Anritsu Mobile Interference Hunting System

Interference Hunting Made Easy

/Inritsu

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Mobile InterferenceHunter™ on Windows® PC Tablet with Spectrum Master™ in Vehicle

Anritsu Mobile InterferenceHunter™ - How it Works

Interference from both illegal and unintentional signals is a significant problem for mobile service providers, security services and government regulators. Interference can often degrade network performance, causing critical communications to be interrupted. Locating these sources of interference has traditionally been labor intensive and time consuming. Traditional methods include manually making numerous measurements from multiple locations using a directional antenna. Triangulation is then used to approximate the signal location. This process is then iterated a number of times until the interferer is precisely located.

The Anritsu mobile interference hunting system automates the interference hunting process. Multiple measurements are automatically taken and processed using the MX280007A software. Using mapping software resident on a Windows laptop/tablet, an Anritsu handheld spectrum analyzer and an omnidirectional antenna, directions and voice prompts are provided in this system to guide the driver to the source of interference.

A key component of the Anritsu mobile interference hunting system is an off-the shelf magnet mount omnidirectional antenna. Depending on the antenna used, this interference hunting system covers the entire frequency range provided by the spectrum analyzer. In most cases, this range covers from 9 kHz to a high frequency of 43 GHz for the Anritsu MS2720T platform series of spectrum analyzers. Most Anritsu handheld spectrum analyzers can be employed with this system.

MX280007A InterferenceHunter map on Windows PC tablet

The patent-pending algorithm in the Anritsu Mobile InterferenceHunter software uses power-of-arrival technology to quickly measure and locate sources of interference. To guide the user to the interferer position, directional arrows are positioned on the map. The accuracy of these directions is enhanced with GPS technology to precisely identify the driver's position and the path to follow. Additionally, voice prompts are given allowing the user to minimize the need for viewing the map while driving. This helps to facilitate one-person operation. Voice prompts can be played on the tablet itself or fed into the car speaker system with an audio cable. *Bluetooth®* wireless technology can also be used where both the vehicle radio and the tablet are equipped with this feature. Care must be taken to insure that *Bluetooth* transmissions are not in the same frequency band being searched for interference.

The interference hunting algorithms employ channel power measurements. This feature facilitates hunting a wide variety of signal types, from wideband modulated signals to narrowband or CW sources. The channel power bandwidth can be easily configured by the user for settings appropriate for the signal of interest.

Once sufficient measurements are accumulated and filtered for multipath, the Anritsu Mobile InterferenceHunter software draws a circle on the map indicating the position estimate of the source of interference. The diameter of the circle becomes smaller as more measurements are taken, providing a higher degree of confidence for the signal of interest. While driving, a series of color-coded dots is shown on the map, with color proportional to signal strength.

On set-up of the mobile interference hunting system, a USB cable is attached between the spectrum analyzer and the Windows tablet. On boot-up, the spectrum analyzer is automatically placed into channel power mode. The operator sets the frequency, channel bandwidth and a few other settings. The appropriate OpenStreetMap™ is loaded into the program by the user. Alternatively, Google Maps™ can be utilized by the user (requires internet access for the duration of the interference hunt).

Once the user gets close enough to the interferer location, the Anritsu handheld spectrum analyzer with a Yagi or other directional antenna can then be used to pin-point the interferer. It is highly recommended that the Anritsu MA2700A Handheld InterferenceHunter device be used as part of this pin-pointing operation.

In developing the Anritsu Mobile InterferenceHunter software, great care was taken to insure user-friendliness and simplicity of use. With an interface optimized for Windows touchscreen tablets, the Mobile InterferenceHunter software is simple to use.

Types of Interferers Found

- Low power
- Narrowband, wideband
- Modulated
- Pulsed signals (similar to radar)
- Signals hidden in LTE uplink channels
- "Black" TV/radio stations and BTS cellular equipment operating illegally

