Commo
by Sparks31

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Disclaimer

- Certain topics discussed in this book may be illegal in your jurisdiction. Do your research and don't break the law.

- Don't be stupid. Just because it may be legal, doesn't mean it's a smart thing to do.

- Stay away from stupid people, doing stupid things, in stupid places, at stupid times. Your quality of life will be greatly enhanced by doing so.

- Don't blame me if you fuck up on your own accord and something bad happens. I warned you.

Freedom begins between the ears

Edward Abbey
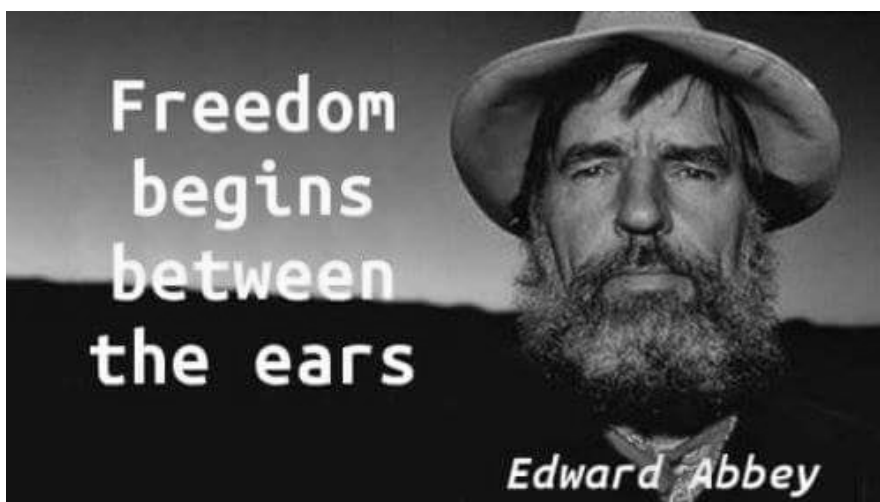
Introduction

You are being controlled and manipulated, or at least there are those among TPTB[1] who are attempting to do so. Your ability to freely communicate among family, friends, and like-minded individuals is also being attacked. Among young people, real-world physical interaction has been subjugated by an army of digital Internet consumption devices locking them into the virtual ghetto of a walled garden known as the World Wide Web. The Matrix is here and now, and many people you know are stuck in it. **I'm going to teach you how to fix that.**

If you are the type of person who does not believe in the mainstream establishment party line, believes in personal freedom, and wishes to effect their own destiny, then you shouldn't be waiting for some specious "event" to act. You likely have already been marked and cataloged by the establishment in a number of different ways, and waiting for the inevitable something to happen is asking for failure.

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1 The Powers That Be

Imagine, for a moment, that right now the grid goes down, either accidentally or by design. Would you be able to:

- Communicate with family members to determine their safety/well-being, and have them initiate contingency plans?

- Alert and mobilize the members of your group?

- Collect intelligence information to find out local conditions?

- Collect intelligence information to find out the geographical extent of a disaster or similar event/situation?

Now lets go to the actual present, our status-quo dystopian reality. Are you able to:

- Communicate with family and group members in a manner that minimizes your footprint?

- Collect intelligence information to find out local, regional, national, and worldwide conditions/events via alternative means?

- Minimize or eliminate your surveillance footprint when necessary for privacy reasons?

Communications skills in a down-grid situation, meaning both now and in an uncertain future, is an essential survival skill for anyone interested in maintaining control over their own destiny. You don't need to be an electronics expert, although your group or tribe will certainly need one. You do need to have a certain level of knowledge, dependent on your aptitude and general skill-set.

These days with the establishment mass media being controlled by a select handful of TPTB, and being used as a

psychological weapon against you, it doesn't matter who you are. You absolutely need to set up alternative means of collecting intelligence information. "Patriot" and "prepper" sites on the World Wide Web of the Internet don't count. Some of the worst information comes from people who profess to be on "our side."

