User Guide

Mobile InterferenceHunter™

MX280007A

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Chapter 1 — Installation

1-1 Introduction

Mobile InterferenceHunter (MIH) is a Microsoft Windows application drivers tool for locating RF interference sources. It runs on a laptop or tablet computer and can connect to Anritsu handheld spectrum analyzers through an Ethernet cable, a Wi-Fi capable Anritsu Spectrum Analyzer, or a travel router. The system displays multiple indicators of power levels which aid in determining the location of the interfering signal source.

This chapter details the initial setup of the hardware, software, and interfaces to the instrument and its RF connections. Chapter 3, “MIH Graphical User Interface” describes the software user interface and features. Chapter 4, “Hunting Interference Signals” describes how to perform specific tasks within the Mobile InterferenceHunter software.

1-2 System Requirements

Operate the Mobile InterferenceHunter with a mobile computer in a vehicle using an Anritsu supported instrument. MIH will also run on a desktop PC and can be used this way to review saved drive test data. Anritsu sells several compatible antennas to cover a wide range of frequencies. Our antennas include both the RF and GPS antennas integrated into a single convenient package. Other options are also possible.

The following is the recommended minimum equipment to operate the system in the field:

- MX280007A InterferenceHunter™ software
- Anritsu handheld spectrum analyzer with automotive DC power adapter (refer to https://www.anritsu.com/en-us/test-measurement/products/mx280007a for compatible instruments)
- Windows 7, 8, or 10 tablet or laptop meeting the following minimum requirements:
  - Quad core processor (> 1 GHz)
  - 4 GB RAM, 500 MB storage space
  - Ethernet or Wi-Fi
  - Internet connection (if using Google/Baidu Maps or the TDOA feature)
  - Off-line maps
  - DC power adapter for the tablet or laptop
- TP Link Model TL-WR802N pocket router and cables (2000-1752-R) or Ethernet crossover cable.
- RF/GPS antenna (must use an instrument mounted GPS antenna or Anritsu PC GPS receiver)
  - Combination RF and GPS antenna for your instrument (2000-1647-R)
  - GPS receiver for PC (2000-1528-R, required if your instrument does not have GPS)
- RF cable compatible with your instrument if using a vehicle mounted RF antenna of your choice

Recommended Accessories:

- Yagi antenna
- Mounting Hardware (2000-1801-R)

1-3 Installing the MX280007A Mobile InterferenceHunter Software

1. Place the software installer (MIH_Installer_Vx.xx.msi) on your Windows tablet/laptop and double-click the icon "MIH_Installer_Vx.xx" (where x.xx is the current software version number).
2. Follow the instructions presented by the installer. If this is a first time installation, you may be prompted to install NI-VISA Runtime if not previously installed. NI-VISA Runtime is bundled with the MIH installer.
3. Once completed, a green icon will then appear on your screen. Double-click the green Mobile InterferenceHunter icon to run the program.

1-4 Installing the License Key

A license key is needed to run the Mobile InterferenceHunter (MIH) program. When the Mobile InterferenceHunter software is purchased, an email with the license key and instructions are sent to you. The license key must be associated with just one Anritsu instrument, but it can be used on multiple computers. The license key may have an expiration date. Please retain the license key as it allows you to use the instrument associated with this key on other tablets or PCs.

Import Licenses and drag-and-drop are two methods of importing the license key into Mobile InterferenceHunter. Follow the instructions below to import the license key into the program.

Import License

1. Under the File | Licensing menu, click Import Machine License to open the folder containing the license key that activates the features of Mobile InterferenceHunter.
2. Highlight the license file and click Open. The license will be entered into the MIH program.

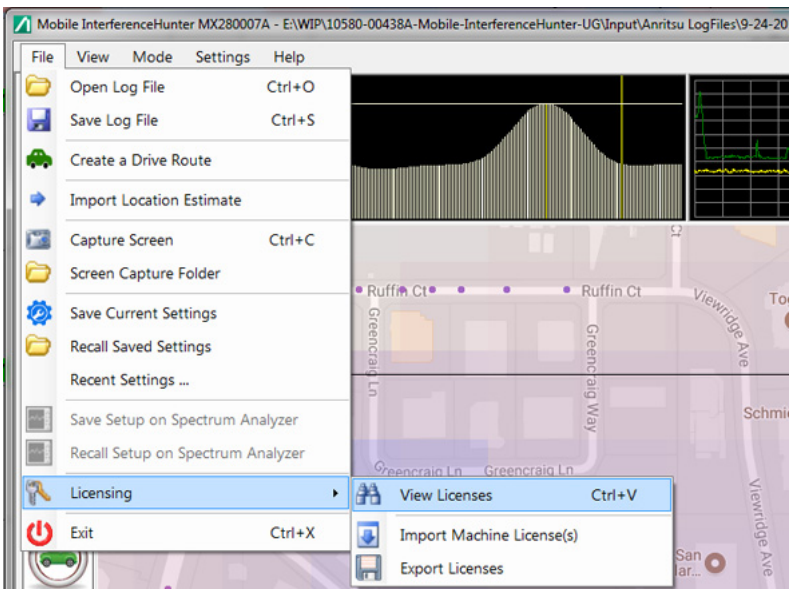


Figure 1-1. Importing the License Keys

Drag-and-Drop License

Depending on the email service, drag-and-drop the attached license key into MIH.

- If using Google/Baidu Maps, drag-and-drop the license key anywhere on the MIH software except for on the Google/Baidu Map itself.
- If using maps from any open source map, drag-and-drop the license key anywhere on the MIH program window.

1-5 Configuring the Computer to Instrument Connections

This section details two methods of connecting Mobile InterferenceHunter software to an Anritsu handheld instrument Ethernet port. For detailed instructions to configure your instrument, please review the user guide specific to your instrument. The procedures below are examples. Other configurations are possible depending on your needs and available resources.

Connecting via an Ethernet Crossover Cable

1. Connect the laptop to the instrument Ethernet port with a crossover cable.
2. Set the host PC to a static IP address as follows:
   a. Click Start Menu > Control Panel > Network and Sharing Center.
   b. Click Change adapter settings.
   c. Right-click on Local Area Connection and click on Properties.
   d. Select Internet Protocol Version 4 (TCP/IPv4), click Properties, and then set the following:
      - IP Address = 10.0.0.1
      - Default Gateway Address = 10.0.0.0
      - Subnet Mask = 255.255.255.0
3. Set the Anritsu handheld instrument Ethernet settings as follows:
   a. Open the System menu via Shift System (8).
   b. Click the System Options menu.
   c. Click Ethernet Config and set the following:
      - IP Address = 10.0.0.2
      - Default Gateway Address = 10.0.0.0
      - Subnet Mask = 255.255.255.0
4. Open a browser on the computer and enter the URL address 10.0.0.2 to access the handheld instrument web interface.

Connect to Analyzers with Built-in Wi-Fi

Anritsu Products, such as the MS2090A, have built-in Wi-Fi and do not require a router to be remotely connected to a PC/tablet running the MIH software. A hotspot or access point is required for communications to take place. To learn more about your Spectrum Analyzer and the Wi-Fi connection, visit the Anritsu Product Page at: https://www.anritsu.com/en-US.

Configure the Spectrum Analyzer

1. Connect the PC/tablet used with MIH to a hotspot.
2. Test the connection by using a Ping command to log into the IPV4 IP address.
3. Locate the Wi-Fi connectivity setting of your spectrum analyzer.
4. Activate the Wi-Fi setting of the spectrum analyzer. Once Wi-Fi is active, a listing of the SSID names will appear based on the Wi-Fi signals that are present.
5. Click the SSID name corresponding to the SSID of your hotspot.

Test the connection to MIH

1. Click Settings at the top of the MIH screen.
2. Click on the Spectrum Analyzer Connection in the menu list.
3. Click on the Test Connection button. You should then receive a message back that the test has passed. A successful connection dialog with the analyzer IP address will display similar as shown in Figure 1-2.

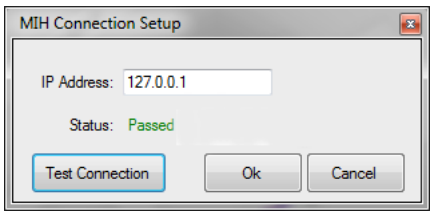


Figure 1-2. MIH Connection Setup Dialog

Connecting via the TP Link TL-WR802N Wireless Router

The router comes factory configured to work with Anritsu instruments. A band pass filter on the input to the spectrum analyzer may help with weak signals when using a Wi-Fi link.

1. Set the Anritsu handheld instrument Ethernet settings as follows:
   - IP Address = 192.168.0.50
   - Default Gateway Address = 0.0.0.0
   - Subnet Mask = 255.255.255.0
2. Connect both the Ethernet and USB ports between the router and instrument.
3. Connect the laptop to the router via Wi-Fi (generally using the icons in the lower right system tray) using the SSID and password that are printed on the router label. These codes are unique for each router. For example:
   - SSID = TP-LINK_39DE
   - Password = 02850450
4. Open a browser on the computer and enter the URL address 192.168.0.50 to access the handheld instrument web interface.

Recover the TP Link Factory Configuration.

1. Connect the laptop to the router through Wi-Fi as described in Step 3 of the previous procedure.
2. Open a web browser and enter the URL address tplinkwifi.net (192.168.0.1 or 192.168.0.254 are router default IP addresses, which will be changed later in the procedure).
3. Log in to the router using the defaults:
   - Username: admin
   - Password: admin
4. Click Quick Setup.
5. Set the Router as an Access Point and continue to click Next until the Quick Setup is done.
6. Review the settings and then reboot the router using the on-screen Reboot button.
7. Connect as described in the previous procedure.

Connecting MIH Ethernet to a Spectrum Analyzer

In the MIH Settings menu, click Spectrum Analyzer Connection mode to set up the Ethernet connection with the instrument as shown in Figure 1-3. The IP address dialog will display similar as shown in as shown in Figure 1-2.

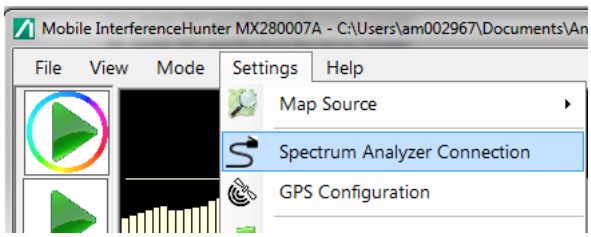


Figure 1-3. Spectrum Analyzer Connection

1. Type in the IP address of the instrument or the Wi-Fi router.
2. Click Test Connection to confirm connectivity. Once the Ethernet connection is complete and verified, begin taking measurements.

1-6 Setting Up an Alternate Ethernet Connection

Following the steps below, it is possible for the Laptop / Tablet PC used with MIH to have a primary Ethernet configuration (for the office network) and an alternate Ethernet configuration (for use with MIH). By doing so, there should be no need to re-configure network settings each time the Laptop / Tablet is used with MIH. Windows will detect the connected network and switch to the appropriate Ethernet configuration automatically.

No changes will be made to the General (primary) settings. Only an Alternate configuration will be added. This process assumes a static IP network configuration as the alternate network communication method between MIH and the spectrum analyzer. A CAT5 cable will be used to connect the spectrum analyzer to the PC. Note that the spectrum analyzer's Ethernet configuration type will be set to 'Manual' and the IP address, Gateway, and Subnet set per the examples below.

Example IP addresses, Subnet Mask, and Gateway:

- Spectrum Analyzer IP address: 192.168.0.100
- MIH PC address: 192.168.0.99
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.0.1

PC Ethernet Adapter Settings

For the Laptop / Tablet PC, navigate to Network Settings.

1. Click the Ethernet connection.

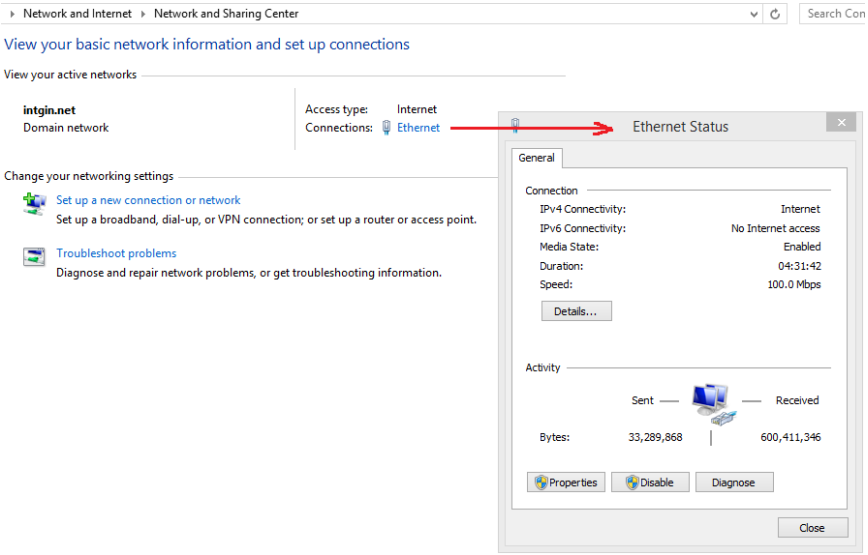


Figure 1-4. PC Ethernet Settings Window

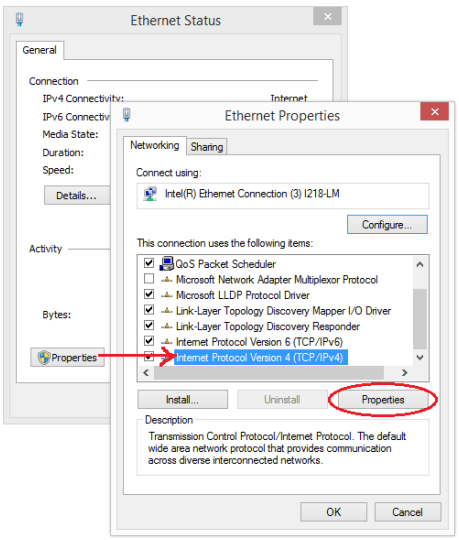


Figure 1-5. PC Ethernet Status and Properties Windows

2. Click Properties.
3. Click Internet Protocol Version 4.
4. Click Properties.

From Internet Protocol Version 4 Properties:

1. Click the Alternate Configuration tab.
2. Check the User configured radio button.
3. Enter the IP address, Subnet mask, and Default gateway as shown in Figure 1-6.

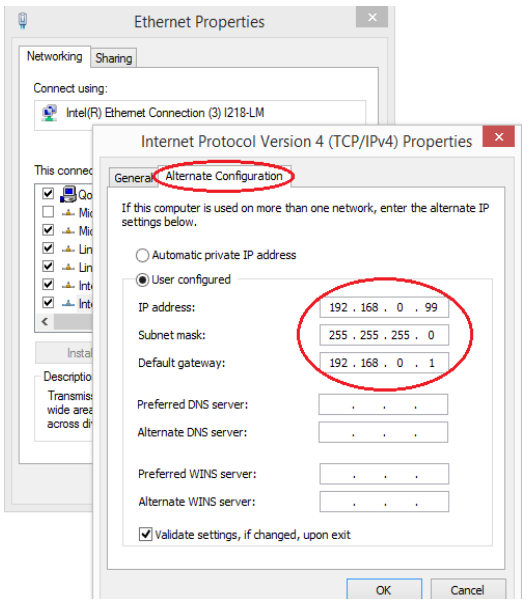


Figure 1-6. Internet Protocol Version Properties Window

The Laptop / Tablet PC is now be capable of utilizing either of the two network settings. General configuration for the office network or MIH Alternate Configuration, depending on which network it is connected.

1-7 Setting Up an External USB GPS Antenna

A GPS receiver is required for proper operation. If your instrument is equipped with a GPS option, use a GPS antenna connected to the handheld instrument and go to "From the MIH program:" on page 1-9. Otherwise, use an Anritsu GPS receiver connected to the computer USB port. MIH currently supports the BU-353S4 GPS receiver (Anritsu part number 2000-1528-R). Set up the receiver.

1. Download and install the latest driver from the GPS manufacturer's website to the tablet or laptop that will be used in finding an interferer. (Anritsu has tested Prolific driver version 3.8.1.3.)
2. Attach the external GPS receiver to the computer's USB port.
3. Confirm that Windows has installed the hardware driver and that it is listed under Ports (COM & LPT) in the Windows Device Manager.
4. Right-click on its listing followed by clicking on Properties to verify the device is working properly and that the Port Setting are configured as shown below (4800/8-N-1).

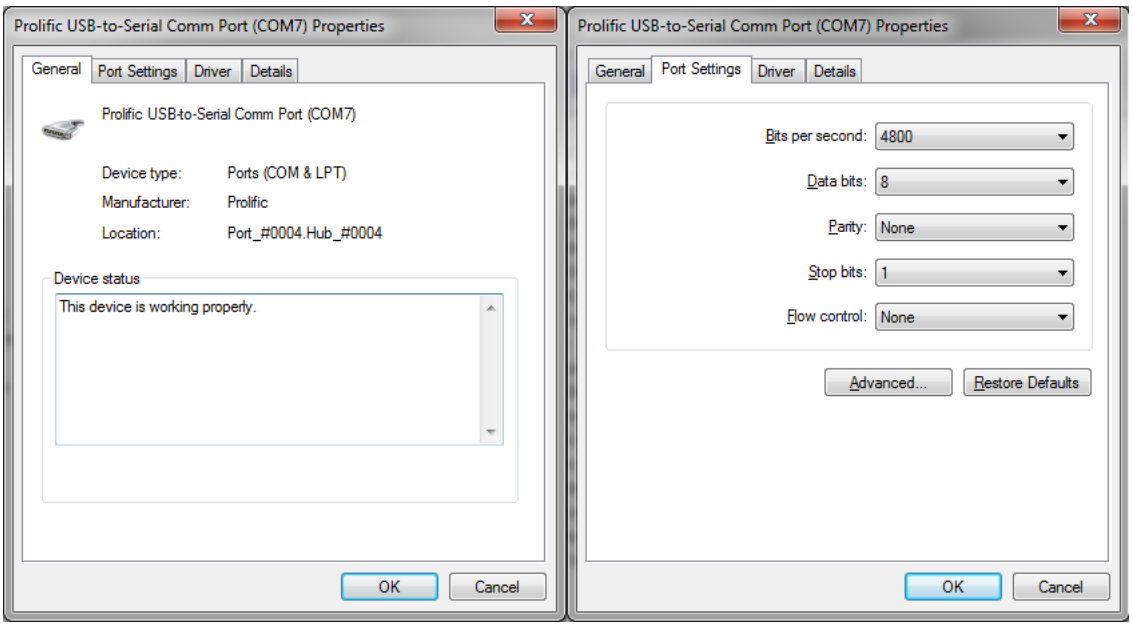


Figure 1-7. Communication Port (COMx) Properties Window

From the MIH program:

5. Click GPS Configuration in the Settings menu.
6. Click the GPS antenna option.

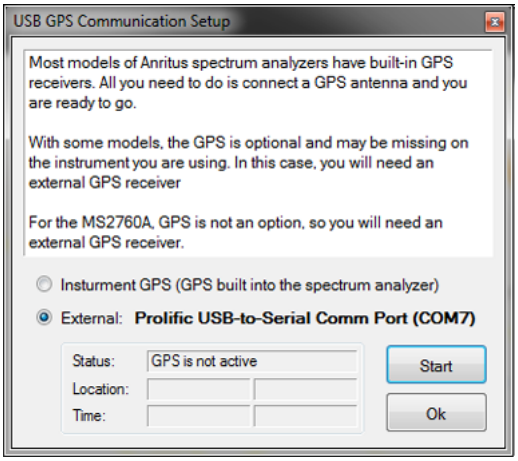


Figure 1-8. MIH USB GPS Communication Setup Window

7. Click Start in the MIH USB GPS Communication Setup. The antenna will search for satellites and obtain a GPS Fix.
8. Click Ok.

Caution	The USB GPS communication must be running and the setup window must be closed by clicking Ok before data collection can be started.

When using the GPS receiver with the computer, the Mobile InterferenceHunter main status bar at the bottom-left of the window has a GPS satellite fix indicator that can also show how many satellites are being tracked.

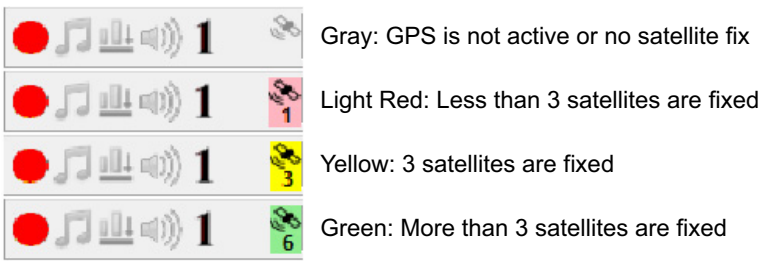


Figure 1-9. GPS Satellite Fix Indicator

To discontinue GPS antenna communication:

9. Open the dialog.
10. Click Stop.

Additional Documentation

This MIH User Guide is part of a set of manuals that describe all of the remote spectrum analyzer functions and their use with MIH. Instrument operations of various document types are listed below.

The MIH compatible instruments and their documents azre listed below.

Document Part Number	Description
10100-00064	Important Product Information, Compliance, and Safety Notices
10580-00419	MS2710xA Remote Spectrum Monitor User Guide
10580-00428	SpectraVision User Guide
10580-00435	MX280001A Vision Programming Manual
10580-00420	MS2710xA Maintenance Manual
10580-00444	MS2090A Field Master Pro User Guide
11410-00898	MS27100A Spectrum Monitor Module Technical Data Sheet
11410-00853	MS27101A Indoor Remote Spectrum Monitor Technical Data Sheet
11410-00847	MS27102A Outdoor Remote Spectrum Monitor Technical Data Sheet
11410-00854	MS27103A Remote Spectrum Monitor Technical Data Sheet
11410-01000	MS2090A Field Master Pro Technical Data Sheet

Contacting Anritsu for Sales and Service

To contact Anritsu, visit the following URL and view the services in your region:
http://www.anritsu.com/contact-us

Chapter 2 — Loading Maps

2-1 Loading Maps Into MIH

Loading or creating a map is essential when using the Mobile Interference Hunter. Ready-made maps are available for cities throughout the world on the Anritsu website. Visit http://www.anritsu.com and search for Maps. Alternately, construct your own maps using the brief instructions provided in the following sections for each mapping solution, or by visiting the map provider's website for their latest features.

Mapping solutions available using Mobile InterferenceHunter:

- OpenStreetMap™ – See "Using OpenStreetMap™" on page 2-2.
- Map Puzzle – See "Install Map Puzzle™" on page 2-3.
- Google Maps™ and Baidu Maps – See "Using Google/Baidu Maps" on page 2-5.
- Map Image Maps – See "Map Image Files (User Provided)" on page 2-5.

Load a Map Into Mobile InterferenceHunter

After selecting a map source from this section, load the user defined map as follows.

1. Click, drag, and drop the downloaded map file onto the Mobile InterferenceHunter program screen.

Note	The downloaded map cannot be dropped directly on top of a Google/Baidu Map.

