Review of ToxicRanch's ORiNOCO PC card modified with an RP-SMA antenna connector.

Section 1: Introduction

The ORiNOCO Classic wireless card is very commonly used because of its compatibility with both Linux and Windows operating systems, intrusion detection software, wardriving software, and wireless network security analysis software. In addition, the card gives you the ability to attach an external antenna, either for radio direction finding, to increase range, or place an antenna in a remote location. The newer Proxim versions, which do not use the Hermes chipset, are not as widely supported.

The stock MC connectors found on ORiNOCO and many other brands of cards are very fragile and wear out quickly. Both the connector on the card and pigtail become loose after bending, twisting, or just being used. When this happens, the pins in the pigtail can get bent or break. A loose connector will only receive intermittent signal, but when they break, the pin usually gets stuck inside of the card, which not only means you can't connect your external antenna any more, but it can even cause the internal antenna to be disabled leaving you with wireless doorstop. In addition, the cable used in the pigtails used to adapt the wireless card to the antenna is made from high loss cable that was not designed to have any stress placed on it.

There are two different companies selling modified ORiNOCO Classic card kits that had been fitted with a RP-SMA (Reverse Polarity SMA) connector:

http://www.toxicranch.com
http://www.etherdesigns.com

Jim Chastian from ToxicRanch makes the modified cards for both companies. Alan Rothberg from EtherDesigns buys the modified cards in bulk from Jim and resells them in kits. Both ToxicRanch and EtherDesigns offer a wide variety of other products.

EtherDesigns sells directional cAntennas, magnetic mount antennas, omni-directional antennas, mounting hardware, antenna stands, lightning protectors, and an all in one wardriving PDA solution, which includes everything, even the PDA. They also sell kits which include choices of additional antennas, software, or just the modified card and rubber 2.5dBi antenna.

ToxicRanch sells the Modified ORiNOCO cards by themselves or in kits with software and your choice of antennas ranging from 2.5 dBi omni directional antennas, to 24 db directional antennas, and cables. ToxicRanch is also makes custom cables and offers Wi-Fi consulting services, and sells high-end wireless access points. In addition, ToxicRanch is also willing to install a different connector on most other wireless devices too.

When you order the kits from ToxicRanch, they have a very good guarantee. If you are not completely satisfied within 7 days, he will refund you your money. In addition, he has an excellent record on eBay and tests each of the cards before he releases them.

The hardware used in the testing was provided from both of these companies. ToxicRanch was kind enough to send the wardriving kit for evaluation plus an unmodified card for comparison, and Alan from EtherDesigns provided a Mobile Mark 5 dBi mag mount omni and the RP-SMA to N pigtail for testing.

Section 2: The Modified ORiNOCO Kit

What I received in the ORiNOCO Classic Gold Wardriving Kit:
Driver CD- Includes ORiNOCO and YDI ORiNOCO drivers and IDS demos
Knoppix-STD CD- A bootable version of Debian, which is already configured for Kismet
15" RP-SMA extension cable
Modified Enterasys card (manufactured by ORiNOCO)
2.5 dBi adjustable angle rubber antenna
1 small strip of adhesive Velcro
Hard copy of the "Getting Started" document from the drivers CD (not pictured)

Picture of kit contents:

The first thing I noticed was that the cards looked like they were brand new. They were in excellent, new condition, not scratched or worn out. On the protective bubble wrap for the cards was a note clearly stating that the cards could be used with 128-bit WEP, even though card originally could not support it. Jim did an excellent job of labeling the CDs. They were done with a printed label with interesting graphics, unlike the jumbo magic marker like the rest of my CDs are labeled in. The size of the antenna was very large. It is almost the size of the card.

Antenna Length:

If you do not already know this, ORiNOCO sold the ORiNOCO classic with different labeling to more than 20 different companies, however they are all the same hardware, however they each have their own proprietary client manager. Many of these companies never even updated the drivers, firmware, or client managers to the latest version.

