article above a certain threshold.

For information on the presence of REACH SVHCs in VIAVI products, see the **Hazardous Substance Control** section of the VIAVI Standards and Policies web page.

EU CE Marking Directives (LV, EMC, RoHS, RE)

This product conforms with all applicable CE marking directives. For details, please see the EU Declaration of Conformity included in the shipping package.

China RoHS

China RoHS documentation is included in the shipping package and available on StrataSync.

California Proposition 65

California Proposition 65, officially known as the Safe Drinking Water and Toxic Enforcement Act of 1986, was enacted in November 1986 with the aim of protecting individuals in the state of California and the state's drinking water and environment from excessive exposure to chemicals known to the state to cause cancer, birth defects or other reproductive harm.

For the VIAVI position statement on the use of Proposition 65 chemicals in VIAVI products, see the **Hazardous Substance Control** section of the VIAVI Standards and Policies web page.

Compliance with 2014/53/EU Radio Equipment Directive (RED)

In accordance with Article 10.8(a) and 10.8(b) of the RED, the instruments for sale in the EU operate in the 5-205 MHz frequency range at a maximum RF transmit power of +15dBm.

Please contact us for more information:

VIAVI Solutions

Network Service Enablement

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About this Guide

Thank you for purchasing the Seeker X. This guide provides setup and operating instructions to get you up and running as soon as possible.

Purpose and scope

The purpose of this guide is to help you successfully use the product features and capabilities. Additionally, this guide provides a complete description of the VIAVI warranty, services, and repair information.

Assumptions

This guide is intended for novice, intermediate, and experienced users who want to use the product effectively and efficiently. We are assuming that you have basic computer and mouse/track ball experience and are familiar with basic telecommunication concepts and terminology.

Technical Assistance

If you require technical assistance, call 1-844-GO-VIAVI / 1.844.468.4284.

Outside US: +1-855-275-5378

Email: **Trilithic.support@viavisolutions.com**

For the latest TAC information, visit
https://support.viavisolutions.com/welcome

Safety and compliance information

Safety information is contained in a separate guide and is provided in printed format with the product.

For information about CE compliance, see the Declaration of Conformity. A copy of the declaration is included in the shipping package.

Conventions

This guide uses typographical and symbols conventions as described in the following tables.

Typographical conventions

Description	Example
User interface actions	On the Status bar, click **Start**.
Buttons or switches that you press on a unit	Press the **ON** switch.
Code and output messages	All results okay
Text you must type exactly as shown	Type: ***a:\set.exe*** in the dialog box
Variables	Type the new ***hostname***.
Book references	Refer to ***Newton's Telecom Dictionary***
A vertical bar | means "or": only one option can appear in a single command.	platform [a|b|e]
Square brackets [ ] indicate an optional argument.	login [platform name]
Slanted brackets < > group required arguments.	<password>

Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive key strokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Symbol conventions

This symbol indicates a note that includes important supplemental information or tips related to the main text.

This symbol represents a general hazard. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See the *"Safety definitions" on page 14* for more information.

This symbol represents an alert. It indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.

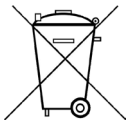
This symbol represents hazardous voltages. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See the *"Safety definitions" on page 14* for more information.

This symbol represents a risk of explosion. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message. See the *"Safety definitions" on page 14* for more information.

This symbol represents a risk of a hot surface. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See the *"Safety definitions" on page 14* for more information.

Symbol conventions (continued)

This symbol represents a risk associated with fiber optic lasers. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message. See the ***Safety Definitions*** below for more information.



This symbol, located on the equipment, battery, or the packaging indicates that the equipment or battery must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.

Safety definitions

Term	Description
DANGER	Indicates a potentially hazardous situation that, if not avoided, will result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
WARNING	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
CAUTION	Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury and/or damage to equipment. It may be associated with either a general hazard, high voltage, or risk of explosion symbol. When applied to software actions, indicates a situation that, if not avoided, could result in loss of data or a disruption of software operation.
ALERT	Indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.

Precautions

WARNING:

Pursuant to FCC 15.21 of the FCC rules, changes not expressly approved by VIAVI might cause harmful interference and void the FCC authorization to operate this product.

CAUTION:

Do not use the instrument in any manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION:

A strong electromagnetic field may affect the measurement accuracy of the meter.

CAUTION:

Use only the battery charger supplied with the meter. Use of any other charger may damage the battery.

CAUTION:

Avoid using the antenna during adverse weather conditions, when lightning could occur.

NOTE:

All spent batteries should be disposed of according to local laws and guidelines.

NOTE:

This hand-held instrument is not intended to be body worn, or operated while held against the body.

What ships with the Seeker X?

When you unpack the Seeker X, the following items are included as standard.

- Seeker X Leakage Detector
- Battery (installed in the unit)
- AC to DC Power Adapter & Battery Charger with USB Charge/Data Cable
- Quick Start Guide (a multi-fold guide that fits easily in the carrying case)
- Safety information sheet

Optional kits

- Walk out – Adds the directional handheld antennas (WFS-1, WFS-2), near field probe (NFP-1), car charger, and carrying case
- Drive out – Adds the Mobile Mount, diplexer (DPF-1), and vehicle antennas (AVM-3, WVM-2)
- Mapping – Adds a Seeker MCA III, and GPS receiver

Preparation for use

This section explains how to start using the Seeker X. When you unpack your instrument, do the following:

- Inspect the unit for damage. If the instrument is damaged, put it back in the box and contact VIAVI customer service (see *"Technical Assistance" on page 11*).
- If undamaged, save the box and packing materials in case you need to ship the instrument in the future.
- Remove the protective film from the LCD. This film is in place to protect the LCD during shipment. Use the tab in the lower right corner to easily remove the film.

Before using the Seeker X for the first time, do the following:

- Turn on the unit and verify it is operating properly by navigating through a few menus.
- If the **LO** appears on the display, charge the battery.

NOTE:

For additonal information about Seeker X options and services, contact your local VIAVI representative or visit www.viavisolutions.com.

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Quick Tour

This chapter provides an overview of the unit, status indicators, connectors, and user interface, including the following:

- "About the Seeker X" on page 20
- "Features" on page 21
- "Optional software" on page 22
- "A guided tour of your Seeker X" on page 23
- "A guided tour of your Mobile Mount" on page 28
- "About the battery of your Seeker X" on page 30

About the Seeker X

The VIAVI Seeker X™ leakage detector provides the agility to monitor leakage anywhere in a channel lineup, with the sensitivity and speed to accurately detect leaks that other systems miss.

With support for up to 4 concurrent monitoring frequencies from 130–150 and 250–1220 MHz including OFDM support, Seeker X affords operators complete flexibility in defining downstream channel lineups, while providing true full-spectrum leakage detection.