2. Open the downloaded map from the Mobile InterferenceHunter Settings menu as follows:

From the main menu:

3. Click: Settings | Map Source | Open Source Maps (User provided) (see Figure 2-2)
4. Browse to your download folder.
5. Open the file.

2-2 Using OpenStreetMap™

Use the OpenStreetMap web site to create and download your map (https://www.openstreetmap.org).

Once on the OpenStreetMap site as shown in Figure 2-1, follow the instructions provided by OpenStreetMaps to download a map.

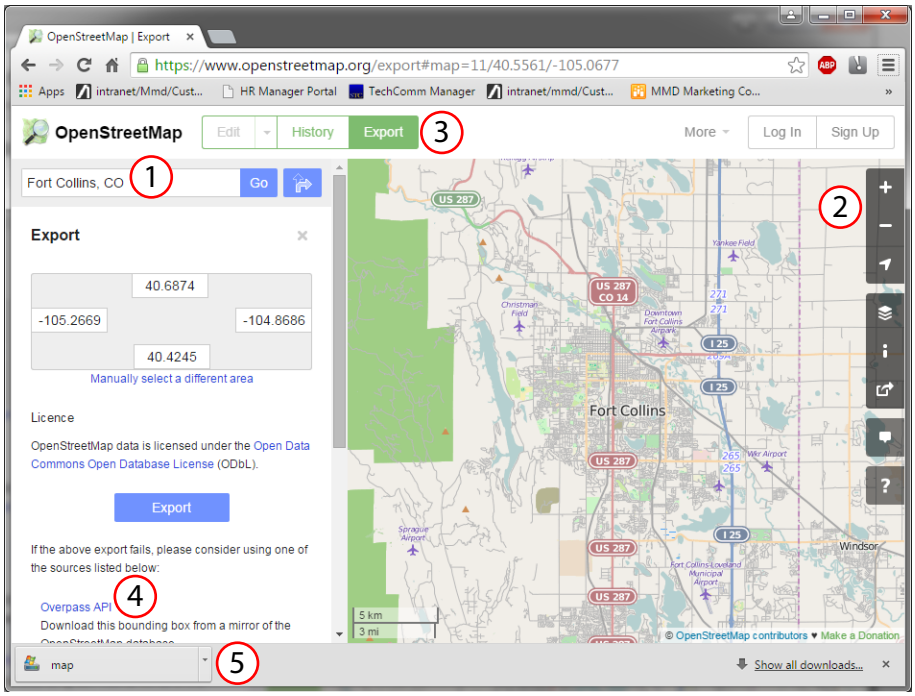


Figure 2-1. OpenStreetMap Website

When you open OpenStreetMap in Mobile InterferenceHunter software, a dialog box prompts you to enter the city and country. Then, the map is converted to the Mobile InterferenceHunter format and opened in the software. The converted files are saved so that when you open that location in the future, no additional formatting is needed.

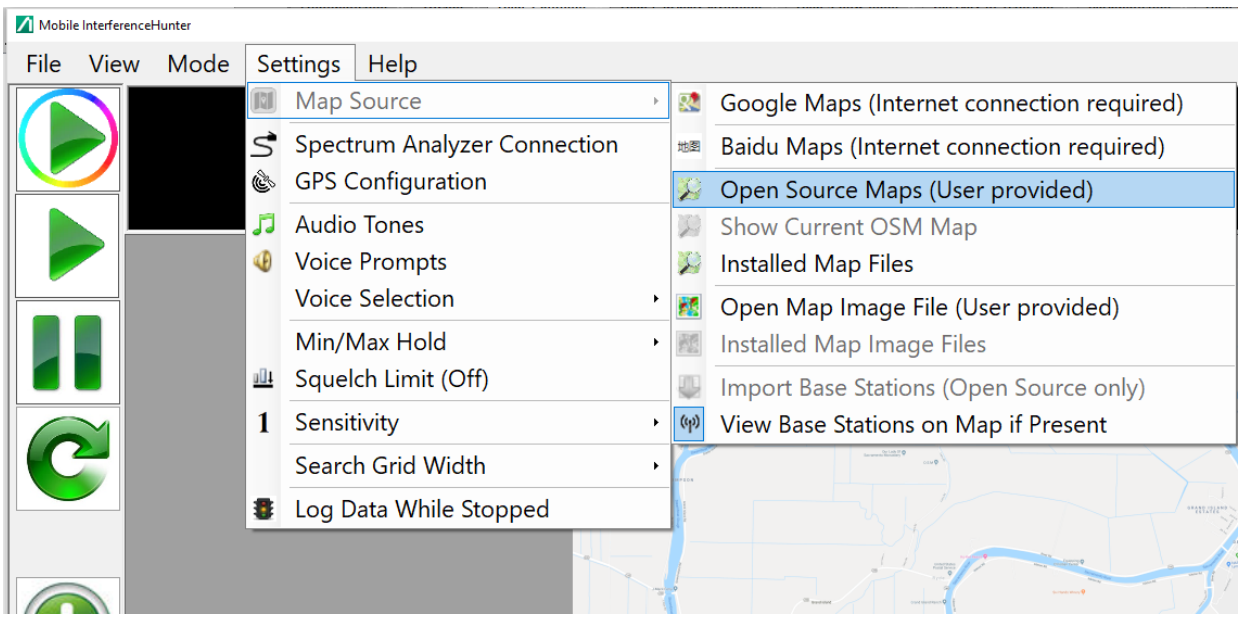


Figure 2-2. Map Source - Open Source Maps

To open existing maps, navigate to the directory on your tablet/laptop where the maps are stored and open any SHP file for your map. See Figure 2-3 where 'roads.shp' is highlighted in yellow for illustration. InterferenceHunter will use all of the map files in the directory for the various map layers.

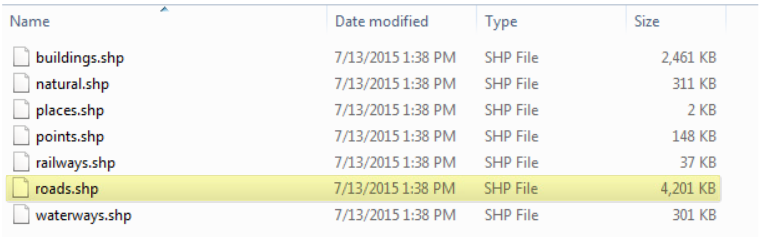


Figure 2-3. Open Source Maps

2-3 Install Map Puzzle™

Users may want to use their own mapping solutions. Here we will describe the use of Map Puzzle. Map Puzzle is a free program for Windows to download maps from Google, Bing, and other public mapping services. For more information not covered in this section using Map Puzzle, visit http://www.mappuzzle.se/doc.htm.

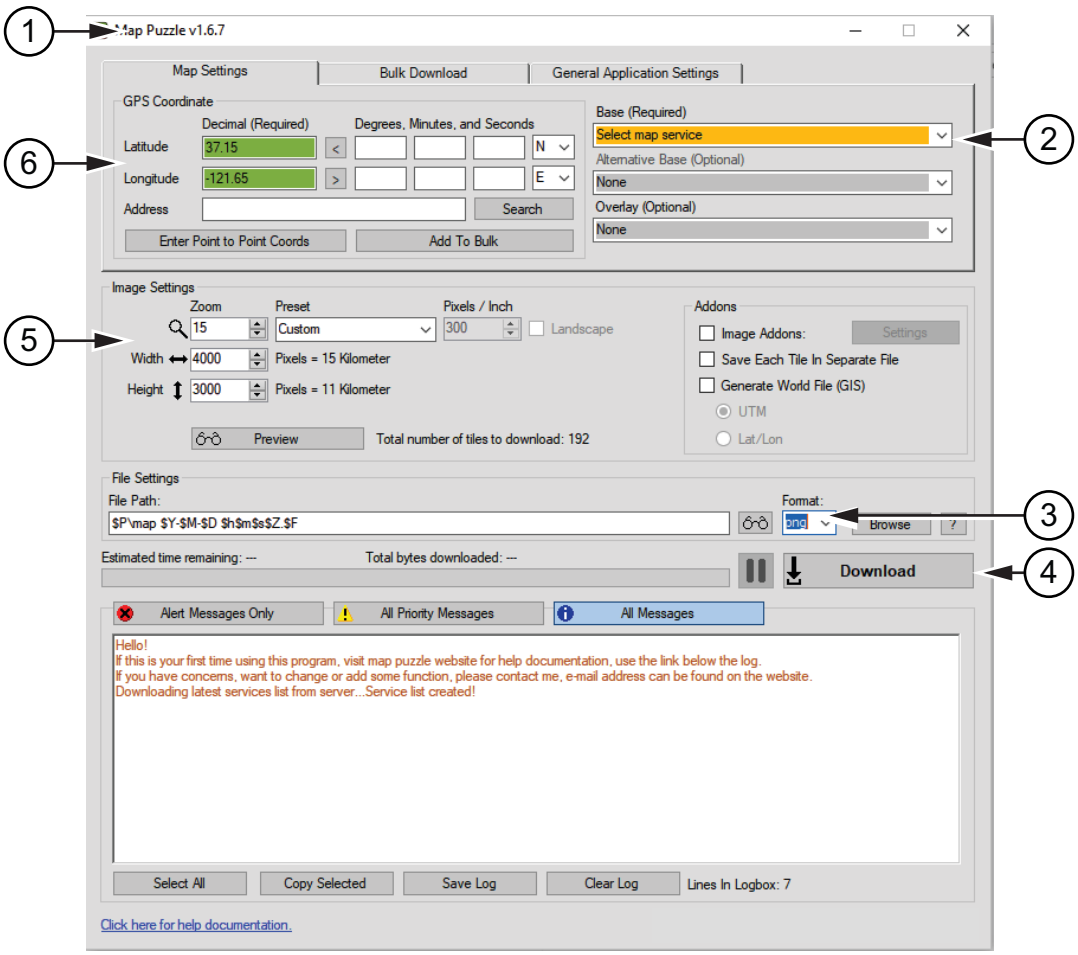


Figure 2-4. Map Puzzle User Interface

1. Map Puzzle Title Bar	4. Download Button
2. Map Service Download	5. Image Settings
3. Map Format	6. GPS Coordinates

Figure 2-4. Map Puzzle User Interface

Run the executable to load the Map Puzzle interface as shown in Figure 2-4. Maps are also supported in the Anritsu Simulator program and the Anritsu TDOA Demo Application.

1. Copy mappuzzle.exe on to the local drive.
2. Type the coordinates settings of the map location.
3. Type the Image Settings for the zoom level, Width and height of the map as it will appear on the screen.
4. Click the Map Selections arrow to see more options. The map service section provides a list of map services to select from.
5. Click the Format arrow to see more options. Selections include .jpg, and .png.
6. Click Download.
   - The map will take a short amount of time to download. The loading green-bar indicator and the amount of time remaining for the download process to complete is indicated by the Map Puzzle user interface as shown in Figure 2-5.

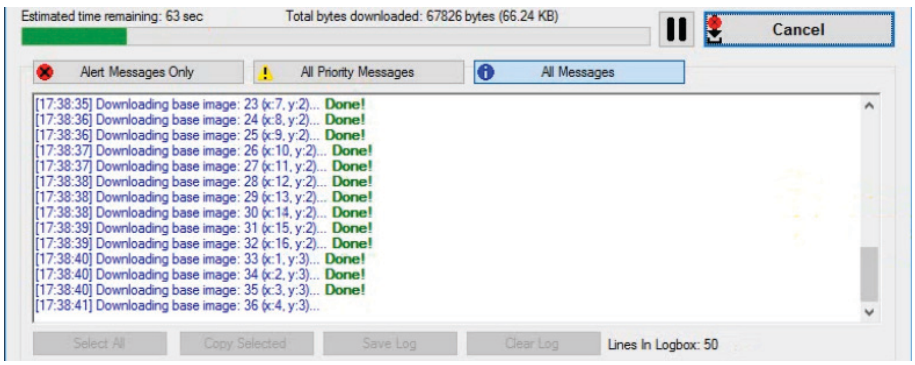


Figure 2-5. Download Map In-Process

Once the download is complete, the map file is stored in the downloads folder as shown in Figure 2-6.

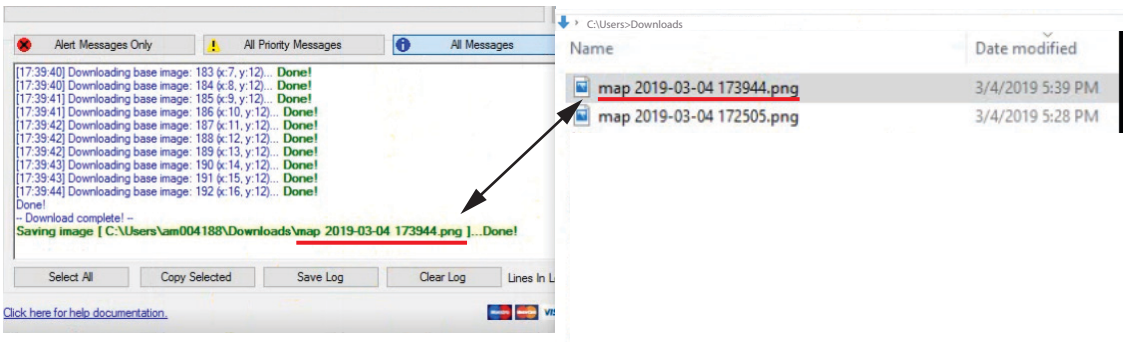


Figure 2-6. Download Complete

2-4 Using Google/Baidu Maps

Using Google/Baidu maps requires an Internet connection for the duration of the interference hunt. A USB modem can be used with the laptop/tablet if your device does not have an integrated radio.

Note	Ensure that the USB modem's radio signal is not interfering with the signal you are trying to find.

Navigate to Settings | Map Source | Google Maps or Baidu Maps. The Google/Baidu map is then automatically displayed.

2-5 Map Image Files (User Provided)

MIH creates a location on the PC to store and retrieve MIH map files: C:\[user documents folder]\Anritsu MapFiles. Although the user is not limited to this location, this is the location MIH looks to find map files.

The Open Map Image File (User provided) menu selection provides a browse menu for the user to select a previously loaded JPG or PNG file. If the user selects a file not previously loaded, they will be requested to enter the GPS coordinates of the corners of the map. See "Enter Map Edge Coordinates" on page 2-6.

Installed Map Image File menu selection provides quick access and opens a sub-menu that lists all of the JPG and PNG files in the Anritsu MapFiles folder. See Figure 2-7. The user can immediately search for and open a map file. If it is the first use of the Image Map file, then the user is prompted for the GPS coordinates of the corners. See "Enter Map Edge Coordinates" on page 2-6.

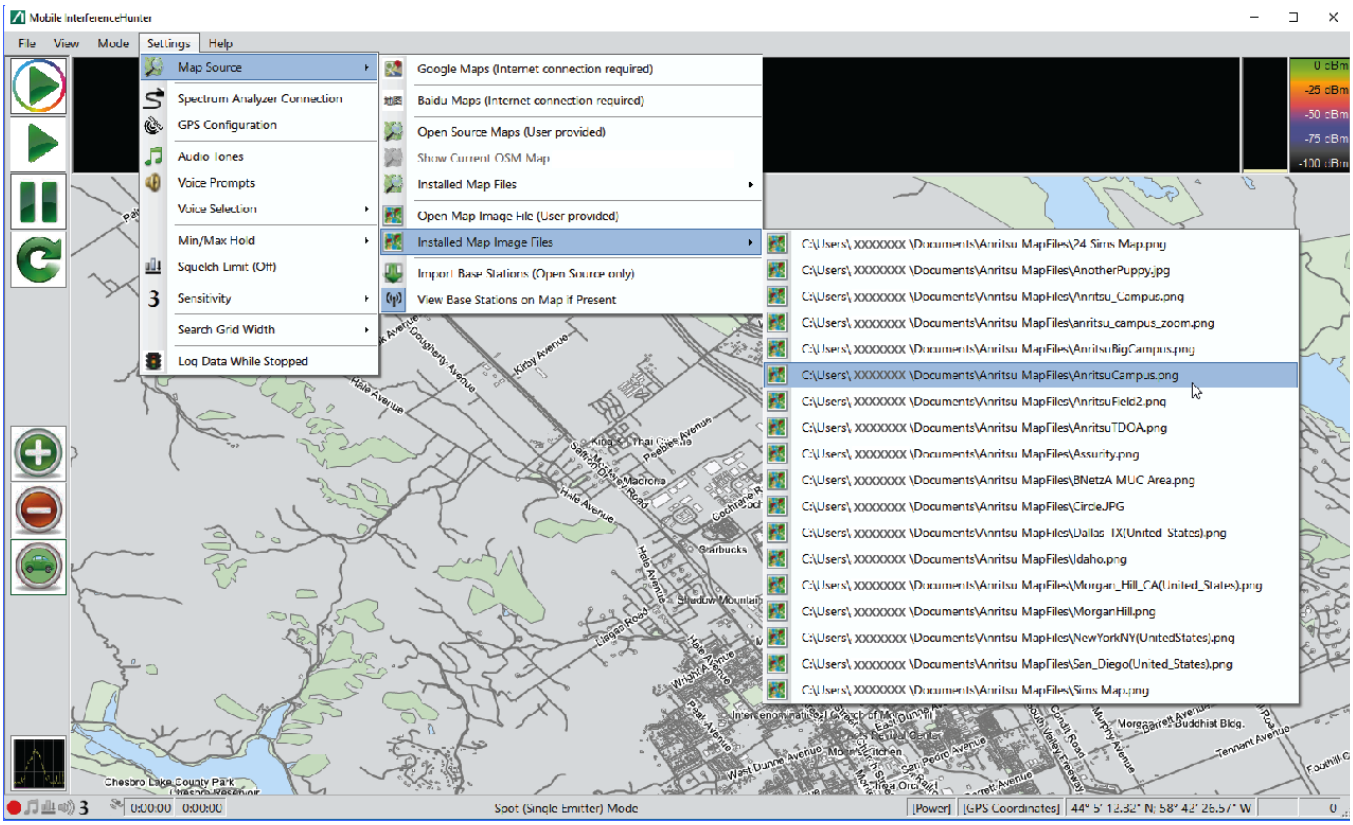


Figure 2-7. Installed Map Image Files

2-6 Enter Map Edge Coordinates

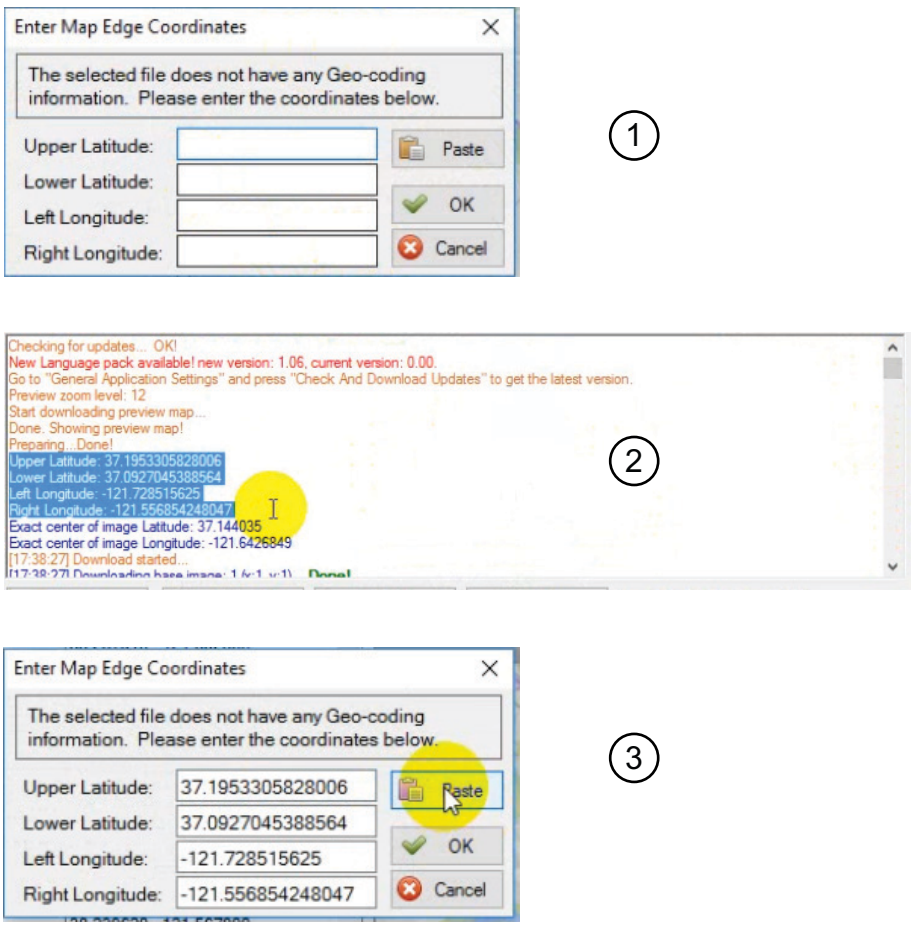
Initially a new map is not pointed to the exact coordinate location. When loading a new map in MIH, a dialog box is displayed requesting the user to Enter Map Edge Coordinates as shown in Figure 2-8. To enter the coordinates:

1. If using MapPuzzle, go to the MapPuzzle download status box and scroll up to the beginning of the download process.
2. Copy the latitude and longitude coordinates in one mouse sweep.

Note	If a user downloads more than one map, the status box will contain information about each download. Scrolling back to the top and copying coordinates will copy the coordinates of the first map downloaded, not the most recent. The user needs to only scroll up to the top of the most recent download, or press the 'Clear Log' button in Map Puzzle before each download.

3. Go back to the Enter Map Edge Coordinates dialog box and click paste. The copied coordinates will paste into the coordinate fields.
4. Click OK.

Using a map file source other than Map Puzzle may require the user to enter the map edge coordinates manually.



