Seeker & Seeker MCA III Leakage Detection System

Operation Manual

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. See Page 2 for complete details.

Industry Canada **Industrie Canada** This equipment has been tested and found to comply with Industry Canada Standards. See Page 3 for complete details.

think ahead.

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FCC Part 15 Compliance

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

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

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the device and receiver

- Connect the device into an output on a circuit different from that to which the receiver is connected

- Consult the dealer or an experienced radio/TV technician for help

The Seeker MCA III can only be used with the following Trilithic approved Wi-Fi antennas:

- P/N 2071677001 - 2.4 GHz antenna

- P/N 2071677004 - 2.4 & 5 Ghz antenna

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Industry Canada Compliance

This device complies with Industry Canada license-exempt RSS standard(s). Operation of this device 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.

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

The Seeker MCA III can only be used with the following Trilithic approved Wi-Fi antennas:

- P/N 2071677001 - 2.4 GHz antenna
- P/N 2071677004 - 2.4 & 5 Ghz antenna

Industrie Canada Conformité

Cet appareil est conforme au Cahier des charges sur les normes radioélectriques d'Industrie Canada concernant les appareils radio exempts de licence. Le fonctionnement de cet appareil est soumis aux deux conditions suivantes : 1) cet appareil ne doit pas produire de brouillage et 2) cet appareil doit accepter tout brouillage, y compris celui pouvant causer un mauvais fonctionnement de l'appareil.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

Le Seeker MCA III ne peut être utilisé avec le Trilithic approuvé antennes Wi-Fi qui suit:

- P/N 2071677001 - 2.4 GHz antenne
- P/N 2071677004 - 2.4 et 5 Ghz antenne

Trilithic Company Profile

Trilithic is a privately held manufacturer founded in 1986 as an engineering and assembly company that built and designed customer-directed products for telecommunications, military and industrial customers. From its modest beginnings as a two-man engineering team, Trilithic grew over the years and broadened its offerings of RF and microwave components by adding broadband solutions to its product line. This was accomplished with the acquisition of components manufacturer Cir-Q-Tel and instruments manufacturer Texscan.

Today, Trilithic is an industry leader providing telecommunications solutions for major broadband, RF and microwave markets around the world. As an ISO 9000:2001 certified company with over 40 years of collective expertise in engineering and custom assembly, Trilithic is dedicated to providing quality products, services, and communications solutions that exceed customer expectations.

Trilithic is comprised of five major divisions:

- **Broadband Instruments and Systems**
  Offers test, analysis, and quality management solutions for the major cable television systems worldwide.

- **RF Microwave Components**
  Provides components and custom subsystems for companies specializing in cellular, military, and other wireless applications.

- **Emergency Alert Systems**
  Leading supplier of government-mandated emergency alert systems used by broadcast TV, cable TV, IPTV, DBS, and radio stations.

- **XFTP**
  Offers a specialty line of field technical products for cable operators and technicians, as well as a line of products for installing electronics in the home of the future.

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General Information

Helpful Website

The following website contains general information which may be of interest to you:

http://www.trilithic.com

Trilithic's website contains product specifications and information, tips, release information, marketing information, frequently asked questions (FAQs), bulletins and other technical information. You can also check this website for product updates.

Where to Get Technical Support

Trilithic technical support is available Monday through Friday from 8:00AM to 5:00PM EST. Callers in North America can dial 317-895-3600 or 800-344-2412 (toll free). International callers should dial 317-895-3600 or fax questions to 317-895-3613. You can also e-mail technical support at support@trilithic.com.

For quicker support response when calling or sending e-mail, please provide the following information:

- Your name and your company name

- The technical point of contact (name, phone number, e-mail)

- The version numbers for the Seeker and/or Seeker MCA III firmware and Seeker Setup Software

- The version of Windows you are using (including any Service Packs and patches)

- A detailed description of the problem you are having, including any error or information messages

How this Manual is Organized

This manual is divided into the following chapters:

- Chapter 1, "General Information" provides Trilithic contact information and describes how this operation manual is structured.

- Chapter 2, "Seeker Introduction" introduces what the Seeker is and what it does. This chapter discusses the practical application, connections and controls of the Seeker. Finally, this chapter discusses the Seeker's battery and how to update your firmware.

- Chapter 3, "Seeker Operation" describes how to configure and operate the Seeker.

- Chapter 4, "Leakage Testing" describes the steps needed to perform leakage testing using the Seeker.

- Chapter 5, "Seeker MCA III Introduction" introduces what the Seeker MCA III is and what it does. This chapter discusses the practical application of the Seeker MCA III. Finally, this chapter will also explain the connections of the Seeker MCA III.

- Chapter 6, "Seeker MCA III Operation" describes how to use the modes of operation of the Seeker MCA III.

- Chapter 7, "Data Upload Options" shows the data upload options for the Seeker MCA III.

- Chapter 8, "Appendix" shows the technical specifications of the Seeker and Seeker MCA III as well as any error codes that may appear on the Seeker's display screen.

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Optional Software

Although the Seeker comes preconfigured and ready to use from the factory, the following software is required for advanced configuration of the Seeker and Seeker MCA III:

- **Seeker Setup** is used to configure the Seeker, 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.

The following software is required for leakage data analysis using the Seeker MCA III:

- **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 through a customer configured Wi-Fi wireless site. Data stored in LAW server may be displayed on maps or as text, used to generate leakage work orders, or downloaded to other Trilithic or third-party applications.

Conventions Used in this Manual

This manual has several standardized conventions for presenting information:

- Connections, menus, menu options, and user-entered text and commands appear in **bold**.

- Section names, web, and e-mail addresses appear in *italics*.