Seeker X will detect tagged leaks and ignore untagged leaks, saving time from false alarms from signals not originating in your system, including overbuild situations. In addition to legacy Seeker D tag signals, Seeker X detects the revolutionary new digitally tagged carrier to provide unmatched leakage sensitivity and positive leak detection. This allows more thorough and accurate coverage of your plant in driveout testing and much more efficient find and fix processes for techs in the field.

Transition to distributed access architectures is simplified by virtualized tagging capabilities supported by most major R-PHY, R-MACPHY, and R-CCAP vendors. With this approach, no specialized hardware is required in the hub, and technicians use the same Seeker leakage detectors and work processes regardless of node type.

Seeker X detectors and Mobile Mounts can be dropped into systems currently using Seeker Ds with no change to existing monitoring and find/fix processes. These new Seeker X units can benefit from the increased speed, sensitivity, and OFDM detection on their own, and can monitor two extra tagged frequencies if CT-4 taggers are swapped out for Seeker-D compatible CT-X units.

The Seeker X may be used in its Mobile Mount for driveouts, or removed from the mount for leakage troubleshooting on foot with the WFS-1 adjustable dipole or WFS-2 wideband log periodic.

Regardless of the system architecture or channel lineup, Seeker X provides all the capabilities to find and fix leaks quickly, accurately, and effectively.

Features

Easy configuration

With the combination of StrataSync and Mobile Tech applications, set up of your Seeker X has never been easier. Now you will have the ability to easily control the deployment of configuration setups and firmware updates to your StrataSync assets. You will no longer have to use cables and PCs with the dedicated setup software with the use of the Mobile Tech application to control the deployment of updates.

Alternatively, the Seeker Setup software simplifies the configuration process. Instead of going to the factory to make hardware modifications, you can use Seeker Setup to adjust frequencies.

Multiple frequency plan

Your Seeker X can be set up to operate on up to 4 different frequency plans with up to 4 unique frequencies each, which makes it easier to monitor and maintain multiple cable systems. These plans define the leakage monitoring frequencies and, if desired, the tag detection frequency as well. You have the option of setting up only one frequency plan for simple operation, or multiple leakage plans for maintaining multiple cable systems. Frequency settings range from 130–150 and 250–1220 MHz.

NOTE:

While in monitoring mode, the Seeker X can toggle between all of the up to 4 frequencies in a plan providing broadband leakage detection.

Signal compatibility

Compatibility with the VIAVI CT-X and existing CT-4 channel tag devices is another feature of your Seeker X. The CT-X can insert up to 4 VIAVI proprietary tagged signals across the entire downstream bandwidth at the same time.

The CT-X eliminates the risk of affecting any adjacent digital channels by injecting an adjustable signal from 10–35 dBmV, setting up a -30 dBc relationship between the peak power of the CT-X setup carrier and the channel power of the adjacent QAM. Channel tag values are configured using the CT-X web interface or front panel buttons.

The Seeker X can also be set up to use the existing DOCSIS 3.1 channel for detection.

Squelch operation

Squelch level is the RF signal threshold that the Seeker X uses to determine the validity of the signal. The signal "breaks squelch" when the RF leakage is greater than the squelch level and tag qualifiers are met as well. The receiver will not alarm for signals below the squelch level.

The squelch level has a factory default of 1 µV/m. However, it can be reconfigured using the Mobile Tech application and StrataSync, or Seeker Setup software.

Source localization

The Seeker X emits an audible tone to help you pinpoint the leakage source. The tone frequency increases with signal strength. As you move closer to the leak, the frequency of the tone will increase to provide an audible indication that the level is increasing, as well.

Optional software

- **Seeker Setup** is used to configure the Seeker meter family, enabling the operator to assemble files containing channel frequencies, squelch levels, and other settings. Users can efficiently download configurations to one or more leakage detectors.
- **StrataSync** and the **Mobile Tech** app are used together to easily control the deployment of configuration setups and firmware updates for your StrataSync assets. Mobile Tech collects the data from your equipment in the field and syncs the data to StrataSync for more detailed reports and troubleshooting.

The following software is required for leakage data analysis using a Seeker Mobile Communications Adapter (MCA):

- **Leakage Analysis Workshop (LAW)** is software that manages the storage and retrieval of leakage information collected by vehicle mounted Seeker GPS systems. Installed on a server, it receives leakage data uploads via the Internet/LAN or Wi-Fi access point. Data stored in LAW server may be displayed on maps or as text, used to generate leakage work orders, or downloaded to other VIAVI or third-party applications.

NOTE:

Common leakage areas are around the tap, drop cable, and any connection of the cable to other devices.

A guided tour of your Seeker X

Front view

DISTANCE button

Changes the distance from the vehicle to the cable plant

VOLUME button

Changes the speaker volume of the leakage tone. Brief presses increase the volume to maximum, then starts again at minimum.

SNAPSHOT button

Activates the Snapshot mode or press and hold to synchronize data with the optional Seeker MCA III when the meter is in the Mobile Mount.

POWER button

Press and hold to turn the meter on or off. When the meter is on, press to activate the display's backlight for approximately 60 seconds.

CHANGE button

Toggles or alters the current display selection. Also toggles frequency presets from the measurement screen.