When I plugged the modified Enterasys card it actually showed up in windows as the ORiNOCO card, not as an Enterasys card. This means that you can use the real ORiNOCO drivers and client manager. With the firmware modification from ToxicRanch, he also enabled the 128-bit WEP.
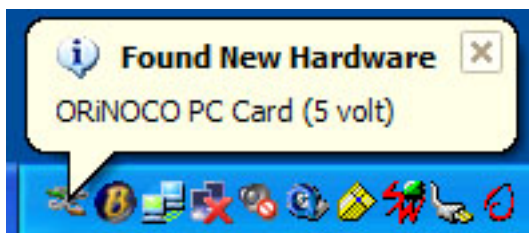
The photos of the two pigtails do not do them justice; you must really see them in real life to tell how much stronger the cable with the RP-SMA connectors is. The 15" extension cable is about twice as thick, which gives it about 4 times the volume. Because of this, it is a little less flexible,

but you can still easily make a 1" diameter 180 degree turn.   The cable is very solid and tough. It makes difficult to pinch or bend even if you would happen to close it in a window.

 The RP-SMA connector was much stronger than the MC connector, so you don't have to worry about breaking the connector any more. The connector is so strong, that Jim filled the card with epoxy to keep you from ripping the circuit board apart. You can easily remove the card from the PCMCIA slot by pulling on the pigtail without breaking it (Even though Jim does not recommend doing this).

The modification to the card looks very clean from the top. If you had never seen an ORiNOCO card, you would not notice it wasn't stock.   It is the same style of connector you will see on many wireless access points that have external antennas.

Looking at the bottom of the card, you can see that the connector is a little too large for what the card was designed for, but the only way you really notice it is if you are looking at the card at an angle. You do not notice this from looking at the side or the top.

On the back of the card, the "J" indicates that the card had been tested and worked properly after re-flashing the firmware and the antenna modification. Each card is individually tested.
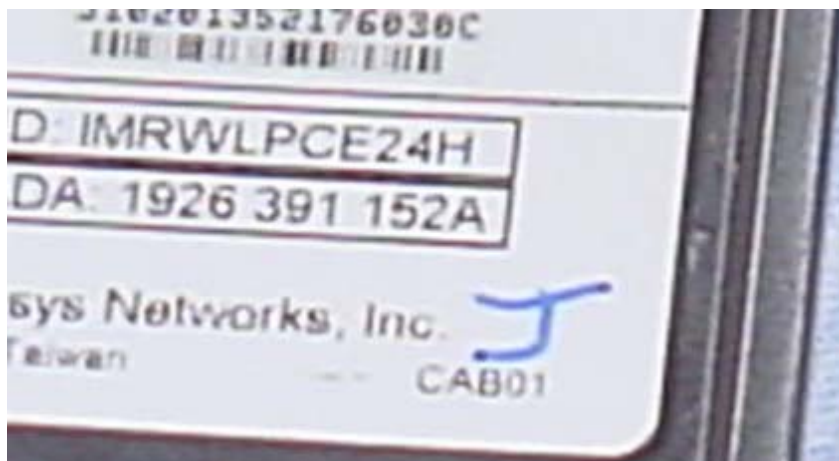
It didn't take long to figure out what the extension cable and Velcro could be used for. If you are using a laptop, you have a huge screen that has a drastic effect on the signal. The cable is long enough to get the antenna above the display on most laptops. It also gets the antenna off the surface that the laptop is sitting on. In addition, it may be long enough to get signal around some other obstructions like a computer case on the desk.