> **NOTE**
>
> *A <u>NOTE</u> is information that will be of assistance to you related to the current step or procedure.*

> **CAUTION**
>
> *A <u>CAUTION</u> alerts you to any condition that could cause a mechanical failure or potential loss of data.*

> **WARNING**
>
> *A <u>WARNING</u> alerts you to any condition that could cause personal injury.*

Precautions

> **WARNING**
>
> *Do not use the Seeker or Seeker MCA III in any manner not recommended by the manufacturer*

> **CAUTION**
>
> *A strong electromagnetic field may affect the accuracy of the Seeker's measurements.*

> **CAUTION**
>
> Use *only the battery charger supplied with the Seeker.*

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Seeker Introduction

This chapter:

- Describes the Seeker's purpose

- Gives an overview of the Seeker's features

- Lists the Seeker's supplied equipment and optional accessories

- Gives a guided tour of the Seeker and Mobile Mount and explains the display screen

- Discusses the Seeker's battery

- Discusses updating the Seeker's firmware

What is the Seeker?

The Seeker is specifically designed for efficient distribution leakage management, displaying numerical measurements of leaks on up to ten selectable channels and emitting a tone proportional to leak strength. The Seeker is a frequency-agile leakage detector (109.25 to 110.5 MHz and 118.50 to 147.25 MHz) with 10 user-selectable presets.

> **NOTE**
>
> *Older Seekers do not include the low band frequency from 109.25 to 110.5 MHz. Seekers that are low band frequency compatible will have a label on the back of the device indicating "LOW BAND ENABLED."*
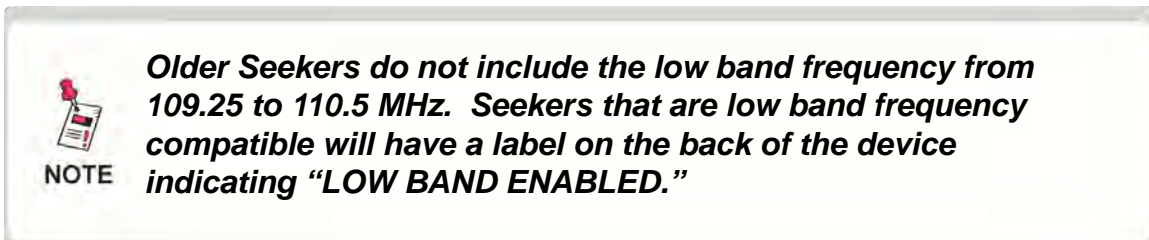
The Seeker may be used in its Mobile Mount for driveouts, or removed from the mount for leakage troubleshooting on foot with a rubber duck or optional dipole antenna.

Seeker Features

Easy Frequency Configuration

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

Multiple Frequency Presets

Your Seeker can be setup to operate on up to 10 different frequency presets, which makes it easier to monitor and maintain multiple cable systems. These presets define the leakage monitoring frequency and, if desired, the tag detection frequency as well. You have the option of setting up only one frequency preset for simple operation, or multiple leakage frequencies for maintaining multiple cable systems. Frequency settings range from 109.25 to 110.5 MHz and 118.50 MHz to 147.25 MHz in 6.25 kHz increments (these increments are sufficient for use with HRC).

> **NOTE**
>
> *The Seeker monitors one frequency at a time.   It does not scan several frequencies at once.*

> **NOTE**
>
> *Older Seekers do not include the low band frequency from 109.25 to 110.5 MHz. Seekers that are low band frequency compatible will have a label on the back of the device indicating "LOW BAND ENABLED."*

Channel Tag Compatibility

Compatibility with both the Trilithic CT-2 and CT-3 channel tag devices is another feature of your Seeker. Channel tagging refers to the process of adding frequency tags to a broadcast channel signal. Your Seeker can be set up to detect a tagged leak and to ignore leaks that are not tagged. With this feature, you are saved from chasing false alarms from signals that do not originate in your system.

Channel tag values range between 10 Hz and 23 Hz (except 16 Hz) and are configured using the Seeker Setup software.

GT Noise Discrimination

Your Seeker works with systems employing digital set top terminals that cannot tolerate "tagged" leakage carriers. Therefore, enhanced "false alarm" resistance can be provided without the use of a tagged leakage signal. The Seeker analyzes the detected RF energy and automatically detects noise and signals that are not caused by leaks from your system.

GT noise discrimination is enabled/disabled using the Seeker Setup software.

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Squelch Operation

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

The squelch level has a factory default of 2 µV/m. However, it can be reconfigured using the Seeker Setup software.

Source Localization

The Seeker emits an audible tone to help the user pinpoint the leakage source. The tone frequency increases with signal strength. As the user moves closer to the leak, the frequency of the tone will increase.

> **NOTE** **Common leakage areas are around the tap, drop cable, and any connection of the cable to other devices.**
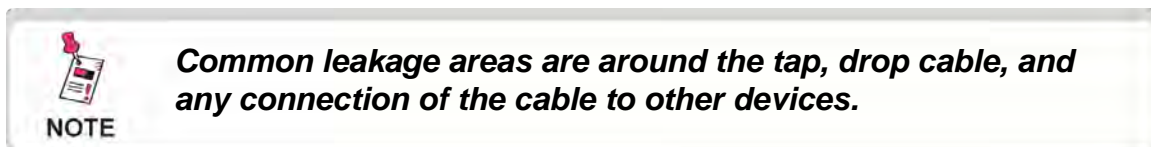
Vehicle Battery Protection

Overview

The Mobile Mount and Mobile Communications Adapter (MCA III) are equipped with circuitry which automatically powers down the MCA III when the vehicle's ignition is turned off, only after all data upload processes have been completed. This feature allows the vehicle to be parked and left unattended for long periods of time without concern for depleting the vehicle's battery. Mobile Mounts and MCA IIIs which feature battery protection circuitry are identified with a "Green Engineering" logo on the device.

This feature allows a vehicle equipped with the "Green Engineering" Mobile Mount and "Green Engineering" MCA III to automatically upload leakage data to the LAW server application while parked and left unattended. Upon completion of the data upload (or after a user-programmed number of attempts to upload data), the MCA III will automatically power down. The MCA III will also stay on for a selectable time period to avoid any "cold start" delay required by the GPS receiver after a power down.

Function

Upon parking and shutting down a vehicle equipped with a "Green Engineering" Mobile Mount and MCA III, the MCA III will attempt to upload leakage data to the LAW server via the Wi-Fi or Ethernet connection. The MCA III will then automatically power down after the vehicle timer delay has expired.