SELECT button

Advances to the next display mode

Back view

Antenna connection

Connects to the Mobile Mount antenna connection

Right side view

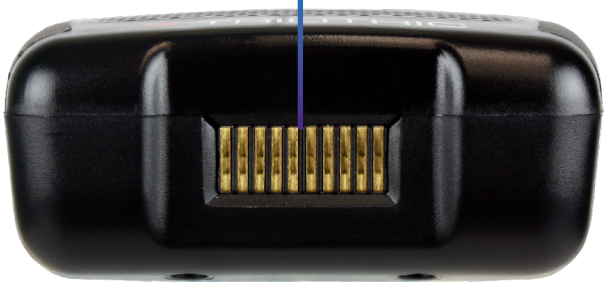
Mini-USB connection

Connect a mini-USB cable to charge the meter or connect to a computer

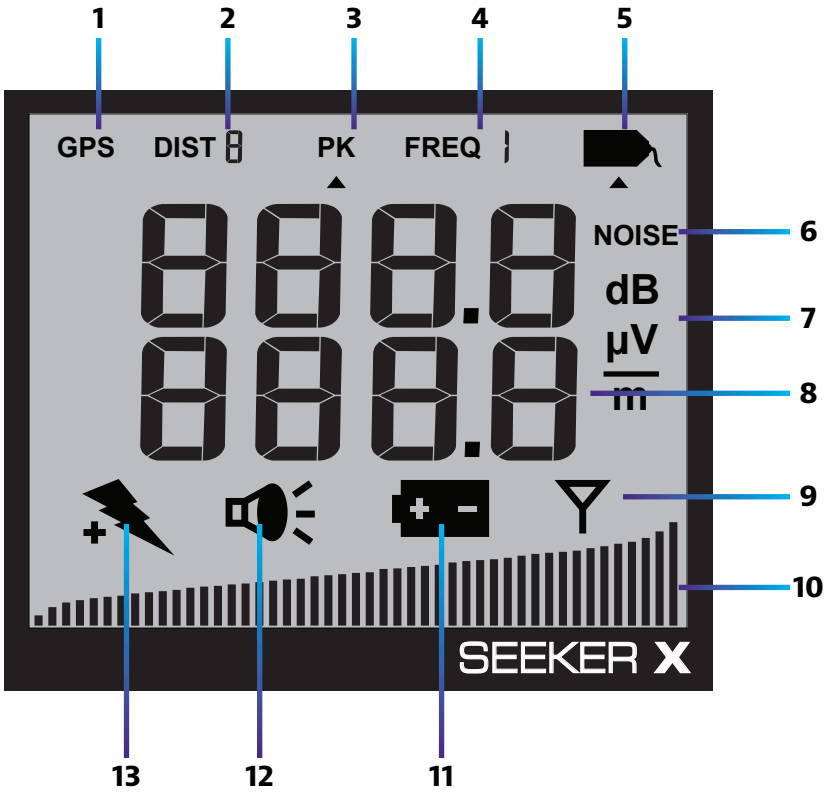
Bottom view

Mobile Mount interface

When the meter is in the Mobile Mount, charges the meter and allows communication between the Seeker MCA III and the meter.



Display screen



1. **GPS** – Shown when the meter is placed in the Mobile Mount and a GPS connection is established with an optional Seeker MCA III. When the icon is not shown, the meter is not in the Mobile Mount or the GPS connection cannot be established with the optional Seeker MCA III. If the icon flashes, the Seeker MCA III is connected to the GPS but the GPS does not have a good position fix.
2. **DIST** – Indicates the number of the currently selected distance preset when the distance correction has been enabled using the Seeker Setup software. Distance correction is used to adjust the level of the received signal based on the distance from the vehicle to the cable plant. Up to eight preset distance correction values can be enabled for the meter.
3. **PK** – Shown when the Peak Hold feature is active. When the icon is not shown, the Peak Hold feature is turned off.
4. **FREQ** – Indicates the number of the currently selected frequency plan.
5. **Tag** – Shown when tagged signal leakage is detected.
6. **NOISE** – Shown when noise is detected.

7. **Measurement units** – Show the measurement units that are selected in Seeker Setup.
8. **Main display** – Shows various parameters, and its function depends on the current display mode selection.
9. **Antenna** – Flashes when the signal mode is selected. This is the normal mode for leakage detection.
10. **Bar graph** – Shows the level of various Seeker X and Seeker GPS parameters, and its function depends on the current display mode selection.
11. **Battery** – Flashes when the battery mode is selected. The icon will stay on when the battery needs to be recharged.
12. **Speaker** – Flashes when the **VOLUME** button is pressed.
13. **Charge** – Flashes when the battery is being charged, or when the device is placed in the Mobile Mount and the Battery Charge Level screen is displayed.

Messages you might see on the display:

- **PC** – The meter is connected to a PC
- **CH** – The meter is charging
- **APP** – The Mobile Tech app is controlling the meter
- **SYNC** – The MCA III is syncing data to the meter

NOTE:

Some messages may indicate unresolvable error conditions.

Please call VIAVI Technical Support at +1-844-GO-VIAVI.

A guided tour of your Mobile Mount

Front view

Antenna connection

Connects the Seeker X antenna input to the Seeker X Mobile Mount. This bypasses the top BNC antenna input of the Seeker X, allowing the use of low and high-band vehicle mounted antennas.

Spring loaded cradle

The cradle is spring loaded to ensure that the Seeker X is held securely in the Mobile Mount.

To place the Seeker X into the Mobile Mount, place the bottom of the Seeker X in the cradle and press down while pressing the top of the Seeker X back into the Mobile Mount to connect the Seeker X antenna input to the Mobile Mount antenna connection.

The spring return of the cradle will secure the top of the Seeker X upward into the recess in the top of the Mobile Mount.

Mobile Mount interface

When the Seeker X is in the Mobile Mount, charges the meter and allows communication between the Seeker MCA III and the meter.

NOTE:

If the spring return of the Mobile Mount cradle is broken or not working properly, contact 1-844-GO-VIAVI for repairs.

Mounting arm

Secures the Mobile Mount to the vehicle. Use the knob to tighten and loosen the arm and then adjust the angle of the arm to achieve the proper mounting angle.

The arm should be securely fastened to the vehicle with four screws or bolts.

Rear view

Antenna input

Connects the included antenna diplexer for use with low and high-band vehicle mounted antennas

Auxilliary Mobile Mount connection

Used to daisy chain an existing Mobile Mount in order to share a single Seeker MCA III

MCA III serial connection

Connects to the Seeker MCA III

DC power cable input

Connects to your vehicle's power

NOTE:

For detailed vehicle installation instructions, see the Seeker X and MCA III Install Guide and the separate MCA III Install Guide.

About the battery of your Seeker X

The Seeker X uses Lithium-Ion batteries. The batteries are not charged during manufacture and should be fully charged prior to using the first time for best results.

Lithium-Ion batteries operate differently than Nickel-Cadmium batteries. They should be charged daily, and should not be deeply discharged as this could damage the battery. There is no memory effect and concerns about charging too soon or with little use are unwarranted.

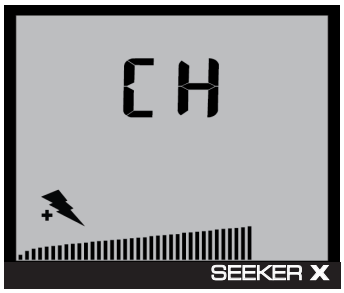
USB charging

You can charge the Seeker X outside of the Mobile Mount using the following charging methods:

- Connecting the Mini-USB cable and charger from an AC power source to the Seeker X. The Mini-USB charge / data cable and charger must be connected to both the Seeker X and a working power outlet before AC charging can begin.
- Connecting the Mini-USB vehicle cable and charger from the vehicle power jack to the Seeker X. The Mini-USB charge / data cable must be connected to both the Seeker X and vehicle power jack before USB charging can begin.

The following conditions apply when charging the Seeker X via USB:

- If the Seeker X is turned back on when USB charging, the Measurement mode is disabled while the Seeker X is USB charging.
- When the Seeker X is on and charging, the **Charge** icon flashes, and the bar graph shows the charging progress, as shown here.



