Advancing beyond

Interference**Hunter**™

Handheld Direction Finding System

MA2700A

Includes GPS and Electronic Compass

Interference**Hunter**™ MA2700A Handheld Direction Finding System
Compact Size: 303 mm x 220 mm x 70 mm (11.9 in x 8.7 in x 2.76 in), Lightweight: < 1 kg (2.2 lb)

Introduction

Simplify your interference hunting tasks with the handheld Interference**Hunter**™ from Anritsu Company.

This broadband, easy-to-use handheld direction finding antenna system includes everything you need to find the sources of signals. With a broadband preamplifier, the system is sensitive. With a GPS receiver, it knows where it is. With the electronic compass it knows where it is aimed. With an antenna attached, the InterferenceHunter captures a direction and signal level when the user presses the trigger on the ergonomic handle.

The included adjustable shoulder strap conveniently holds the MA2700A when out in the field. The ergonomic handle can be used with antennas having a female Type-N connector located at the back of the antenna. The included coupling nut allows for easy antenna connection. Compatible antennas and filters in many cellular bands are available from Anritsu. For details on antennas, including frequency range, gain, and pattern information, refer to the Directional Antennas Technical Data Sheet (11410-00376); for details on filters, refer to the Bandpass Filters Technical Data Sheet (11410-00719). Both are available for download from the Anritsu web site (www.anritsu.com).

Combined with Interference Analysis (Option 25) on Anritsu handheld instruments with spectrum analyzers, the captured location and bearing data is displayed on the instrument.

Specifications

All specifications and characteristics apply to Revision 1 instruments. All published specifications are typical.

Power Consumption		
	Preamplifier On	0.6 Watts
	Preamplifier Off	0.5 Watts
Bandwidth		9 kHz to 6 GHz
Preamplifier		
	Bandwidth	10 MHz to 6 GHz
	Gain	≥ 8 dB: 10 MHz to 2.4 GHz
		≥ 5 dB: > 2.4 GHz to 4 GHz
		≥ 3 dB: > 4 GHz to 6 GHz
Electronic Compass		
	Power	Powered from USB
	Accuracy	≤ 5°, nominal
	Interface	USB
GPS Receiver		
	Satellites Tracked	12 (maximum)
	GPS Locking Time	Cold start: 30 s, typical, with a clear view of the sky
		Warm start: 2 s, typical, with a clear view of the sky
	Position Uncertainty	± 2 meter, typical
Cables		USB cable terminated with a USB Type A Female Plug, 1.5 meters
		Coaxial cable with Type-N male connector, 1.5 meters
Tripod Mount		1/4 - 20 UNC x 7 mm
Regulatory Compliance		
	European Union	EMC 2014/30/EU, EN 61326-1:2013 CISPR 11/EN 55011, IEC/EN 61000-4-2/3/4/5/6/8/11 Low Voltage Directive 2014/35/EU Safety EN 61010-1:2010 RoHS Directive 2011/65/EU + 2015/863
	United Kingdom	EMC SI 2016/1091; BS EN 55011 & BS 61000-4-2/3/4/5/6/8/11 Consumer Protection (Safety) SI 2016/1101; BS EN 61010-1:2010 Environmental Protection SI 2012/3032;2011/65/EU & 2015/863
	Australia and New Zealand	RCM AS/NZS 4417:2012
	South Korea	KCC-REM-A21+-0004
	Canada	ICES-1(A)/NMB-1(A)
	United States	FCC ID: SQG-60SIPT
Environmental		
	Operating Temperature	–10°C to +55°C
	Maximum Humidity	95 % non-condensing
	Altitude	4600 meters
	Shock	MIL-PRF-28800F Class 2
	Storage	–40°C to 71°C
Size and Weight (antenna not included)		
	Size	303 mm x 220 mm x 70 mm (11.9 in x 8.7 in x 2.76 in)
	Weight	< 1 kg (2.2 lb)

How to Use the MA2700A

Connections

- Connect an antenna to the male N-connector (inside the coupling nut).
- Connect USB cable between the MA2700A and the instrument. Connect coaxial cable between the MA2700A and the instrument's RF Input connector.

Instrument Setup

- Confirm that the instrument has Interference Analyzer (Option 25) or Interference Finder (Option 24) with the latest software installed.
- Select the Interference Analyzer (Option 25) or Interference Finder (Option 24) mode on the instrument. Refer to your instrument's spectrum analyzer measurement guide for detailed information.
- Follow the instructions in the instrument's user guide on how to turn on GPS or GNSS (GPS) and preamp enabling.