Seeker MCA III and Mobile Mount Compatibility

"Green Engineering" Mobile Mounts are compatible only with "Green Engineering" Seeker MCA IIIs. Do not attempt to use an MCA III with a Mobile Mount unless both devices feature the "Green Engineering" logo.

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Equipment Supplied with Your Seeker

The Seeker comes with the following:

- Seeker leakage detector

- Rubber "duck" antenna

- Built-in battery

- AC travel charger and mini-USB charge / data cable

- DC power cable for the Seeker Mobile Mount

- Mobile Mount and arm with mounting hardware

- Operation manual and hardware USB driver on CD

- Printed installation guide and installation checklist

> **NOTE**
>
> *The Seeker requires a monopole antenna (not included) for use with the mobile mount.*

Accessories & Replacement Parts for Your Seeker

The following accessories & replacement parts are available for the Seeker:

Part Number	Description
2071679000	Rubber "Duck" Antenna
2071743000	Seeker Mobile Mount
2071585007	Power Cable for Seeker Mobile Mount
0610169007	Vehicle Power Adapter
2131249000	Seeker Holster
2071802000	Seeker Pole Mounting Kit
0610169006	Seeker Charger
0610169011	International Power Adapter Kit
2072585004	Mini-USB Data Cable
0090048000	Seeker Battery

To place an order, please call Trilithic at (800) 344-2412 or (317) 895-3600.

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A Guided Tour of Your Seeker

Front View

Additional Function button

Press this button to directly enable and disable tag detection. Also, when in WaveTracker mode, press this button to change the distance from the vehicle to the cable plant.

VOLUME button

Press this button to change the volume of the leakage tone. Brief presses increase the volume to maximum and then it rolls over to the minimum volume.

SNAPSHOT button

Press this button to activate the Snapshot mode or sync data while in the mobile mount

ON/OFF button

Press and hold this button to turn the Seeker on or off. Also, when the meter is on, press this button to activate the display's backlight for approximately 60 seconds.

CHANGE button

Toggles or alters the current display selection.

SELECT button

Press to advance to the next display mode.

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Back View

Antenna connection

The antenna connection is used to connect the Seeker to the Mobile Mount antenna connection.

Right Side View

Mini-USB connection

The Mini-USB connection is used to connect the charger to the Seeker and/or to connect a PC or laptop computer to the Seeker using the mini-USB charge / data cable.

Bottom View

Mobile Mount interface

The Mobile Mount interface is used to charge the Seeker as well as communicate with the MCA III unit when the Seeker is in the mobile mount.
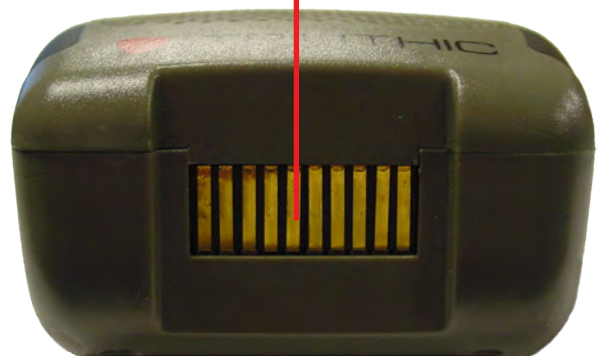
Display Screen

1. GPS - This icon is shown when the Seeker is placed in the Mobile Mount and a GPS connection is established with the MCA III. When the icon is not shown, the Seeker is not in the Mobile Mount or the GPS connection cannot be established with the MCA III. If the icon blinks the MCA III is connected to the GPS but the GPS does not have a good position fix.

2. DIST - This icon indicates the distance from the vehicle to the cable plant when the Seeker is in distance corrected mode.

3. PK - This icon is shown when the Peak Hold feature is active. When the icon is not shown, the Peak Hold feature is turned off.

4. FREQ - This icon indicates the number of the currently selected frequency preset.

5. Tag - This icon is shown when tag detection is active. The icon is not shown when tag detection is turned off.

6. Measurement units - This indicator will show the measurement units that are selected in Seeker Setup and the selected icon will blink when GT noise qualifiers have been met.

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7. Main display - This is used to show various parameters, and its function depends on the current display mode selection.

8. Antenna - This icon blinks when the signal mode is selected. This is the normal mode for leakage detection.

9. Bar graph - This is used to show the level of various Seeker and Seeker GPS parameters, and its function depends on the current display mode selection.

10. Battery - This icon blinks when the battery mode is selected. The icon will stay on when the battery needs to be recharged.

11. Speaker - This icon blinks when the volume button is pressed.

12. Charge - This icon blinks when the battery is being charged, or when the device is placed in the Mobile Mount and the Battery Charge Level screen is displayed.

If you see any of the following messages on your display:

- The word "AP", "CE", "E", or "FL" along with a number – See **Chapter 8: Appendix**, Display Messages & Error Codes.

- PC - Appears when the Seeker is connected to a PC and is in PC Communications mode.

- CH - Appears when the Seeker is connected to a battery charger (AC adapter) or a USB connection and the Seeker is not in PC Communications mode and is in Charge mode.

- LO - Appears when Seeker's battery is too low for the meter to function.

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A Guided Tour of Your Mobile Mount

Front View

Antenna connection

The Mobile Mount antenna connection is used to connect the Seeker antenna input.

Spring loaded cradle

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

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

The spring return of the cradle will secure the top of the Seeker upward into the recess in the top of the mobile mount.

> **CAUTION**
>
> *If the spring return of the mobile mount cradle is broken or not working properly, contact Trilithic at 1-800-344-2412 for repairs.*

Left Side View

Mounting arm

The arm is used to secure 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

Audio output connection

This connection is used to connect the audio from the Seeker to an external audio system.

MCA III serial connection

This connection is used with the Mobile Communications Adapter serial cable to connect the Seeker Mobile Mount to the Seeker MCA III.

Antenna input

This connection is used to connect an external monopole antenna. The rubber duck antenna does not function when the Seeker is placed in the Mobile Mount.