Mobile Mount charging

Placing the Seeker X into the Mobile Mount will begin charging. The following conditions apply when charging the Seeker X via the Mobile Mount:

- The Mobile Mount DC power cable must be connected to the Mobile Mount and the vehicle power supply before charging can begin.
- When the Seeker X is off and it is placed in the Mobile Mount, the device will charge and nothing will be shown on the display.
- When the Seeker X is on and it is placed in the Mobile Mount, the display remains on the Measurement mode screen.

Charging with the optional Seeker MCA III

When the Seeker X is used with the optional Seeker MCA III, the following charging actions will occur.

- When the Seeker X is on and charging, the display remains on the Measurement mode screen.
- If the Seeker X is turned off and is placed in the Mobile Mount, the Seeker X automatically turns on when the vehicle is turned on.
- If the Seeker X is turned on and placed in the Mobile Mount, the Seeker X automatically turns off when the vehicle power has been turned off (and the vehicle timer of the Seeker MCA III has expired).

2

Using Your Seeker X

This chapter provides an overview of how to configure and operate the unit, including the following:

- "Seeker X setup" on page 34
- "Basic operation" on page 34
- "Using the display" on page 37
- "Using your Seeker X" on page 38
- "Distance correction adjustment" on page 45
- "Speaker volume level" on page 47
- "Saving measurement snapshots" on page 48
- "Seeker MCA III display screens (optional)" on page 51

Seeker X setup

You must configure the settings of the Seeker X using the Seeker Setup software. The Seeker X comes from the factory with default settings, but it is likely they will need to be customized.

See the ***Seeker Setup Software User's Guide*** for more information.

Basic operation

Power

Press and hold the **POWER** button until you hear three ascending tones. Within a few moments your Seeker X will startup into the RF Signal Measurement mode.

To turn off the meter, press and hold the **POWER** button until you hear three descending tones as the meter turns off.

Low battery warning

A very low battery may cause the Seeker X not to turn on. When the battery is too low for your Seeker X to function, **LO BATT** shows on the display. The battery must be charged for a few minutes before using again.

Low battery

Seeker MCA III communication successful (optional)

After placing the Seeker X in the Mobile Mount and upon successful communication with the optional Seeker MCA III, the screen shown here is displayed.

Communication successful

NOTE:

Ensure that the Seeker X is properly seated in the Mobile Mount, otherwise the Seeker X will display an error message and it will not be able to communicate with the Seeker MCA III.

PC communications mode

This mode is used by the Seeker Setup software to send and retrieve configuration parameters from your Seeker X. **PC** is displayed when connected.

Connect the Seeker X to your computer using a mini-USB charge / data cable and then open Seeker Setup.

PC communication mode

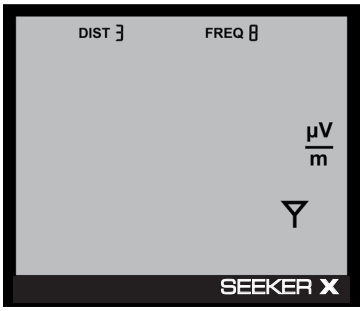
RF signal measurement mode

The RF Signal Measurement mode is the default display mode for leakage testing and is used to accurately determine the strength of a leak, pinpoint its location, and provide a leakage value for documentation. Measured RF leakage values can range from 1–2000 µV/m and are displayed in large, easy-to-read numbers. A bar graph at the bottom of the display illuminates proportionally to the signal strength of the leak.

Additionally, an audible tone will sound if the measured signal breaks squelch. The signal breaks squelch when the RF leakage is greater than the squelch level and tag qualifiers are also met. This tone can be used to help locate the source of the leak and, perhaps more importantly, the potential source of ingress.

The screen to the right represents the leakage detector measurement mode with no signal detected. Notice how no values are displayed and the bar graph at the bottom of the screen remains blank.

Within the leakage detector measurement mode, the antenna icon in the lower right side of the screen flashes to indicate that the leakage detector is currently taking measurements.

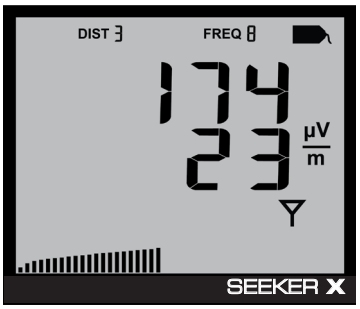


No signal detected

The screen to the right indicates detected leakage values of 174 µV/m on the frequency the user has selected to show at the top; and 23 µV/m on the frequency the user has selected to show on the bottom.

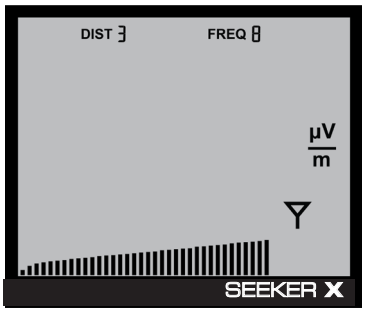
The bar graph at the bottom of the screen displays the relative signal level of the detected signal.

Additionally, the tag icon is displayed in the upper right corner of the display to indicate the leakage detector is receiving at least one tagged signal from the CT-X.



Tagged signal detected (high frequency)

If the tag icon is not displayed along with the signal level, the show noise setting is turned on. In this mode, the signal levels that are displayed will also include non-tagged noise that is received by the leakage detector.



Untagged signal detected

Using the display

Your Seeker X will operate differently, depending on whether it is in the Mobile Mount or if you are using it outside the vehicle in walkout mode.

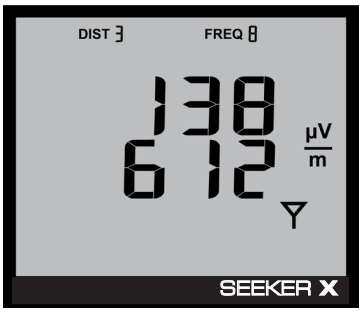
In the Mobile Mount

In the Mobile Mount, the Seeker X automatically scans all of the frequencies in the selected frequency plan, if available, and shows up to two of the plan's leakage values on the screen simultaneously.

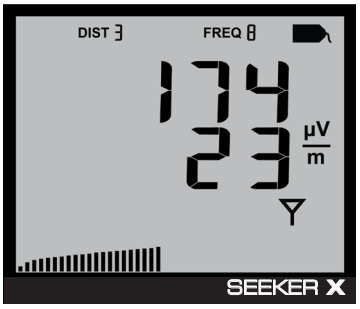
- To show the current frequency setting, press the **CHANGE** button.
- To toggle through the frequencies, press the **CHANGE** button multiple times.

The leakage values for each frequency are then displayed in the corresponding area of the screen.