1. Enter Map Edge Coordinates dialog	3. Paste Coordinates
2. Copy Coordinates	

Figure 2-8. Enter Map Edge Coordinates

Chapter 3 — MIH Graphical User Interface

3-1 Introduction

The Mobile InterferenceHunter software controls Anritsu Handheld Spectrum Analyzer products that can be run from a Windows-based desktop, laptop, or tablet computer via Ethernet connectivity. The main window is consists of a:

- Title bar
- Menu bar
- Vertical tool bar
- Signal display windows
- Drive map display
- Status bar

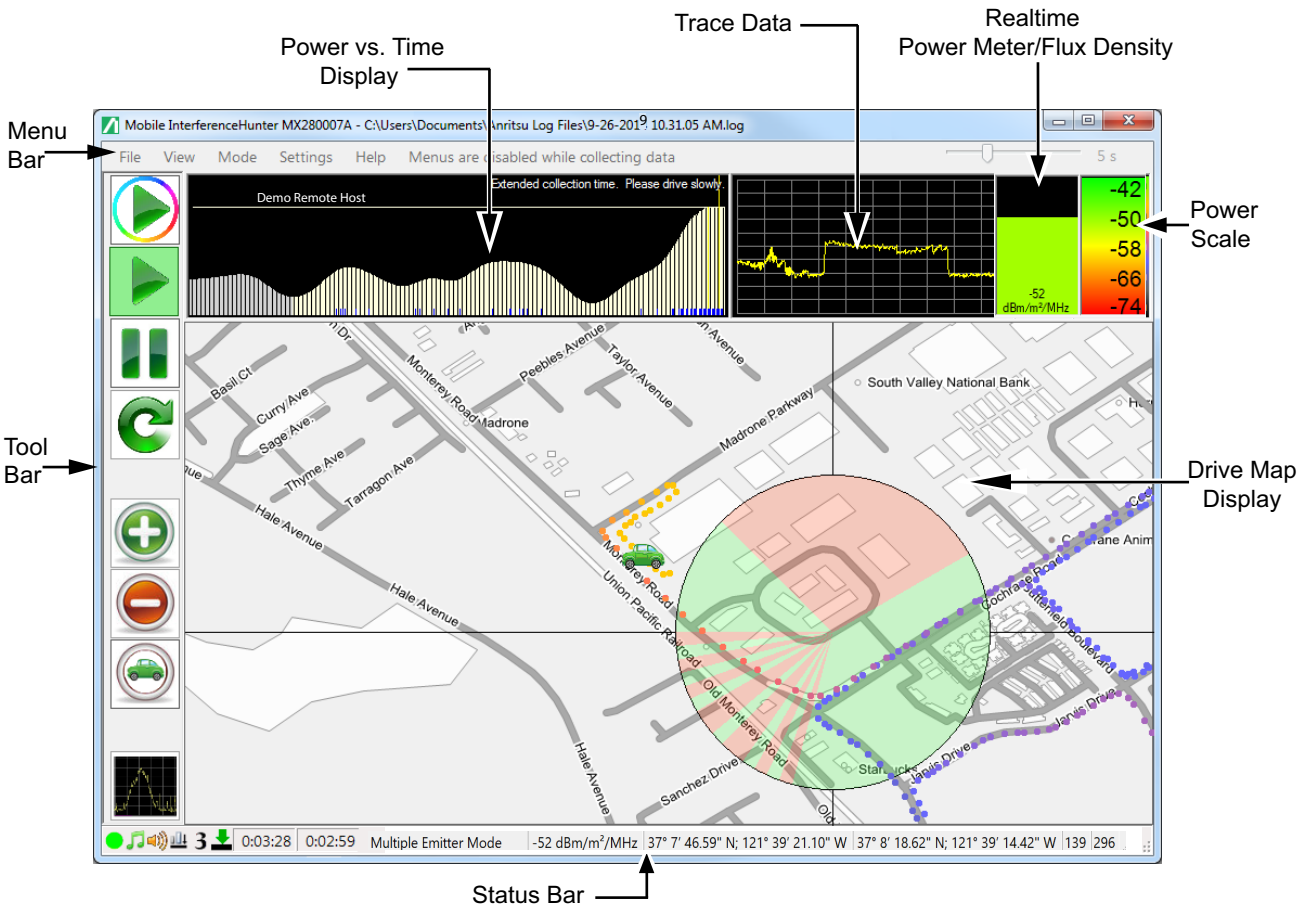


Figure 3-1. Main Window

3-2 Tool Bar

The toolbar is at the left edge of the Mobile InterferenceHunter application window. Use the Settings | Button Size menu option to adjust the screen size. Each Toolbar button is detailed below.

Icon	Description
	**Start Scan Driving:** Scan driving is a search method that looks for an interferer in a general area. The dark lavender shaded area on the drive map indicates areas where more data is required. Scan driving is used more to eliminate areas where the interferer is not likely located, rather than to locate the interferer directly. Begin with this mode and drive a wide area in the direction of the darkest map shading. Once no longer areas of dark shading are visible, switch over to Spot driving mode for a more targeted hunt to the interferer. The button turns yellow when connecting and green when active.
	**Start data collection:** Begins data collection of real-time power and GPS coordinates. When moving, data will display in the Time vs. Power bar graph and breadcrumbs are displayed in the drive map. As a safety feature, the menus in the Menu bar are deactivated and not accessible in the Run mode. If the message “Spectrum Analyzer Not Responding” pops up, there is no connection to an instrument. The button turns yellow when connecting and green when active.
	**Pause data collection:** Stops data collection and communication between the computer and Spectrum Analyzer. Click this button at the end of an interferer hunt or to halt data collection. An example for pausing data collection is going over an overpass will increase the received power even though you are not closer to the RF source. The menus in the Menu bar are reactivated for use.
	**Clear Data:** Click to clear all data collected. Removes all data from the active data set. When hunting interfering sources, some data may be erroneous due to various sources for example attenuation, reflection, multi-path, and fading. As power level increases and direction becomes clearer you may want to purge old data and start fresh. It is recommended that you always clear the data buffers before starting a new hunt.
	**Zoom In:** Click to zoom into the map. This button replaces the Zoom In control within the maps. It is easier to access. The map will recenter in relation to the Green Car.
	**Zoom Out:** This button replaces the Zoom Out control within the maps. The map will recenter in relation to the Green Car.
	**Auto-Centering:** When active, the auto icon on the map and its location will return to the center of the display window after having moved 50% and beyond the center of the display. Also at this time, the center of the button is green. The button turns green when active. Auto-centering can be turned on before running data collection or during data collection. When Auto-Centering is off, you will have to manually drag the auto icon into view.
	**Toggle Trace Data:** View the spectrum trace. The placement of the spectrum analyzer instrument may not be in a convenient location for viewing when interference hunting. The Instrument Trace button allows you to view the signal within the Mobile InterferenceHunter window. This window will be updated approximately once per second. Also in this mode, a snapshot of the trace will be taken per measurement taken during data collection and will be stored as a .jpg file. View the traces during a log playback or manually viewing a log file. When scrolling through the signal lines in the Power vs. Time display, the trace associated with that signal line will be displayed in the Instrument Trace Display.

3-3 Menu Bar

The menu bar extends across the top of the application window and includes four menu categories: File, View, Mode, Settings and Help. This section describes the basic set of menu items. These menus are disabled when MIH is in either run modes.

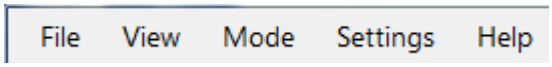


Figure 3-2. Menu Bar

File Menu

Open Log File (Ctrl+O): Opens the file directory to load a saved drive test data set (.log file). This is useful for reviewing test results and documenting hunting excursions. Log files can be opened or appended to existing data to aggregate multiple runs. The log file can also be opened as a playback file. A playback file is like reviewing the gathered data as a movie.

Save Log File (Ctrl+S): Saves the current drive test data set. If you clear the data, you will not be able to get it back unless it has been saved. Saved data is only useful to reload and review previous interferer hunts.

Create a Drive Route: Opens the dialog box shown in Figure 3-3. Follow the instructions provided to create a drive route. The drive route can be created at the office and then sent to the technician out in the field. The field tech-supervisor and field technician should be signed into the same Google Maps account.

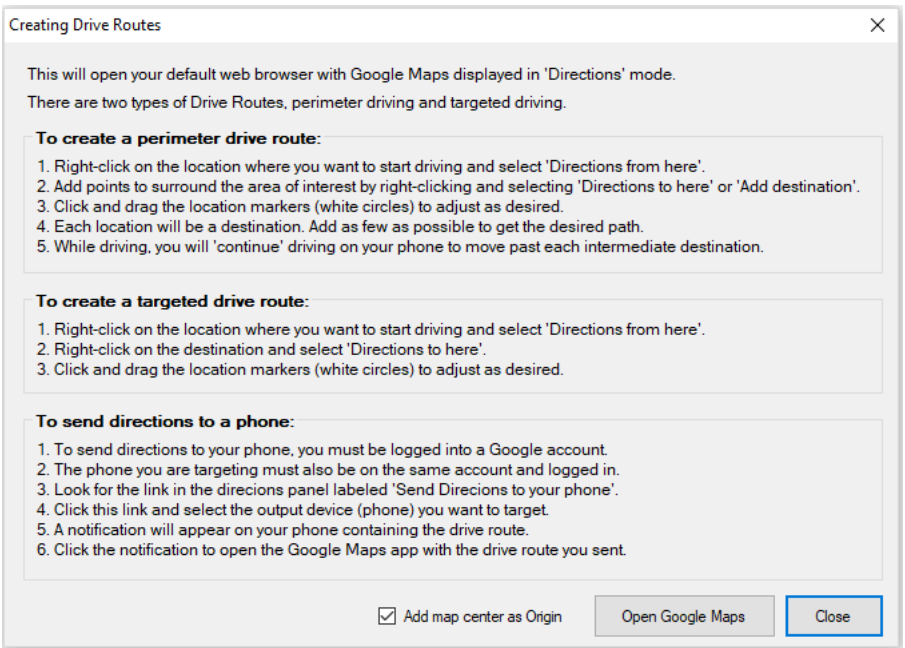


Figure 3-3. Creating Drive Routes Instructions

Export Drive Log to KML

Export a drive test log to a (.kml) file. See “Export to KML” on page 3-5.

Import Location Estimate: The location files (.loc) were produced by the Anritsu Vision software. The estimated locations are a result of the different techniques used to locate an interferer:

- Angle of Arrival (AoA)
- Power on Arrival (POA)
- Time Difference of Arrival (TDOA)

Once imported, the data from .loc files will be displayed on the Drive Map Display. Use this information to create a drive route.

Capture Screen (Ctrl+C): Captures the current map display and saves it to the directory folder labeled Anritsu ScreenShots. The captured screen is in PNG format and labeled with the date and time stamp.

Note	The Anritsu ScreenShots folder is created during the installation of Mobile InterferenceHunter and is placed in the My Documents folder.

Screen Capture Folder: Opens the file directory containing all of the captured screens. The directory folder is labeled Anritsu ScreenShots.

Save Current Settings: Opens the Save As window. Name the file and click Save. The file extension.mih, will be added to the end of the name given. Most MIH settings and key instrument settings are saved.

Recall Saved Settings: Opens the Open window containing all of the configuration settings files. These MIH files are located in the default directory folder, My Documents.

Recent Settings: Opens a list of up to 10 previously saved Settings files.

Save Setup on Spectrum Analyzer: Initiate a save setup on the instrument from the MIH software. Click to open the Filename dialog and enter a name for the setup file to be saved on the instrument. After the setup name has been entered, click OK.

Recall Setup on Spectrum Analyzer: Use this command to load a setup on the instrument for measurement testing. Click to open the Select a Setup File dialog. A list of Setup files on the instrument is displayed. Click the desired setup file then click the Load button.

Licensing: Opens a list of commands related to instrument licenses:

- **View Licenses (Ctrl+V):** Opens the About Anritsu Mobile InterferenceHunter dialog. It contains the lists of single instrument license keys and/or network license keys currently in use.
- **Import Machine License(s):** Click to import a single instrument license key.
- **Export Licenses:** Creates a file containing all of the licenses on that PC that can be imported to another PC. Note that a license can be associated with only one Anritsu instrument.

Exit: Closes the Mobile InterferenceHunter program. Any data collection not saved will be erased at this time.

Export to KML

A drive test log can be exported to a (.kml) file. Open a drive log to view in the MIH window. From the File menu, click **“Export Drive Log to KML”**. Name and save to a (.kml) file. Click to open the (.kml) file to provide the drive route in a Google Earth format as shown in Figure 3-4.

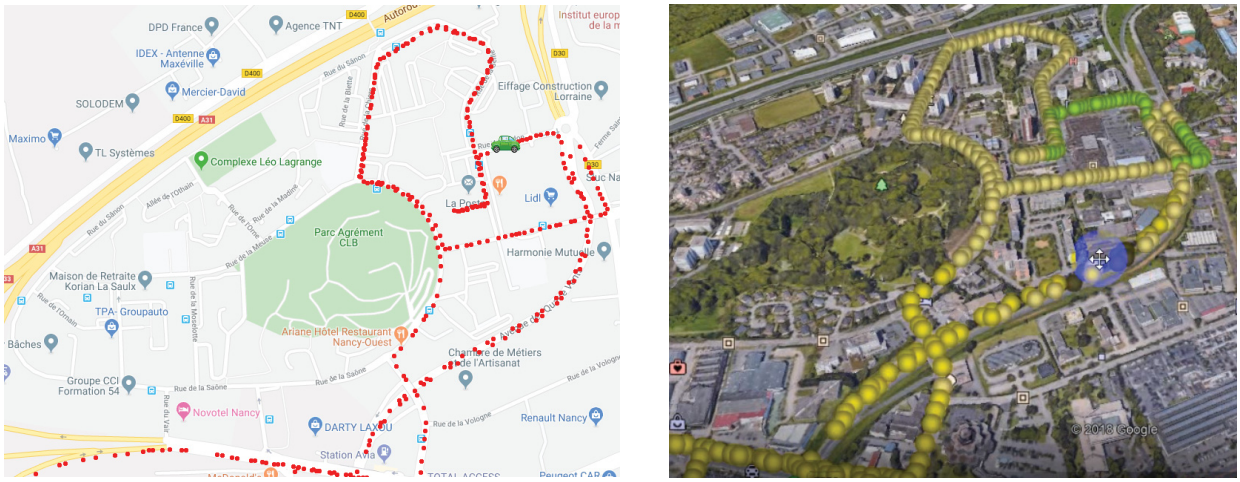


Figure 3-4. Export Drive Test to KML

Channel Power

To view the channel power of a particular breadcrumb as shown in Figure 3-5, the Trace Data window must be active. To activate, click **“Toggle Trace Data”** from the MIH “Tool Bar”. The data shown in the Trace data display is then available to view when a (.kml) file is opened.

Clicking a breadcrumb then displays the signal’s channel power trace data and the power readout. The direction links are provided through Google. Click ‘To here’ to enter a starting location. Click ‘From here”, to enter a destination.

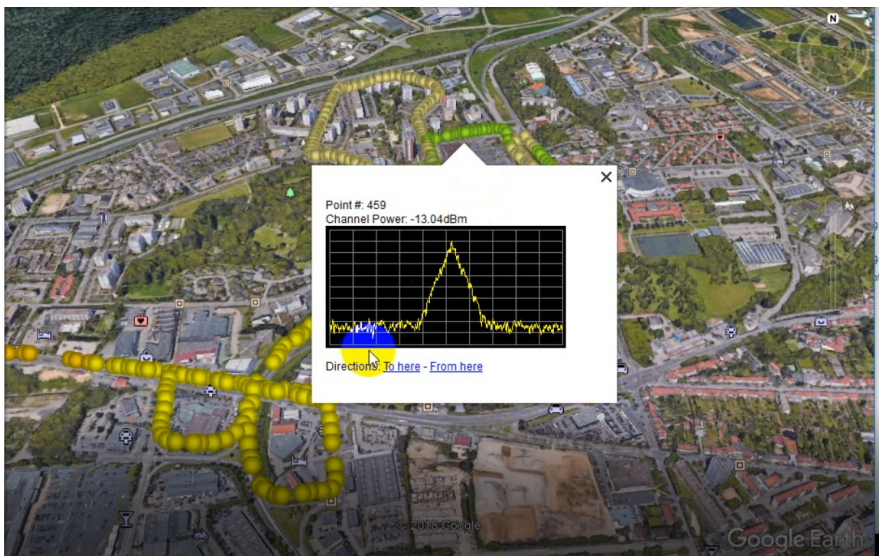


Figure 3-5. Channel Power

View Menu

Button Size: Click a button size. The four selections are 32 x 32, 64 x 64, 96 x 96, and 128 x 128. The buttons will scale to fit the toolbar if the button size selected is larger than what can be accommodated by the toolbar size. Expanding the window size will grow the size of the buttons until they reach the maximum size selected.

Menu Font Size: Click a font size for text in the Menu Bar, its sub-menus and in the Status Bar and most dialogs. The font sizes are 9, 10, 11, 12, 14 and 16. The font size affects the amount of information displayed on Status Bar. As the font size increases, status parameters may be removed from view.

Growing Breadcrumbs: Breadcrumbs are placed on the map along your traveled route. In its default setting, breadcrumbs' color changes but may still be difficult to see while driving. The breadcrumb size increases as received power increases. With Growing Breadcrumbs set, breadcrumb power levels are denoted not only in color but with size.

Estimation Circle: A red and green circle appears as more breadcrumbs with higher power levels are left on the map. When the position of the signal source becomes available, the Green Arrow is eliminated and replaced by the Circle. The Circle may be large at first but will reduce in size as more signal data is accumulated. This indicates that you are closer to the interfering signal source and that the power level of the interferer is increasing. Also, the default colors of the circle area colors red and green and can be change in the Color Mode setting.

From the center of the circle looking out, the green areas of the circle depict how the breadcrumbs are dispersed for calculating the location of the interfering signal. If the Circle is heavily shaded red or one side of the Circle is a quarter to half shaded green then drive in the direction of the area shaded red to accumulate a more even distribution of breadcrumbs to calculate the location of the interferer. The Estimation Circle is not available in Multiple Emitter and Spectrum Clearing Modes. (For Drive Map Display, click to view either the Estimation Circle or the Heat Map. The Estimation Circle is the default view).

Heat Map: The Heat Map covers a larger area of displaying the level of intensity of the interferer signal by color than the Estimation Circle. A matrix of rectangles creates the heat map and the colors signify the probability that the pattern of observed power measurements would be caused by an emitter in that grid cell – green being the strongest signal and pale blue/gray the weakest signal. (For Single Emitter Mode, click to view either the Estimation Circle or the Heat Map. The Estimation Circle is the default view).

Allow Level Adjustment: Places a bright blue horizontal line in the Power vs. Time display. Click and move it up or down. Changing the horizontal location of the line changes the threshold level and data used for determining either the Estimation Circle or Heat Map.

Show Cross Hairs: Adds a horizontal and a vertical line that cross at the best estimated location of the interferer.

Show Line Estimates: Line Estimates are used for determining the location of an interferer. Green lines are drawn perpendicular to the vehicle's direction of travel. Line Estimates can only be used in Single Emitter Mode. To use Line Estimates, click Show Line Estimates (F11) command.

Toggle Current Line Estimate: Toggles on or off the setting for the current measurement as indicated by the bright yellow vertical line in the Power vs. Time display. Move the bright yellow vertical line using the left/right keyboard keys or by clicking on the bar chart. When toggled on, the color of the bar highlighted by the bright yellow vertical line changes to a pale blue. Also with Show Line Estimates on, a green line is drawn on the map perpendicular to the direction of travel at that location. This should only be done at local maxima and where the vehicle is traveling in a straight line on the bar chart. When performed so that the lines cross at nearly right angles, the intersection of the lines will mark the position of the interferer.

Clear All Line Estimates: Toggles off all green line estimates.

Clear Location Estimate (Imported or TDOA): Clears location line estimate from the map. When you run TDOA or import TDOA data, location estimate lines are drawn on the map that triangulate an interferer. These lines persist until MIH is closed or until this menu item is used.

GPS Coordinate Format: Click either Decimal degrees or Degrees, Minutes, Seconds format.

Color Mode: Click a color when viewing the drive map in changing lighting conditions. In cases such as using the instrument in bright sunlight, use the High Contrast (Transparency) setting.

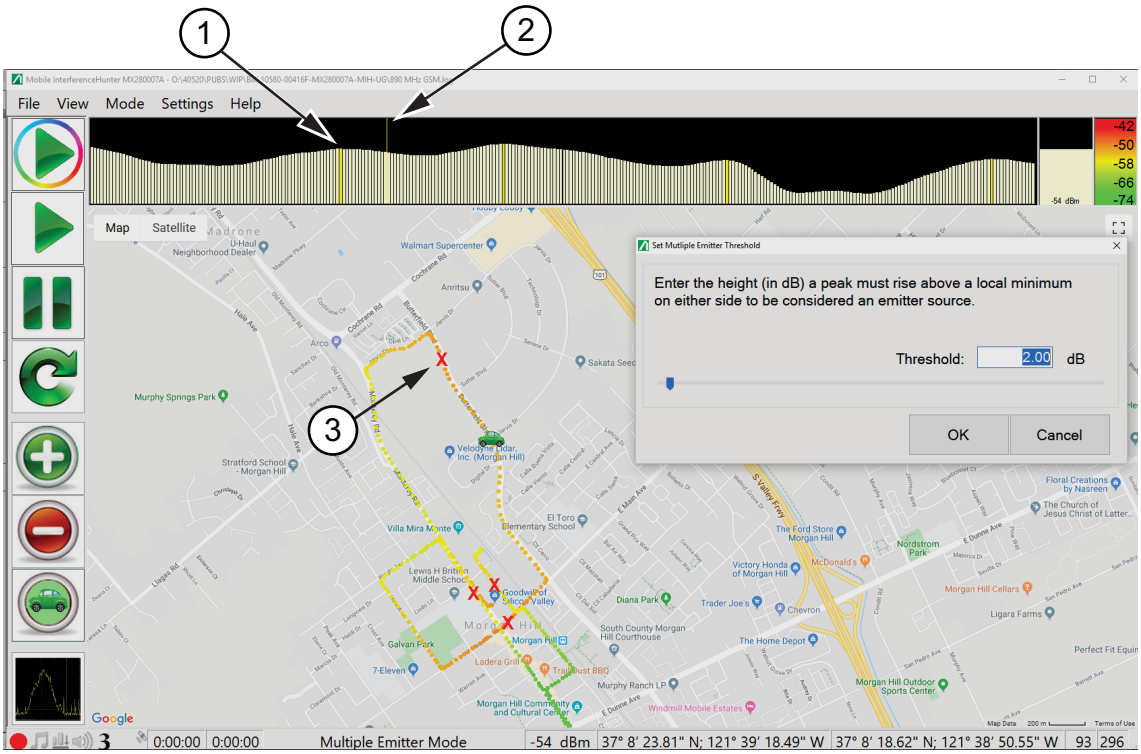
- **Map Colors:** Full Color or Reduced Color
- **Estimation Circle:** Green/Red, Blue/Yellow, Black/White, High Contrast Transparency
- **Base Station Icons:** Aquamarine, Green, Orange, Red, Blue, Tan, Yellow

Mode Menu

Scan Driving (Initial Perimeter Survey): Used to establish a general area of where an interfering signal may be found.

Spot Driving: Single Emitter (Standard Operation): Hunting for a single interfering signal.

Multiple Emitter: Click opens a dialog with sliding scale as shown Figure 3-6. Enter the height (in dB) that a peak must rise above a local minimum on either side to be considered and emitter source.



1. Signal Peak
2. Car Position Slider
3. Peak Signal Location

Figure 3-6. Multiple Emitter Mode

Signal Peak: The signal peak is the strongest signal that rises above the threshold of the nearest minimum power point of either side of the peak signal. This peak signal would be an emitter signal.

Car Position Slider: Move the bar with the mouse pointer to scan the signal strengths. Move the car through the breadcrumbs to find the location of the peak signal.

Peak Signal Location: The peak signal locations highlighted in the bar graph are identified by the red X on the map.

Spectrum Clearing: Opens the dialog and sliding scale as shown in Figure 3-7. The colored power scale appears at the top right corner of the user screen disappears.

Type the threshold power in (dBm). The threshold power level entered is represented by a horizontal line across the channel power display. The breadcrumbs will be red (above threshold) or green (below threshold).

Screen images are automatically saved when the threshold is exceeded.