DC power cable connection

- Red wire - Connect to an always-on positive (+) 12 Volt power supply between the vehicle battery and the vehicle key switch

- White wire - Connect to an ignition-switched positive (+) 12 Volt power supply

- Both black wires - Connect to ground or the negative (-) battery terminal
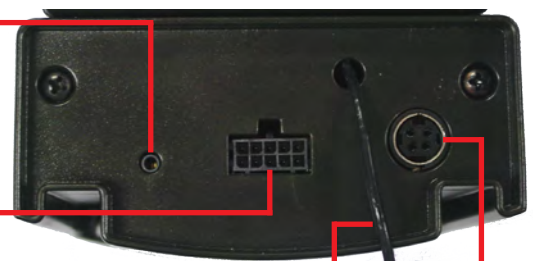
About Your Seeker's Battery

Overview

• The Seeker uses a Lithium-Ion battery. The battery is charged during manufacture and should be ready to use as long as it has not been stored for a long period of time.

• 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.

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

If Your Seeker Does Not Turn On

• A very low battery may cause the Seeker not to turn on. Try charging the battery for a few minutes to see if that fixes the problem.

Checking the Battery Level

• To check the battery level, turn your Seeker on and press the **SELECT** button once. The **Battery** icon will flash to show you are in the Battery Charge Level display. The bar graph at the bottom of the display shows the amount of battery charge available. As long as there are at least a few bars left, your Seeker has enough charge to operate. If the battery meter shows less than 50%, the Seeker should be placed on the charger.

• If the battery icon appears while in any of the other menus, this is a warning that the battery is getting low and needs to be recharged soon.

• When the battery is too low for your Seeker to function, the screen shown to the right will appear.

• Typical operating time from a full battery charge is eight hours.

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Charging the Battery

AC Charging

Connecting the Mini-USB cable and charger to the Seeker will begin AC charging.

- The Mini-USB charge / data cable and charger must be connected to both the Seeker and a working power outlet before AC charging can begin.

- When the Seeker is off and it is charging, the device will go into background charging and nothing will be shown on the display screen.

- When the Seeker is on and is charging, the following screen will be displayed, the **Charge** icon will blink, and the on-screen bar graph will show the charging progress.

- If the Seeker is on when it is connected to a working power outlet, the device will automatically turn off. The Seeker can be turned back on, but Measurement mode **IS** disabled while the Seeker is AC charging.

USB Charging

Connecting the Mini-USB charge / data cable from a PC or laptop computer to the Seeker will begin USB charging.

- The Mini-USB charge / data cable must be connected to both the Seeker and a PC or laptop computer that is ON before USB charging can begin.

- When the Seeker is off and it is charging, the device will go into a background charging and nothing will be shown on the display screen.

- When the Seeker is on and is charging, the screen above will be displayed, the Charge icon will blink, and the on-screen bar graph will show the charging progress.

- If the Seeker is on when it is connected to a PC or laptop computer, the device will automatically turn off. The Seeker can be turned back on, but Measurement mode IS disabled while the Seeker is USB charging.

Mobile Mount Charging

Placing the Seeker into the Mobile Mount will begin Mobile Mount charging.

- The Mobile Mount DC power cable must be connected to the Mobile Mount and the vehicle power supply before Mobile Mount charging can begin.

- When the Seeker is off and it is charging, the device will go into a background charging and nothing will be shown on the display screen.

- When the Seeker is on and is charging, the display will remain on the Measurement mode screen. From the Measurement mode screen, press the Select button once to view the on screen bar graph showing the battery charge level. Press the Select button a second time and the charge icon will blink while the bar graph shows charging progress.

- If the Seeker is not completely seated in the Mobile Mount, the charge screen may not be displayed. If the Charge icon blinks but the bar graph isn't shown, then the Seeker is not detecting any power to the Mobile Mount. If two or more bars are displayed, then power is present and charging is in progress.

- Measurement mode IS NOT disabled while the Seeker is mobile mount charging.

Updating Your Seeker's Firmware

To update your Seeker's firmware, you must use the Seeker Setup software. For more information on how to update your firmware, see the Seeker Setup Software Operation Manual.

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Seeker Operation

This chapter:

- Provides information on Seeker's operation and display modes

Configure Settings

You must configure the Seeker's settings using the Seeker Setup software. The Seeker comes from the factory with default settings, but it is likely they will need to be customized. Detailed instructions can be found in the Seeker Setup Software Operation Manual.

- The following settings are configured with the Seeker Setup software: Display units, squelch, GT noise discrimination (enable or disable), the entering of leakage frequency values, and tag frequencies. You can also use the Seeker Setup software to update your instrument's firmware.

- The Tag Enable and Enable Peak Hold settings can be turned on or off using either the Seeker Setup software or the Seeker.

- The speaker volume setting of the Seeker cannot be changed.

Seeker's Operation Modes

Measurement Mode

Measurement Mode 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 2 to 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, as long as any enabled tag or GT noise discrimination qualifiers are also met. This tone can be used to help locate the potential source of the leak.

Enter Measurement Mode by:

Press and hold the red button until you hear three ascending tones. Within a few moments your Seeker will begin to measure and then display ambient RF leakage.

PC Communications Mode

This mode is used by the Seeker Setup software to send and retrieve configuration parameters from your Seeker. The following screen will be displayed while your Seeker is in this mode.

Enter PC Communications Mode by:

Connecting the Seeker to a PC or laptop computer using a mini-USB charge / data cable and then initializing the Seeker Setup software to communicate with the Seeker.

> **NOTE**
>
> **When the Seeker is on and it is connected to a PC or laptop computer using the Mini-USB charge / data cable, the device will turn off.**

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Display Modes

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

- Use the Seeker's **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.

Signal Level

The Signal Level display is the normal display mode for leakage testing.

In this mode the Antenna icon on the display blinks to show the Signal Level display is selected.

The signal level detected for the selected frequency will be displayed numerically and the bar graph will indicate the relative signal level.

Also:

You can freeze the numerical display to make documenting the leakage value easier.

- To freeze the display, press the Seeker's CHANGE button.

- To unfreeze the display, press either the Seeker's CHANGE or SELECT button.