Section 3: Testing

I placed a D-link DI-624 broadcasting full power on the roof of the truck and placed a non-metal folding card table 150 yards away in an open field. The antennas were placed in the middle of the table for testing. The signal strength reporting was done with Network Stumbler 0.4.0 available from http://www.netstumbler.com. Note: If you are not familiar with dBm, signal strength closer to 0 is better than a more negative value. In addition, the dB scale is not linear, it is exponential. This means that the higher you are up on the scale, the larger the change in signal strength. The items that I tested are:

- Stock Enterasys OSIBD-AA with ToxicRanch's modified firmware
- Enterasys OSIBD-AA with the RP-SMA connector and 2.5 dBi rubber omni
- Stock Enterasys, Mobile Mark IMAG5-2400 omni, and BuffaloTech WLE-LNC pigtail.
- Modified Enterasys, Mobile Mark IMAG5-2400 omni, RP-SMA pigtail
- MN-510 (for comparison)

First I tested the stock ORiNOCO. I was expecting the results to be worse than the modified card because the polarization of the antenna is wrong and the internal antenna is very close to the rest of the laptop. The internal antenna is also blocked by its own metal case. The stock Enterasys card had an average –74 dBm signal strength and –95 noise.

(See Test Results)

Because the polarization of the internal antenna of the stock Enterasys card is wrong and the screen makes a massive RF shield, I turned the laptop up on its side with the top of the card facing the DI-624 and the screen of the laptop closed. A signal strength of –70 dBm and an average noise of –95 dBm was achieved.

(See Test Results)

The next test was with the modified Enterasys card with the 2.5 dB rubber duck antenna. The card averaged –62 dBm with –97 dBm noise. This is a huge improvement over the stock ORiNOCO card.

(See Test Results)

Just to be fair, I turned the laptop up on its side and closed the screen just as I did with the stock ORiNOCO. There was very little change in performance, if anything it was worse than lying down because I had to hold the laptop to keep it from tipping over.

(See Test Results)

The MN-510 is a USB wireless NIC that has a short omni directional antenna on it. I thought it would perform similar to the modified ORiNOCO card, however the noise was much higher and the gain was considerably less compared to the modified Orinoco card. The MN-510 averaged –65 dBm signal and –92 noise.

(See Test Results)

The next tests are to compare the amount of loss in the MC connectors and pigtails compared to LMR cable and RP-SMA connectors by using the same model antenna.

The first test used the stock Enterasys, Buffalo Tech pigtail, and the Mobile Mark IMAG5. The card averaged –64 dBm with a –96 dBm noise.

(See Test Results)

The next test used the modified Enterasys and the Mobile Mark IMAG5 and RP-SMA pigtail provided by Alan from EtherDesigns. The modified card averaged a –61 dBm signal and –97 dBm Noise. The difference between the two different cables is enormous, even though the pigtails are only 1 foot long! In addition, the noise was lower.
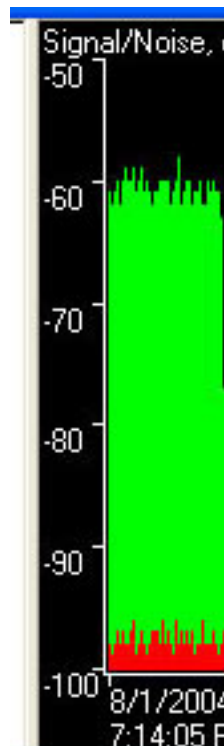
(See Test Results)

Test Results:

Stock   Stock Sideways   Modified   Modified Sideways   MN-510
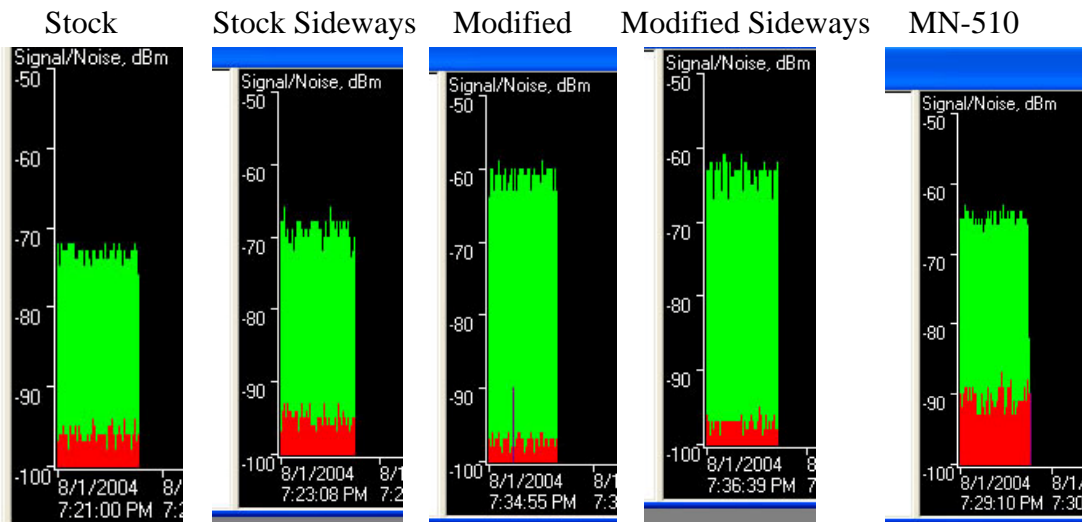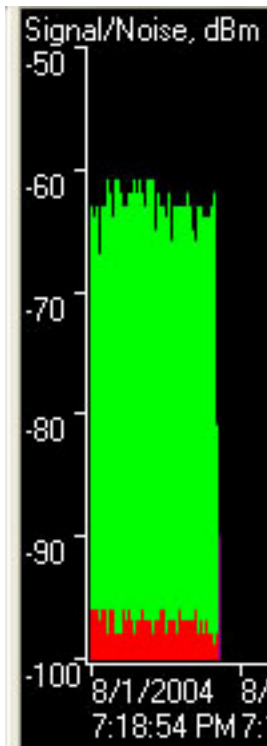
Stock with Mobile Mark   Modified with Mobile Mark

Section 4: Conclusion

I was very satisfied with the modified wardriving kit. It has survived over a year in a mobile application, where I had broken 3 pigtails. In addition, I was able to now use my laptop at work, in the parking lot, where I previously had to be inside of the building with the stock Orinoco card.

I found the durability of the connectors to be cost saving. If I would have bought the modified ORiNOCO card first, I would have paid for it in the modified card and pigtail from the cost of replacing the pigtails I broke in 1 year.

In addition, I am not worried about damaging the card or cables from switching between the 5dBi Mobile Mark antenna, directional antenna, and the rubber antenna.

The connectors and cable are so durable, that they survived a laptop drop that I grabbed the coaxial cable while the laptop was falling. The card was ripped out of the PCMCIA slot and the laptop hit the ground, but the card and cable were just fine.

I had a very difficult time thinking of things wrong with the modified ORiNOCO kit.

For the price that that the modified ORiNOCO classic kit sells for, you could buy several of the stock ones, however, you must consider that modifying the cards does take a lot of skill and time. You risk damaging the card opening the case and furthermore risk

damaging the thin circuit board inside of it by installing a connector that takes a lot of heat to solder.   Jim from ToxicRanch does quality work, and will not give you a card that has been damaged during the process. You also have to consider that if your pigtail or card breaks when you need it, you are out of luck. The RP-SMA connector and pigtails are going to be a lot more reliable and have better performance. If you need an ORiNOCO classic card and are planning to use an external antenna on the road or remove the pigtail from the card frequently, I would definitely recommend buying the RP-SMA modified card.

Pros:
- Connectors and pigtails are a lot more durable. You don't have to worry about breaking them or keeping spares. In addition, you don't lose signal if you are moving the cable as you would with the stock ORiNOCO connectors.
- The MC connectors and the thin pigtails that go with them have a lot more loss than the RP-SMA connectors and LMR cable.
- The 2.5 dBi antenna greatly improves the range of the card.
- There is no internal antenna to drive you nuts when you are using a directional antenna to locate an AP using direction finding.
- Jim from ToxicRanch tests the cards before he sells them and stands behind them. You are guaranteed to get a working ORiNOCO card.

Cons:
- The cost of the card is higher.
- The external antenna does stick out considerably, but who cares… Everyone who noticed thought it was great!