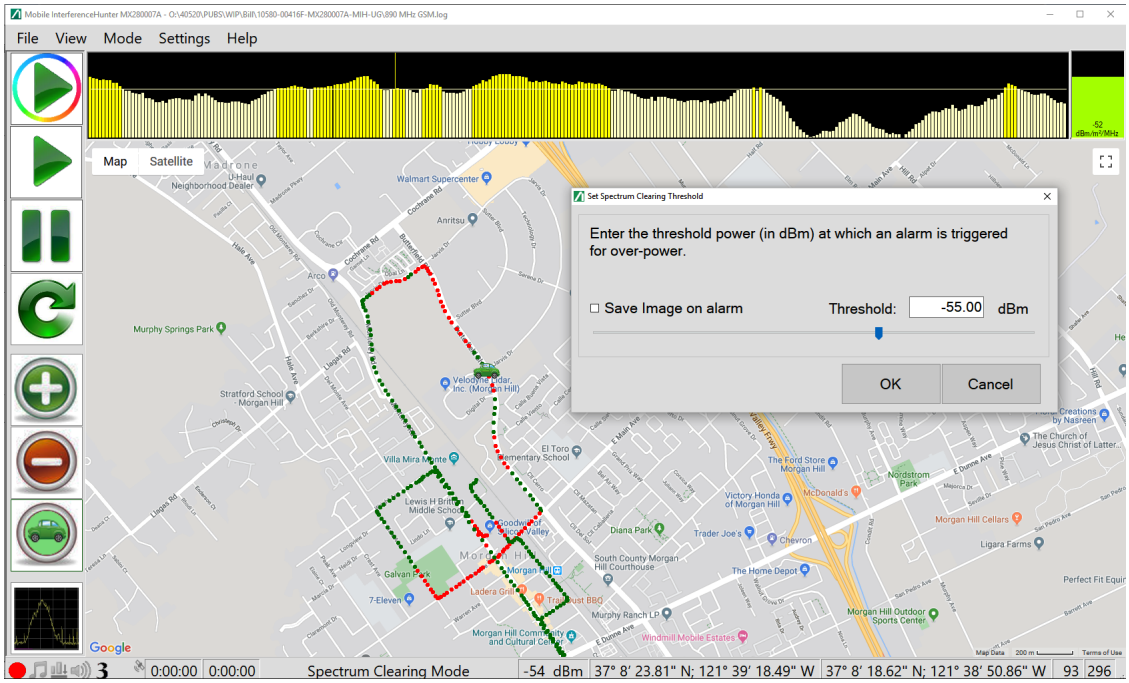


Figure 3-7. Spectrum Clearing Mode Screen

Time Difference of Arrival (TDOA): Use TDOA to locate interference sources and other modulated broadcasters. TDOA is not a driving mode like the other modes mentioned above. For TDOA, you must stop the car to perform the measurement. You must also have access to at least three remote spectrum monitor probes (MS2710xA). Note that one MS2710xA probe can be used as a spectrum analyzer for normal interference hunting. Refer to "Setting Up TDOA" on page 4-12.

Settings Menu

Map Source: Click a map source to use in the map display, Google/Baidu maps or a map from Open Source Maps. If using Open Source Maps, then switch to Google/Baidu Maps and want to return to the same Open Source Map, just click Show Current OSM Map to view the same OSM map without reloading. To view the list or load a new OSM map, click Installed Map Files. Click to load the new OSM map.

Google Maps (Internet Connection Required): Opens Google Maps.

Baidu Maps (Internet connection required): Opens Baidu Maps.

Open Source Maps (User Provided): Directs user to Open Source Map file location.

Show Current OSM Map: Displays the current Open Source map.

Installed Map Files: Displays the file directory of the user installed map files.

Open Map Image File (User Provided): Browse for a map file to load.

Installed Map Image Files: Provides a sub menu with existing map files in the default map folder. (Documents\Anritsu MapFiles)

Import Base Stations (Open Source only): Opens the Import Base Station dialog to load a list of base stations onto the driving map. The file with the extension .lst is a text file which contains the latitude, longitude and the name of the site. This file can only be overlaid onto OSM map files. Refer to "Creating, Importing, and Viewing Base Stations (Open Source Only)" on page 4-2.

View Base Stations on Map if Present: Toggles base stations location icons on the map display. For details on downloading maps, see: https://www.anritsu.com/en-US/test-measurement/products/Maps.

Spectrum Analyzer Connection: Opens the MIH Connection Setup dialog to set up the Ethernet connection to an Anritsu spectrum analyzer.

1. Enter the IP address of the instrument.
2. Click Test Connection to confirm connectivity.
3. Click OK to return to the main screen.

GPS Configuration: For Anritsu Handheld instruments without an internal GPS receiver, this setup allows you to use an external USB GPS antenna. The default setting is Instrument GPS. See "Setting Up an External USB GPS Antenna" on page 1-8.

Power Detection Mode: This menu becomes available after connecting to a MS2090A through the "**Spectrum Analyzer Connection**" menu. Used when performing flux density measurements. See the detailed description at Section 4-16 "Flux Density" on page 4-13. The submenus are:

1. Channel Power
2. Flux Density (dBm/m2/MHz)
3. Flux Density (dBW/m2/MHz)

Audio Tones: Tones fluctuate in pitch relative to the power level received which can be seen in the Real-Time Power Meter. The higher the power level the higher the tone pitch and most likely the closer the interferer signal. The audio tone update is approximately once every 100 ms but is considerably slower if the Spectrum Display is on.

Voice Prompts: Voice Prompts are given at fifteen second intervals and will point you in the general direction towards the interference source. When activating Voice Prompts, a voice will inform you that Voice Prompts is on.

Voice Selection: Mobile InterferenceHunter provides options for voices to use as voice prompts. Click:

- Microsoft David Desktop
- Microsoft Zira Desktop

Other voices are commercially available from various vendors should you find the Microsoft voices not understandable.

Min/Max Hold: Click to display sub-menu with Normal Trace, Min Hold, or Max Hold functions. A timer control located at the top corner of the MIH window appears, as shown in Figure 3-8, when Min/Max is selected and can be set from 1 to 15 seconds.

Note	Using this feature lengthens the data collection time. You will need to reduce your driving speed.

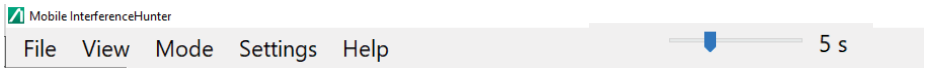
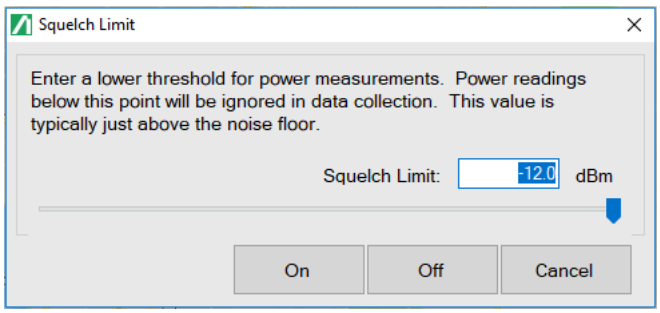


Figure 3-8. Min/Max Timer Control

Squelch Limit: Displays the dialog shown below. Set a minimum power signal threshold with squelch limit. Click On to activate the squelch limit value. This value appears with the Squelch Limit menu in the Setting menu list.

Any signal below squelch limit will be ignored during the data collection. This value is typically a few dB above the instrument noise floor. Measured with Channel Power for the current setup. Refer to Allow Level Adjustments control in the "View Menu" for doing this post-acquisition.



The squelch limit value will appear with the Squelch Value menu in the Setting menu list.

Sensitivity: Sensitivity relates to how data is collected in different types of geographical areas. In urban areas, small fluctuations in the receive power are more likely to be caused by a reflected or attenuated signal. We do not want to use these fluctuations in the location algorithm, so we lower the sensitivity by smoothing the data set. In rural areas there are fewer obstacles so small changes in the receive power are more likely to be of interest. We use higher sensitivity (less smoothing) so these small changes can help locate the interference source.

In urban canyon settings, the GPS signal can suffer from multi-path, and a stopped vehicle can appear to wander some distance from its true location. Decreasing sensitivity in urban areas increases the minimum distance the vehicle's position must change to be considered moving. In the case of 0, No Sensitivity (zero averaging), the data displayed will be raw data taken. No averaging has been applied to the data collected. Select the environment type that closely resembles the area that an interferer is being hunted. Sensitivity is only used for Single and Multiple emitter Modes. It does not apply to Spectrum Clearing Mode.

Along with the Sensitivity settings there is a Peak Detection Threshold setting. Before a location estimate is made, it is important to have enough useful data that an estimate is of value. The algorithm requires a peak in power to be detected, indicating that you have at least driven somewhere in the neighborhood of the interference source. If the threshold (power above background) for this peak is too low you will get false positives, meaning a location estimate based on multi-path or other environmental effect, rather than the true interferer location.

When seeking low power sources, it is sometimes necessary to lower the peak detect threshold in order to get a position estimate at all. Generally, it is best to start with the Peak Detect Threshold set to High, and only lower it if you feel certain you are in the right area, but still not seeing a location estimate.

Both the Sensitivity and Peak Detect Threshold affect calculations over the entire data set each time a new value is added. The raw power levels are kept in memory. Therefore, changing settings during a hunt is perfectly fine. The new value will be applied to the entire data set, and changes are reversible.

Search Grid Width: Changing this setting widens (or narrows) the search grid, the area in which an RF source searched. If the RF source is outside of this area, as indicated by a box drawn on screen, it will not be located by MIH. MIH only looks inside the search grid area for an interferer. This setting has the same effect on both estimation circle and heat map mode.

Log Data While Stopped: Normally, the Mobile InterferenceHunter will not collect data when you come to a stop, for example, when stopped at a street light, pulled over for a moment to change settings or to get a better view at the map. When selected, Log Data While Stopped allows you to continue collecting data when not moving. The minimum speed for data collection varies with the Sensitivity setting, ranging from 2 m/s to 10 m/s. The data collection interval significantly reduces below that speed.

Help Menu

The Help Menu button provides access to this Help file, the MIH Setup Wizard, Product Information and Map Sources, and the About Anritsu Mobile InterferenceHunter dialog. See Figure 3-9.

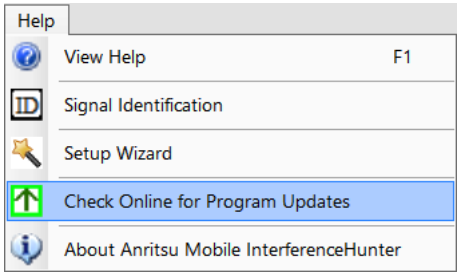


Figure 3-9. Help Menu

View Help (F1): Opens this Help file.

Signal Identification: Opens the Signal Identification window. This is a .jpg file viewer with a title index pane (left side) and navigation buttons on each side of the image. Sample signal measurement displays with descriptions are included as a reference to common signal types. Additional images can be added by the user via drag-and-drop onto the title pane. The software will use the Title metadata field and prompt for a user title. Image files are copied to the program installation folder, typically `C:\Program Files (x86)\Anritsu Company\Mobile InterferenceHunter\SignalID`.

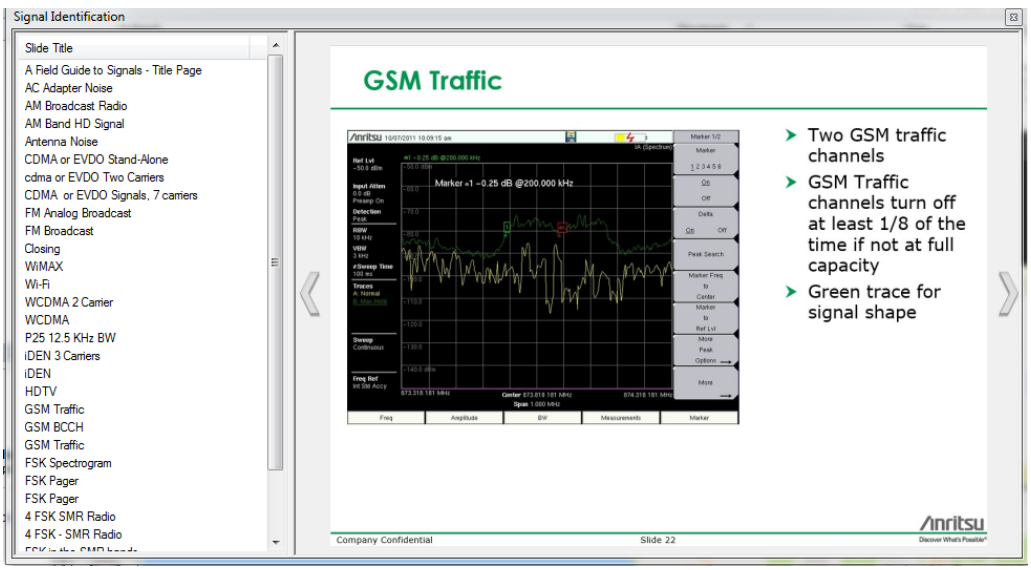


Figure 3-10. Signal Identification Window

Setup Wizard

A guided setup wizard with on-screen instructions for setting up Mobile InterferenceHunter that includes:

- Mode Setting
- Audio Settings
- View Preferences
- Performance Settings
- Connection Setup
- Instrument Setup

Mode Setting

The Mode Setting menu is shown in Figure 3-11.

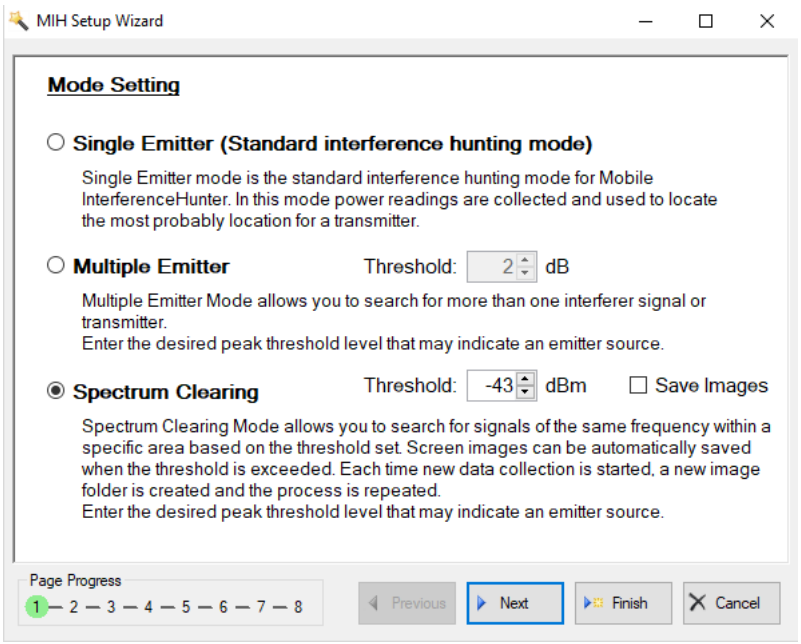


Figure 3-11. Mode Setting

To set the MIH Mode Setting:

- Click Single Emitter to set the standard interference hunting mode
- Click Multiple Emitter to search for multiple interferer signal. Enter the peak threshold level that may indicate a source.
- Spectrum Clearing to search for signals of the same frequency based on the threshold set. Enter the peak threshold level that may indicate a source.

Audio Settings

The MIH Audio Settings menu is shown in Figure 3-12.

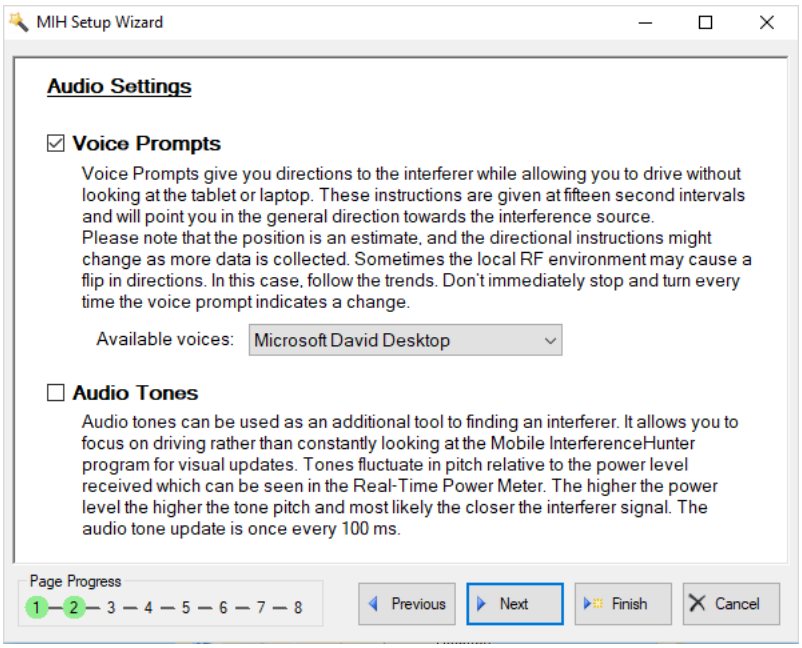


Figure 3-12. Audio Settings

To set the MIH Audio Setting:

- Click Voice Prompts to receive directions to the interferer while driving.
- Click Audio Tones to receive tones that fluctuate in pitch relative to the power level of the interferer signal strength.

View Preferences (page 1)

The MIH View Preferences (page 1) menu is shown in Figure 3-13.

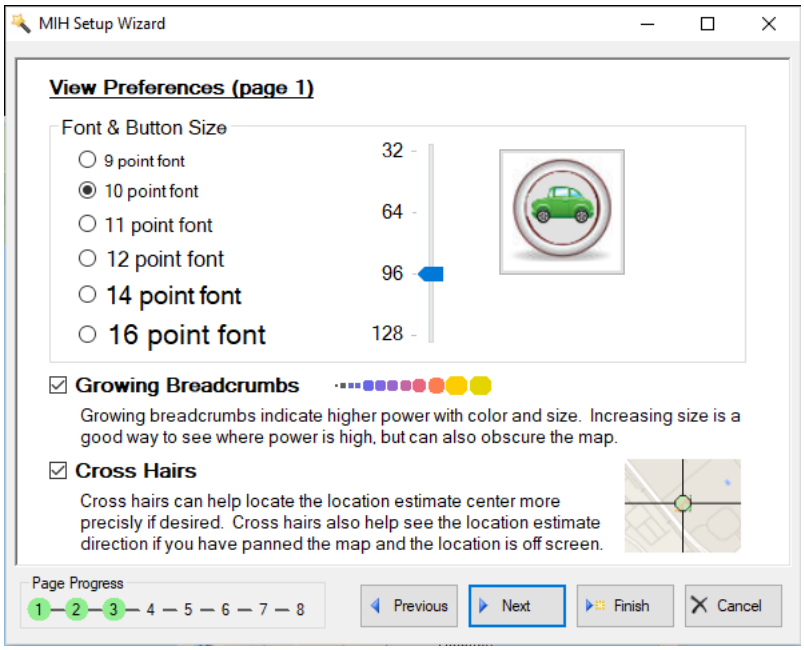


Figure 3-13. View Preferences (page 1)

To set the MIH View Preference Settings (page 1):

- Click Font and Button Size: to adjust the font size of the menu buttons and the sliding scale adjusts the size of the car on the map, Growing Breadcrumbs, and Cross Hairs.
- Click Growing Breadcrumbs: to indicate bread crumb size to indicate power levels.
- Click Cross Hairs to indicate more precisely of the location estimate.

View Preferences (page 2)

The MIH View Preferences (page 2) menu is shown in Figure 3-14.

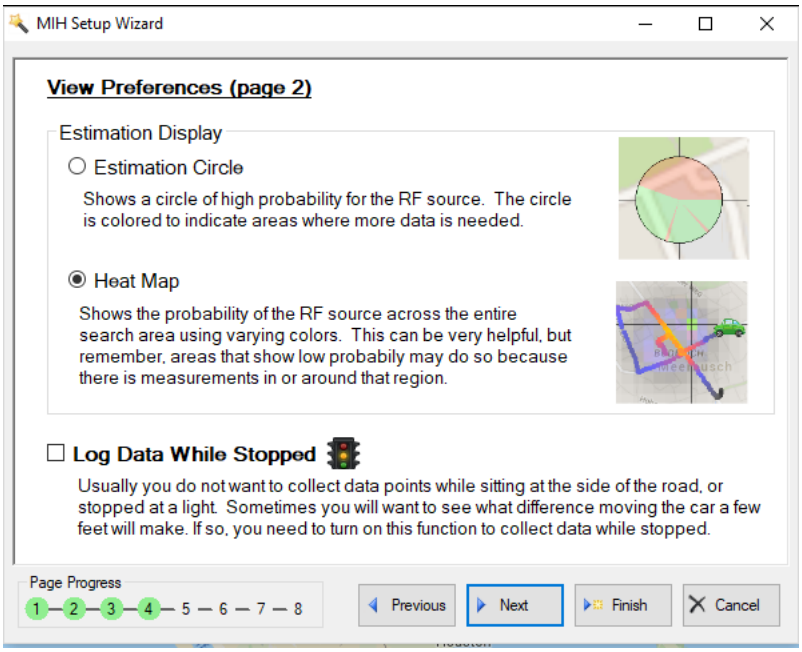


Figure 3-14. View Preferences (page 2)

To set preferences from View Preferences (page 2):

- Click Estimation Circle to show a circle of high probability for the RF source.
- Click Heat Map to show the probability of the RF source across the entire search area.
- Check the Log Data While Stopped to collect data while stopped.

Performance Settings (page 1)

The MIH View Performance Settings (page 1) menu is shown in Figure 3-15

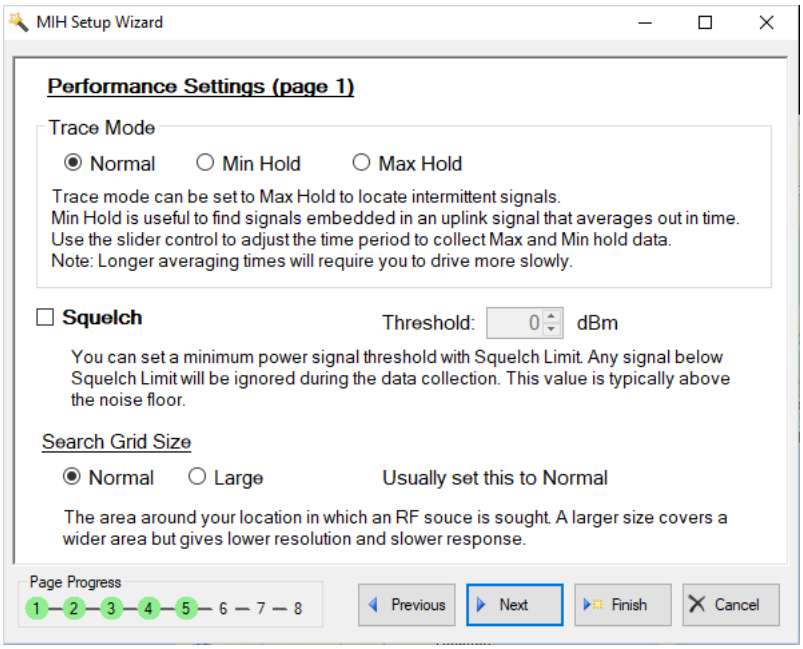


Figure 3-15. Performance Setting (page 1)

To set the MIH View Preference Settings (page 1):

- Click Trace Mode as Normal, Min Hold, or Max Hold
- Check Squelch to set a minimum power signal threshold.
- Click Search Grid Size as Normal of Large to search the area around your location in which an RF source is sought.