The display will blink to remind you it has been frozen. Even though the numerical display doesn't change, the bar graph will continue to update and the audible tone will still sound if the measured signal breaks squelch.

> **NOTE**
>
> ***After a few seconds in any other Display Mode without any action by the user, the display will revert to the Signal Level display.***

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Battery Charge Level

The Battery Charge Level display is used to test the charge level of the battery.

In this mode the Battery icon on the display will blink to show the Battery Charge Level display is selected.

The bar graph at the bottom of the display will indicate the relative battery charge level. The numerical display will continue to display the RF signal level.

Pressing the CHANGE button will display the Seeker Firmware version for five seconds. A display of 0123 would indicate a Firmware version of 1.23.

> **NOTE**
>
> *After a few seconds in the Battery Charge Level display without any action by the user, the display will revert to the Signal Level display.*

> **NOTE**
>
> *For detailed instructions on how to update the Seeker Firmware, see the Seeker Setup Software Operation Manual.*

Peak Hold

The Peak Hold display is used to turn the Peak Hold function on or off.

In the Peak Hold display, the PK icon at the top of the display will blink if the Peak Hold function is off. The "PK" symbol will be constantly displayed if the Peak Hold function is on.

Press the CHANGE button to turn the Peak Hold function on or off.

When the Peak Hold function is on, the numerical display will hold 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.

With the Peak Hold function on, the peak element of the bar graph at the bottom of the display will also hold it's peak indication for five seconds while the other elements of the bar graph continue to indicate the signal strength of the live signal.

> **NOTE**
>
> ***After a few seconds in the Peak Hold display without any action by the user, the display will revert to the Signal Level display.***

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Preset Frequencies

The Preset Frequencies display is used to view the preset frequencies and select the one used for leakage testing by the Seeker. Preset frequencies are numbered from 0 to 9 and are configured and downloaded with the Seeker Setup software.

> **NOTE**
>
> ***The Seeker comes from the factory loaded with the following preset frequencies; 121.2625, 127.2625, 133.2625, 139.2500, and 146.2625 MHz.***

In the Preset Frequencies display, the FREQ icon at the top of the display will blink and be followed by the preset frequency number.

To change the frequency selection, press the CHANGE button.

When entering the Preset Frequencies display or selecting a new preset frequency, the numeric display will momentarily show the leakage frequency and tag frequency for the preset channel. First the MHz digits will be displayed. After this, the fractional digits are displayed. Finally a "t" is displayed followed by the tag frequency for the preset channel.

For example: For a frequency of 121.2625 MHz. with a tag frequency of 20 Hz., the display will indicate:

> 121
> 2625
> t 20

When the numerical display has cycled through the frequency information for the selected channel, the display will resume indication of the signal level for that channel.

> **NOTE**
>
> ***After a few seconds in the Preset Frequencies display without any action by the user, the display will revert to the Signal Level display.***

Channel Tag

The Channel Tag display is used to enable or disable the channel tag feature for the selected frequency preset.

A Channel Tagger adds a low frequency tag (10-23 Hz, excluding 16 Hz) to a CATV channel. When the Channel Tag feature is enabled in the Seeker, it will alarm and produce an audible tone only when the leakage signal has the required tag. This eliminates false alarms from signals that do not originate in the user's system.

In the Channel Tag display, the Tag icon in the upper right corner of the display will blink if the tag feature is not enabled. The Tag icon will be constantly displayed if the tag feature is on.

Press the CHANGE button to turn the tag feature on or off. When the tag feature is turned on, the display will momentarily show the tag frequency for the selected frequency preset.

> **NOTE**
> ***The Channel Tag feature requires the installation, use, and proper setup of the CT-2 or CT-3 Channel Tagger. It also requires the corresponding setup of the Seeker.***

> **NOTE**
> ***After a few seconds in the Channel Tag display without any action by the user, the display will revert to the Signal Level display.***

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Snapshot Modes

While testing for leaks the user may need to record the pre fix and post fix leakage information recorded by the Seeker.

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

The Snapshot button is used to synchronize data between the Seeker and the Seeker MCA III when the Seeker is in the Mobile Mount. For more information, see Chapter 6: Seeker MCA III Operation, Seeker GPS Display Modes, Data Synchronization.

NOTE

Pre-Fix

To record the pre-fix leakage information recorded by the Seeker, press the Snapshot button when the following screen is displayed:
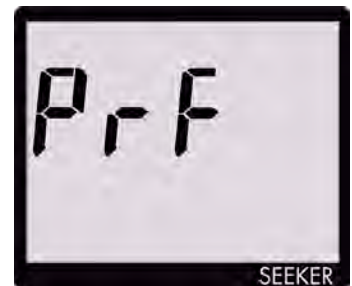
Post-Fix

To record the post-fix leakage information recorded by the Seeker, press the Snapshot button when the following screen is displayed:

No Snapshot

To cancel the snapshot of the information recorded by the Seeker, press the Snapshot button when the following screen is displayed:

NOTE

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

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Leakage Testing

This chapter:

- Discusses how to test for leaks using the Seeker

Before You Begin Leakage Testing

- A low battery may cause the Seeker to NOT turn on. Try charging your battery for 3 hours to see if that fixes the problem, or use the Seeker while in the mobile mount.

- The Seeker 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, when you turned it back on again the meter would automatically begin testing that same preset.

- When turning on or changing modes on the Seeker, there is a ten (10) second delay for the audible tone.

Testing For Leaks

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

1. **Turn on the Seeker**

   Press the red on/off button until you hear 3 ascending tones. The Seeker will power up in Measurement Mode.

2. **Confirm the desired frequency (0 to 9) is selected**

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

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

   Also, confirm the Tag Feature is enabled or disabled as required for testing. This will be in the state last set for the selected frequency.

> **NOTE**
> *For more information about using the Preset Frequency or Channel Tag features, see Chapter 3: Seeker Operation, Display Modes.*

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

   The Antenna icon on the display should be blinking for the Measurement mode. If necessary use the SELECT button to move to the Measurement mode.