Installing Digital Maps

- Field Master and Site Master instruments use NetToolKit® and OpenStreetMap™ to create maps to be installed unto internal memory via an Internet connection.
- All other spectrum analyzers use easyMap Tools™ to create maps that are displayed on the instrument screen. The easyMap Tools™ software can be downloaded from the Anritsu web site: www.anritsu.com.

Supported Spectrum Analyzers

Below are the list of Anritsu spectrum analyzers that support Interference Analysis (Option 25) or Interference Finder (Option 24):

- MS2090A, MS2080A, MS2070A Field Master™ Series Instruments and MS2089A Site Master™
- S332E, S362E Site Master™
- MT8213E Cell Master™
- MS2720T, MT2713E Spectrum Master™
- S412E LMR Master™
- MS2034B, MS2035B, MS2036C VNA Master™ with Spectrum Analyzer

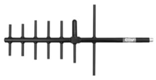
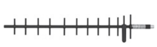
Note	Secure Communication, Option 17 is now supported in Field Master and Site Master instruments. The MA2700A is compatible for use with instruments installed with Option 17. Option 17 creates a secure tunnel on the spectrum analyzer with certain ports kept close while others are open. Security certificates can be loaded onto the instrument to establish a secure connection. Remote access to the instrument ports can be password protected. The USBTMC connection interface does not work with instruments installed with secure communication Option 17.

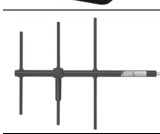
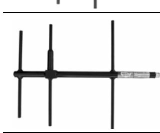
Standard Accessories (included with instrument)

Accessory	Description
	2000-1729-R Shoulder Strap

Optional Accessories

Directional Antennas

Accessory	Description
	2000-1411-R 824 MHz to 896 MHz, N(f), 12.3 dBi, Yagi
	2000-1412-R 885 MHz to 975 MHz, N(f), 12.6 dBi, Yagi
	2000-1413-R 1710 MHz to 1880 MHz, N(f), 12.3 dBi. Yagi
	2000-1414-R 1850 MHz to 1990 MHz, N(f), 11.4 dBi, Yagi
	2000-1415-R 2400 MHz to 2500 MHz, N(f), 14.1 dBi, Yagi
	2000-1416-R 1920 MHz to 2170 MHz, N(f), 14.3 dBi, Yagi
	2000-1659-R 698 MHz to 787 MHz, N(f), 10.1 dBi, Yagi
	2000-1660-R 1425 MHz to 1535 MHz, N(f), 14.3 dBi, Yagi
	2000-2107-R Log Periodic, 20 MHz to 8.5 GHz

Accessory	Description
	2000-1726-R Antenna, 2500 MHz to 2700 MHz, N(f), 14.1 dBi, Yagi
	2000-1798-R Port Extender, DC to 6 GHz
	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) (requires Port Extender 2000-1798-R)
	2000-1778-R Portable Directional Antenna, 20 MHz to 200 MHz, N(f) (requires Port Extender 2000-1798-R)
	2000-1779-R Portable Directional Antenna, 200 MHz to 500 MHz, N(f) (requires Port Extender 2000-1798-R)
	2000-1812-R Portable Yagi Antenna, 450 MHz to 512 MHz, N(f), 7.1 dBi
	2000-1825-R Portable Yagi Antenna, 380 MHz to 430 MHz, N(f), 7.1 dBi

Bandpass Filters

Accessory	Description
	2000-1734-R 699 MHz to 715 MHz, N(m) and N(f), 50 Ω
	2000-1735-R 776 MHz to 788 MHz, N(m) and N(f), 50 Ω
	2000-1736-R 815 MHz to 850 MHz, N(m) and N(f), 50 Ω
	2000-1737-R 1711 MHz to 1756 MHz, N(m) and N(f), 50 Ω
	2000-1738-R 1850 MHz to 1910 MHz, N(m) and N(f), 50 Ω
	2000-1739-R 880 MHz to 915 MHz, N(m) and N(f), 50 Ω
	2000-1740-R 1710 MHz to 1785 MHz, N(m) and N(f), 50 Ω
	2000-1741-R 1920 MHz to 1980 MHz, N(m) and N(f), 50 Ω

Accessory	Description
	2000-1742-R 832 MHz to 862 MHz, N(m) and N(f), 50 Ω
	2000-1743-R 2500 MHz to 2570 MHz, N(m) and N(f), 50 Ω
	2000-1799-R 2305 MHz to 2320 MHz, N(m) and N(f), 50 Ω
	2000-1911-R 703 MHz to 748 MHz, N(m) to N(f), 50 Ω
	2000-1912-R 788 MHz to 798 MHz, N(m) to N(f), 50 Ω
	2000-1925-R 663 MHz to 698 MHz, N(m) to N(f), 50 Ω
	2000-1926-R 776 MHz to 806 MHz, N(m) to N(f), 50 Ω
	2000-2147-R 3700 MHz to 3980 MHz, N(m) to N(f), 50 Ω