Performance Settings (page 2)

The MIH View Performance Settings (page 2) menu is shown in Figure 3-16.

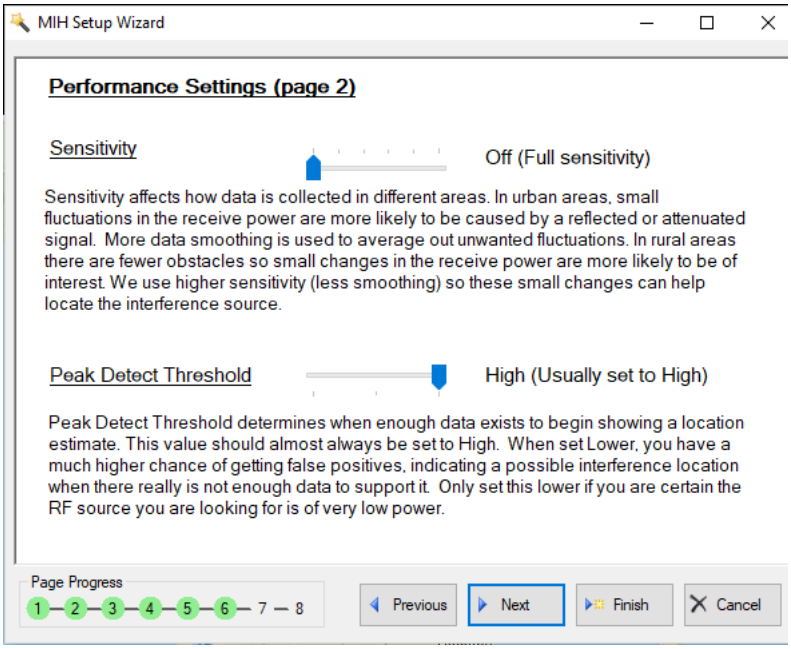


Figure 3-16. Performance Setting (page 2)

To set the Performance Setting (page 2):

- Slide the Sensitivity level scale is used to adjust how data is collected in different areas.
- Slide the Peak Detect Threshold scale to determine the amount of data collection is received to begin showing a location estimate.

Connection Setup

The MIH Connection Setup menu is shown in Figure 3-17.

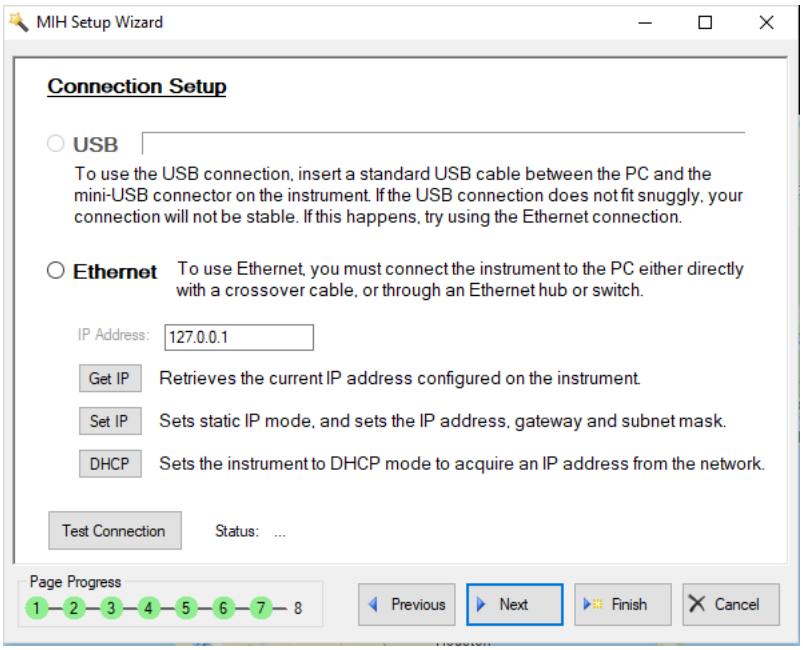


Figure 3-17. Connection Setup

To set the Connection Setup menu:

- Click USB to use a USB connection
- Click Ethernet to connect through an Ethernet connection. To use Ethernet, Get the IP, Set the IP and DHCP connectivity.
- Test Connection to check the status of the connectivity. The status field will indicate a Pass or Fail.

Instrument Setup

The MIH setup menu is shown in Figure 3-18/

Note	Connect the instrument to the computer in use before running the wizard.

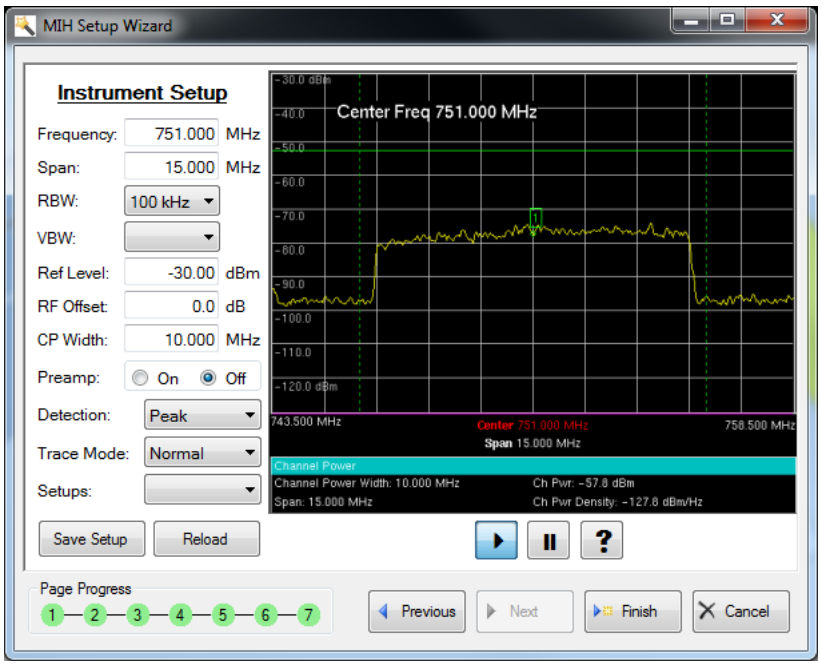
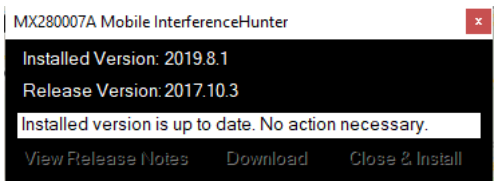


Figure 3-18. Setup Wizard Instrument Setup Window

The Instrument Setup step allows you to remotely set up and view handheld instruments. This feature does not apply to all Handheld products as most of the newer models provide their own interfaces.

Check Online for Program Updates

Displays the installed version details shown below.



About Anritsu Mobile InterferenceHunter: Opens the About dialog that displays the MIH version, copyright date, and license key information. The license key information includes an instrument's model and serial number, the license key, the version of the MIH software that the license key will work with, and the expiration of the license key. The Anritsu link at the bottom left corner of the dialog opens the Anritsu Web page. Show All Licenses will display expired and superseded licenses.

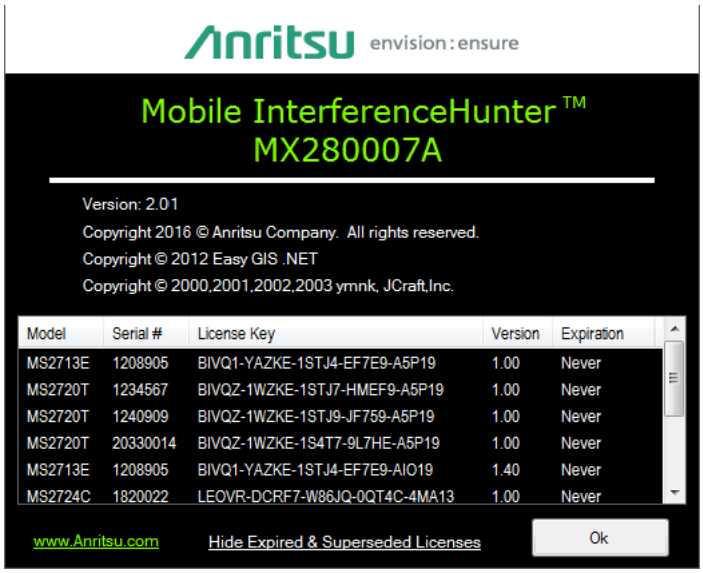


Figure 3-19. Help About Window

Note	License keys shown are examples only.

3-4 Signal Display Windows

There are four signal related display windows: Power vs. Time, Instrument Trace Display, Real-time Power Meter, and Power Scale.

Power vs. Time

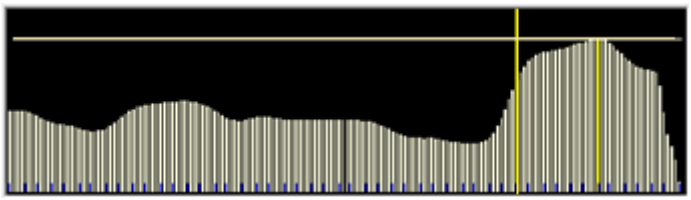


Figure 3-20. Power vs. Time Display

Run Mode: During run mode, Power vs. Time displays the power levels in sequential time order with the time sequence starting at the left and the latest reading on the right. The signal with the highest power level is highlighted in bright yellow. When the window is full, the signal bars will reduce in width so that the entire collected data is always visible. The horizontal cross hair is another visual indicator of the amplitude of the highest signal level. Data to the Power vs. Time display updates about 1 time per second.

Pause Mode : Place the MIH program in Pause Mode to review the data collected. Click on a signal bar and the vertical cross-hair will move to that position. On the map, the Green Car will move to the breadcrumb associated with that signal bar and the Power Level, Longitude, Latitude and Counter 1 information will be displayed. Place the cursor on the Power vs. Time display area and right-click the mouse. A pop-up menu is displayed to assist you in reviewing the collected data:

Peak Search: Places the vertical cross hair on the highest level signal bar and the Green Car on the breadcrumb on the map with the highest signal level.

Delete Selection: During data collection, large amounts of insignificant data could be collected filling the Power vs Time display with not useful signal bars. Delete Selection allows you to remove signal bars not useful in determining the location of an interferer.

1. Click on the left most signal bar of the group of signal bars to delete.
2. Drag the cursor to the right of the unwanted signal bars.
3. Right-click
4. Click Delete Selection on the pop-up menu. The highlighted section is deleted.

Trim to Selection: Keep a section of the signal bars collected. Click on the left most signal bar of the group of signal bars to keep. Drag the cursor to the right of the signal bars to keep, right-click then click Trim to Selection on the pop-up menu. The signal bars surrounding the highlighted section are deleted.

Delete All: Removes all of the signal bars from the Power vs. Time display and all data from the active data set. Right-click to open the pull down menu. Click Delete All.

Note	For both Run Mode and Pause Mode, light yellow signal bars and short black hash marks are displayed. The light yellow signal bars are a result of crowding. As more signal bars are added to the display, some will overlap creating a light yellow signal bar. The short black hash marks indicate the actual values used in calculating the position estimate.

Instrument Trace Display

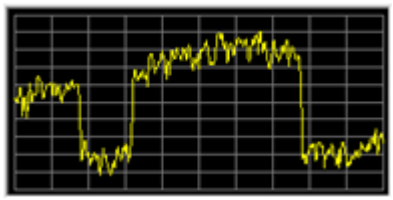


Figure 3-21. Instrument Trace Display

Click the Display Instrument Trace button in the Toolbar to toggle this window on and off. It is off by default and not visible unless you turn it on. The placement of the spectrum analyzer instrument may not be in a convenient location for viewing when interference hunting. The Instrument Trace Display allows you to view the signal within the Mobile InterferenceHunter window. This window will update approximately once per second.

To view a larger version of this trace, double click on the Instrument Trace Display and the trace on the instrument will display in the Drive Map Display window. Therefore, no mapping or mapping data collection occurs. This window will be updated approximately 4 times per second. Click on the Drive Map Display window once and the Drive Map will return and mapping data collection resumes. This feature slightly affects the frequency of updates of the Power vs. Time bar graph and audio tones if turned On.

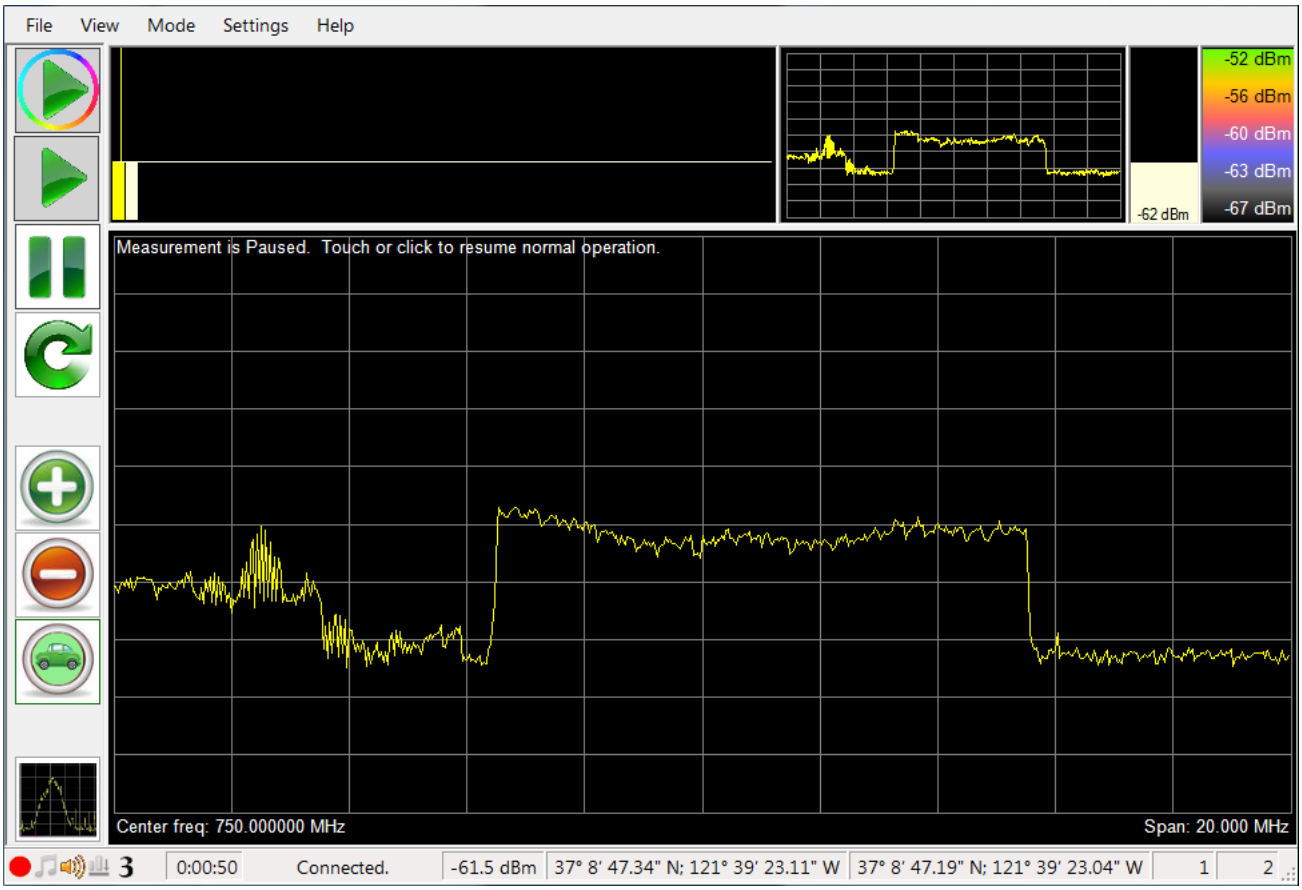


Figure 3-22. Instrument Display in the Main Window

Copy, Save Trace Display

Right-click the trace display to show dialog as shown in Figure 3-23.

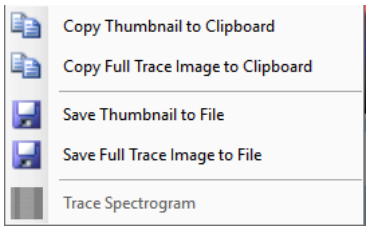


Figure 3-23. Trace Display Dialog

Copy Thumbnail to Clipboard: Copy the trace display as a thumbnail to the clipboard.

Copy Full Trace Image to Clipboard: Copy the full trace image to the clipboard.

Save Thumbnail to File: Save the thumbnail display to a file.

Save Full Trace Image to File: Save the full image to a file.

Trace Spectrogram: Open displays the trace view in a spectrogram window as shown in Figure 3-24.

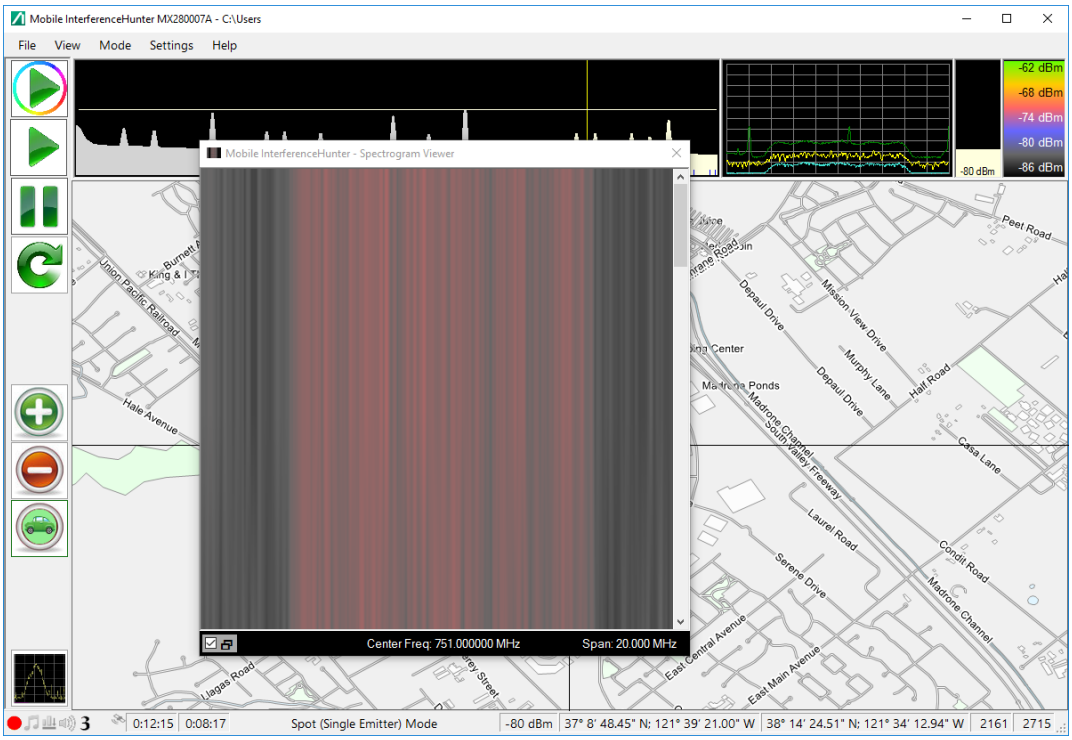
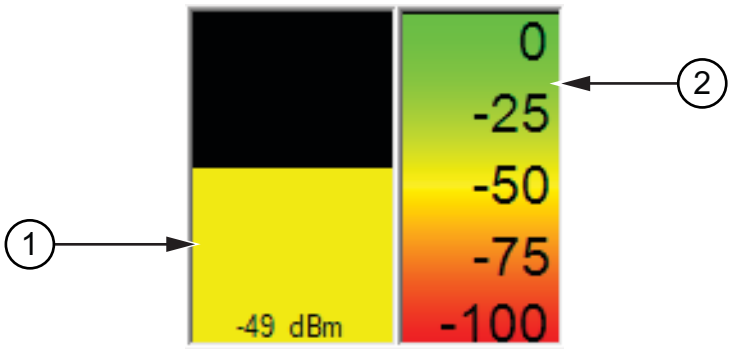


Figure 3-24. Trace Spectrogram

Color Power Meter and Power Scale

The color power scales provide a color readout with the power meter readout to indicate the approximate power level at a glance.



1. Real-Time Power Meter Color Scale Window
2. Power Level Color Scale Window

Figure 3-25. Power Meter and Power Color Scale

Color Power Meter Scale

This signal Real-time Power Meter updates are limited by the instruments sweep time and is available to see immediate power levels. Since the data collection rate is slower, this is useful to observe the actual received power level without waiting for the screen to update with a new point saved to the active data set. The current power level color correlates with the color power scale to the right. For example, if the power meter reading was –10 dBm, then the power meter color would show a green color scheme as this is the color scheme indicated by the color scale to the right. If the power meter measured –90 dBm, the power meter color would be red color scheme.

Color Power Level Scale

The power scale displays the current color coding for the active data set. This color coding is used in coloring the breadcrumbs on the screen. The color scale changes as you accumulate data. The scaling in this window also indicates the power scale used in both the real-time Power Meter and the Power vs. Time bar graph as well as the color for the breadcrumbs.

Right-click the colored power scale opens the menu shown in Figure 3-26.

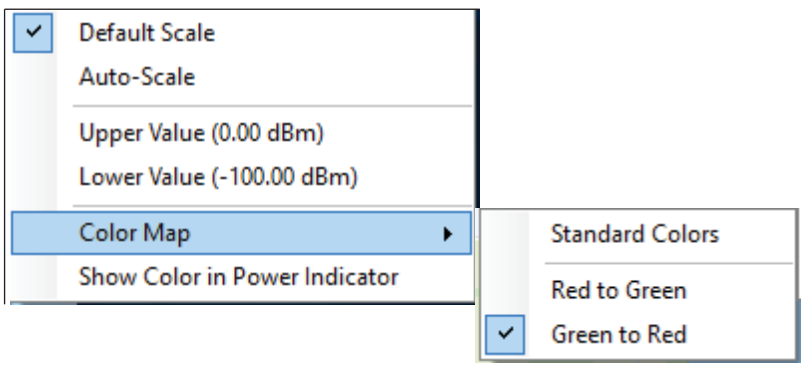


Figure 3-26. Power Level and Color Control

Default: Displays the default color scale as shown in Figure 3-25.

Auto-Scale: Auto adjust power levels to view the full spectrum of power levels in the channel power window.

Upper Value: Opens a dialog box to type in the upper power level of the color scale.

Lower Value: Opens a dialog box to type in the lower power level of the color scale.

Color Map: Click to change the power level color scheme as shown in Figure 3-27.

Show Color in Power Indicator: Displays power level color in the real-time power scale window.

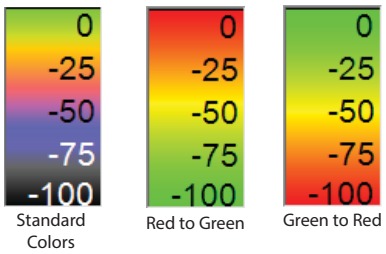


Figure 3-27. Power Level Color Control

3-5 Drive Map Display

The map pane may be a map provided by Google/Baidu maps or one that you have downloaded from OpenStreetMap. On the map are various icons and markers used to indicate your position and also help locate the interference source. The map icons and markers are only drawn when data collection is active.

