

WARNING: UNTILL SHIT HITS THE FAN, THE FCC REQUIRES THAT YOU OWN A HAM RADIO LICENSE (Technician Class) BEFORE OPERATING A HAM BAND RADIO SUCH AS THE BAOFENG UV-5RA. THE FCC HATES THIS RADIO, BECAUSE IT DOESNT MEET THEIR "GOOD GOY TECH STANDARD". SO EVEN IF YOU HAVE A TECHNITION'S LICENSE, IT'S STILL ILLEGAL TO USE. IF YOU GET YOUR ASS HANDED TO YOU BY THE FCC BECAUSE YOU WERE CARELESS AND STARTED BROADCASTING FART NOISES THROUGH YOUR LOCAL REPEATERS, THAT'S ON YOU. JUST REMEMBER, EVERY TIME YOU KEY THE MIC WITHOUT A LICENSE, YOU'RE PLAYING RUSSIAN ROULET WITH A SWAT TEAM AND A 5 FIGURE FINE!!! ALSO, THIS GUIDE IS ONLY TO HELP SPARK YOUR INTEREST IN RADIO TECH. MUCH OF WHAT IS SAID HERE IS THE OPINION OF THE WRITER, AND SHOULD BE TREATED AS SUCH. I EXPECT YOU ALL TO DO YOUR OWN FUCKING RESEARCH AND TO GET LICENED. BECAUSE SHTF OR NOT, HAM RADIO IS JUST FUCKING FUN. IF DRAGON DILDO SUCKING FURRIES CAN DO IT, SO CAN YOU!!!

## ***The Strelok's Beginner's Guide to Ham Radio and Antenna Theory.***

Okay Strelok. You want to learn how to shoot skip on 10 meters on a sunny day to get the latest QSOs? Well too bad! Here Bomb! Fuck you! Cause Shit just hit the fan and you're out innawoods with a shitty Baofeng and a slavshit SKS!!! Better make the best of what you've got! Hope you memorized your phonetic alphabet and Morse Code... You'll need them...

### **UNDERSTANDING YOUR RADIO**

Radios don't run on magic you moron! They rely on an invisible force called, THE ELECTROMAGNETIC SPECTRUM! Or radio for short. Radio waves are a form of radiation. Relax silly, it's not "Hiroshima" radiation. Electromagnetic Radiation is a non-ionizing radiation that doesn't fuck with your DNA. So no grandpa, cell phones don't give you cancer! But if you're close enough to an exposed antenna that has a 1.5 kilowatt transmitter going, you're going to get real toasty real fast. Remember, it's the same shit you warm your breakfast burritos with every morning. So be careful regardless.

### **HOW RADIO WAVES TRAVEL**

Well, chances are you bought yourself a 30 dollar ching chong radio called a Baofeng UV-5R/A. This is a Frequency Modulated (FM), VHF/UHF (Very High Frequency/Ultra High Frequency), dual band, Hand Transceiver radio. VHF and UHF are very good for basic "Line of sight" field communications. Line of

sight means exactly that. These radios operate best when the users are within eye shot of each other, thus "Line Of Sight". HOWEVER!! There are ways of extending the range of these radios by way of better propagation and MORE radios.

## **REPEATERS**

Repeaters are essentially two radios. One that receives and one that transmits. They are connected together and once the receiver picks up your signal, the transmitter will re-transmit (or Repeat) your signal on a different frequency. Most if not all repeaters are usually set up on mountain tops, overlooking a town or city so that anyone within range of the repeater may communicate freely.

## **METHODS OF PROPOGATION**

Another way of getting a signal out is by either;

1. Climbing a damn tree or mountain to get better Line of Sight Propagation.
2. Finding a clearing in the dense woods or city so that the signal carries farther. (Usually this isn't a problem as VHF/UHF is known for cutting through dense objects and foliage better than High Frequency signals.)
3. Moving your antenna to a horizontal or vertical position. (This is known as Changing the Polarization)
4. Pray to god that the Ionosphere is giving off Sporadic E. (See Below)
5. Making a better antenna. (more on this later)
6. Increasing Radio Output Power

## THE IONOSPHERE AND YOU

Did you pay attention in earth science while you were in 5th grade? I hope so. Because there's this thing that surrounds the earth in a nice warm glow that makes radio waves horny as fuck! It's called the ionosphere. Think of it as a giant trampoline that bounces radio signals around the earth. Now, VHF/UHF signals are special in that they can pass through the ionosphere and into outer space. In fact, if you have a Technician's license, you can talk to the crew aboard the International Space Station. YOU HEARD RIGHT STRELOK! YOU CAN TALK TO ASTRONAUGHTS!!

Where was I...?

Oh yeah, so Sporadic E! This is a phenomena that happens every so often to the ionosphere. In simple terms, it gets a huge lady boner for VHF signals during this time. She starts to squirt sporadic E all over the place, and you'll be able to get signals WAY beyond Line of Sight. How this works is that when Sporadic E happens, the ionosphere refracts the radio waves coming off your radio and scatters it like a beam of light through a prism to make a gay rainbow of jolly communication. But it only works a short time, as the layer likes to move around. Kind of like a cloud on a windy day.

