

Seeker & Seeker GPS Leakage Detectors

(Green Engineering)

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

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Canada

This equipment has been tested and found to comply with Industry Canada Standards. See Page 2 for complete details.

think ahead.

 TRILITHIC

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.
- **Network Services**
Provides network data management and support services to safeguard and protect your network and data by employing certified, experienced, and dedicated network engineers.

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.

Changes to this device that are not expressly approved by Trilithic, Inc. could void the user's authority to operate this device.

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. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

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

Industry Canada Compliance



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Operation of this device is subject to the following two conditions; This device may not cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation.

To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

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Chapter 1

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 techsupport@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 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 GPS Introduction” introduces what the Seeker GPS is and what it does. This chapter discusses the practical application of the Seeker GPS. Finally, this chapter will also explain the connections of the Seeker GPS.
- Chapter 6, “Seeker GPS Operation” describes how to use the modes of operation of the Seeker GPS.
- Chapter 7, “Data Upload Options” shows the data upload options for the Seeker GPS.
- Chapter 8, “Appendix” shows the technical specifications of the Seeker and Seeker GPS as well as any error codes that may appear on the Seeker’s display screen.

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 GPS:

- **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. Includes capability to assemble Seeker GPS leakage data files in a format compatible with the CLT Aplas service.

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

- **Leakage Analysis Workshop (LAW)** is software that manages the storage and retrieval of leakage information collected by vehicle mounted Seeker GPS systems. Installed in a user-provided server, 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 standard conventions for presenting information.

- Connections, menus, menu options, and user-entered text and commands appear in **bold**.
- Section names, web and email addresses appear in *italics*.



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



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



A ***WARNING*** alerts you to any condition that could cause personal injury.

Precautions



Do not use the Seeker or Seeker GPS in any manner not recommended by the manufacturer.



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



Use only the battery charger supplied with the Seeker and Seeker GPS.

Chapter 2

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 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.

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 $\mu\text{V}/\text{m}$. 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) are equipped with circuitry which automatically powers down the MCA 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 MCAs 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 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 will automatically power down.

Function

Upon parking and shutting down a vehicle equipped with a “Green Engineering” Mobile Mount and MCA, the MCA will attempt to upload leakage data to the LAW server via the Wi-Fi connection. The MCA will then automatically power down, provided that one of the following criteria is met:

- The vehicle is parked in the “home zone” and all leakage data has been successfully uploaded
- The vehicle is parked in the “home zone” and cannot upload all leakage data after a user-programmed number of attempts have been made
- The vehicle is parked outside of the “home zone” and the ignition is turned off



NOTE

If the Seeker or Seeker GPS is not Wi-Fi enabled and a manual synchronization between the Seeker and MCA is desired, the sync must be started before the vehicle’s ignition is turned off. The sync will not start after the ignition is turned off, however, it will continue after the ignition has been turned off.

Seeker/Seeker GPS and Mobile Mount Compatibility

“Green Engineering” Mobile Mounts are compatible only with “Green Engineering” Seeker MCAs. Do not attempt to use an MCA with a Mobile Mount unless;

- Both devices feature the “Green Engineering” logo, or
- Neither device features a “Green Engineering” logo.

For Seeker/Seeker GPS devices and Mobile Mounts produced prior to the inclusion of battery protection circuitry, neither device will feature the “Green Engineering” logo.

Mobile Mount and MCA Compatibility

A Mobile Communication Adapter (MCA) produced prior to the inclusion of battery protection circuitry can be installed with “Green Engineering” Mobile Mount, however it will function as if neither component features the “Green Engineering” battery protection circuitry.

To install a pre “Green Engineering” MCA with a “Green Engineering” Mobile Mount, both the RED and WHITE wires from the MCA and Mobile Mount must be connected to a non-switched vehicle power source.

Installing a “Green Engineering” MCA with pre “Green Engineering” Mobile Mount will cause the Seeker GPS not to function properly, while displaying an error code.

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.

Optional Accessories for Your 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 adaptor kit
2071585004	Replacement mini-USB data cable
0090048000	Replacement Seeker battery

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

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.

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.