If leaks are detected in alternate frequencies, a tone will sound to alert you, but the level won't be shown.



Current frequencies



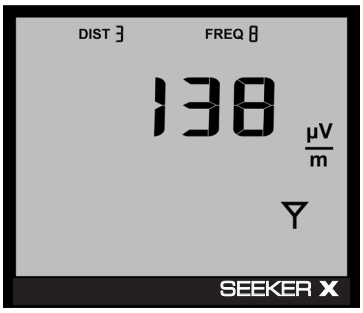
Current leak values

Outside the Mobile Mount

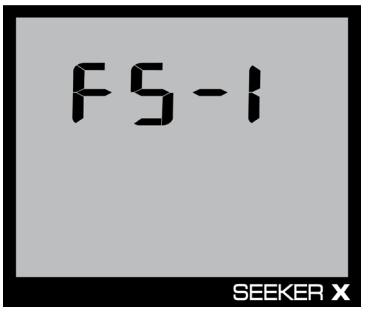
When removed from the Mobile Mount, the Seeker X no longer automatically scans through the frequency plan (and only displays one frequency at a time, as shown here).

- To show the current frequency setting, press the **CHANGE** button. The type of antenna you need to attach is then displayed.
- To toggle through the frequencies, press the **CHANGE** button multiple times.

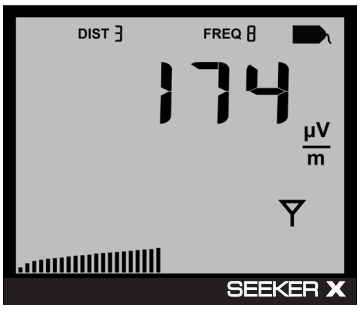
The leakage values for each frequency are then displayed.



Current frequency



Attach WFS-1 antenna for 130–450 MHz



Current leak value

Using your Seeker X

While testing for leaks, you will need to view the information shown by the Seeker's display modes.

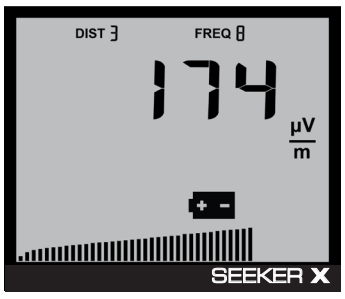
- Use the **SELECT** button to toggle through its display modes. As you toggle, the display modes will appear in the same order in which they are discussed in this section.
- Use the **CHANGE** button to adjust the settings of some display modes. Also toggles frequency presets from the measurement screen (press once to view, twice to change).

Viewing the battery charge level

To check the battery level, turn your Seeker X on and press the **SELECT** button once.

- When the battery charge level display is selected, the **Battery** icon flashes as shown here.
- When this display is selected, the following will occur:
  - The bar graph will indicate the amount of battery charge available. As long as there are at least a few bars left, your Seeker X has enough charge to operate.

    If the battery meter shows less than 50%, the Seeker X should be charged.
  - The numerical display will continue to display the RF signal level.



Battery charge level

NOTE:

The display will revert to the signal level display after a few seconds in the battery charge level display (without any action by the user).

Low battery

If the battery is getting low and needs to be recharged soon, the **Battery** icon blinks constantly on all screens. An example of a low battery warning while performing a level measurements is shown here.

When the battery reaches a very low state and is about to turn off, the **Battery** icon no longer blinks and stays on.

Low battery alert

Firmware version

When you are in the battery charge level display, pressing the **CHANGE** button will display the following information:

- The **Battery** icon will continue to flash and the bar graph will continue to indicate the relative battery charge level.
- The screen first displays the application firmware version number.
- After 5 seconds, the screen displays the FPGA firmware version number.
- Finally, the screen displays the package information.

Application firmware

NOTE:

The display will revert to the signal level display after a few seconds in the firmware version display (without any action by the user).

Checking the battery charging status

NOTE:

If the Seeker X is not completely seated in the Mobile Mount, the charge screen will not be available.

To view the charging status of the battery, turn your Seeker X on and press the **SELECT** button twice.

- The Charge icon will flash to show you are in the Battery Charging Status display.
- The numerical display will continue to display the RF signal level.
- The bar graph will display the progress of the charging cycle. If two or more bars are displayed, then power is present and charging is in progress.

Battery charging status

NOTE:

If the Seeker X is not detecting any power to the Mobile Mount, the bar graph will not be displayed.

NOTE:

The display will revert to the signal level display after a few seconds in the battery charging status display (without any action by the user).

Enable/Disable peak hold

To enable/disable the Peak Hold function, turn your Seeker X on and press the **SELECT** button repeatedly until the arrow appears under the PK icon**,** as shown here.

- When the Peak Hold display is selected, pressing the **CHANGE** button will enable/disable the Peak Hold function.
- When this display is selected, the following will occur:
    - If the Peak Hold function is currently disabled, the **PK** icon flashes with the arrow below the icon.
    - If the Peak Hold function is currently enabled, only the arrow below the **PK** icon flashes.

Peak hold disabled

NOTE:

The display will revert to the signal level display after a few seconds in the peak hold display (without any action by the user).

- When the Peak Hold function is enabled, the following will occur in the Signal Level display:
    - The **PK** icon is constantly displayed at the top of the screen.
    - The numerical display holds the latest peak RF level reading for up to five seconds, unless the RF level increases. This is useful if you are not able to look at the display immediately or if you want to confirm the highest level reading.
    - The peak element of the bar graph at the bottom of the display also holds its peak indication for five seconds, while the other elements of the bar graph continue to indicate the signal strength of the live signal.

Peak hold enabled

Selecting a frequency

The Preset Frequencies display is used to select the RF signal level measurement frequency plan used by the Seeker X. The preset frequencies 1–4 can be configured using the Mobile Tech application, StrataSync, or Seeker Setup software.

NOTE:

For detailed instructions on how to set the frequency plans and their associated tag settings, see the StrataSync or Seeker Setup Software User's Guides.

Press the **CHANGE** button to toggle through the enabled presets (1–4).

To select a frequency plan, press the **SELECT** button repeatedly until **FREQ** flashes at the top of the display.

First 3 digits for first 2 frequencies

Last 4 digits for those frequencies

Frequency attributes

- The display will show the 1st frequency in the plan on line 1, with the 2nd frequency on line 2. It only shows the first 3 digits of the frequency for each, at first.
- After a few seconds, the display shows the remaining 4 digits for both frequencies.
- The signal type is then displayed, followed by the tags for those frequencies.
- The remaining information for the first two presets will be displayed on subsequent screens until complete and then repeat the steps above for the remaining frequencies in the plan, if there are any (up to 4 total frequencies).
    - Possible attributes you might see (depending how frequencies are configured in Seeker Setup: Chirp, Dual, and sub channel spacing.
    - For OFDM signals, you may also see screens for cyclic prefix (CP).
- When the display has cycled through the information for all of the enabled frequencies in the selected plan (if selected), the display will resume RF signal level measurement of the selected preset frequencies.