MA2700A Transit Cases

Accessory	Description
	760-261-R Large Transit Case with Wheels and Handle 63.1 cm x 50 cm x 30 cm (24.83 in x 19.69 in x 11.88 in), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
	760-262-R Transit Case for MA2700A, holds several Yagi antennas and filters/port extender 96.8 x 40.6 x 15.5 cm (38.12 in x 16.00 in x 6.12 in)

Accessory	Description
	2000-1727 Monopod, extends to 180 cm (72 in)
	760-271-R Transit Case (For Portable Directional Antennas and Port Extender P/N 2000-1777-R, 2000-1778-R, 2000-1779-R and 2000-1798-R) (Case can contain all loop antennas at once)

Related Manuals (available at www.anritsu.com)

Part Number	Description
10580-00361	MA2700A Interference Master User Guide
10580-00349	Spectrum Analyzer Measurement Guide
11410-00376	Directional Antennas Technical Data Sheet
10580-00444	Field Master Pro User Guide
10580-00447	Spectrum Analyzer Measurement Guide
10580-00483	Field Master User Guide
	Anritsu easyMap Tools software

Additional Documents and Software

- The *User Guide* and *Spectrum Analyzer Measurement Guide* applicable for your Anritsu instrument. The Interference Analysis chapter will include a section on "Interference Mapping" with information on setup and selecting the MA2700A as the Direction Finding Antenna.
- Anritsu easyMap Tools software creates Geo-enabled maps which are viewed on the Anritsu instruments during interference hunting.
- Directional Antennas Technical Data Sheet (11410-00376) lists compatible antennas in many frequency bands and applications.

These documents and programs, along with additional applications notes, white papers, and videos covering interference analysis are available from the Anritsu web site (www.anritsu.com).

Training at Anritsu

Anritsu has designed courses to help you stay up to date with technologies important to your job. For available training courses, visit: www.anritsu.com and search for training and education.

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White Paper

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Using Anritsu's Handheld InterferenceHunter MA2700A

Anritsu's Handheld InterferenceHunter, the MA2700A, is a tool designed to make locating signals through direction finding easier and quicker.

Traditionally, RF Engineers would find signals using a spectrum analyzer, a directional antenna, a compass, and a map. The engineer would take directional bearings to the signal, mark the results on the map (which needs to be properly oriented to the surrounding terrain) and continue the process until the signal was found by triangulation and successive approximation. The technique takes quite a bit of time and requires considerable RF, map, and compass skills.

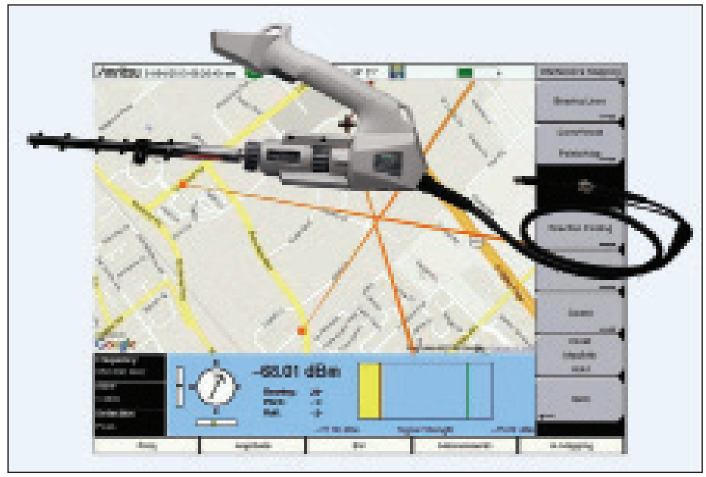


Figure 1. Anritsu's MA2700A Handheld InterferenceHunter

The MA2700A works with Anritsu handheld spectrum analyzers in the Spectrum Master, Site Master, Cell Master, and BTS Master families to greatly simplify the signal mapping process. The MA2700A is a member of Anritsu's Spectrum assurance solutions.

Overview

The MA2700A allows users to record bearings to the signal-of-interest by simply pulling the trigger when pointing at the signal. The position and compass direction of the antenna is automatically recorded on a map within the host spectrum analyzer. The MA2700A uses GPS and a built-in compass to take care of the map reading part of the task, freeing up users to concentrate on finding the signal.

The process goes like this:

1. Use Anritsu software to generate a map for your spectrum analyzer
2. Select an antenna for the frequency band you are working with
3. Select a bandpass pre-filter for the band
4. Travel to a site where the signal can be seen
5. Set up the spectrum analyzer to display the signal to best advantage
6. Go to interference mapping mode
7. Find the direction to the signal and pull the trigger
8. Repeat the direction finding process from several locations
9. Travel to the point where the bearings intersect and repeat the direction finding process until the signal is found

Let's take a look at each of these steps in turn.