The Map

- **Google/Baidu Maps:** Using Google/Baidu as the map source requires an Internet connection while you are driving. Click Run. The Google/Baidu maps will discover the vehicle's current location and display the map for that area.
- **Open Source Maps:** Downloaded maps from OpenStreetMap does not require an Internet connection when running Mobile InterferenceHunter. Depending on the coverage area or the number of locations that are tested for interfering sources, multiple maps may need to be downloaded onto the tablet or laptop. See Product Information and Map Sources in Help for more details on using maps from OpenStreetMap.
- **Image Maps (User Provided):** User created maps stored at the C:\[user documents folder]\Anritsu MapFiles location. These are retrieved and opened by selecting Settings > Map Source > Open Map Image File or Installed Map Image File.

The Green Car 

It represents your position on the map as you drive. When data collection is paused, click and move the yellow vertical marker in the Power vs. Time Bar Graph in the upper pane and reposition the car icon to a location of interest, for instance peak power locations. The data for the Real-time Power Meter, the Status Bar Power Level, Longitude and Latitude, and Power vs. Time Bar Graph counters will update with the car's geographical position.

Breadcrumbs

Dots or small circles placed on the screen following the movement of the Green Car. It is the data collected – GPS coordinates and received power at each location. The color of each dot will be set in reference to the color and power level of the Power Color Scale. To see the dots during drive test, set them to grow in size as the power level increases. Click on Settings in the Menu Bar and click on Growing Breadcrumbs.

Cross Hairs

The horizontal and vertical lines intersect at the estimated location of the interferer.

Green Arrows

Once you have collected several data points, an arrow will appear on screen. This arrow indicates a suggested direction of travel towards the interfering signal. The arrow will be in one of three states: Forward, Backward, or two sideways arrows. If the current trend is increasing power the arrow will point forward. If the trend is decreasing power or moving away from the interfering signal, the arrow will point backward. If the trend in the power if fairly level, then you are probably moving more or less perpendicular to the direction of the interferer. This arrow will point in both directions, right and left. This is an indication that the location algorithm needs data in a different direction in order to make a decent approximation of the interferer location. Once you have enough data for Mobile InterferenceHunter to make an approximation of the interferer location, the direction arrows will be removed and either an Estimation Circle or Heat Map will be drawn. The Green Arrows are only available in Spot Mode.

Heat Map

The Heat Map covers a larger area of displaying the level of intensity of the interferer signal by color. A matrix of rectangles creates the heat map and the colors signify the probability that the pattern of observed power measurements would be caused by an emitter in that grid cell – green represents the strongest signal and pale blue/gray represents the weakest signal. For Drive Map Display, click to view either the Estimation Circle or the Heat Map. The Estimation Circle is the default view.

Figure 3-28. Heat Map with Breadcrumbs

Estimation Circle

A colored Estimation Circle appears as more breadcrumbs with higher power levels are left on the map. When the position of the signal source becomes available, the Green Arrow is eliminated and replaced by the Circle. The Circle may be large at first but will reduce in size as more signal data is accumulated. This indicates that you are closer to the interfering signal source and that the power level of the interferer is increasing. Also, the default colors of the circle area, red and green, can be changed in the Color Mode setting. From the center of the circle looking out, the green areas of the circle depict how the breadcrumbs are dispersed for calculating the location of the interfering signal. If the Circle is heavily shaded red or one side of the Circle is a quarter to half shaded green then drive in the direction of the area shaded red to accumulate a more even distribution of breadcrumbs to calculate the location of the interferer. The Estimation Circle is not available in Multiple Emitter and Spectrum Clearing Modes. For Drive Map Display, click to view either the Estimation Circle or the Heat Map. The Estimation Circle is the default view.

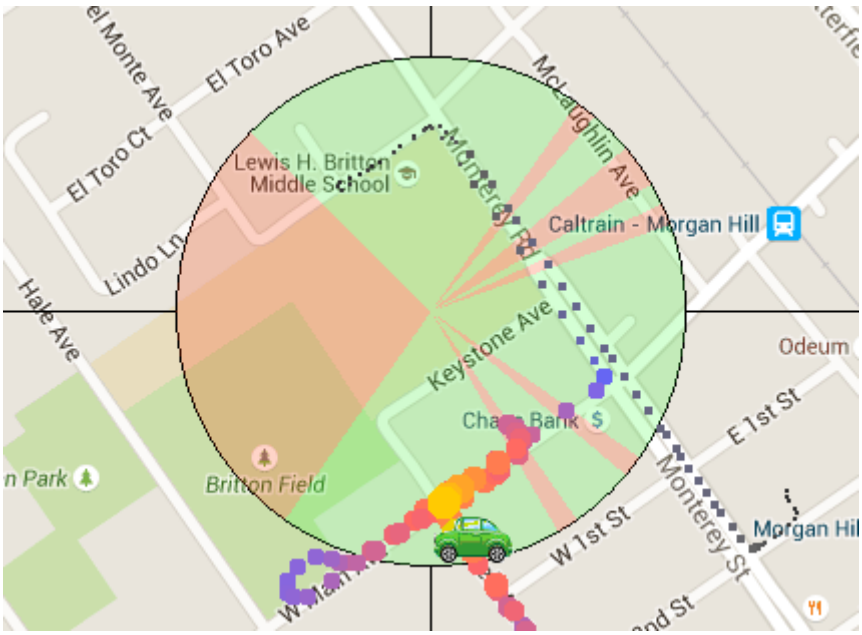
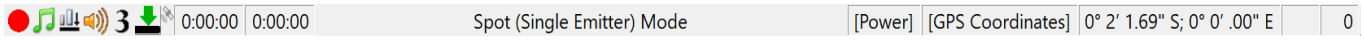


Figure 3-29. Estimation Circle with Breadcrumbs

3-6 Status Bar

At the bottom of the Mobile InterferenceHunter (MIH) window is the Status Bar which consists of status icons and information windows.



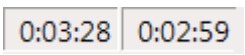
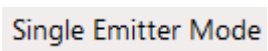
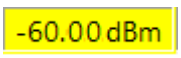
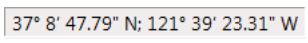
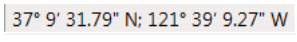
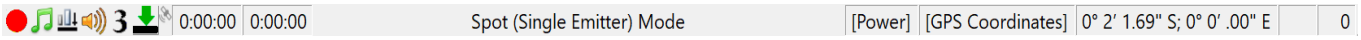
Icon	Description
	**Program Indicator:** **Red**: MIH program started but has not been operated. **Green**: MIH is currently running. **Yellow:** MIH is paused.
	**Audio Indicator:** By default these functions are off and the indicators will be gray. Music Note: Indicates Audio Tone is on. Speaker: Indicates that Voice Prompt is on. Adjust the volume by clicking on this icon then adjusting the slide bar to the desired volume level.
	**Squelch Limit:** This symbol is colored white and black when active.
	**Sensitivity:** Indicates the sensitivity level. Sensitivity is used for Single and Multiple emitter Modes. It does not apply to Spectrum Clearing Mode.
	**Min/Max Hold:** **Min Hold:** Indicates Min Hold is active. **Max Hold:** Indicates Max Hold is active.
	**GPS Satellite Indicator:** When an external USB GPS receiver is connected: **Gray:** Indicates GPS is not active or no satellite fix. **Light Red:** Indicates less than 3 satellites are fixed. **Yellow:** Indicates 3 satellites are fixed. **Green:** Indicates more than 3 satellites are fixed.
	**Timers:** Timer 1 (left): Counts the elapsed time since data collection started. It will continually run till the program is exited, although the display will only be updated while measurements are being collected. Timer 2 (right): Counts the actual data collection time. Click **Pause** to stop counting Click **Run** to restart.
	**Mode:** Displays the selected measurement mode - Single Emitter, Multiple Emitter, and Spectrum Clearing. The default selection is Single Emitter mode. Click the Data Collection Start button. The connection is made with the instrument, the display will change to Connected.
	**Power Level:** Displays the real-time power numerical value. If Squelch is on, the background color is green for levels above the Squelch Threshold, and yellow for levels below the Squelch Threshold.
	**GPS Coordinates (left):** Displays the longitude and latitude of the vehicle location.
	**Map Center Coordinates (right):** Displays the center of the map's longitude and latitude coordinate. As the map changes with the movement of the vehicle, the map center coordinate changes.

Figure 3-30. Status Bar



Icon	Description
	**Counters:** There are two counter displays that relate to the Power vs. Time window. The one on the left designates the power bar that the bright yellow vertical line is selecting and the vehicle position when in Pause mode. The display on the right indicates the total number of bars in the window.

Figure 3-30. Status Bar

Chapter 4 — Hunting Interference Signals

4-1 Introduction

This section details hunting interference signals with the MIH software.

Recalling Saved/Recent Settings

Load previously saved settings into the Mobile InterferenceHunter software using:

Recall Saved Settings

1. Click Recall Saved Settings in the File menu and the Open window displays.
2. Click the desired configuration file with the extension .mih.
3. Click Open. Configuration settings are loaded into the Mobile InterferenceHunter software.

Recent Settings

1. Click Recent Settings from the File menu.
2. Choose from a list of no more than 10 setting files saved to the laptop or tablet.

Selecting the Mode

Select the desired type of interference hunt that is going to take place. Switch modes during or after acquisition, for further analysis.

Scan Driving (Initial Perimeter Survey): Use this mode to search for an interferer in a general area. This mode works well with the View set to Heat Map. The dark lavender shaded area on the drive map indicates an approximate area where the interferer could be. Once an interferer's general location has been determined, refer to "Creating a Drive Route" on page 4-7 to hone in on the signal in this area.

Spot Driving (Standard Operation): Hunting for a single interfering signal.

Multiple Emitter: Hunting for multiple interferer transmitters such as cable TV leakage.

Spectrum Clearing: Hunting for multiple transmissions of the same frequency whose power exceeds the threshold set by the user. Screen images can be automatically saved when the threshold is exceeded.

Time Difference of Arrival (TDOA): Use TDOA to locate interference sources and other modulated broadcasters. TDOA is not a driving mode like the other modes mentioned above. For TDOA, you must have access to at least three remote spectrum monitor probes (MS2710xA). Refer to "Setting Up TDOA" on page 4-12 when using this mode.

Selecting the Map Source

Click a map from the map sources to use in the map display. For more on loading maps, see Chapter 2, "Loading Maps".

Google/Baidu Maps: The Google/Baidu map will identify the vehicle's current location and display the map for that area.

Open Source Maps: Open a folder where Open Source maps are saved. Click any .shp file and then Click Open to load the map. Depending on the coverage area or the number of locations that are tested for interfering sources, multiple maps may need to be downloaded onto the tablet or laptop. Click a map from a map source to use in the map display – Google/Baidu map or a map from any open source map. See Product Information and Map Services in the Help Menu.

Show current OSM Map: Displays the name of the Open Source Map in use.

Open Map Image Files (User provided): Opens a browse dialog to search anywhere on their PC for a JPG or PNG file.

Installed Map Image Files: Opens a sub-menu that lists all of the JPG and PNG files in the Anritsu MapFiles folder stored in C:\[user documents folder]\Anritsu MapFiles.

4-2 Creating, Importing, and Viewing Base Stations (Open Source Only)

A base station list file (.lst) is a plain text file with a header line and a line-by-line delimited list of base station details. These details must be in order and can be delimited with a comma, tab, or semicolon. The first line is a header for the user and is ignored when importing the list. Each of the remaining lines is for a single base station, where the first two numbers are the decimal latitude and longitude, respectively. Next is the base station name or other identifying information. The last number is an angle, measured clock-wise from North, and is optional. Base stations sometimes have an orientation and the angle is the direction an antenna points, or the center of the beam width. Many base stations have three sectors and this would be the angle from North of the center of the alpha sector. If you look closely at the icon on the map, there are three sectors shown and one of them has a black line through the middle – this should be in the direction indicated in the .lst file (see Figure 4-1).

Below is an example of three separate base station entries, the first of which is shown in the image below:

```
32.869333, -117.216278, DOYLE PARK PCS, 56
33.068856, -117.152606, ELFIN FOREST PCS, 44
33.037778, -117.239167, ENCINITAS RSF PCS, 52
```

To import a base station list, you must be using an open source map that covers the area of the base stations. Google/Baidu maps do not support viewing base stations.

1. Click Settings | Map Source | **Importing Base Stations (Open Source only)**.
2. Click the Import File button to find the directory and folder of the Base Stations list (.lst). When selected, the latitude, longitude and description of the site will be displayed in the list.
3. Click the Create Map Overlay to place the base station locations on to the current map.
4. Click View Base Stations on Map if Present to see if there are any base stations in the Drive Map display. Base station symbols will display on the map as shown below when this function is selected. Note that your map must cover the area of where the imported base stations are located.

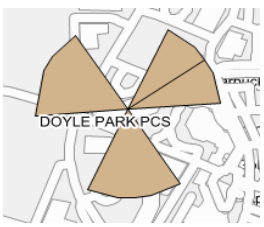


Figure 4-1. Base Station Symbol

4-3 Configuring Display Elements

This section covers how to configure many display elements to suit your particular situation and preferences.

Setting Signal Strength Indicators

There are two position-estimate indicators that cover the area where an interferer could be – Heat Map and Estimation Circle. Only one of these can be selected for viewing at one time. Click either Estimation Circle or Heat Map. The check-mark denotes the indicator selection.

Showing Cross Hairs

Adds a horizontal and a vertical line that cross at the estimated location of the interferer.

Setting the Button Size

Provides four button size selections, 32 x 32, 64 x 64, 96 x 96, and 128 x 128. The buttons will scale to fit the toolbar if the button size selected is larger than what can be accommodated by the toolbar size. Expanding the window size will grow the size of the buttons until they reach the maximum size selected.

Setting the Menu Font Size

Click a menu font size from the Menu Bar, the sub-menus, the Status Bar, and most dialogs. The font size selections are 9, 10, 11, 12, 14 and 16. The font size affects the amount of information displayed on Status Bar. As the font size increases, status parameters may be removed from view depending on the window size.

Growing Breadcrumbs

In its default setting, breadcrumbs' color changes but still may be difficult to see while driving. Click the breadcrumb size increases as the power increases. With Growing Breadcrumbs set, breadcrumb power levels are denoted not only in color but with size.

4-4 Setting up Audio and Voice

Audio tones and voice prompts assist the driver while operating the Mobile InterferenceHunter. For a detailed description of audio tones and voice prompts, see Section "Settings Menu" on page 3-9.

Setting Audio Tones

Click to activate. The music notes turn green in the Status Bar.

Setting Voice Prompts

Click to activate. The speaker turns yellow in the Status Bar.

Selecting the Voice

1. Place the cursor on Voice Selection to display the list of voices.
2. Click the desired voice.

4-5 Setting Min/Max Hold

For a detailed description of setting Min/Max Hold, see Section "Settings Menu" on page 3-9.

Click to activate. The symbol associated with the desired "hold" will be displayed in the Status bar.

Note	Using this feature lengthens the data collection time. You will need to reduce your driving speed.

4-6 Setting the Squelch Limit

For a detailed description of the Squelch Limit function, see Squelch Limit in Section "Settings Menu" on page 3-9.

1. Click the Squelch Limit dialog window.
2. Enter the desired peak threshold level or move the slider to a level that may indicate an emitter source.
3. Click ON.
   - The Squelch Limit icon is highlighted in black and white. Turn off this feature at any time during the interference hunt.

4-7 Setting the Sensitivity

For a detailed description of the Sensitivity function, see Sensitivity in Section "Settings Menu" on page 3-9.

1. Click Settings.
2. Click Sensitivity.
3. Click on the selection that closely resembles the area you are hunting for an interferer or "0" to display only raw data taken.
4. Click Peak Detect Threshold.
5. Click High. If you are certain you are in the right area of the interferer but not seeing a location estimate, select Medium or Low.

4-8 Logging Data While Stopped

Normally, the Mobile InterferenceHunter will not collect data when you come to a stop. Selecting Log Data While Stopped allows you to continue collecting data when stopped. The minimum data collection rate varies with sensitivity, ranging from 2 m/s to 10 m/s. The data collection interval significantly reduces below that rate.

4-9 Searching Grid Width

For a detailed description of the Search Grid Width function, see Sensitivity in Section "Settings Menu" on page 3-9. Click to set grid width to 4, 8, 16, or 32 Kilometers.

4-10 Displaying the Instrument Trace

The placement of the spectrum analyzer may not be in a convenient location for viewing when drive testing. The Display Instrument Trace button allows you to view the signal within the MIH window. This window will be updated approximately once per second.

4-11 Setting Up the Spectrum Analyzer

Interference hunting will take place in the Channel Power measurement mode of spectrum analyzer measurements. The following are basic instructions to set up this mode. For detailed instructions to configure your instrument, review the user guide specific to your instrument.

Setting Up the Channel Power Measurement Mode

1. Power on your instrument.
2. Click the Spectrum Analyzer Measurement mode.
3. Ensure the GPS is On if using the instrument GPS option.
4. Click Channel Power Measurement (does not apply to MS2710xA instruments).
5. Enter the frequency of the suspected interferer as the Center Frequency.
6. Set both the Channel Power Width and Span. It's best if you set the channel width to be as narrow as possible while still covering the signal of interest. (The MS2710xA instruments only use the Span).
7. Set the amplitude reference level to –40 dBm and turn on the preamp or IF gain if needed to see the signal. The Reference Level must be –40 dBm or below in order to turn on the preamp or IF gain. Bursty signals such as Wi-Fi or DECT signals may be easier to find if you set the spectrum analyzer to Burst Detect mode, if available.

If the network connection is not yet established, refer to "Configuring the Computer to Instrument Connections" on page 1-3. The instrument is ready for interference hunting.

4-12 Installing the System into a Vehicle

Setting up the hardware in your vehicle for hunting:

1. Secure the spectrum analyzer in the passenger seat.
2. Connect the antennas.
3. Place the RF magnet mount omni-directional antenna on the vehicle rooftop and run cables to the interior. If the RF antenna does not also contain a GPS antenna, mount the GPS antenna on the roof.
4. Connect the antennas to the spectrum analyzer.
5. Connect the instrument's power cable to vehicle power (cigarette lighter adapter).
6. Set up the computer car mount (if used) according to the manufacturer's instructions.
7. Make all connections between the instrument and computer as described in "Configuring the Computer to Instrument Connections" on page 1-3.
8. Verify that all equipment is secure in the vehicle and provides convenient visibility and access while driving. Also verify that no cables are under stress and that proper strain relief is used.

Danger	Use a passenger to help with operating the equipment while driving on the hunt. Do not attempt to change the settings or otherwise operate the equipment while operating the vehicle. It is safe to pull to the side of the road before changing any settings or operating the equipment or computer. Follow all local regulations and always operate your vehicle in the safest manner possible.

4-13 Creating a Drive Route

A drive route should be created to not directly pinpoint the direction of the interferer, but to create a drive perimeter that will allow you to collect many data points that will closely direct you to the interferer. A drive route is typically created directly in Google Maps.

Note	It is better to create a drive route at the office than out in the field.

1. Click Google Maps under Map Source in the Settings menu.
2. Click Create a Drive Route in the File menu.

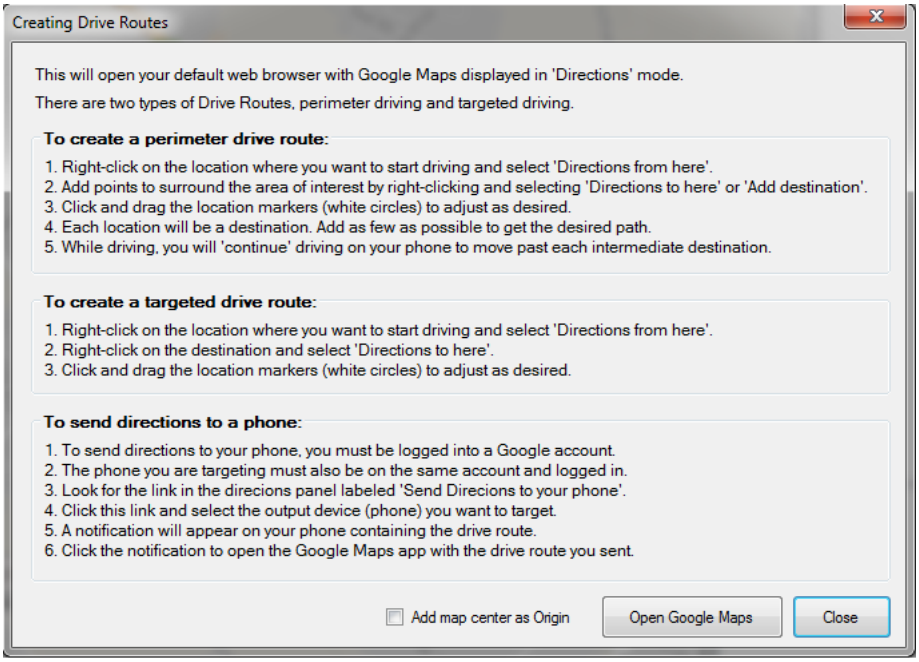


Figure 4-2. MIH-Navigation Window with Driving Points and Instructions Example

3. Click Open in Google Maps and follow the on-screen instructions for using Google Maps and sending the route to your personal navigation device.

Note	Confirm that the Google Maps account used on the computer and your phone used for audible instructions are signed into the same Google Maps account.

Once the field tech has received the drive route on his phone, he can use the audio commands to direct him through the route perimeter around the interferer.

4-14 Finding the Interferer

Mobile InterferenceHunter is not designed to provide directions to the precise location of an interferer source. MIH will get you very close to the exact building or source. In the final stage of the driving portion of the hunt, watch the power bars and try to park your car as close to the maximum bar readout as possible. The source of interference will be very near.

Preparing for the Drive

Below is a quick rundown of the steps needed to get set up for a hunt.

1. Place the mag-mount antenna on top of the vehicle.
2. Connect it to an Anritsu spectrum analyzer.
3. Power on the instrument.
4. Set the instrument measurement to Channel Power (review your instrument user documentation for details on setting up this measurement mode for your model).
5. Locate the interferer signal on the instrument.
6. Connect the computer and Anritsu Spectrum Analyzer via Ethernet or Wi-Fi.
7. Run the MIH program.
8. Set up the MIH software for interference hunting, starting with Scan Driving mode to isolate the general interferer signal.
9. Switch to Spot mode to pinpoint its location.

Searching the Source of Interference

Anritsu strongly suggests that a passenger be available to accompany the driver to assist with the navigational instruction. Use the Voice Prompts and/or Audio Tones to minimizing glances at the display.

Start MIH in Scan Drive mode at a location where you know an interference problem occurs, such as a base station that is having interference problems. Obtain the interferer signal from your starting location, drive in the direction of the signal. In the Power vs. Time display, observe the increase or decrease in signal level. If the signal level decreases over time, most likely you are driving away from the signal source. If the signal level increases over time, you are probably heading in the direction of the signal source.