Preset frequency toggle

To quickly toggle within the selected frequency plan:

1. Press the **CHANGE** button to show the current preset setting.
2. Press the **CHANGE** button repeatedly to quickly toggle through the frequencies.

When first entering the preset frequencies display or after selecting a new preset, the following will occur:

- The display will show the primary frequency on the top line, as shown here. The second frequency in the plan will be displayed on the second line.

Preset frequency

- After a few seconds, the display will change to show the tag for both the first and second frequencies.
- The remaining information for the first two presets will be displayed on subsequent screen changes until complete and then repeat the steps above for the remaining frequencies in the plan, if there are any (up to 4 total frequencies).
- When the display has cycled through the information for all of the enabled frequencies in the selected plan (if selected), the display will resume RF signal level measurement of the selected preset frequencies.

Tag selection

NOTE:

In this example, the first frequency in the plan 1 is 138 MHz, Tag 2.

NOTE:

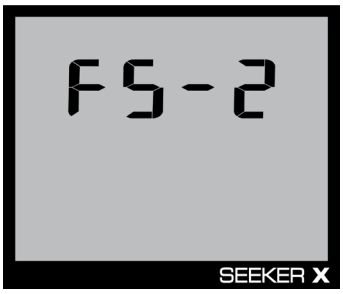
The display will revert to the signal level after a few seconds in the presets display (without any action by the user).

Antenna selection

When the Seeker X is either removed from the Mobile Mount, turned on, or the selected preset frequency is changed to another frequency band (High to Low, Low to High), the following will occur:

- An suggestion is displayed that tells you which antenna should be used based on the selected preset frequency as shown in the following images.
- Attach the proper antenna and then press any button to dismiss the alert.

Attach WFS-1 antenna



Attach WFS-2 antenna

Ambient noise level measurement

This measurement is used to find ambient noise sources such as vehicle wiring, Wi-Fi access points, or cellular devices that may be emitting RF signals at the currently selected leakage frequency.

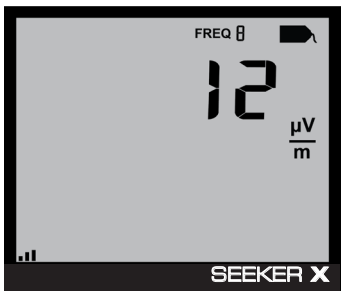
This provides a useful tool for troubleshooting noise issues that may occur when the Seeker X is installed in close proximity to other devices within a vehicle.

When ambient noise is detected, **NOISE** is displayed, as shown here.

- The bar graph indicates the relative signal level of the ambient noise.
- The RF signal level of the ambient noise is also displayed next to **NOISE**.
- Noise is not indicated when the Seeker X is in the Mobile Mount.

Noise detected

When signal is detected, the **Tag** icon is displayed.



Signal detected

Distance correction adjustment

NOTE:

This feature is disabled by default at the factory. In the Seeker Setup software, the Enable Distance Correction checkbox must be selected and at least one distance has been configured and enabled before this feature will work.

While testing for leaks, you may want to adjust the distance correction value to account for differences in distance between the Seeker X and the cable plant.

Use the **DISTANCE** button to display the Distance Correction mode.

NOTE:

The display will revert to the signal level display after a few seconds in the distance correction display (without any action by the user).

Selecting a distance correction preset

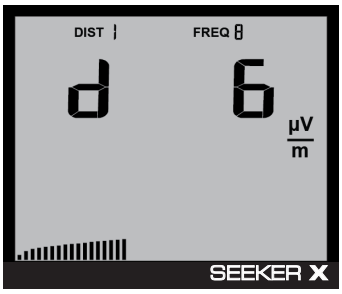
The Distance Correction display is used to select the distance correction preset used by the Seeker X. The preset distances 1–8 can be configured using StrataSync or the Seeker Setup software.

NOTE:

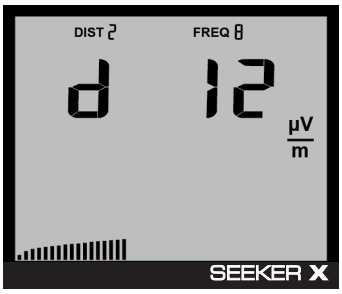
For detailed instructions on how to set the distance correction values, see the Seeker Setup Software User's Guide or the StrataSync User's Guide.

To select a preset distance, turn your Seeker X on and press the **DISTANCE** button.

- When the **DISTANCE** button is selected, the distance preset will toggle through the enabled presets 1–8, as indicated below.
- The distance correction for each preset is displayed.



Preset #1



Preset #2

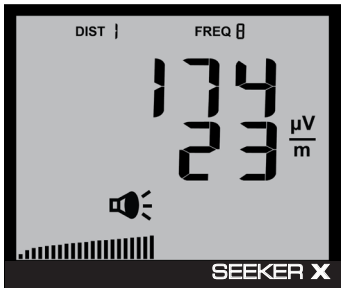
Speaker volume level

While testing for leaks, you may need to adjust the volume of the leakage tone.

Use the **VOLUME** button to adjust the volume. The bar graph at the bottom will show the level.

Adjusting the speaker volume

To check the volume of the leakage tones, press the **VOLUME** button. The speaker icon displays.



Speaker volume

- Press **VOLUME** again to adjust the level. There is no sound for the adjustment, the bar graph shows the level instead, as shown here.

  When leaks are found, you will hear the volume change in the leakage tone.

- The display continues to show the RF signal level as you adjust.
- You can also press and hold the volume button to quickly increase the volume and lower it again.

NOTE:

The display will revert to the signal level display after a few seconds in the speaker volume level display (without any action by the user).

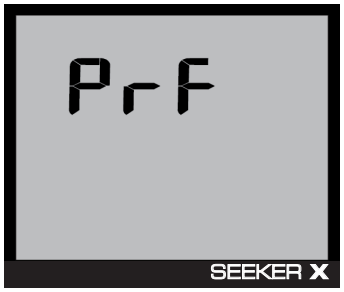
Saving measurement snapshots

While testing for leaks, you may need to record the pre-fix and post-fix leakage information recorded by the Seeker X.

Use the **SNAPSHOT** button to display the Snapshot mode. The Snapshot modes will appear in the same order in which they are discussed in this section.

Pre-Fix

To record the pre-fix leakage information recorded by the Seeker, press the **SNAPSHOT** button when this screen is displayed.