4. **Begin leakage testing**

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

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

5. **Turn OFF the Seeker**

   When testing is complete, turn off the Seeker by holding down on the red on/off button. This step is not required if the user leaves the Seeker in the Mobile Mount.

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Seeker MCA III Introduction

This chapter:

- Describes the purpose of the Seeker MCA III

- Lists the equipment supplied with the Seeker MCA III

- Gives a guided tour of the Seeker MCA III

What is Seeker GPS?

The Seeker GPS system provides a cost-effective way to equip each vehicle in a fleet with GPS-based reporting capabilities. The Seeker GPS system consists of the standard Seeker, a Seeker MCA III, and a GPS receiver. The Seeker MCA III module includes a standard Wi-Fi communications module for the wireless upload of data to the Leakage Analysis Workshop (LAW).

Equipment Supplied with Your Seeker MCA III

The Seeker MCA III includes the following:

- P/N 2011690000 - Seeker MCA III with Wi-Fi

- P/N 2071585029 - Seeker MCA III to Mobile Mount Power and Data Cable

- P/N XXXXXXXXXX - Remote Wi-Fi Antenna

- P/N 2072213010 - CAT5e Ethernet Patch Cable - 10 Foot (Quad-Shielded)

- P/N 0500994002 - Mounting Screws (x2)

Accessories for Your Seeker MCA III

The following accessories are available for the Seeker MCA III:

- P/N XXXXXXXXXX - Garmin GPS Receiver for Seeker MCA III

- P/N 2011222000 - Seeker Approved A/B/G/N Wi-Fi Access Point

- P/N 2071585026 - Seeker MCA III Garmin Cable (FMI-15)

- P/N 2071585030 - Seeker MCA III to Wireless Matrix or SageQuest Data Cable

Device Overview

The Seeker MCA III is used to store leakage data collected from the Seeker and to upload the same leakage data to the user's PC or laptop computer or the central server.

> **NOTE**
>
> ***Changes to the devices not expressly approved by Trilithic, Inc. could void the user's authority to operate the equipment.***
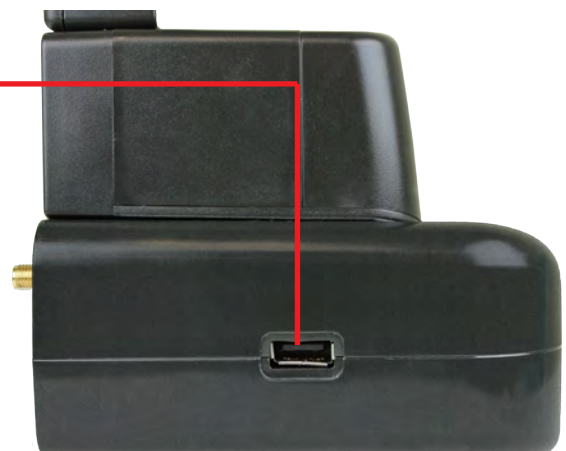
Front View

Display Screen

The LCD is used to display the setup and operation status of the MCA III. The information displayed on this screen is for reference only, the settings shown here can be adjusted using Seeker Setup.

Left Side View

USB Connection

The USB connection is reserved for future use and has no current purpose or use.

Rear View
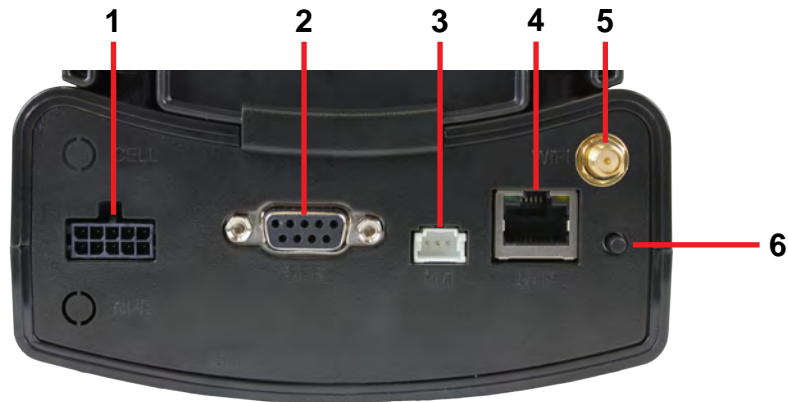
1. Mobile Mount Serial Data Connection - This connection is used with the MCA III serial cable to connect the Seeker Mobile Mount to the MCA III. Also, power is supplied to the MCA III through this connection from the Mobile Mount.

2. GPS Serial Data Connection - This connection is used to connect to a serial (RS-232) enabled GPS receiver.

3. Fleet Management Interface Connection - This connection is used to interface with your GARMIN FMI enabled Portable Navigation Device (PND).

4. Ethernet Connection - This connection is used to connect to a LAN network in order to upload leakage records to a LAW server.

5. Select Button - Single click this button to scroll through the device status menus and double click this button to enter a specific status menu.

6. Wi-Fi Antenna Connection - This connection is used to connect a Wi-Fi antenna in order to transmit leakage records to a LAW server.

Display Screen Overview

The display screen of the MCA III is used to display the setup and operation status of the unit.

Normal Display Screens

The information displayed on this screen is for reference only, the settings shown here can be adjusted using the Seeker Setup software.

The Seeker MCA III Home Screen shows the name and version number of the installed firmware/software.

Activity / Error Screens

If a new activity and/or error occurs within the device, the system displays a popup message to indicate the type of activity and then returns to the previous screen after 10 seconds. If a new activity or error occurs prior to expiration of the 10 seconds, then the new message will be displayed and the 10 seconds will start again. The only exceptions to this rule are the Wi-Fi, Cellular, and Ethernet Upload In Progress screens which will remain on the screen until the upload is complete, an error occurs, or the Select button is single clicked.

Using the Select Button

To navigate the display screens, perform the following actions using the Select button on the back of the MCA III:

Single click the Select button to scroll through the device status menus, indicated by blue lines and the symbol shown to the left or dismiss any popup messages related to device activity and/or errors.
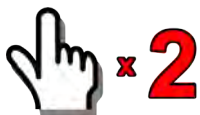
Double click the Select button to enter a specific status menu, indicated by red lines and the symbol shown to the left.