Generating the Map

Anritsu provides easyMap Tools™ as a part of the Anrtisu Software Tool Box. It's a free download from Anritsu. The software allows you to capture geo-referenced maps of your area, to your PC, suitable for use on Anritsu's handheld spectrum analyzers. These maps allow you to pan and zoom on the analyzer, giving you great flexibility when in the field. You need internet access to download the map, and a USB stick to transfer the map to the spectrum analyzer. Further instructions can be found in the easyMap help file.

Select an Antenna

There are many different directional antennas available. If you don't already have a suitable antenna, Anritsu provides a selection of robust antennas for your convenience, which are described in the "Antennas and Antenna Kits Technical Data Sheet." Useful antenna categories include Yagi, Log Periodic, and Loop antennas. Each have their pros and cons which we will review in this section.

Yagi Antenna

Traditionally, a Yagi antenna is used for direction finding. They have:

- Good directivity, which means that it is easy to figure out when the antenna is pointing at the signal
- Good front-to-back ratio, which is very useful when checking for reflections.
- Generally low side lobes, which means that it's not too likely you will be misled by signals received from a minor lobe, which would throw off the direction finding.

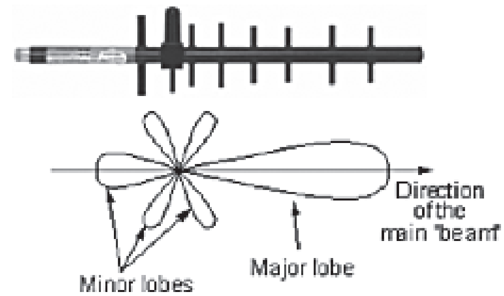


Figure 2. A Yagi antenna and its pattern

The biggest disadvantage with a Yagi is that they tend to have a fairly narrow frequency band. You might need one Yagi for signals between 800 and 900 MHz and a different one for signals between 900 and 1000 MHz. If you work with a fixed set of receive frequencies, this becomes a minor issue. If it's possible to use a Yagi, it's normally the easiest antenna to use.

Log Periodic

A Log Periodic antenna has the broadest frequency range. Each antenna can cover a wide range of frequencies. The trade-off is that they have less directivity, and the antenna pattern changes with frequency. In practice, it may be harder to establish a direction with a Log-Periodic as the main beam is broad and the minor lobes of the antenna may be strong enough to be potentially confused with the main beam.


Figure 3. A Log-Periodic antenna

One technique to deal with this is to set up the spectrum analyzer with a Normal and a Max-Hold trace, which allows you to see small differences in amplitude easier.

Loop Antenna

Loop antennas are used for lower frequency ranges, as Yagis or Log Periodics designed for these frequencies become way too large to be transportable. Loop antennas may have a bi-directional pattern, so you need to be aware that there may be a 180 degree ambiguity in the signal direction. Taking multiple bearings from different places can resolve this, as you will see the bearings taken in the direction of the signal converge.

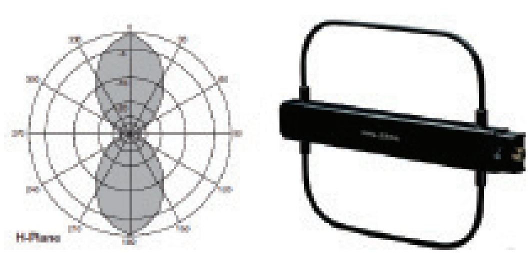


Figure 4. Loop antennas

Bandpass Filter

As discussed in the application note “RF Interference Hunting Concepts,” an interfering signal does not need to be in-channel to desensitize a receiver, it only needs to be in-band. This concept applies to spectrum analyzers as well. After all, they are another type of radio receiver and have a very broad-band input.

If you are using your spectrum analyzer near a strong signal source, even if it’s not within the instrument’s span, it may be overloaded by the signal. For instance, if you are physically near a TV transmitter, the transmission, typically in the 50 MHz to 500 MHz range, may well cause your spectrum analyzer’s receiver front end to overload, even if your span is set to, say, 1800 – 1900 MHz. Other sources of overloads may be closer to the frequency band you are working with, for instance, transmissions from other cellular providers, commercial FM radio, Wi-Fi, or public safety transmissions.

The solution is to use a bandpass filter as a pre-filter on the input of the spectrum analyzer. Anritsu has a set of bandpass filters suitable for use as pre-filters with the MA2700A that will resolve this problem. Use of a pre-filter, though not required, may prevent some very frustrating interference hunting experiences. For more details, see the Anritsu “Bandpass Filters Technical Data Sheet.”