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

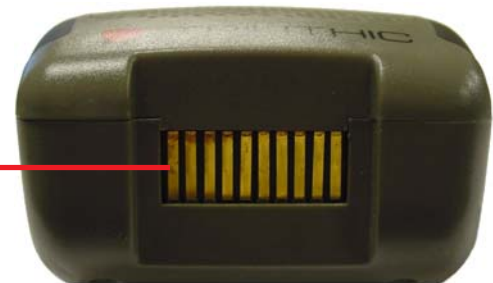
The Mini-USB connection is used to connect the charger to the Seeker and/or to connect a PC or laptop computer to the Seeker using the mini-USB charge / data cable.



Bottom View

Mobile Mount interface

The Mobile Mount interface is used to charge the Seeker as well as communicate with the MCA 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. When the icon is not shown, the Seeker is not in the Mobile Mount or the GPS connection cannot be established with the MCA. If the icon blinks the MCA 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 WaveTracker 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.

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.

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.



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 serial connection

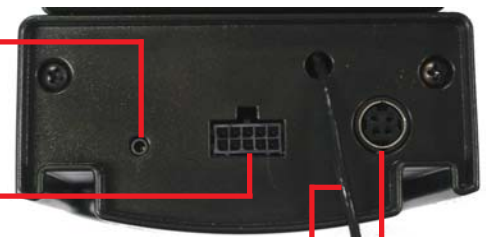
This connection is used with the Mobile Communications Adapter (MCA) serial cable to connect the Seeker to the MCA. The MCA is included as part of the Seeker GPS configuration.

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

- **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.



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

NOTE

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 following screen will appear:



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

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***.

Chapter 3

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 $\mu\text{V}/\text{m}$ 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.

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.

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 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 its 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.

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.



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.



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.

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.



NOTE

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

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.

Chapter 4

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.

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.

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 $\mu\text{V}/\text{m}$), 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.

Seeker GPS Introduction

This chapter:

- Describes the Seeker GPS's purpose
- Lists the Seeker GPS's supplied equipment
- Gives a guided tour of the Seeker GPS

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 Mobile Communications Adapter (MCA) mounted in the user's vehicle, and a GPS receiver. Two different MCA modules are available to choose from. This allows convenient use of the system with an optional Wi-Fi module for the wireless uploading of data to the Leakage Analysis Workshop (LAW). Purchase a GPS receiver from Trilithic for use with System, or use a Trilithic approved GPS receiver.

Seeker GPS Options

The following MCAs are available:

- Seeker MCA with serial data connection (RS-232) to a GPS receiver
- Seeker MCA with serial data connection to a GPS receiver and a Wi-Fi option to allow direct upload of leakage data from the user's vehicle to LAW (through a properly configured wireless site).

Equipment Supplied with Your Seeker GPS

The Seeker GPS includes the following:

- Seeker MCA
- Serial data cable for connecting the Seeker Mobile Mount to the Seeker MCA
- Wi-Fi antenna (Included with the Wi-Fi option)
- Mounting hardware

Optional Accessories for Your Seeker GPS

Part Number	Description
2071707000	GPS receiver unit - RS-232
2011222000	Wi-Fi access point
2071585004	Replacement mini-USB data cable
2071677001	Remote Wi-Fi antenna with 12' coaxial cable and magnetic mount

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

Mobile Communications Adapter (MCA)

The Mobile Communications Adapter (MCA) 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.



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

Front

Mobile Mount serial connection

This connection is used with the MCA serial cable to connect the Seeker Mobile Mount to the MCA. Also, power is supplied to the MCA through this connection from the Mobile Mount.

Auxiliary input connection

Not used; reserved for future use.



Right Side

Wi-Fi antenna connection

This connection is used to connect a Wi-Fi antenna in order to transmit wireless data to a PC or laptop computer or the central server.

Serial data connection

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



Left Side

Mini-USB connection

The Mini-USB connection is used to connect a PC or laptop computer to the MCA for setup.



Chapter 6

Seeker GPS 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) settings using the Seeker Setup software. The MCA 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**.



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

NOTE

Seeker GPS Display Modes

Mobile Mount Communication Successful

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



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 .

NOTE

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 will not record leakage data from the Seeker.

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

Data Synchronization

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

To synchronize the data between the MCA and the Seeker, press and hold the **Snapshot** button. While the MCA 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 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.