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Seeker MCA III Operation

This chapter:

- Lists recommended software

- Provides information on Seeker GPS operation and display modes

Configure Settings

You must configure the Mobile Communication Adapter (MCA III) settings using the Seeker Setup software. The MCA III comes from the factory with default settings, but it is likely they will need to be customized. Detailed instructions can be found in the Seeker Setup Software Operation Manual.

> **NOTE**
>
> *For detailed instructions on how to update the MCA II Firmware, see the Seeker Setup Operation Manual.*

Seeker GPS Display Modes

Mobile Mount Communication Successful

After placing the Seeker in the mobile mount and upon successful communication with the MCA III the Seeker will momentarily show the following display.

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

GPS Signal

When the Seeker is placed in the Mobile Mount, the GPS Signal display is used to display the status of the GPS Signal.

When the GPS receiver is off, the text GPS icon is not shown on the display.

When the GPS receiver is on but the GPS receiver IS NOT receiving a satellite signal, the GPS icon will blink.

> **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 nor will it be able to communicate with TechPoint for FMI updates.***

When the GPS receiver is on and the GPS receiver IS receiving a satellite signal, the GPS icon will be on constantly.

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Data Synchronization

When a user does not have a Wi-Fi or cellular connection available to upload recorded data from the MCA III to the central server, the user may synchronize the data of the MCA II with the internal memory of the Seeker.

To synchronize the data between the MCA III and the Seeker, press and hold the Snapshot button. While the MCA III is transferring data to the Seeker, the Seeker will display the following screen:

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

When the MCA III is done transferring data to the Seeker, the Seeker will display the screen to the right. Press any button to return to the Measurement display.

This mode will only work when the Seeker is in the Mobile Mount. The Snapshot button is used to record the pre fix and post fix leakage information recorded by the Seeker when the Seeker is not in the Mobile Mount. For more information, see Chapter 3: Seeker Operation, Snapshot Modes.

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Data Upload Options

Standard Internet Connection

The leakage data can be uploaded via an Internet connection. The user removes the Seeker from its Mobile Mount and connects it to a PC or laptop computer. The leakage data is then uploaded to the central server using a website on the internet.

Wi-Fi

The leakage data can be uploaded via a wireless connection. Whenever the user's vehicle is parked for a user determined duration in a user determined upload position/zone within range of an authorized wireless hotspot, the leakage data is uploaded directly to the central server.

Fleet Management System Integration

For fleets equipped with GPS-based fleet management systems, the real-time leakage data can be automatically uploaded directly to the central server through the truck's cellular connection via the MCA III ethernet connection.

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General Specifications

Frequency Range	Settable using Seeker Setup Software, in 6.25 kHz steps. **Low Band:** 109.25 to 110.50 MHz **High Band:** 118.50 to 147.25 MHz Older Seekers do not include the low band frequency from 109.25 to 110.5 MHz. Seekers that are low band frequency compatible will have a label on the back of the device indicating "LOW BAND ENABLED".
Frequency Presets	10 user-set operating frequencies, selectable on front panel. Selections are loaded into the detector using Seeker Setup software.
Level Range	2 to 2000 mV/M. Can freeze current numeric reading or hold peak readings.
Numerical Display	LCD readout of any detected leakage within sensitivity range.
Audible Tone	Tone is present if leakage amplitude exceeds squelch setting. Pitch is proportional to strength of leak.
Leakage Sampling & Recording Rate	33 times/second sampling, 1 record/second continuous logging.
Channel Tag Range	10 Hz to 23 Hz (Excluding 16 Hz)
Power	Built-in Lithium-ion battery
Operation Time	**Measurement Mode:** Eight hours, typical **Charge Time:** Less than three hours for full-charge in the mobile mount, six hours for charging using the mini-USB connection.
Dimensions	7.48 x 3.43 x 1.85 in (190 x 87 x 47 mm)
Weight	0.95 lbs (431 g)

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Display Messages & Error Codes

Seeker Error Codes

The codes shown below are displayed on the Seeker display screen as "E##" to indicate an error with the Seeker.

"E##" Code	Error Description	Solution
01	Factory 1 Parameters	The checksum is not valid for this area or the calibration date for this area is not set. Factory 1 contains the filter, level, and GT calibration items. If a power cycle does not fix this, return to the factory for recalibration.
02	Factory 2 Parameters	The checksum is not valid for this area or the calibration date for this area is not set. Factory 2 contains the temperature calibration items. If a power cycle does not fix this, return to the factory for recalibration.
03	Bad Identity	The identity voltage read does not correspond to a known configuration. If a power cycle does not fix this, return to the factory for repair.
04	Temperature Calibration Trigger	There was an error re-writing the temperature calibration trigger pattern when starting the temperature cal cycle. The meter probably needs to be retriggered by CalibrATE.
05	Temperature Calibration Write	An error occurred while writing values during the temperature calibration cycle. Power cycling the meter will probably return back to the ""THnn"" display and start the temp cal cycle over again.
06	Factory 2 Parameters Pending	This happens when the meter is power-cycled after the temperature calibration cycle has completed, but CalibrATE has not yet read and checked the results.

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"E##" Code	Error Description	Solution
07	Sync Error	A problem occurred during a hot sync from an MCA back into a meter. This is most likely a communication error with the MCA. Try the sync process again.
08	Bad Flash ID	The flash ID read did not correspond to either the ST M25P64 or Winbond W25X64 device. If a power cycle does not fix this, then return to the factory for repair.
09	RTC Error	The RTC power-on test failed (the value read from a RAM location in the RTC did not match the value written). If a power cycle does not fix this, then return to the factory for repair.
10	Pairing Error	An error occurred during the meter/MCA pairing process. Retrigger the meter for pairing and try again.
11	Pairing Error	The meter is not paired with the connected MCA. If they are the correct meter and MCA, then retrigger the meter for pairing and try again.