Anritsu Mobile InterferenceHunter Software Special Capabilities

For signals hidden in LTE uplink bands, the Mobile InterferenceHunter software uses a "min hold" algorithm which captures the interfering signal while eliminating the LTE traffic signal from measurement consideration. Once the signal of interest is captured, min hold is reset for another power measurement of the interferer. Min hold can be enabled under the 'Settings' tab in the software application user interface. Timing for the resetting of min hold is user settable.
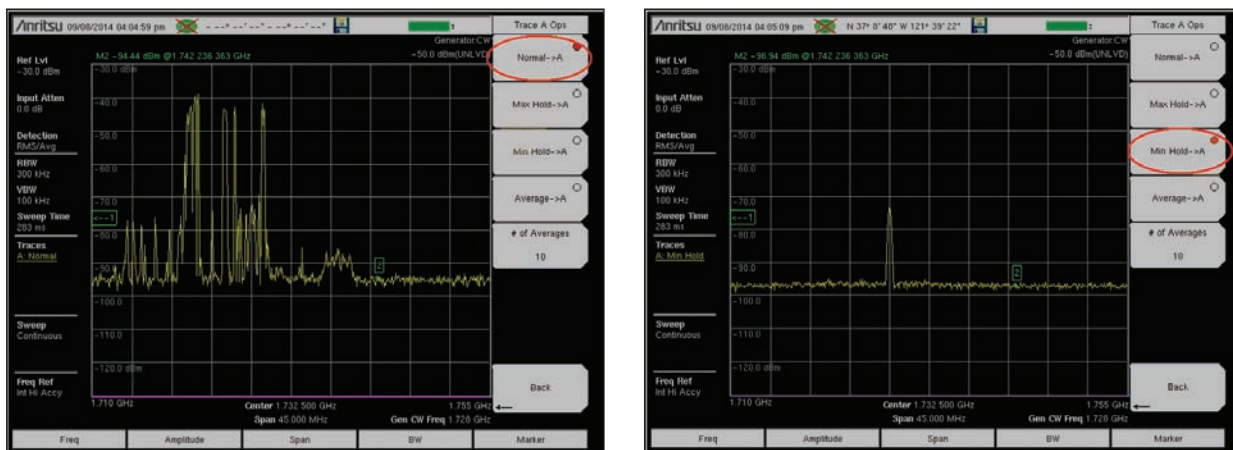
Comparison of LTE Uplink Band screenshots taken before and after MIN HOLD applied. Interferer obscured by LTE traffic on left can clearly be seen on screen on right.

For finding pulsed signals, the Mobile InterferenceHunter software uses a "max hold" algorithm, capturing the pulsed signal only when it is transmitting. This eliminates the possibility of erroneously measuring a pulsed signal when not active. Timing for the max hold reset time is user settable.

For finding extremely fast signal pulses, an innovative feature developed by Anritsu called "Burst Detect" can be used. Using FFT technology, Burst Detect enables the spectrum analyzer to capture and process intermittent signals at receiver-like speeds. Burst Detect is available on the MS2720T Spectrum Master™, the MT8220T BTS Master™, and the MS203xC VNA Masters™.

Other features provided by the Anritsu Mobile InterferenceHunter software include:

- Multi-emitter mode of operation, ideal for finding multiple leakage sources such as cable TV
- Squelch Control to optimize hunting for low-level signals or when signals are obscured by buildings and other obstructions
- Choice of Internet-provided Google Maps or maps to store on the laptop/tablet (provided by OpenStreetMap)
- Zoom In/Out controls provided on the map for desired street level view
- Full-Screen Spectrum View on the laptop or tablet allows easier examination and analysis of the spectrum trace data
- Visual indicators showing power levels measured at each point along the drive path
- Ability to capture and store interference hunt log files for later playback and analysis
- Voice prompts providing the driver with turn-by-turn directions to locate the source of interference (facilitates one-person operation)
- Extensive Help Menu for on-site assistance pertaining to Mobile InterferenceHunter operation

Anritsu Handheld Spectrum Analyzer
with GPS Option

Dash-mounted Windows® PC Tablet
with MX280007A Software and
2000-1801-R mounting hardware

2000-1647-R
Broadband Magnet Mount Omnidirectional Antenna
700 MHz to 6 GHz with GPS Antenna in one housing
(recommended antenna for users operating in this frequency range)

Configuration Overview

## Anritsu Mobile Interference Hunting System Configuration

- Anritsu Mobile InterferenceHunter software with license key.

- Anritsu handheld spectrum analyzer with GPS receiver

- Tablet/laptop running Windows 7 or 8 (tablet running Windows 8 highly recommended for touchscreen capability)

- Off-the-shelf magnet mount omnidirectional antenna (Anritsu P/N 3-2000-1647-R or equivalent) This part also contains an integrated GPS antenna.

- Mounting hardware for tablet (Anritsu P/N 2000-1801-R or equivalent)

- Magnet mount GPS antenna (Anritsu P/N 2000-1528-R or equivalent) Required only if omnidirectional antenna used does not incorporate a GPS antenna.