These is one particular pundit, who claimes to have "found God" and "went Galt" (what an oxymoron) after shutting down her financial business. She was found guilty of fraud during an arbitration hearing before her alleged conversion. Another pundit, who claims to be into "info war", had rented a string of advertising billboards along an Interstate highway down south. Billboards that are owned by the same establishment mass media machine he alludes is controlled by a secret society bent on destroying the country.

Those of you who are fans of FOX News, do you honestly think Rupert Murdoch and his employee Megyn "There's a lot of brain damage that comes with this job." Kelly are on your side? Do you really want to trust those people? At the very least you want to vet their claims by using another source of information. Even if the information they provided was vetted as accurate and reliable, how does it apply to your specific area of responsibility/interest? Intelligence information of a nationwide and worldwide focus is all fine and dandy, but it's more important to concentrate on your local and regional areas. I'm going to show you how to do it.

"Freedom begins between the ears."
-Edward Abbey
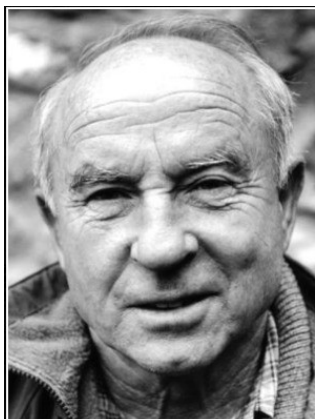
The more you know, the less you need.

— *Yvon Chouinard* —

AZ QUOTES

The Epiphany

I met Yvon Chouinard once, although I didn't know who he was when I met him. I suppose that's the way it was supposed to happen. After the event, I later researched the gentleman. Those of you familiar with the name probably know that he is the founder of Patagonia clothing, and Black Diamond Equipment. I discovered that he designed and hammered out his own climbing aids in a blacksmith shop, and developed removable implements that replaced pitons, which was the birth of modern rock climbing technique. I also learned that he is a minimalist fly-fishing aficionado. As I continued to research Mr. Chouinard, I came upon this quote attributed to him: *"The more you know, the less you need."* We all have moments of epiphany. Finding that quote was one of mine.

Shortly after this happened, I was surfing Amateur Radio sites, and came across N2CQR - Bill Meara's blog Soldersmoke[2]. Bill does a podcast of the same name, and is an accomplished homebrew ham. After reading the blog and listening to a few podcasts, I ordered his book. That was when I first learned about the Five Meter Liberation Army story series. More research followed.

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2 http://www.soldersmoke.blogspot.com/

I don't care if you're a survivalist, prepper, 3per, or whatever. I don't care if you're into grid-down, down-grid, off-grid, or wherever-grid. Knowledge and skill trump toys, and that's what this updated edition is about.

Victory Against Ignorance

Victory Against Ignorance

Lessons From the Five Meter Liberation Army (FMLA)

Frank C. Jones, W6AJF/SK
Photo from 73 Magazine - May, 1966

I first came across mention of the FMLA in Bill Meara's book **Soldersmoke: Global Adventures in Wireless Electronics**[3]. The FMLA is a series of online stories written by the late Michael Hopkins, AB5L/SK. It is about the reincarnation of Amateur Radio homebrew and VHF pioneer Frank C. Jones, W6AJF/SK, and his efforts to take back the 5 Meter Band (56-60 MC) that was taken away from the Amateur Radio Service right after World War II. The original site for the story is no longer in existence, but was crawled by archive.org and can be found at http://web.archive.org/web/20161112212036/http://www.sunflower.com/~brainbol/frank/. One of my readers, "Chainsaw" had also converted the series to PDF and made it available for download at https://chainsawprivacy.files.wordpress.com/2018/01/frank_and_the_fmla.pdf. If you have not yet read it, I recommend you go visit the site before reading the rest of this article.

Now taken into perspective from the time the story was written, TV broadcast was switching from analog NTSC

3http://www.soldersmoke.blogspot.com/

to digital ATSC format, and many of the TV stations on the lower VHF TV Channels were moving up to UHF. It was expected at the time that the lower VHF TV channels 2-6 (54-88 MC) were going to be abandoned and reallocated. TV Channel 2 (54-60 MC) was of particular interest to amateur radio operators because of its next door neighbor status to the Six Meter Amateur Band (50-54 MC) and previous allocation as the 5 Meter Amateur Band.