Use the breadcrumb color and size to indicate the relative location of the emitter as well as the heat map color shading. A large yellow breadcrumb generally means higher signal power suggesting you are closer to the source. A small dark breadcrumb means low signal power and that you are probably far from or driving away from the signal source. Darker shaded areas of the heat map indicate stronger signals.

The example below is from Scan Drive mode showing that you are driving toward the signal. Note that MIH will only scan out to the Search Boundary, the size of which is set via Settings | Search Grid Width.

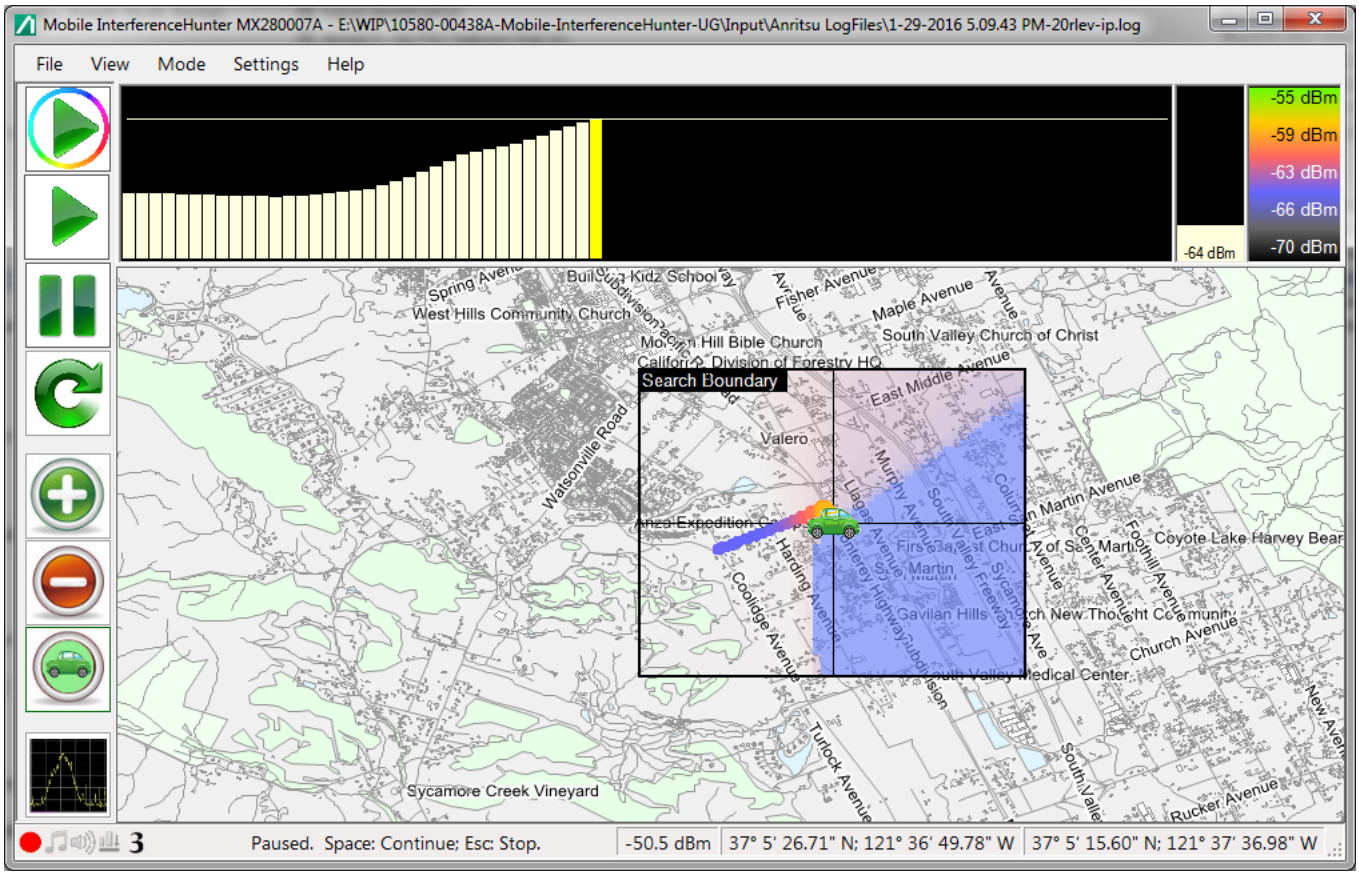


Figure 4-3. Approaching the Interferer

The example below is showing that you have driven past the signal and have isolated a general area of where the interferer could be, shown by the darker shaded region. The next step is to circle around the shaded area to continue narrowing it down into a smaller circle before switching to Spot mode.

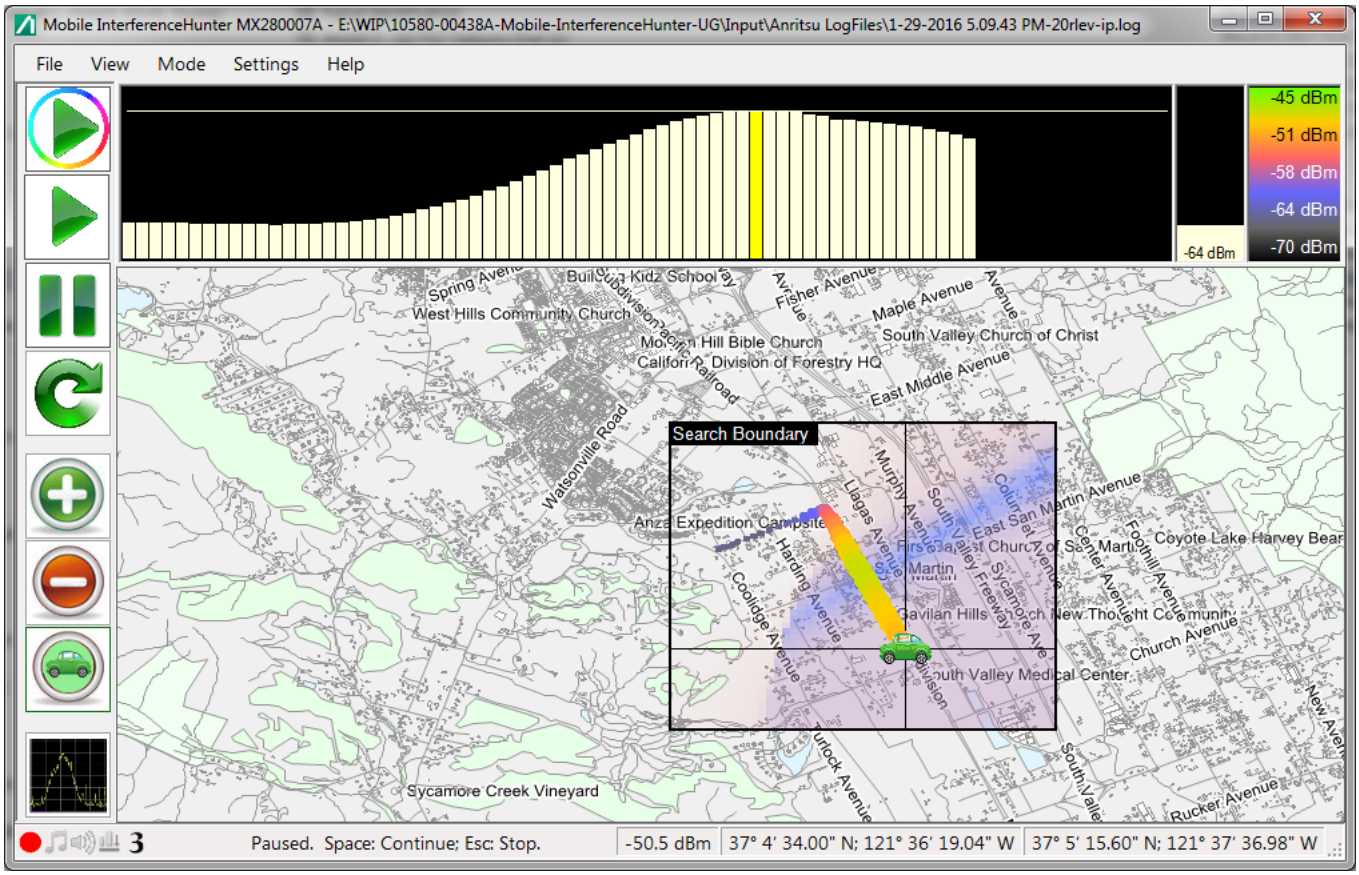


Figure 4-4. Isolating the Interferer

Once you have isolated the general area, switch to Spot mode to further isolate the signal and start collecting signal data.

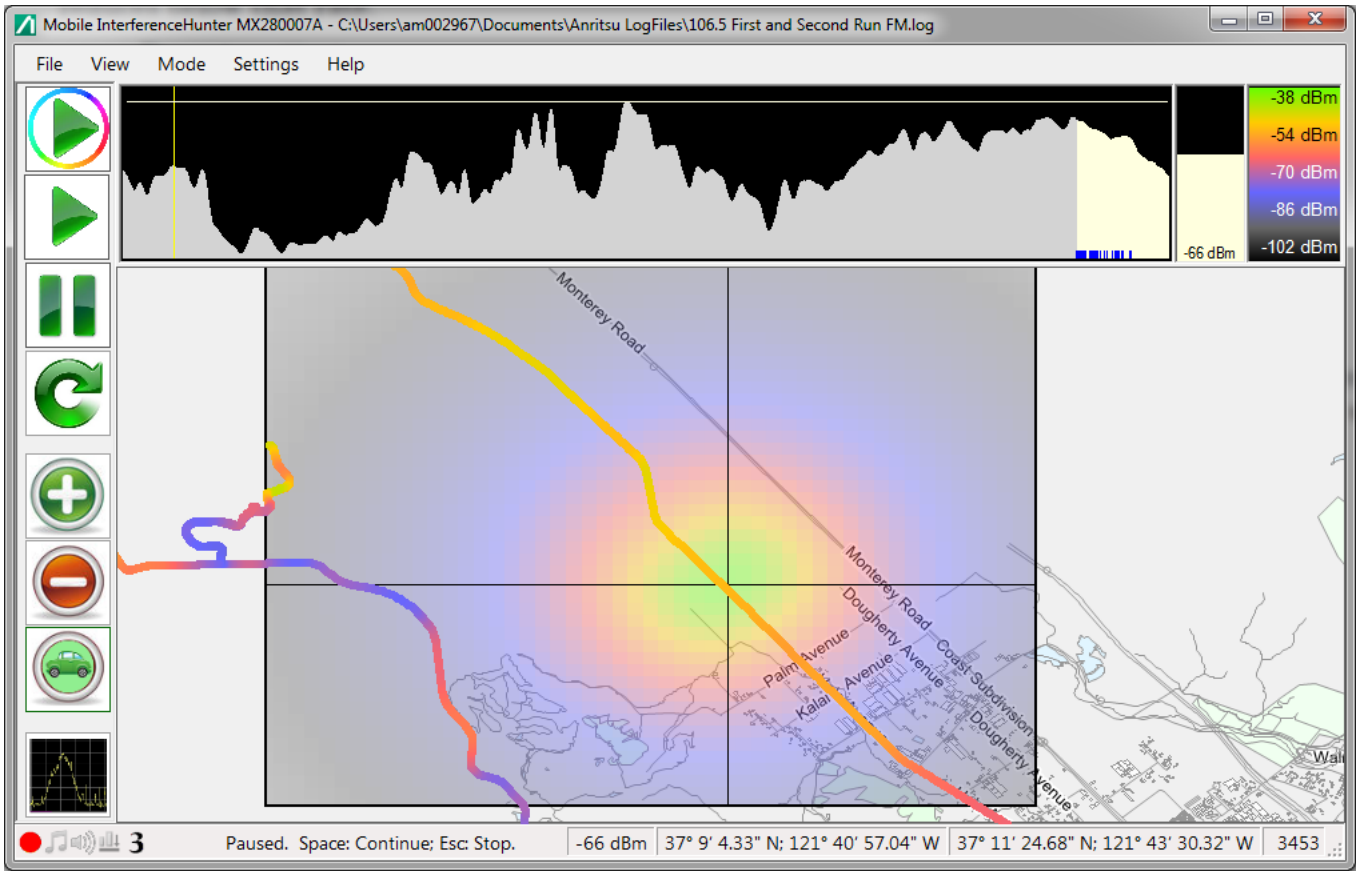


Figure 4-5. Pinpointing the Interferer

As more data is collected, a green arrow will show on the map pointing you in the general direction of the signal source. A shadow circle replaces the arrow and will appear on the map as additional data is accumulated. The shadow circle is the general area where the signal is coming from. Its initial size may be large but will decrease in size as you get closer to the signal source and the power level of the interferer increases.

At times you may want to park and evaluate the data received. Once a very close approximation on location has been established, get out of the vehicle and proceed on foot with a handheld instrument and directional antenna to find the exact emitter location.

4-15 Setting Up TDOA

TDOA is not a mobile hunting mode, but can be used to compliment a mobile interference hunt. TDOA uses the Time Difference of Arrival technology introduced with the Anritsu Vision software, which can now be used with MIH to help you locate a general area of where an interfering signal may be found. This gives you a good idea of where to start Creating a Drive Route before using the mobile modes with a spectrum analyzer in the vehicle. This is easily accomplished in the office before you leave, or while out in the field and connected to a remote spectrum monitor system.

Remote Monitoring Probes positioned in a triangular pattern perform TDOA to identify a stationary signal's longitude and Latitude coordinates. Use either Google Maps™, or a bit map to identify and geo-locate the interferer's signal source.

To use TDOA to locate interference sources, the following considerations need to be made:

- Three probes (Anritsu MS2710xA series remote spectrum monitors) are required to do the TDOA triangulation of the RF source. Best results will be achieved if the interferer source is contained inside a virtual triangle made by connecting the remote spectrum monitor locations. TDOA works for sources outside of this triangle too and it may be used to locate a source that is many kilometers outside the triangle, but it is more accurate for sources that are close by.
- An Internet connection for the computer is required for MIH to connect to the remote probes. If this is not already built into the computer, a USB mobile broadband adapter or Wi-Fi adapter to a local hotspot from your cellular provider can be used.
- The source must be modulated. TDOA looks for features in the RF spectrum as measured at three locations. Those features are time-aligned, and the difference in the time for the signals to reach each receiver is used to calculate the location. If the signal of interest does not have features that can be aligned in time, then TDOA will produce meaningless results. Typically, that means the signal must be modulated.
- A clean IQ produces much more accurate results. The better you can set up the spectrum monitor to capture IQ data, the more accurate the position estimate will be. This means more time may be needed to set up each remote monitor and to adjust the frequency, span, reference level, and preamp settings to get the best possible IQ capture. Strong signals that are close by will be relatively better, but weaker signals, and especially distant signals, take some care to get meaningful results. This implies that you should either have a dedicated MIH operator in the vehicle, or be parked so you can devote your attention to setting up the measurement.
- Distance matters because of the uncertainty in any measurement made. You are looking for the intersection of three lines and for where those lines intersect at nearly right angles, then any uncertainty in the line positions produces a similar uncertainty in the intersection. However, if the lines approach each other at very shallow angles, then the lines may be within the distance of uncertainty for several kilometers. Distant sources outside of the triangle of the remote monitors will almost always produce lines that have very small incident angles, and that can greatly multiply the uncertainty in position.

4-16 Flux Density

The MS2090A Field Master Pro spectrum analyzer must be used when measuring flux density. MIH measures and displays the flux density of the power/m^2/ MHz (dBm/m^2/MHz) or (dBW/m^2/MHz).

Connect to Measure Flux Density

To measure flux density, you must connect to the MS2090A. From the Settings menu, click Spectrum Analyzer Connection as shown in Figure 4-6.

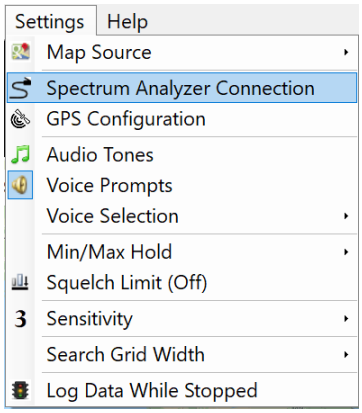


Figure 4-6. Connect to Measurement Source

The MIH Connection Setup dialog appears as shown in Figure 4-7.

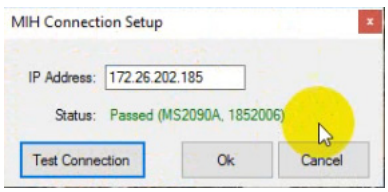


Figure 4-7. MIH Connection Setup Dialog

Testing the connection must be complete before the MIH identifies and uses the MS2090A spectrum analyzer.

1. Type the IP address of the MS2090A.
2. Click Test Connection.

The connection status will indicate Passed of Failed. If the Test Connection indicates Failed, troubleshoot the failed connection and retry. The flux density measurement options will only be available with the MS2090A when connection is complete and Passes.

Setting up the MS2090A for Flux Density Measurements

The flux density application may be used with calibrated antennas. Using the MS2090A, field strength mode can be used to choose an antenna with calibration factors. A listing on Anritsu antennas with calibration factors is available in the MS2090A. Additional antennas may be added. See the MS2090A User Guide for additional information.

Once connected to the MS2090A, Power Detection Mode will be available in the Settings menu. Click Power Detection Mode to display the measurement submenus shown in Figure 4-8.

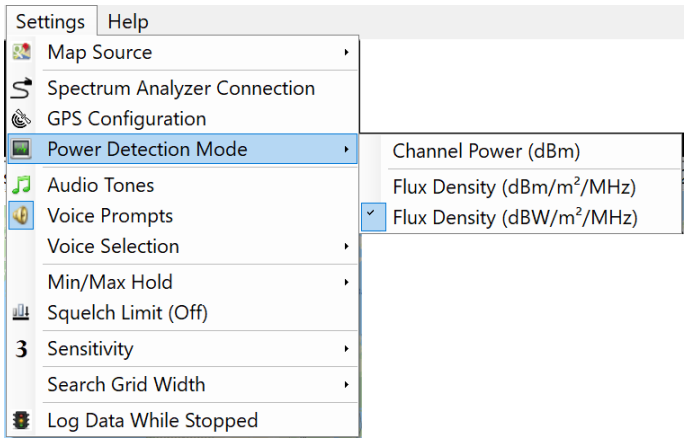


Figure 4-8. Power Detection Mode

Channel Power (dBm): This is the normal MIH measurement mode.

Flux Density (dBm/m^2/MHz): Provides flux density in the dBm per meter^2 per MHz.

Flux Density (dBW/m^2/MHz): Provides flux density in dBW per meter^2 per MHz..

Clicking one of the flux density measurement submenus noted above displays an information text line above the map window as shown in Figure 4-9.

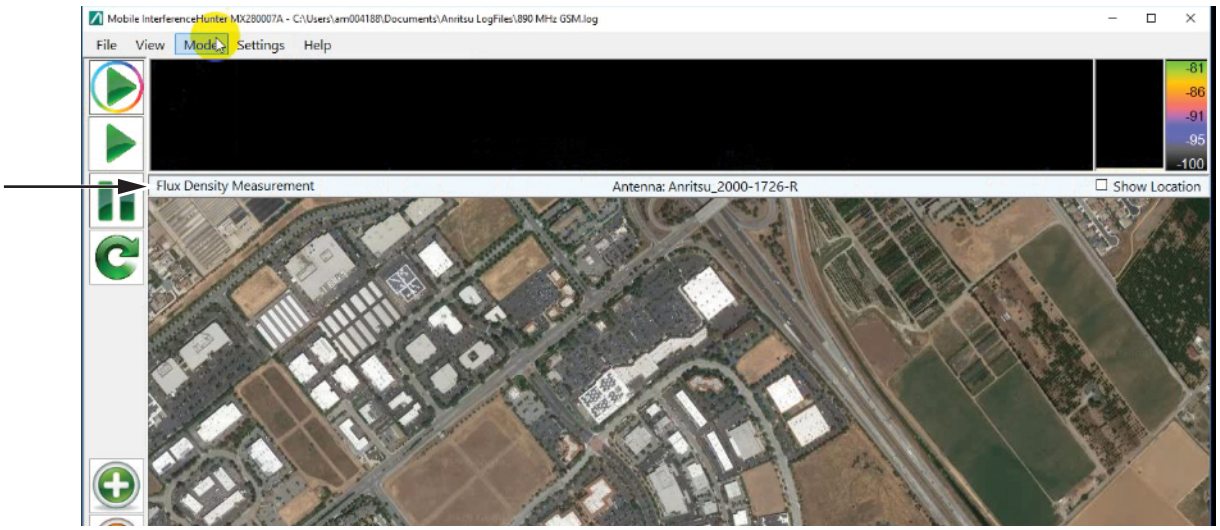


Figure 4-9. Flux Density Measurement Active

The information text line shows the Flux Density Measurement is active and the Anritsu Antenna part number being used. Check the Show Location checkbox to show an estimation location grid as shown in Figure 4-10. This feature is available when Mode is set to "**Spot Driving: Single Emitter (Standard Operation)**". The spot driving function is chosen by clicking on the green triangle in the left-hand column of the interface depicted in Figure 4-10 on page 4-15. The Spot Driving move is the 2nd green triangle from the top.

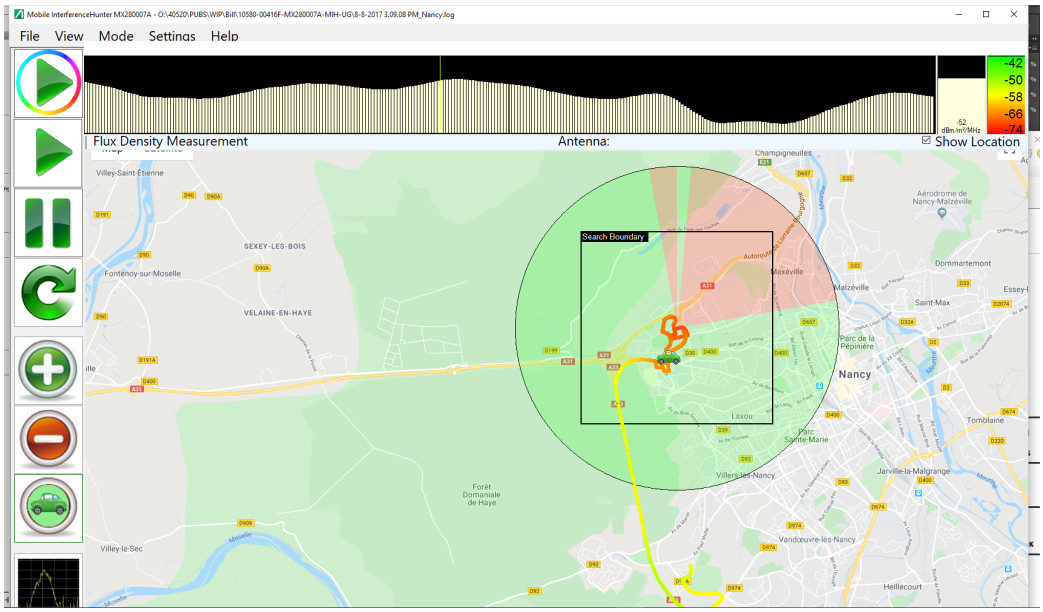


Figure 4-10. Show Location

Collecting Flux Density Data

From the Tool Bar, click "**Start data collection**". As a default, the Channel Power measurement begins. The field strength measurement begins when the flux density measurement type is selected from the Power Detection Mode menu. The real time measurement results are displayed in the power meter/flux density window and status bar shown in Figure 4-11. The data collected can be saved as a (.log) file and then exported as a (.kml) file as described in Section "**Export Drive Log to KML" on page 3-3**.