Wi-Fi Upload Status

The status of the Wi-Fi upload is displayed on the Seeker display as follows;

- If the meter is on, then the message “**Strt**” is displayed to indicate that the MCA has successfully associated with a Wi-Fi access point and is trying to start uploading records to a LAW server.
- If the last upload attempt was successful, then the display will show a “**donE**” message.
- If the last upload attempt was not successful, then the display will show a “**FAIL**” message.



These messages may be cleared by pressing any button. Clearing the “**Strt**” message will also clear the subsequent “**donE**” or “**FAIL**” messages from being displayed.

If the meter was turned off during the Wi-Fi upload attempt, then the status of the last Wi-Fi upload attempt that was made will be displayed on the Seeker when it is powered on.

The **Charge** and **Antenna** icons are also displayed during these messages.

Wi-Fi Test Mode

To activate the Wi-Fi Test Mode, hold the **Additional Function** Button when powering the meter on. An “**AP00**” message is briefly displayed to indicate that this mode has been activated.

Once a successful “**CA0**” has occurred, the meter will display “**AP00**” again while trying to associate with an access point.

If there is a Wi-Fi Error, an “**AP##**” error code will be displayed. For more specific information about error code values, see **Chapter 8: Appendix, *Display Messages & Error Codes, Wi-Fi Access Point Errors.***



Upon successful association with an access point, the Wi-Fi signal strength level is displayed.

The **Charge** icon will be displayed in this mode and the **Antenna** icon is displayed if the MCA is currently associated with an access point.

The **Select** button will rotate between the Quality, Signal, and Noise Values as follows;



Quality



Carrier Signal



Noise

The **Change** button will select the desired home zone to be monitored and will be displayed in the frequency field location.

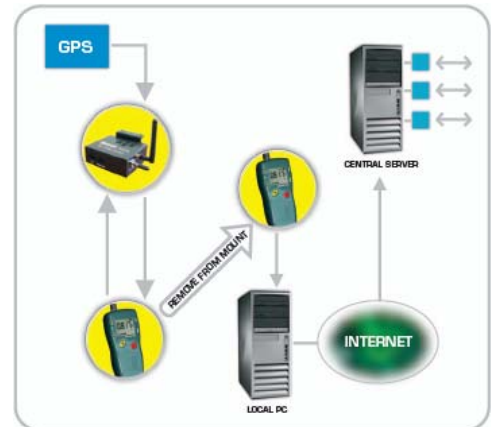
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Chapter 7

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

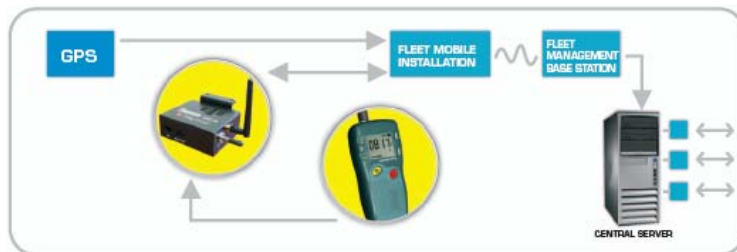
The leakage data can be uploaded via a wireless connection. Whenever the user's vehicle is parked for a user determined duration in a user determined upload position/zone within range of an authorized wireless hotspot, the leakage data is uploaded directly to the central server.



The Trilithic MCA supports up to 128 bit Wired Equivalent Privacy (WEP) and Wi-Fi Protected Access (WPA-PSK TKIP) security.

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.



Specifications

- **Frequency range:** 109.25 to 110.5 MHz and 118.50 to 147.25 MHz, settable using Seeker Setup software.



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:** Up to 10 selectable operating frequencies. Selections are loaded into the detector using Seeker Setup software.
- **Level range:** 2 to 2000 $\mu\text{V}/\text{M}$. 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.
- **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.
- **Other:**
 - Dimensions:** 190mm x 87mm x 47mm (7.48” x 3.43” x 1.85”)
 - Weight:** 0.95 lbs (431 g)

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	Description
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.
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.

"E##" Code	Description
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.

MCA Error Codes

The codes shown below are displayed on the Seeker display screen as “**CE##**” to indicate an error with the MCA.