Figure 5. Bandpass filter

Figure 6. Pre-filter (bandpass filter) in place between an antenna and the MA2700A

Getting Started

It’s almost too simple to mention, but if you can’t see a signal, you can’t find a signal. And interfering signals don’t have a clearly defined coverage area, by definition. So how do you find a starting location?

A good place to start is at the affected tower and the affected sector receiver. The Rx test port on an affected cellular sector will show the interfering signal. After all, if it’s not present at the input to the receiver, it’s not interference! The Rx test port has the advantage of using the affected Rx antenna, so it has the height and coverage pattern of the sector. It also is affected by any base station sector pre-filters that may be installed, so if a suspect signal has been filtered out, it’s not a problem and you don’t need to fix it!

Once you see an interfering signal, you need to set up the spectrum analyzer to best display the signal. Here’s a quick process to set up the spectrum analyzer:

- Center the signal-of-interest on the screen
- Span down to remove other signals from the screen
- Turn the preamp on
- Set the reference level so that the signal is 20 or 30 dB below the top of the screen for headroom. This allows you some margin when moving around chasing the signal.
- Set the span so that the interfering signal takes up about half of the display width. This allows you to view the true shape of the signal and gives you another check that you really are viewing the same signal you started chasing.

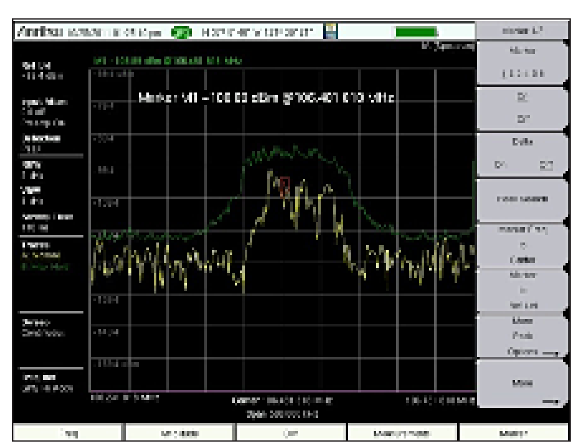


Figure 7. Signal centered on screen with Max-Hold enabled

- Set the sweep mode to “Fast”
- Pulsed signals will benefit by going to “Burst” signal detection mode
- Set Trace B to Max-Hold, while leaving Trace A on Normal. The Max-Hold trace records your maximum signal strength while the normal trace shows the current signal level. This makes it really clear when your antenna is pointing at the maximum signal.
- Characterize the signal. It’s critical to know the signal shape, bandwidth, power, and time of occurrence.

For more information on this topic, see the Anritsu application note “RF Interference Hunting Concepts.”

Using a Ground Level Antenna

Now that the signal has been characterized, and the spectrum analyzer set up to view the signal, it’s time to locate the signal from a ground level antenna. This may be simple, if the signal is present at the foot of the base station. If buildings or terrain are blocking the signal from reaching the foot of the base station, the task gets more complex. Try driving around, or traveling to high spots or roof tops in the affected sector. Once you can receive the signal from ground level, you can start the hunt.

Anritsu has other signal hunting and monitoring tools to help in this situation. For more information, see the application notes listed in the Appendix and the Anritsu web site.

Mapping Mode

At this point, it’s time to enter the spectrum analyzer’s signal mapping mode. To do this, you will need to:

- Set the spectrum analyzer to the “Interference Analyzer” mode
- Select the “Interference Mapping” measurement
- Enter “Save/Recall Points/Map,” and “Recall a Map”
- Open the AZM map file you previously generated with easyMap Tools
  – It’s quite useful to leave the AZM file on the USB stick, and also save the resulting KML file there as well.
  – The KML results file can be displayed in third party mapping programs such as Google Earth.

Map the Signal

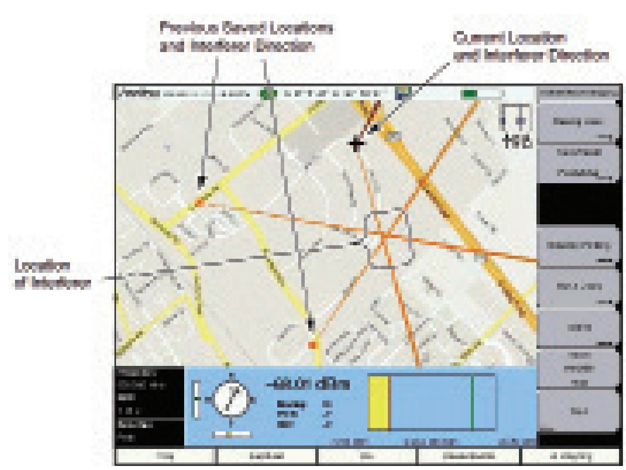


Figure 8. Plotting directions to an interference source on an embedded map

In the Interference Mapping mode, the signal strength is displayed as a yellow bar with Max-Hold and Min-Hold lines. The Signal strength display takes its measurements from the center frequency of the spectrum display, so it’s important that the signal be centered in the display before going to the Interference Mapping mode, as mentioned above.