- USB A - 5-PIN Mini-B Cable (Anritsu P/N 3-2000-1498 or equivalent) This cable is provided as an accessory for compatible Anritsu handheld spectrum analyzers.

- Optional audio cable or *BlueTooth* transmitter to connect the tablet speaker to the car audio system

- Mobile Internet connector for tablet/laptop to use Google Maps or download OpenStreetMap-based maps from www.openstreetmap.org

Compatible Spectrum Analyzers

Most Anritsu handheld spectrum analyzers with a GPS receiver will work with the Anritsu mobile interference hunting system. This includes members of the VNA Master™, Spectrum Master™, Site Master™, BTS Master™, LMR Master™ and Cell Master™ platforms. No firmware upgrades are required.

VNA Master™ MS2034B/35B
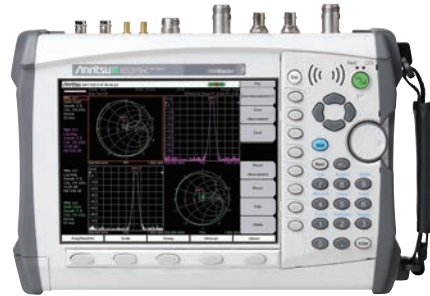
VNA™ Master MS2036C/37C/38C

Spectrum Master™ MS2720T

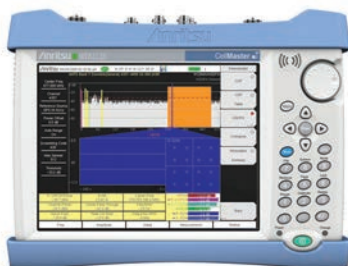Spectrum Master™ MS2721B

Spectrum Master™ MS2722C/23C/24C/25C/26C

Spectrum Master™ MS2711E/12E/13E

BTS Master™ MT8220T

BTS Master™ MT8221B/22B

Cell Master™ MT8212E/13E

Site Master™ S332E/62E

LMR Master™ S412E

Maps

Two types of mapping solutions are available using the Anritsu mobile interference hunting system:

- Google Maps - a free service offering the user the flexibility to automatically download maps for many parts of the world. However, an Internet connection must be set up and maintained during the entirety of the interference hunt. In many cases, a cellular USB modem is used for this connection. Care must be taken to ensure frequencies used by the modem do not interfere with interference signals being measured.

- OpenStreetMap - an open source database of maps that must be downloaded to the hard drive of the tablet before the interference hunt begins. Anritsu has created hundreds of maps of cities throughout the world that can be downloaded and used with this interference hunting system. Alternatively, users can create their own maps using an easy 4-step process. Maps and instructions can be found at the following Anritsu web page: http://www.anritsu.com/en-US/Products-Solutions/Products/Maps.aspx
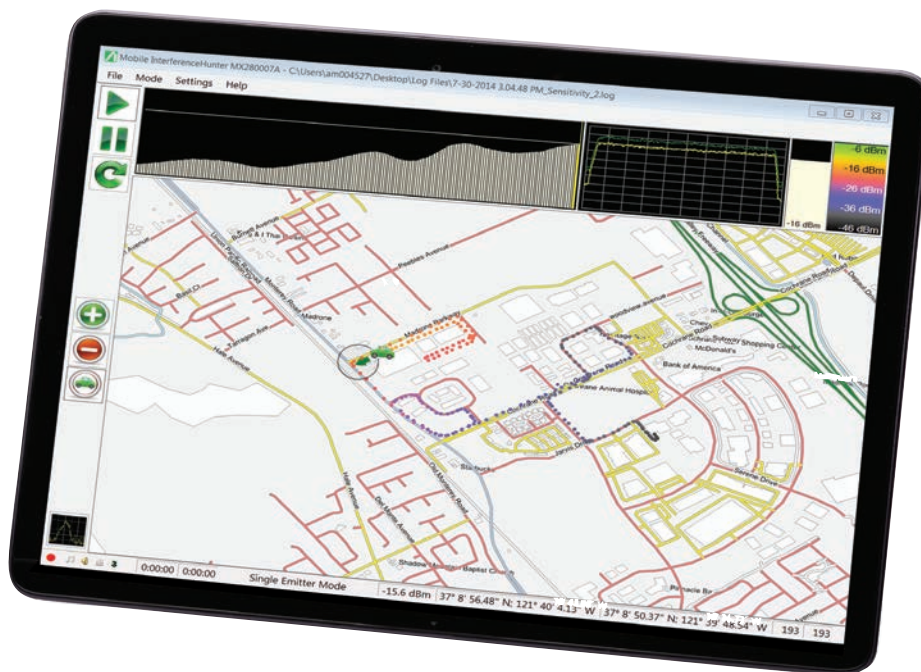
OpenStreetMap™ Displayed on Windows PC Tablet

Post Interference Hunt Analysis

Records of your interference hunt can be saved as log files either for submission to management or for use in analyzing the hunt itself. The log files can be re-played on the MX280007A software to examine the drive route taken and to review areas where the hunting process might be optimized.