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## ANTENNAS: THE EYES AND MOUTH OF YOUR TRANSCEIVER!

One thing about your radio is that in order for this fucker to work, it has to have a decent way to "see" the signals you want it to. Like your eyes, the antenna is designed to "see" a specific part of the Electromagnetic spectrum. Human Eyes are essentially antennas that can see the 390 to 700 Nano Meter band. (Yeah that's right, visible light IS electromagnetic radiation! HUMANS ARE RADIOS! Did I just blow your fucking mind or what?) Anyway, the antenna is a very important part of your radio.

Now I know what you're thinking. "But Strelok, I just clipped a mile long piece of wire I found in my garage to my car radio plug and that worked out great!" Well shut your diarrhea spewing sewer, and listen here you little shit... You clip any length of wire to a radio and there's no doubt that it's going to "work". But the big question is, is it going to work PROPERLY?! You might be receiving well, but once you key the mic, and you get no reply from your comrades, because they couldn't make out heads or tails of what the hell you just said. They're going to be the ones who find your brutally raped and shot up corpse in a wheat field because you had the bright idea of putting a shitty antenna on your radio, with no knowledge of how antennas work.

So what was the problem? His antenna wasn't tuned to the right frequency! Now don't get confused when I say tuned, I don't mean the radio, I mean the antenna. The antenna of your radio has to match the wavelength of the frequency you're using to talk to your fellow comrades. In the case of your hand held transceiver, the antenna it came with is what we hams call a, "Rubber Duck". It's neither the best, nor the worst kind of antenna to use. But if you want better performance out of your hand held, then you better invest in a nice aftermarket 1/4 wave or full wave VHF/UHF antenna.

You see, when you have an antenna that's out of tune, your transmitting effectiveness will suffer horribly, unless you either cut or lengthen your antenna to the proper wavelength.

Antennas need to be AT LEAST a 1/8 wavelength in size to be moderately effective in the field. Bonus points if you can make a full wavelength antenna. In fact, here is a SUPER EASY mathematical formula that YOU can use to find the proper length of wire IN FEET, for the frequency that you and your buddies will be operating on, so that you can build your own antennas! Keep in mind, an antenna can be so much more than just a length of copper wire. (More on this later.)

**Full wave = 936 / frequency you want to use**

**BURN THIS FUCKER IN YOUR HEAD!!! IT WILL SAVE YOUR LIFE ONE DAY!**

I will also include the formulas for making shorter antennas. They are as follows:

1/2 wave = 468 / frequency

1/4 wave = 234 / frequency

1/8 wave = 117 / frequency

Now, so far I've only shared with you information on building a simple a VERTICAL antenna. This is as simple as an antenna can get. But did you know that there are different kinds of antennas that can do different kinds of jobs? It's true!

### ***DIPOLE***

The dipole antenna is quite simply a "balanced" antenna that is probably the most easy to make antenna right next to the Vertical Antenna. Except this one is usually hung up high in the trees, horizontally polarized, so that it can pick up whatever it's tuned to pick up. It's uglier than your mom's cottage cheese ass, but its simplicity makes it one of a kind for quick deployment.

### ***YAGI***

If you've lived anywhere near a house with a TV, you already know what a Yagi antenna looks like. A Yagi antenna is simply a dipole with reflectors mounted in line on a stick. It was invented by a Japanese man by the name of Yagi Uda, who said one day that his dipole didn't have enough shit on it, so he put a bunch of metal rods in ascending order from largest to smallest on the sides of this dipole (because autism) and discovered that by doing that, he just increased the gain of his antenna! You see, the Yagi antenna is known for being kind of the "Sniper Scope" of radio antennas. A "High Gain antenna" means that it both receives and transmits in a narrow beam that can be directed toward where ever you want. In fact, this is what you want to use if you ever want to talk to Cosmonaut Ivan on the ISS. It's also useful for finding faint signals in a specific direction.

### ***J-POLE***

You like J-Pop right? Well just you wait until you've heard J-Pole! (Shut up, I thought it was funny...) Whatever, a J-Pole is just a Dipole that's been vertically polarized. Meaning that the long end is pointed up and so is the short end. So it kind of looks like the letter "J". Simple and effective.

### ***GROUND PLANE***

Okay, this is really just a normal vertical antenna that has 4 or so reflectors connected to the ground on the radio. It's a little more involved than a J-Pole, but it's worth it.

### ***NVIS***

I'll get to this antenna when I get into HF propagation and the like. Trust me though; it's a fun antenna to build!

Okay that should do it for a basic introduction to antenna theory. I expect you to google around and do more research on these antennas, as each antenna will suit a different need. Now that that's over with, we can finally get into some way more cooler stuff! That's right! I'm talking...

### **COAX CABLE: NOT JUST THAT UNPLEASANT TV WIRE ANYMORE**

Of course, your nice, new, homemade, antenna would be absolutely useless without the proper coax to go with it! Coax is a special kind of cable that has a copper core, surrounded by a foam insulator, and has a metallic braid going the whole length around the cable. I will now explain the basic function of coax and explain the different types, as not all coax is made the same!