Pre-fix snapshot

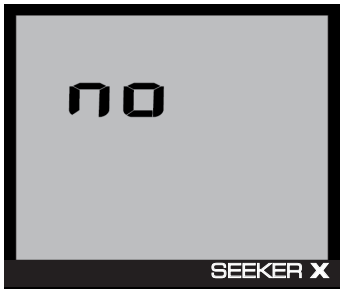
Post-Fix

To record the post-fix leakage information recorded by the Seeker, press the **SNAPSHOT** button when this screen is displayed.

Post-fix snapshot

No snapshot

To cancel the snapshot of the information recorded by the Seeker, press the **SNAPSHOT** button when this screen is displayed.



No snapshot

NOTE:

In Snapshot mode, the display will cycle through the screens displayed above until you make a selection. This enables you many opportunities to take a snapshot of the leakage signal.

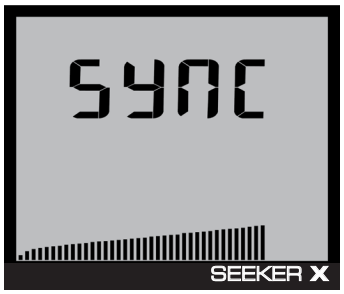
Data synchronization with Seeker MCA III (optional)

If you do not have a network connection for LAW uploads when using the Seeker X with the Seeker MCA III, the data recorded in the Seeker MCA III can be synchronized with the internal memory of the Seeker X for later upload through a PC.

NOTE:

Data synchronization will only work when the Seeker X is in the Mobile Mount. The SNAPSHOT button is used to record leakage information recorded by the Seeker X when it is not in the Mobile Mount.

To synchronize the data between the Seeker MCA III and the Seeker X, press and hold the **SNAPSHOT** button until SYNC appears. While the Seeker MCA III is transferring data to the Seeker X, the screen shown in the image to the right will be displayed.



Syncronization progress

IMPORTANT:

The bar graph will show the progress of the data synchronization, do not remove the Seeker X from the Mobile Mount until the data synchronization is completed, otherwise data corruption (although unlikely) may occur.

When the Seeker MCA III is done transferring data to the Seeker X, the screen shown in the image to the right will be displayed. Press any button to return to the RF Signal Measurement display.

Synchronization done

Seeker MCA III display screens (optional)

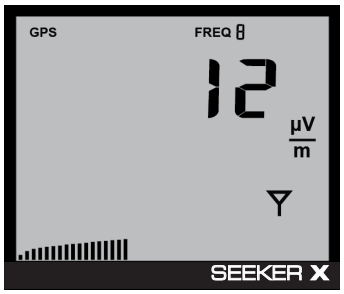
GPS signal

NOTE:

When the Mobile Mount is not connected to a Seeker MCA III, the GPS icon is not shown on the display.

When the Seeker X is placed in the Mobile Mount, the GPS icon is used to display the status of the GPS Signal as follows:

- When the GPS receiver is receiving a satellite signal, the **GPS** icon is on.
- When the GPS receiver is not receiving a satellite signal, the **GPS** icon flashes.



GPS signal

NOTE:

When the GPS receiver has been off or has not been able to receive a satellite signal, for more than five minutes, the device will beep twice every few seconds until the condition is corrected.

NOTE:

When the GPS receiver IS NOT receiving a satellite signal, the MCA III will not record leakage data from the Seeker.

3

Leakage Testing

This chapter provides an overview of the steps needed to perform leakage testing using the Seeker X., including the following:

- “Before you begin leakage testing” on page 54
- “Testing for leaks” on page 54

Before you begin leakage testing

- A low battery may cause the Seeker X to NOT turn on. Try charging your battery for 3 hours to see if that fixes the problem, or use the Seeker X while in the Mobile Mount.
- The Seeker X will retain the setup from when the meter was last shut off. For example, if you were testing frequency preset number two and then turned off your Seeker X, when you turned it back on again the meter would automatically begin testing that same preset.

Testing for leaks

The Seeker X should be configured with the Seeker Setup software before beginning leakage testing.

> ***NOTE:***
>
> ***Unless OFDM leakage detection is used, the CT-X Digital Channel Tagger must be installed and set up within the system before testing for leaks.***

1. **Turn on the Seeker X.**

   Press the **POWER** button until you hear 3 ascending tones. The Seeker X will power up in RF Level Measurement mode.

2. **Confirm the desired frequency preset (1–4) is selected.**

   If using the Seeker X for the first time, the default frequency preset during configuration with Seeker Setup software will be selected.

   If the Seeker X has been used since configuration with Seeker Setup software, the last frequency used will be selected.

3. **Confirm the Seeker is in the RF Level Measurement mode.**

   The Antenna icon on the display should be flashing for the RF Level Measurement mode. If necessary use the **SELECT** button to move to the Measurement mode.

> ***NOTE:***
>
> ***For more information about using the Preset Frequency or Channel Tag features, see Chapter 2: "Using Your Seeker X" on page 33.***

4. **Begin leakage testing.**

   Move the Seeker X around the test area. If the detected leakage level exceeds the squelch level (default 2 µV/m), the Seeker X will alarm.

   The frequency of the alarm tone will increase as the detected signal strength increases. Continue to move the Seeker X in the direction producing the highest tone frequency to locate the source of the leak.

5. **Turn OFF the Seeker X.**

   When testing is complete, turn off the Seeker X by holding down the **POWER** button until you hear 3 descending tones. This step is not required if you leave the Seeker X in the Mobile Mount.

4

Appendix

This appendix includes troubleshooting and supplemental information, including the following:

- “Specifications” on page 58
- “Ordering information” on page 59
- “Feature matrix” on page 59
- “Display messages” on page 61

Specifications

Seeker X	
Frequency Range	130–150 and 250–1220 MHz, adjustable via Seeker Setup Software and Mobile Tech App
Frequency Settings	4 user selectable frequency presets, plus 4 different selectable frequency plans.
Receiver Sensitivity	-158 dBm
Calibrated Level Range	1–2000 µV/m
Level Accuracy	±2.0 dB
Display	Dual numerical readout of up to 2 detected leakage frequencies and carrier types within sensitivity range
Audible Tone	Tone is present if leakage amplitude exceeds squelch setting and digital tag is detected
	Pitch is proportional to strength of leak
Automatic Noise and Overbuild Discrimination	Internal circuitry discriminates between leaks and noise
	Overbuild discrimination provided by CT-X channel tagger installed in hub or head-end
Power	Internal battery with 3 hours of operation per charge; ~2 hours charging time OR Vehicle power of 12 VDC while in Mobile Mount
Configuration Methods	• StrataSync with the Mobile Tech App via Bluetooth Low-Energy Connection • USB connection from Leakage Detector to local PC running Seeker Setup Software