Once set up, rotate the Yagi around to find the direction of the strongest signal. Bear in mind that hills and buildings look like a mirror to many RF signals, and can produce strong reflections. Once the direction of the strongest signal is located, click the trigger on the MS2700A. This will place a line on the map, starting at your current location and aimed in the same direction as you have the antenna pointed. Now, move to a new location a few blocks, or perhaps a few miles, away and repeat the direction finding process. After three or more lines have been plotted, you can go to the location where the majority of the lines converge. If the uncertainty is large, it might be good to go through another direction finding exercise at closer range. If the area is small, it might work well to use the directional antenna as a sniffer and walk towards the strongest signal. Don’t forget that the signal may be elevated. It’s worthwhile to move the directional antenna up and down occasionally to check for an elevated or depressed source.

Direction Finding Tips and Tricks

One technique that works well at close range for screening out reflections is to step behind something that will shield you from the supposed source. If the signal is really coming from the direction you assume it is coming from, stepping behind a wall, building, shipping container, or van should shield your antenna from the signal and the signal strength should drop. If the signal is really coming from a radically different angle, the signal strength will not drop and you will know you have been chasing a reflection.

In heavily built-up urban areas, try to take your direction finding bearings from the tops of buildings. This will tend to eliminate many reflections that you would otherwise need to chase down to eliminate.

Another technique that works in urban areas is to drive to an intersection and take four signal strength measurements, one in each direction. Travel towards the strongest reading and take another set of readings at the next intersection. This tends to deal with multi-path issues.

You can also use the antenna's front-to-back ratio to your advantage. When you think you have a valid direction to the RF source, flip the antenna so it points in the opposite direction. The signal strength should go down by 20 dB or whatever the front-to-back ratio is for your antenna. If not, start thinking about reflections.

If you often deal with reflections, multi path, or dense urban areas, consider Anritsu's Mobile InterferenceHunter software, which is designed to untangle these sorts of issues.

Locating the Source without a Map

While a mapping spectrum analyzer makes signal hunting easier, in some cases, a map is not needed. In the simplest cases, it can be faster to seek the signal with a directional antenna and a spectrum analyzer. Some signals can be found simply by pointing the directional antenna in the direction of the strongest signal and sighting along the antenna. Others can be found by walking or driving in the direction of the strongest signal. Both of these techniques assume that the source is fairly close.

In some cases, such as in-building signal searches, the analyzer's audio tone is designed to change in pitch with signal strength. With this setup, you can walk into a room with the spectrum analyzer and a directional antenna, turn in a circle, and look towards the location where the audio pitch is the highest. It's a quick method to clear a room.

A signal strength meter (figure 9) is available on many spectrum analyzers. The idea is to move a directional antenna around until you get the highest reading, move in the direction the antenna is pointing, and repeat the process. This can continue until the antenna is literally touching the source of the signal.

The advantage of a tone based system is that it allows the user to sight along the directional antenna while swinging it in a circle. This helps you spot likely objects that might be the signal source. The advantage of a meter based system is that it is easier to get exact highest readings, which help make sure that the antenna is pointing in the right direction.

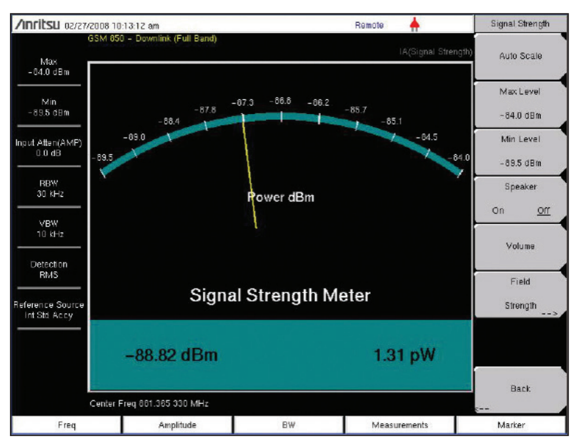


Figure 9. A signal strength meter

You can also use a two trace setup, with a Normal and Max-Hold trace, as mentioned earlier, to do much the same task. This has the advantage that the peak signal value is always marked, and that any change in the signal is immediately apparent. After all, some of these interfering signals come from broken equipment and are inherently unstable.