Additional Equipment for the Interference Hunt

The Anritsu mobile interference hunting system allows the user to find the approximate location of interference fast. It has easy setup, user-friendly operation, and powerful patent-pending algorithms used by the software for finding interference sources. The Anritsu mobile interference hunting system allows the user to find the approximate location of the interferer quickly and efficiently. As a final step, the MA2700A Handheld InterferenceHunter mated with a directional antenna is the perfect solution for pinpointing the interference signal source.

Pinpointing interference location with the MA2700A Handheld InteferenceHunter.

MA2700A Handheld InterferenceHunter
with directional antenna and channel filter

Interference hunt screen capture. Dots shown along drive path are colored according to signal strength.

Summary

Users will appreciate the flexibility of the Anritsu mobile interference hunting system. When not employed on interference hunts, the spectrum analyzer can be re-purposed for a variety of other applications including signal quality analysis and coverage mapping. Portable off-the-shelf magnet mount omnidirectional antennas provide the ability to easily target a variety of signals at a wide range of frequencies. Channel bandwidth control allows easy measurements for both narrowband and wideband signals. Low noise floor and high dynamic range on the spectrum analyzer allows signal tracking of low-level signals from a greater distance from the interference source. With a less than 5 minute setup time and ease of use for one person operation, the Anritsu mobile interference hunting system adds up to be the optimal solution for finding interference.

Anritsu Mobile Interference Hunting System Ordering Information

The following current Anritsu handheld spectrum analyzer models may be utilized in the Anritsu mobile interference hunting system.

Spectrum Master™		
MS2711E/12E/13E	Option 31, GPS Receiver	
MS2720T	Option 31, GPS Receiver	
BTS Master™		
MT8220T	GPS Receiver is standard	
Cell Master™		
MT8212E/13E	Option 31, GPS Receiver	
Site Master™		
S332E/62E	Option 31, GPS Receiver	
LMR Master™		
S412E	Option 31, GPS Receiver	
VNA Master™		
MS2034B/35B	Option 31, GPS Receiver	
MS2036C/37C/38C	Option 31, GPS Receiver	

The following former Anritsu handheld spectrum analyzers may also be used in the Anritsu mobile interference hunting system.

BTS Master™	
MT8221B/22B	Option 31, GPS Receiver
Spectrum Master™	
MS2721B	Option 31, GPS Receiver
MS2722C/23C/24C/25C/26C	Option 31, GPS Receiver

Mobile InterferenceHunter™ Software

Model Number	Description
MX280007A	Mobile InterferenceHunter Software (Spectrum Analyzer must have GPS Receiver)

Important: When placing order, an email address is always needed. For Spectrum Analyzers previously owned, the model and serial number of the analyzer must also be provided.

Part Number	Description
MX280007A-PL001	Perpetual license ordered with a new Spectrum Analyzer
MX280007A-PL002	Perpetual license ordered with an existing Spectrum Analyzer

Note: Customers order one of the two part numbers listed above to obtain a license. An email is then sent with a link to download the MX280007A Mobile InterferenceHunter software along with the license key. Multiple licenses may also be ordered that work with a corresponding number of Anritsu handheld spectrum analyzers.

Accessories

- Tablet/laptop running Windows 7 or 8 (tablet running Windows 8 highly recommended for touchscreen capability)
- Off-the-shelf magnet mount omnidirectional antenna (Anritsu P/N 3-2000-1647-R or equivalent) This part also contains an integrated GPS antenna.
- Mounting hardware for tablet (Anritsu P/N 2000-1801-R or equivalent)
- Magnet mount GPS antenna (Anritsu P/N 2000-1528-R or equivalent) Required only if omnidirectional antenna used does not incorporate a GPS antenna.
- USB A - 5-PIN Mini-B Cable (Anritsu P/N 3-2000-1498 or equivalent) This cable is provided as an accessory for compatible Anritsu handheld spectrum analyzers.
- Optional audio cable or *BlueTooth* transmitter to connect the tablet speaker to the car audio system