Look at the white letters on the rubber jacket of the cable. You will see the letters "RG-", followed by an identifying number and another number followed by an Omega symbol. The RG rating is an old military rating that hasn't left the field since the 40's. The number with the horseshoe (Omega) is the impedance (or Ohms). Typically, the lower the impedance the better for radio transmissions, 50 ohms is the ideal number in this case.

Here are the three most common used coax you can find and use with your radio.

#### ***RG-6 75 Ohm***

This is your typical television coax. It's possible for use in ham radio, but the impedance is too high. That means most of the radio energy is going to be converted into heat through the wire and will be wasted. Use only if nothing else is available.

#### ***RG-58 50 Ohm***

This is what you should be using for your radio. So use it faggot!

#### ***RG-8 50 Ohm***

This is the fancy shit! It has less loss per foot, making it best suited for receiving and transmitting with higher quality base station radio.

## 99 RED BALUNs

If you want to use one of those balanced antennas such as the dipole, you'll need something that will convert the "balanced signal" from the antenna to an "unbalanced signal" for use with your coax\*. You see, a balanced line has two signals going where ground is not needed. Whereas with a coax cable; the signals going in and out are unbalanced and need a ground connected to the braid. While it is possible to just run the core of your coax in one direction and the braid of your coax in another and call it a dipole, you certainly can! But to get the most out of your antenna, you will need a balun to help convert the signal so it's easier for the radio to convert the signal, so you won't burn your hand or lips when you're using your radio.

Unfortunately, baluns are too complicated for me to explain in simple terms, so I will leave you with a link to study up on.

<http://www.hamuniverse.com/k4dpkfirsthfdipole.html>

\*Note: This is totally optional, as this is mainly for HF radios. But they're nice to have for VHF/UHF as well.

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## OPERATING MODES: THE MANY LAUNGUAGES OF THE HAM

Okay. So after talking about your hand set and your antenna, now we can talk about how your radio can communicate with MORE than just your voice. But for the sake of starting simple, lets talk about Voice Modes!

### ***FM***

Frequency modulation. As you may or may not know, when you key the mic on your radio, you start transmitting a "Carrier Wave". Simply put, the carrier wave does exactly what the name implies. It carries your voice on an electromagnetic wave. With Frequency Modulation, your voice is converted into a varying frequency inside the wave when transmitted out by your transceiver.

## **AM**

AM is much simpler compared to FM. AM is Amplitude Modulation. In this mode, you're literally imprinting your voice onto the carrier wave. Not much else to say really.

## **SIDEBAND**

Okay, now we're going to have some fun! Sideband is like AM's dirty little secret. Yeah you thought AM was a plain and simple girl, well buy her a drink and watch her go wild! Because I would like you to meet AM's two sexy sisters; LSB and USB (Lower Side Band and Upper Side Band).

Think of them as a group of sub frequencies that are underneath the primary frequency you're tuned to and are almost entirely their own thing. A neat thing about sideband is that they don't use nearly as much bandwidth as AM or FM, so not only are you going to have more room for communication, but you can also transmit farther without overdoing the power of your radio. HOWEVER! If you use a sideband frequency and some jackass transmits on AM near your sideband Frequency, you're going to get jammed up worse than an M16 in Vietnam.

Okay, that just about does it for voice modes. Now on to the Computer stuff!

## **DIGITAL MODES: HEY KID, I'M A COMPUTER! STOP ALL THE DOWNLOADING!!!**

Okay I'm only going to say this once! So listen closely...

Download a piece of software called; "FLDIGI".

It has almost everything you need for operating digital "Packet" radio.

## **CW**



Or Continuous Wave, is a mode for transmitting morse code. It's known for having the absolute least amount of bandwidth for transmission.

### ***RTTY***

Or Radio Teletype. Yes, THAT Teletype. Yes, from the 60's show Dragnet. No, it's not obsolete. Yes, it's still useful even today.

### ***PSK31***

Or Phase Shift Keying 31bps. Think of it as a remote terminal for radios, except you can communicate with other people with it.

### ***HELLSHREIBER***

One of my favorites, because it reminds me of an Enigma machine for some reason. Think of it as RTTY, but with ticker tape instead.

### ***AX.25***

Okay, remember how you would sit in your living room or basement, and stare into your TV screen with your Atari ST or your Commodore Amiga, and just tack away at your keyboard, hooked into your parents phone line with an 11 baud modem hanging off the side of your PC, plugged into Fidonet, and logging into the local BBS servers, playing on DOORS, and reading old 2600 magazine articles the SysOp sends you? That's the feeling I get every time I search for AX.25 TNCs.

### ***APRS***

Okay, now this is where things get particularly OPERATOR! APRS or Automatic Packet Reporting System is a TACTICAL real time information exchange system, which was developed by a Navy Academy Engineer that wanted to share his glorious GPS reporting system with the world! Long story short, it's a mode where your position on a GPS is transmitted to other APRS ready radios, and everyone can keep an eye on each other in real time. Pretty damn cool right?