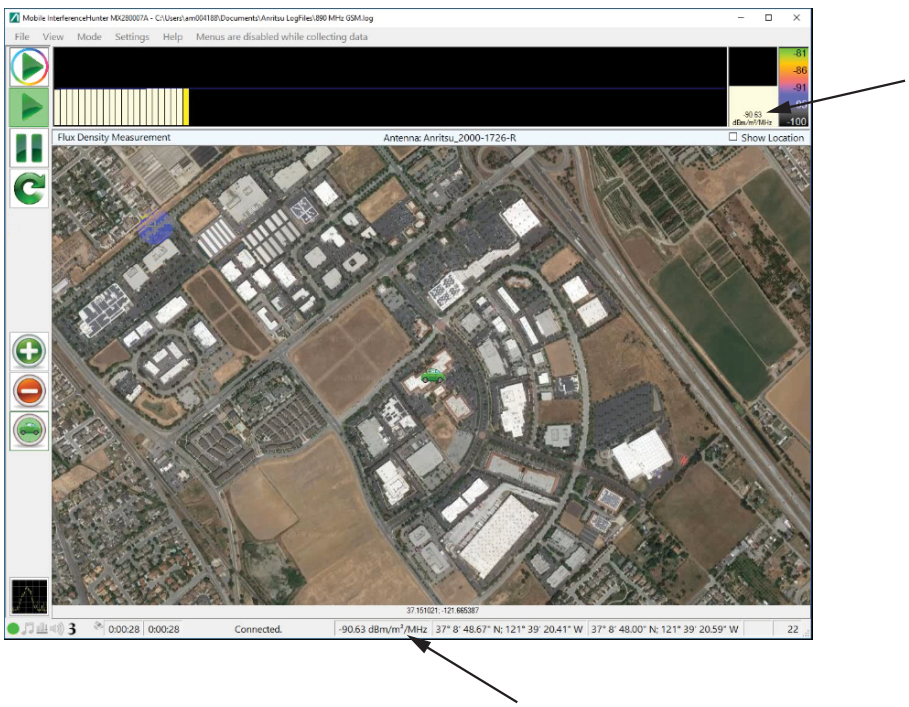


Figure 4-11. Channel Power and Flux Density

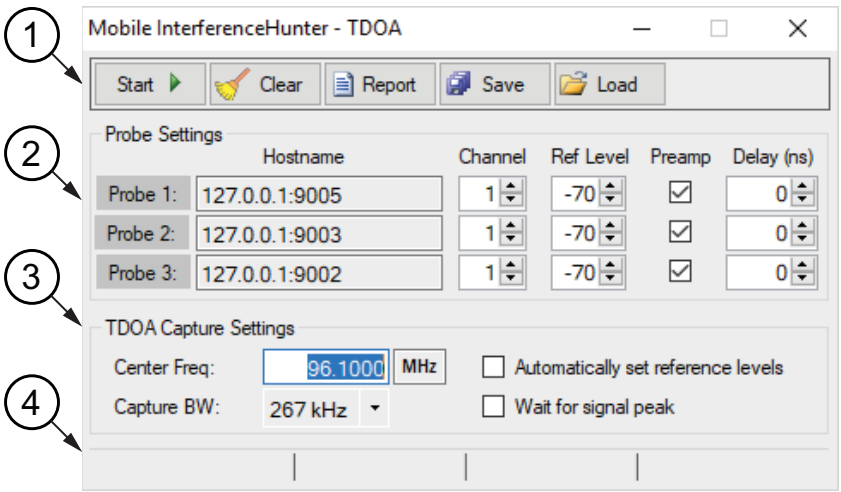
4-17 Using TDOA

For clarification of the TDOA functionality, we use the Vision Simulator program to develop the single screen interface as shown in Figure 4-12. Although the simulator does not understand and respond to all Probe SCPI commands, it does respond to the complete sub-set of commands that Vision uses.

Typically, a map is loaded from an existing user file. The TDOA Graphical User Interface provides the approximate location of the simulated probes along with a series of locations that are used to simulate RF sources. These RF source locations can represent:

- Interference sources when working with Power of Arrival (PoA) or Time Difference of Arrival (TDOA).
- A series of locations when tracking a moving RF emitter.

Note	The Vision Simulator Program and the simulated RSMs do not have regional settings; therefore, the numbers are displayed in US-English notation.



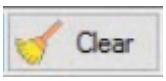
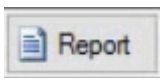
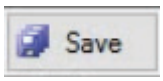
1. Toolbar	3. TDOA Capture Settings
2. Probe Settings	4. Status Bar

Figure 4-12. TDOA Graphical User Interface

TDOA Toolbar

The TDOA's menu toolbar descriptions are listed in Table 4-1.

Table 4-1. TDOA ToolBar

Icon	Description
Mobile InterferenceHunter - TDOA	**Mobile InterferenceHunter - TDOA:** This program icon is located at the top-left corner of the Source Locator GUI screen. Click provides GUI display screen-view sizing and positioning choices. • **Restore:** Resets the screen display to the default view. This selection is active only after Maximize has been selected and the GUI screen is in a full screen mode. Restore is normally grayed and becomes available after Maximize is active. • **Move:** Move the display screen. • **Size:** Click a corner of the display and resize the display by dragging the corner. • **Minimize:** Minimizes the screen to the bottom tray. Click it from the tray to view the screen display. • **Maximize:** Maximize the screen to full size. • **Close:** Closes the screen display.
	**Start:** Starts the TDOA tracking.
	**Clear:** Removes all measurement and map tracking results.
	**Report:** Generates a TDOA report that includes the probe information, search parameters and the current displayed map results.
	**Save:** Opens a dialog box to enter the name of a file to save everything shown as a configuration file (*.cfg). Save does not save the results that appear in the Mobile Tracker Index-Latitude-Longitude box. Can also save the most recent IQ captures data as Binary IQ Data (*.IQ).
	**Load:** Search and load a saved configuration file.

Probe Settings

The Probe Settings section provides text boxes to type or enter the probe setting parameters. Probe 1, Probe 2, and Probe 3 identify the communication setting parameters for each probe as shown in Figure 4-13.

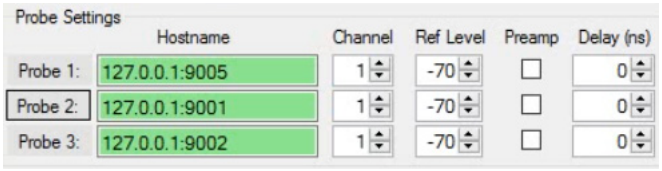


Figure 4-13. Probe Settings

The Probe Settings section is described in Table 4-2.

Table 4-2. Probe Settings and Control Buttons

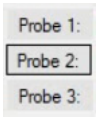
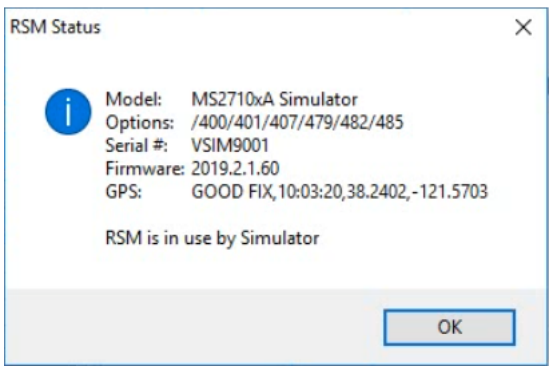
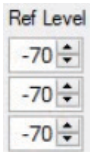
Icon	Description
	**Probe 1,2,3:** Identifies each RSM Probe. Each Probe label is a button. Click each probe label to display its RMS Status dialog as shown below. The RSM Status dialog provides details of each probe as shown: • **Model:** The model of the RSM. • **Options:** The RSM options installed. • **Serial #:** The serial number of the RSM. • **Firmware:** The firmware installed. • **GPS:** Indicates the GPS as GOOD FIX (Strong GPS signal connected). NO FIX (GPS signal is too weak or none found). The RSM coordinates are displayed. • **RSM in use**: Flag indicating the RSM is in use and also displays the end-user. In this case the end user is the Simulator. If the RSM is not in use, the flag will indicate – RSM is available for use. 
	**Hostname:** Type in the Host name settings. The URL Hostname is the communication link to the Remote Spectrum Monitors.

Table 4-2. Probe Settings and Control Buttons

Icon	Description
	**Channel:** Type or select the probe channel.
	**Ref Level:** Type or select the RSM probe Reference Level.
	**Preamp:** Click the Preamp check box to activate the Preamp for each probe.
	**Delay (ns):** Type or select a delay time. The delay time selections are in nano seconds.

TDOA Capture Settings

Enter the TDOA Capture Settings section as shown below in Figure 4-14.

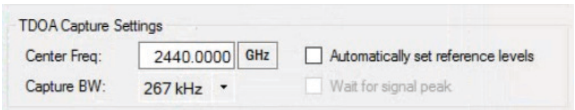
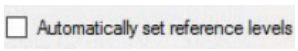


Figure 4-14. TDOA Capture Settings

The TDOA Capture Settings section is described in Table 4-3.

Table 4-3. Capture Settings

Icon	Description
	**Center Freq:** Type the center frequency and then select the frequency terminator.
	**Capture BW:** Click to open the Capture BW frequency list and select the frequency.
	**Automatically set reference level:** Click the check box to set reference levels automatically.
	**Wait for signal peak:** Click to enter a check-mark to set – Wait for signal peak.

Status Bar

The Status Bar provides the probe sweep details.

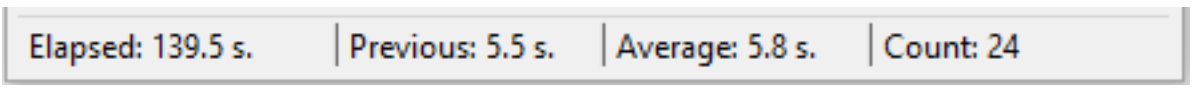


Figure 4-15. TDOA Capture Settings

Elapsed Time: The total time taken for the set of measurements in the current result.

Previous Time to Measurement: The time the most recent measurement took. If this number gets very large, one of the RSMs might be off-line.

Average Time: The average time for each IQ capture and position calculation.

Count: Due to the uncertainty in each position estimate, several sequential measurements and average the results are performed. This is the number of measurements in the current result.

4-18 File Management

Opening a Log File

Click Open Log File in the File menu and open the desired file, (Ctrl+O on the PC keyboard). Viewing a log file is useful for reviewing test results and documenting hunting excursions. The .log file can also be opened as playback file. A playback file is like reviewing the gathered data as a movie. To open a log file for playback, select the desired Replay mode from the lower right selection box. When viewing a log file in playback mode, use the Space Bar to fast forward through the traces and the Esc key to pause the playback. Log files can also be opened and appended to the currently open data. This option is also selected via the lower right selection box.

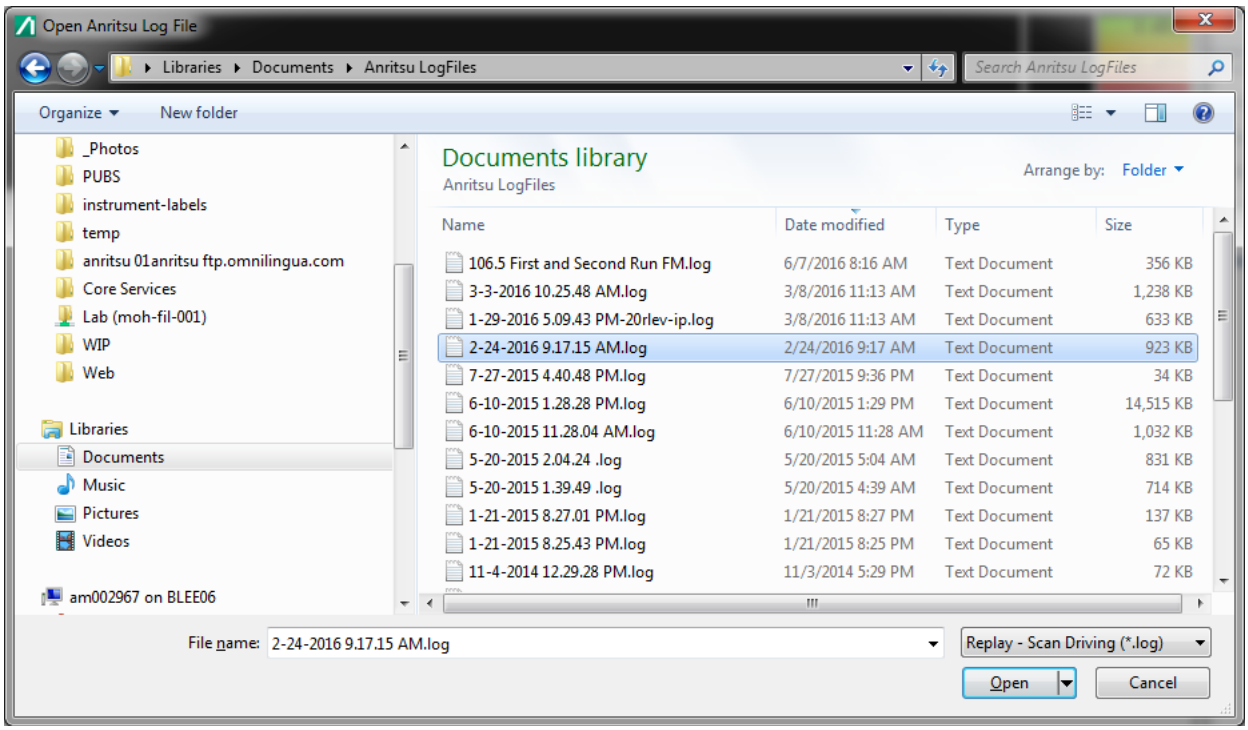


Figure 4-16. Open Log File Window

Importing and Viewing .loc Files

Anritsu "Vision" program location (.loc) files can be imported, opened, and viewed on the MIH screen. Files that can be imported from Vision include:

- TDOA (Time Distance of Arrival)
- POA (Power of Arrival)
- AoA (Angle of Arrival)

To open a .loc file:

1. Click Import Location Estimate from the file menu as shown in Figure 4-17.

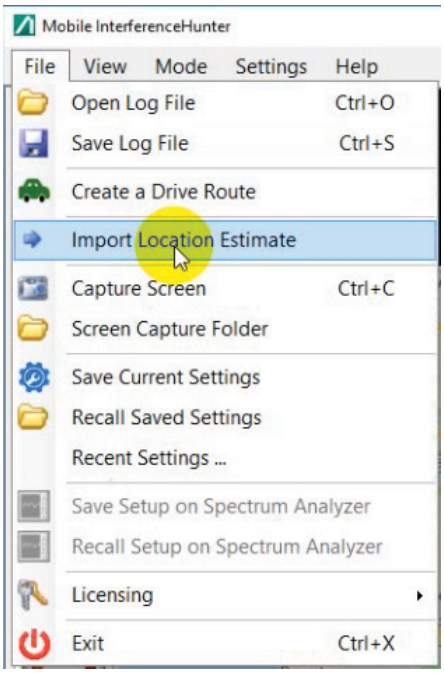


Figure 4-17. Import Location Estimate

2. Click a .loc file as shown in Figure 4-18.

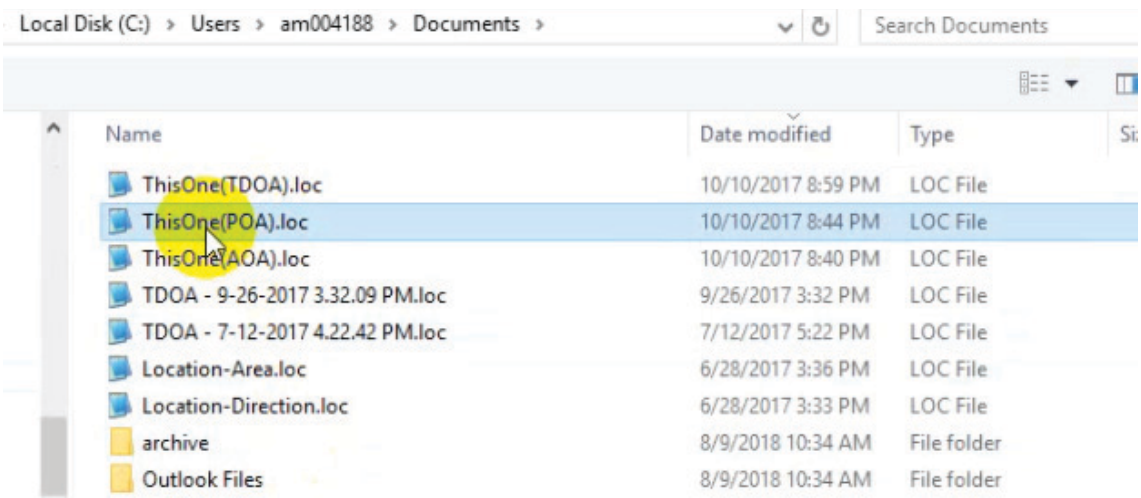


Figure 4-18. Click .loc file to Import

3. Import the TDOA, POA, and AoA file to view on the MIH screen as shown in Figure 4-19.

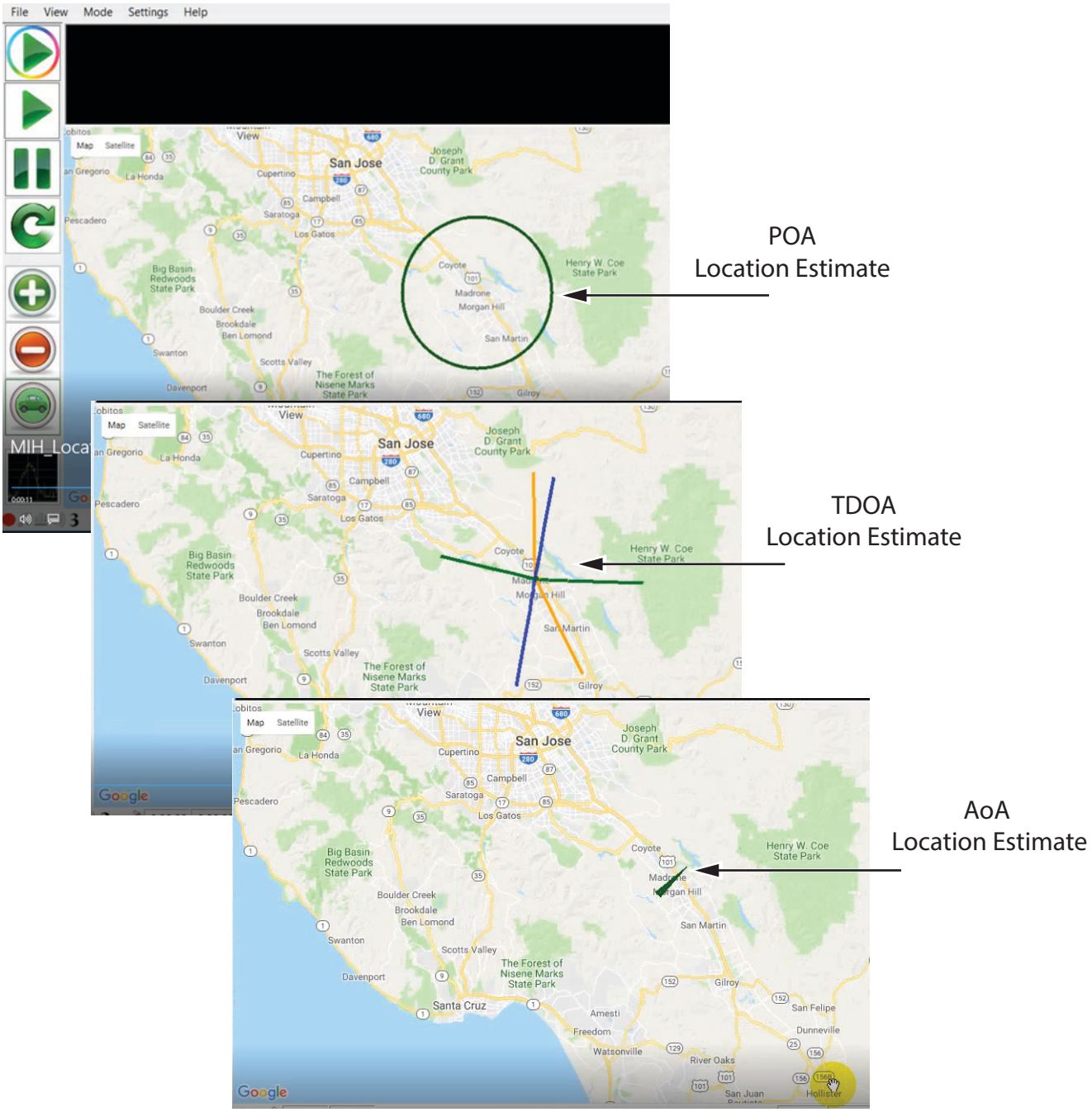


Figure 4-19. View Imported .loc files

Saving a Log File

Click Save Log File in the File menu and the Save As widow opens, (Ctrl+S on the PC keyboard). Use the date and time stamp for the name or create your own. Click Save. If you clear the data before saving it, you will not be able to get it back.

Auto Archive

MIH can collect data for many hours. Data is not written to a file, but is held in memory until the user stops data collection and choses to save. If a trace graph is open, then it is also saving full trace data for each data point, and this can get very large after a few hours.

There is no set time limit that the data is saved, but there is a certain point count. When more than 5,000 data points are collected and the trace window is open, then the data will automatically be saved as a log file and the last 600 points will remain in the current data list. The rest is removed to make room in memory for continued data acquisition.

Auto archive is a feature that cannot be turned off.

Capturing the Map and Signal Windows

Click Capture Screen in the File menu, (Ctrl+C on the PC keyboard). Captures the current drive map display, Power vs. Time Display, Instrument Trace Display, Real-time Power Meter (if displayed), and the Power Scale and saves it to the directory folder labeled Anritsu ScreenShots. The captured screen is in PNG format and labeled with a date and time stamp. To view the captured image, click Screen Capture Folder in the File menu and the folder labeled Anritsu ScreenShots will open.

Saving Current Settings

Click Save Current Settings in the File menu and the Save Program Settings File window opens. Name the file and Click Save. Most of the MIH settings and key instrument settings are saved. The extension .mih will be added to the name.

Recalling Saved Settings

Click Recall Saved Settings in the File menu and the Recall Settings widow opens. Select the desired configuration file, extension .mih. Click the Open button. Configuration settings are loaded into the Mobile InterferenceHunter software. If the instrument is not connected to the computer a warning dialog, 'The Anritsu Spectrum Analyzer is no longer connected.', will pop up indicating the Spectrum Analyzer is disconnected and to check the connection. After checking the connections, click Retry.

Anritsu

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