Seeker MCA III (Optional)	
Standard Communications Interfaces	10/100 RJ45 connection to fleet management systems WiFi (802.11 a/b/g/n) to operator-controlled and configured hot-spot
Early Detection Notification (EDN)	Email notification of threshold exceeding leaks

Ordering information

Package Name/Description	Package Part Number
Seeker-X Find and Fix kit w handheld antennas case and car charger	TRI-SKR-X-FIND-FIX-PKG
Seeker-X Mobile Find and Fix kit w/Mobile Mount vehicle/handheld antennas	TRI-SKR-X-DRIVE-PKG
Seeker-X Mobile Mapping kit w/MCAIII/GPS/MM vehicle antennas	TRI-SKR-X-DRIVE-ONLY-PKG
Seeker-X Mobile Mapping kit w/MCAIII/GPS/MM vehicle/handheld antennas	TRI-SKR-X-DRIVE-GPS-PKG

Feature matrix

Description	Part #	Find/ Fix	Drive Only	Drive/ Fix	Drive GPS
Seeker X Mobile Mount	TRI-LKG-SKR-X-VEH-MOUNT	—	■	■	■
Seeker X Mobile Mount Wiring Kit	TRI-LKG-SKR-X-MM-WIRE-KIT	—	■	■	■
AC Travel Charger and USB Cable		■	—	■	■
Wideband VHF/UHF Antennas					
WFS-1 Low-band adjustable dipole 130 MHz – 450 MHz	TRI-LKG-ANT-WFS-1	■	—	■	■
WFS-2 High-frequency wideband directional antenna 450 MHz – 1220 MHz	TRI-LKG-ANT-WFS-2	■	—	■	■
WVM-2 magnetic base, wideband vehicle antenna (250–1220 MHz)	TRI-LKG-ANT-WVM-2	—	■	■	■
UHF Band Antennas					
AFS-7 Handheld YAGI antenna 580-640 MHz	TRI-LKG-ANT-AFS-7-YAGI	—	—	—	—
Rubber duck antenna, high band 580-690 MHz	TRI-LKG-ANT-DUCK-HI	—	—	—	—
AVM-4 magnetic base, colinear array antenna (612 MHz)	TRI-LKG-AVM-4	—	—	—	—
VHF Band Antennas					
AVM-3 magnetic base, vertical quarter wave whip antenna (trimmed to 130-150 MHz)	TRI-LKG AVM-3	—	■	■	■
Rubber duck antenna, low band 127-136 MHz	TRI-LKG-ANT-DUCK-LOW	—	—	—	—
Near Field Probe					
Near Field Probe	TRI-LKG-NFP-1	■	—	■	■

Feature matrix (continued)

Description	Part #	Find/ Fix	Drive Only	Drive/ Fix	Drive GPS
Optional Seeker MCA III					
MCA III	TRI-LKG-SEEKER-MCA-WIFI	—	■	—	■
Seeker MCA III to Mobile Mount Power and Data Cable	TRI-LKG-SKR-MCA-PWR-CBL	—	■	—	■
2.4 and 5 GHz WiFi antenna	TRI-LKG-MCAIII-WIFI-ANT	—	■	—	■
Shielded ethernet cable (10 ft)	TRI-ACCY-CAT5-10FT-QUAD	—	■	—	■
Optional Accessories					
GPS receiver for Seeker MCA II and Seeker MCA III	TRI-LKG-GPS-MCA	—	■	—	■
CL-9 vehicle power adapter	TRI-ACCY-USBPWR-VEH-WCBL	■	—	—	—
Carrying bag with strap for meter and accessories	AC-BAG-METER-MEDIUM	■	—	■	■
Digital Channel Tagger					
CT-X Channel Tagger	TRI-LKG-CTX				
Available Software					
Seeker Setup Configuration Software	TRI-LKG-SW-SEEKER-PC				
Hosted Leakage Analysis Software (support for 5–1000+ instruments)					

Display messages

You may see the following messages, warnings, and errors on the display.

Messages and warnings

Messages are general connection messages or status updates.

Warnings are notices or reminders to keep in mind and can be dismissed temporarily with a button press.

Display messages	Descriptions
CA 0	The meter is connected to the MCA.
CA 1	The meter is syncing snapshots to the MCA.
LO BATT	Displays when the battery is very low, recharge the battery.
FS-1	Attach the WFS-1 low-band antenna.
FS-2	Attach the WFS-2 high-band antenna.
SYNC	The MCA is syncing snapshots to the meter.
DB FULL	Database is full on the meter. Sync to the MCA or LAW.
SYNC DONE	Sync from the MCA to meter is complete.
CAR BAT	No vehicle power or low power. Check connections to vehicle battery.
CAL DUE	Calibration is out of date.

Error messages

Some errors may be corrected through a power cycle or a software update. All other errors will require returning the device to the factory for repair.

Error messages	Descriptions
DB ERR	Sync from MCA to the meter failed. Try again.
SYNC ERR	Sync from MCA to the meter failed. Try again.
FPGA 1	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FPGA 1_8	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
PREG 2	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
PREG 3_3	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
RF 3	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
RF 1_8	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
RF 2	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
RF 5	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
CLOC SYN	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FPGA BOOT	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.

Error messages	Descriptions
FPGA R_T	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
PLOC 1	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
PLOC 2	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
RTC OSC	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
24 OSC	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FLSH ID	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FL_T FAIL	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FL_E FAIL	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
BAD TSEN	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
NO CAL	Calibration file is missing. Try to recover from StrataSync or Seeker Setup.
FILE CORR	File system is corrupted. Contact VIAVI at 1-844-GO-VIAVI / 1.844.468.4284 for assistance.
SYNC FAIL	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
BAD FPGA	File system is corrupted. Contact VIAVI at 1-844-GO-VIAVI / 1.844.468.4284 for assistance.

Error messages	Descriptions
BAD APP	File system is corrupted. Contact VIAVI at 1-844-GO-VIAVI / 1.844.468.4284 for assistance.
FPGA DONE	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.
FPGA INT	Reboot the unit and retry. If it doesn't fix, return to the factory for repair.

Limited warranty

For the latest warranty information, visit

https://www.viavisolutions.com/literature/viavi-solutions-inc-general-terms-en.pdf

https://www.viavisolutions.com/en-us/literature/viavi-manufacturer-warranty-nse-products-en.pdf

Technical assistance

If you require technical assistance, call 1-844-GO-VIAVI / 1.844.468.4284.

For the latest TAC information, visit
http://www.viavisolutions.com/en/services-andsupport/support/technical-assistance

Additional information

For more detailed information, contact us at **Trilithic.support@viavisolutions.com** for these additional documents.

Seeker X Installation Guide

Seeker MCA III User's Guide

Seeker MCA III Installation Guide

Seeker Setup Software User's Guide

LAW Software User's Guide

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