If you use any of these non-mapped signal strength systems with an omnidirectional antenna, you will need to move around, seeking the strongest signal level. In small areas, this technique can be surprisingly fast.

Locating the Source

Figure 10. A broken RF TV remote can cause interference

Once you are close to the RF interference source, you can use some of the non-mapped techniques listed above to find the source. As mentioned above, it is even possible to end up with your antenna touching the source, if it is accessible from ground level.

It's helpful to look around for possible sources of the interference. If you are chasing an intermodulation signal, look for rust or poor metallic connections. If in a residential neighborhood, look for consumer grade RF devices, like the TV remote pictured in figure 10. Intentional jammers are also a possibility.

Nearby radio transmitters are always a possible source of RF interference. They have the signal strength, and only need the right (or wrong) frequency, to become a problem. Antennas that are shared by multiple carriers are a great place for passive intermodulation (PIM). Finally, leaky cable TV lines or security cameras with an RF link can be an issue. The RF linked video cameras seem to be a particular problem as they seem to be freely exported/imported without regard to local RF spectrum assignments.

For more information on interference sources see the Anritsu application note "InterferenceHunting Concepts."

What to Look for in a Signal Hunting Spectrum Analyzer

Some spectrum analyzers are more capable than others when looking for interference. Handheld spectrum analyzers clearly have an edge over bench instruments, since they can easily go to where the signal is.

Long battery life is important. If you are going to be spending hours away from power sources, good battery life is critical. 12 volt adapters for use in a car help, but in the end, you are likely to end up with the instrument in your hand, walking towards the interference source.

The ability to see small signals in the presence of large signals that may be nearby in the RF spectrum is important. This is specified as dynamic range. There are several different meanings to this term, depending on whose specification sheet you are looking at. However, for our purposes, we are talking about a spectrum analyzer that can see a small signal 90 or 100 dB below a strong signal, while both signals are present.

Another key capability is a fast sweep speed with a low resolution bandwidth. This allows the spectrum analyzer to sweep fast while still seeing a lot of detail. It's hard to pin down a set of numbers here, because there are so many combinations of sweep speed and resolution bandwidth possible.

Mapping is very useful when interference hunting. A key question during this process is "Where?" This is reflected in the common questions of "Where am I?", "What direction is the signal coming from?" or "Where is the interfering signal strongest?" Mapping provides the answer to these "Where?" questions.

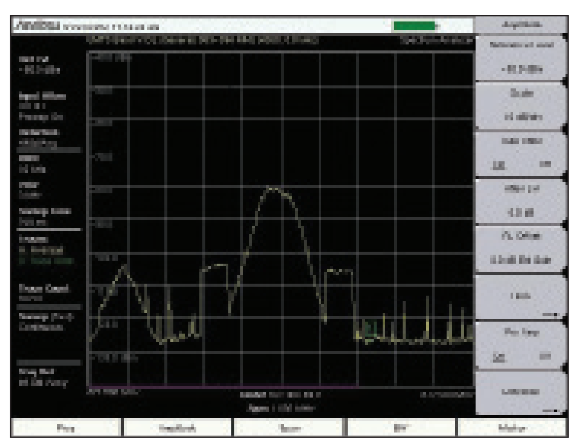


Figure 11. A fast sweep speed with good resolution

Summary

In this paper, we covered how to use the MA2700A Handheld InterferenceHunter to locate interference through direction finding. We went through the process of creating maps for the spectrum analyzer, selecting antennas and pre-filters, where to start looking for the interference, spectrum analyzer setup, taking bearings, and interpreting the results. In addition we discussed “last block” strategies for finding signals once we know we are close to the source.

The MA2700A is part of Anritsu’s Spectrum Assurance solutions.

Appendix: Signal Monitoring, Interference Hunting, and Coverage Mapping Application Notes from Anritsu Company

Monitoring

- **Spectrum Monitoring Techniques**
  This is a Techniques application note focused on using a handheld spectrum analyzer to best advantage in remote monitoring situations. It covers instrument setup and the concepts behind those setups, as well as a variety of techniques for gathering and analyzing data.
- **Applications of Remote Spectrum Monitoring**
  This application note is focused on Anritsu’s dedicated remote monitoring solutions and the software that goes with those solutions. Many of the tips and concepts from the Techniques application note apply to using these headless units.