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MCA III Error Codes

The codes shown below are displayed on the Seeker MCA III display screen or on the MCA III display screen as "DEVICE ERRORS" to indicate an error with the MCA II.

```
DEVICE ERRORS
##
```

"E##" Code	Error Description	Solution
0	No errors detected	N/A
3	Factory Calibration is not valid	Return the device to the factory for repair.
4	User Parameters are not valid	Use Seeker Setup to reconfigure the device.
7	Invalid Flash ID detected	Cycle power on the unit, if the error persists return the device to the factory for repair.
8	Flash memory is Full	Use any of the means available to either erase the data, synchronize to the meter, or move the data to a valid LAW connection.
9	Flash memory write failed	If the error persists, return the device to the factory for repair.
10	Wi-Fi Post failed	If the error persists, return the device to the factory for repair.
11	Wi-Fi module communications failed	If the error persists, return the device to the factory for repair.

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"E##" Code	Error Description	Solution
12	WEP key communications failed	Check to ensure that your WEP key is valid and reconfigure the device using the correct WEP key.
13	WPA key communications failed	Check to ensure that your WPA/WPA2 key is valid and reconfigure the device using the correct WPA/ WPA2 key.
14	WiFi signal level communications failed	If the error persists, contact support as this error may require a firmware update to correct.
30	Flash memory erasure error	If the error persists, return the device to the factory for repair.
31	Cellular modem communications error	If the error persists, contact support as this error may require a firmware update to correct. If the error persists, return the device to the factory for repair.
32	Cellular connection could not obtain an IP	If the error persists, contact support as this error may require a firmware update to correct. If the error persists, contact your cellular data provider for further support.
33	Cellular connection could not establish a network socket to the desired end point	Check to ensure that your connection settings are correct and reconfigure the device using the correct information.
34	No data erasure command received from LAW after data upload	If this error persists, contact support to confirm that your LAW server is set up correctly.
35	Upload stopped	Ethernet communications attempt caused an upload to be postponed. Information only, uploading was postponed due to a Seeker Setup connection attempt.

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"E##" Code	Error Description	Solution
36	Wi-Fi Association Failed	Check the Wi-Fi information and ensure that the security keys are correct and reconfigure the device using the correct Wi-Fi settings.
37	Wi-Fi DHCP Request Failed	Could not obtain an IP address using DHCP, if enabled. Verify that the Access Point has a DHCP server enabled or has a route to a network DNCHP server.
38	Wi-Fi DNS request failed	Check the IP information and ensure that the DNS servers are correct and reconfigure the device using the correct Wi-Fi settings.
39	Wi-Fi connection could not establish a network socket to the desired end point	Check to ensure that your connection settings are correct and reconfigure the device using the correct information.
40	Undefined Wi-Fi Error	If the error persists, return the device to the factory to repair.
41	Ethernet connection could not establish a network socket to the desired end point	Check to ensure that your connection settings are correct and reconfigure the device using the correct information.
42	External FMI connection communications error	If the error persists, return the device to the factory to repair.
43	Ethernet DNS request failed	Check the IP information and ensure that the DNS servers are correct and reconfigure the device using the correct Ethernet settings.
44	Ethernet connection failure	If the error persists, contact support as this error may require a firmware update to correct.

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Access Point Error Codes

The codes shown below are displayed on the Seeker display screen as "AP##" to indicate an error with the access point.

"AP##" Code	Error Description
00	Displayed for 3 seconds at power on when this mode has been activated. Also displayed (could be for minutes) while the Wi-Fi module is being set up and associating with the access point for testing of a new zone.
01	There was a communications problem between the Seeker and the MCA.
02	The Wi-Fi module returned a Power On Self Test error.
03	There was no access point association for the selected zone.
04	There was no IP defined for the selected zone (no DHCP?)
05	There was a problem communicating to the Wi-Fi module.
06	The Wi-Fi module rejected the WEP key for the selected zone.
07	The Wi-Fi module rejected the WPA key for the selected zone.
08	The selected home zone has not been enabled.
09	The selected home zone has not been enabled for Wi-Fi.
99	Undefined error - this indicates a firmware bug.

Seeker & MCA II Communication Messages

The codes shown below are displayed on the Seeker display screen as "CA#" to indicate the communication status between the Seeker and MCA II.

"CA##" Code	Error Description
0	The Seeker meter has successfully established a connection to an MCA.
1	The Seeker meter is in the process of "syncing" snapshots to the MCA memory.

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Seeker & MCA II Memory Full Messages

The codes shown below are displayed on the Seeker display screen as "FL#" to indicate the internal memory status of the Seeker and MCA II.

"FL##" Code	Error Description
0	MCA internal memory is full. Shows after "CA0" if there are less than 30,000 records available. This display is cleared by a button press on the Seeker meter, which will cause a 1 hour "snooze" until the FL0 message is displayed again.
1	Seeker internal memory is full. Shows at power-on if there is not enough room for at least an 8-hour day's worth of data (30,000 records). Shows at sync time if there is not enough room to store the MCA contents in the meter memory.
2	Seeker "snapshot" memory is full - needs to be cleared with Seeker Setup or docked to transfer snapshots to an MCA.

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Trilithic Broadband Instruments 2-Year Limited Warranty

Trilithic, Inc. ("Trilithic") warrants to the buyer that the product will be free from defects in materials and workmanship, under normal use, operating conditions and service for a period of two (2) years from date of delivery. Trilithic reserves the right, before having any obligation under this limited warranty, to inspect the damaged product, and all costs of shipping the product to Trilithic for inspection shall be borne solely by the buyer. Trilithic's obligation under this limited warranty shall be limited, at Trilithic's sole option, to replacing or repairing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana. If neither of the two options is reasonably available, then Trilithic, in its sole discretion, may provide a prorated refund to the buyer of the purchase price of the product, as evidenced by the proof of purchase, less any applicable service fees in accordance with the following schedule: months 0-3 = 100%; months 4-12 = 50%; and months 13–24 = 25%. Batteries and fans are not included or covered by this limited warranty. Any product or part that is repaired or replaced under this limited warranty shall be covered only for the remainder of the original warranty period which applied to the original product or part, or for ninety (90) days, whichever is longer. All products or parts that are exchanged for replacement shall become the property of Trilithic.

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