# Anritsu Mobile Interference Hunting System Ordering Information

Additional Accessories

Bandpass Filters

Part Number	Description
1030-106-R	1710 MHz to 1790 MHz, N(m) to N(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz, N(m) to N(f), 50 Ω
1030-109-R	824 MHz to 849 MHz, N(m) to SMA (f), 50 Ω
1030-110-R	880 MHz to 915 MHz, N(m) to SMA (f), 50 Ω
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA (f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA (f), 50 Ω
1030-114-R	806 MHz to 869 MHz, N(m) to SMA(f), 50 Ω
1030-155-R	2496 MHz to 2690 MHz, N(m) to N(f), 0.8 dB loss, 50 Ω
1030-178-R	1920 MHz to 1980 MHz, N(m) to N(f), 50 Ω
1030-179-R	777 MHz to 798 MHz, N(m) to N(f), 50 Ω
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 Ω
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 Ω

Bandpass Filters (used with MA2700A InterferenceHunter™)
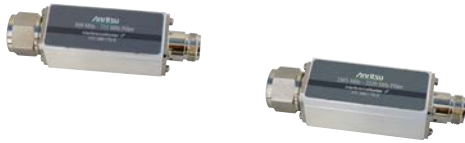
Part Number	Description
2000-1734-R	699 MHz to 715 MHz, 50 Ω, type N(m) and N(f)
2000-1735-R	776 MHz to 788 MHz, 50 Ω, type N(m) and N(f)
2000-1736-R	815 MHz to 850 MHz, 50 Ω, type N(m) and N(f)
2000-1737-R	1711 MHz to 1756 MHz, 50 Ω, type N(m) and N(f)
2000-1738-R	1850 MHz to 1910 MHz, 50 Ω, type N(m) and N(f)
2000-1739-R	880 MHz to 915 MHz, 50 Ω, type N(m) and N(f)
2000-1740-R	1710 MHz to 1785 MHz, 50 Ω, type N(m) and N(f)
2000-1741-R	1920 MHz to 1980 MHz, 50 Ω, type N(m) and N(f)
2000-1742-R	832 MHz to 862 MHz, 50 Ω, type N(m) and N(f)
2000-1743-R	2500 MHz to 2570 MHz, 50 Ω, type N(m) and N(f)
2000-1799-R	2305 MHz to 2320 MHz, 50 Ω, type N(m) and N(f)

Highpass/Lowpass Filters

Part Number	Description
1030-149-R	Hi-Pass, 150 MHz, N(m) to N(f), 50 Ω
1030-150-R	Hi-Pass, 400 MHz, N(m) to N(f), 50 Ω
1030-151-R	Hi-Pass, 700 MHz, N(m) to N(f), 50 Ω
1030-152-R	Lo-Pass, 200 MHz, N(m) to N(f), 50 Ω
1030-153-R	Lo-Pass, 550 MHz, N(m) to N(f), 50 Ω

Directional Antennas

Part Number	Description
2000-1677-R	300 MHz to 3 GHz, SMA(m), Log Periodic
2000-1659-R	698 MHz to 787 MHz, N(f), 8 dBd, Yagi
2000-1411-R	822 MHz to 900 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 12 dBd, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz N(f), gain of 2 dBi to 10 dBi, typical
2000-1726-R	Antenna, Yagi 2500 MHz to 2700 MHz N(f), 12 dBd
2000-1747-R	Antenna, Log Periodic, 300 MHz to 5000 MHz N(f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N(f), 6 dBi, typical
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N(f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N(f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N(f)

Other Accessories

Part Number	Description
2000-1647-R	Magnet mount broadband antenna Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz 5 dBi peak gain, N(m) 50 Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft
2000-1648-R	Magnet mount omnidirectional antenna 1700 MHz to 6000 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1801-R	Hardware for mounting Windows tablet onto car dash
2000-1689	EMI Near Field Probe Kit
2000-1653	Anti-glare Screen Cover (package of 2)
633-75	High Capacity Battery Pack, 7500 mAh
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
MA2700A	Handheld InterferenceHunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
2000-1528-R	GPS Antenna, SMA(m) with 5 m (15 ft) cable, 3 dBi gain, requires 5 VDC
3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm

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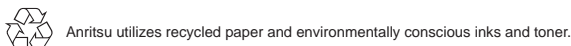
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