Interference Hunting

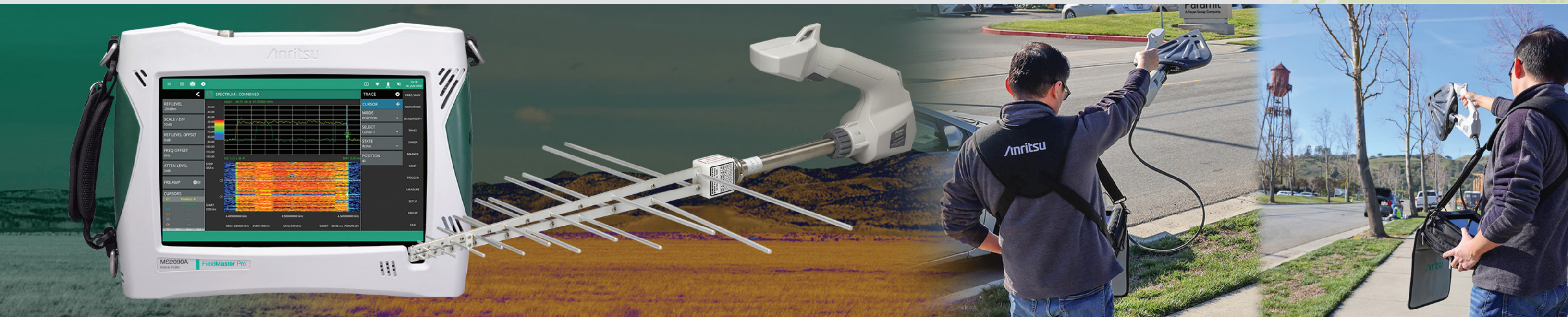
- **Interference Hunting Concepts**
  This is a concepts application note focused on Interference. It’s essential to recognize signals that are, and are not, causing interference to your radio system. This application note covers the definition, causes, and solutions to many common interference problems.
- **Mobile InterferenceHunter**
  Anritsu’s Mobile InterferenceHunter provides a reliable way to locate interfering signals by their strength, to within a block. This application note covers five use cases with detailed instructions for each case.
- **Identifying and Locating Cable TV Interference**
  This application specific primer covers how to use the Mobile InterferenceHunter to locate cable TV egress. This is a common cause of LTE uplink interference when cable TV installations are present.
- **Using Anritsu’s Handheld InterfereneHunter MA2700A**
  Anritsu’s Handheld InterferenceHunter, in combination with an Anritsu handheld spectrum analyzer, provides an easy way to locate signals by direction finding. The application note covers how to use the tool both with maps, in stand-alone mode, and in combination with the Mobile InterferenceHunter.

Coverage Mapping

- **In-Building Mapping with the Anritsu S412E LMR Master and the MA8100A Series TRX NEON Signal Mapper**
  This application note covers how to use Anritsu’s in-building geo-referenced signal mapping solution.

Anritsu Advancing beyond

Using the InterferenceHunter™ MA2700A
with Antennas above 6 GHz



Overview

The Anritsu Field Master Pro™ MS2090A used with the InterferenceHunter MA2700A is the perfect combination for locating the position of illegal transmitters or interfering signals. The InterferenceHunter MA2700A RF circuits are specified to 6 GHz and so the RF signal path through the InterferenceHunter MA2700A restricts the use of higher frequency antennas above 6 GHz. This application flyer shows how to use the electronic compass (eCompass) and GPS features of the InterferenceHunter MA2700A with higher frequency antennas if an additional splitter is used.

Configuration

Connecting a 6 dB splitter to the RF port of the InterferenceHunter MA2700A and then an RF cable from the splitter port to the RF port of the Field Master Pro MS2090A provides an uninterrupted RF signal path from the antenna to the analyzer input. The USB cable from the InterferenceHunter MA2700A is still connected to a USB port on the Field Master Pro MS2090A. This provides eCompass and GPS data to the analyzer. The RF cable from the InterferenceHunter MA2700A is not fully utilized in this configuration. As long as the antenna is connected in line with the splitter, the direction the antenna is pointing is communicated to the analyzer over the USB interface. A barrel connector may also be required depending on the connector gender of the antenna.

Operation

When the components and accessories are connected as show in the diagram below, the operation of the interference hunt and user display of the expected transmitter location is the same as when hunting signals below 6 GHz. See this video for a practical demonstration in the field: https://www.youtube.com/watch?v=wnaiRwc_n5Q

Required Items

The following list includes the necessary instrument options and accessories to complete interference hunting with directional antennas above 6 GHz.

- Field Master Pro MS2090A
  - Must include Option 24 Interference Finder
- MA2700A Handheld InterferenceHunter
- 1091-28-R Power Splitter DC to 18 GHz, N(f) Connectors
- 34NN50A N(m) to N(m) Connectors
- 15NN50-1.0B Test Port Extension Cable, 1 Meter
- 2000-2107-R: 20 MHz to 8.5 GHz Log Periodic Antenna
- 2000-1748-R: 1 GHz to 18 GHz Log Periodic Antenna (only required for measurements above 8.5 GHz)