"CE##" Code	Description
01	Wi-Fi Identity - The Wi-Fi identity voltage read does not correspond to a known configuration. This error is currently disabled.
02	GPS Identity - The GPS identity voltage read does not correspond to a known configuration (Bluetooth or RS-232). If a power cycle does not resolve this, return to the factory for repair.
03	Factory Parameters - The checksum is not valid for this area. This area contains the cal serial number. This error is currently disabled for v01.00 and enabled for v01.01 and higher. If a power cycle does not resolve this, return to the factory for recalibration.
04	User Parameters - The user flash area has a bad checksum or fails other integrity checks. This area contains values written by Seeker Setup, so try rewriting the setup values to the MCA.
05	Bluetooth Timeout - The Bluetooth module is not responding. This error is currently disabled since it was not reliably indicating the condition.
06	Bluetooth Error - The Bluetooth module is not responding correctly. This error is currently disabled since it was not reliably indicating the condition.
07	Bad Flash ID - The flash ID read did not correspond to either the ST M25P64 or Winbond W25X64 device. If the error persists, return to the factory for repair.
08	Full Datalog - The MCA datalog is full. This is generated when a record is attempted to be added and there is no room left. This is not a fatal error, the Wi-Fi download is still allowed to occur. This error will clear when the data has been successfully uploaded.
09	Datalog Write Error - The MCA was not able to successfully write a record to the datalog (the flash write timed out or the readback verification failed). Try clearing the datalog and trying again in case the contents got corrupted (by uploading the data and letting that clear the datalog). If the error persists, return to the factory for repair.

"CE##" Code	Description
10	The Wi-Fi module is indicating a Power On Self Test error. If a power cycle does not fix the problem, return to the factory for repair.
11	There was a problem during communications to the Wi-Fi module. If it persists, return to the factory for repair.
12	The Wi-Fi module returned an error when the WEP key was sent to it. Use Seeker Setup to verify that a valid WEP key has been set up.
13	The Wi-Fi module returned an error when the WPA key was sent to it. Use Seeker Setup to verify that a valid WPA key has been set up.
14	There was an error parsing the Wi-Fi signal level parameters returned from the module. If this persists then return to the factory for repair.
15	For BB-2 only, this indicates that the Vdrive firmware version is lower than the required version 3.64. Return to the factory for a firmware upgrade of the Vdrive (unless otherwise directed by Trilithic customer service).
16	("Green Engineering" models only) Power on hardware not functioning correctly. This could be that a non-GE mobile mount is being used.
17	("Green Engineering" models only) Power off hardware not functioning correctly.

Seeker & MCA 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.

"CA#" Code	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.

Seeker & MCA 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.

"FL#" Code	Description
0	MCA internal memory is full. Shows after "CA0" if there is not enough room for an 8-hour day's worth of data (30,000 records). 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 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.

Wi-Fi Access Point Errors

The codes shown below are displayed on the Seeker display screen as “**AP##**” during the Wi-Fi Test Mode to indicate any errors related to the Wi-Fi access point. These error codes only apply to systems that include a Wi-Fi enabled MCA.

"AP##" Code	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.

Warranty Information

Trilithic, Inc. warrants that each part of this 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, Inc.'s obligation under this Warranty shall be limited, at Trilithic, Inc.'s sole option, to replacing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana; provided that the Buyer shall give Trilithic, Inc. written notice.

Batteries are not included or covered by this Warranty.

The remedy set forth herein shall be the only remedy available to the Buyer under this Warranty and in no event shall Trilithic, Inc. be liable for incidental or consequential damages for any alleged breach of this Warranty. This Warranty shall not apply to any part of the product which, without fault of Trilithic, Inc., has been subject to alteration, failure caused by a part not supplied by Trilithic, Inc., accident, fire or other casualty, negligence or misuse, or to any cause whatsoever other than as a result of a defect.

Except for the warranty and exclusions set forth above, and the warranties, if any, available to the Buyer from those who supply Trilithic, Inc., there are no warranties, expressed or implied (including without limitation, any implied warranties of merchantability or fitness), with respect to the condition of the product or its suitability for any use intended for it by the Buyer or by the purchaser from the Buyer.

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