Now most, but not all, Channel 2 TV stations did move up in frequency when they did the ATSC switch, and it was discovered that the surplus Channel 2 transmitting gear would work on Six Meters with minor to no modifications. There still, however, remain a few TV stations, mostly in rural areas, running on Channel 2 with ATSC. A search on the FCC ULS site can tell you which stations are on Channel 2, and where they are located.

This is useful knowledge because despite being a digital signal, TV stations using ATSC transmit a pilot carrier signal at 310 KC above the lower edge of the Channel allocation. In Channel 2's case, the frequency would be 54.31 MC. If there is no local Channel 2 in your area, and you can hear a signal on 54.31 MC, then you know that Six Meters is open to somewhere. You would do this with a VHF communications receiver or transceiver on CW or SSB mode tuned just below 54.31 MC so you can hear a tone. You could also tune one of the cheap RTL-SDRs to the frequency and look for a signal on the spectrum/waterfall display. If you use a directional antenna,

you would also be able to determine where the opening is from, or you could do a sector search of the 50.06-50.08 MC 6m beacon sub-band, note which beacons are coming in, and know the direction and distance of the band opening.

So what is the essence of the FMLA story? First and foremost it is a story about amateur radio as self-reliance. The protagonist builds his own radios from junk. It is also a good reference list of old-school VHF homebrew information. If you read the story you will not only be entertained, but if you check out the references you'll get a good education on old-school VHF homebrew. You know, the stuff I advocate. As a service to my readers, I went through the FMLA chapters, pulled all the references, and have listed them there.

Chapter 3:
http://archive.org/details/73-magazine-1974-03 – There is an error in chapter 3, and the Comsat 19 6 meter conversion article is actually in the March, 1974 issue of **73**, and not March, 1973. The latter issue, however, does have a nice 6/2 meter amplifier project.

73 Magazine did a lot of CB conversion articles, and especially for the 10 meter band. A search of the magazine index for "10 to" will find you some good stuff.

Chapter 4:
http://archive.org/details/73-magazine-1974-02 – A historical look-back at early ARRL gayfishery.

Chapter 5:
http://archive.org/details/73-magazine-1980-06 – An article, "CB to 6", on converting a 49 MC HT to 6 meters.

Chapter 6:
http://archive.org/details/73-magazine-1966-06

http://archive.org/details/73-magazine-1970-07
Articles on the SCR-522.

Chapter 9:
https://archive.org/details/VhfHandbook - This is a good one.

Chapter 27:
QST - July, 1959 - High-Power Triode Amplifiers for 50 Mc.,
by Bob Richardson, W4UCH
QST – December, 1997 - An Ultra-Simple VHF Receiver for
6 Meters, by Charles Kitchin, N1TEV. Not the November
issue as indicated in the story.

Chapter 28:
http://n4trb.com/AmateurRadio/GE_HamNews/ge_ham_new
s.htm – GE Ham News has a lot of good information.

Chapter 32:
QST – July-September, 1961 - Title: Complete Two-Band
Station for the VHF Beginner, (3 part article), by Edward
Tilton, W1HDQ/SK

Chapter 33:
http://w5jgv.com/downloads/5-Meter%20Radiotelephony
%20by%20Frank%20Jones.pdf
https://archive.org/details/VhfForTheRadioAmateur
https://archive.org/details/FrankC.JonesUltra-high-
frequencyHandbook-1937

Chapter 39:
QST – June, 1950 - An Impedance Bridge for Less than Ten
Dollars, by Beverly Dudley

Chapter 54:
http://www.dli.ernet.in/bitstream/handle/2015/475026/Under
standing-Radio.pdf?sequence=1&isAllowed=y - This is
another good one.

Notes

- Frank C. Jones' callsign was W6AJF. Enter that callsign in the "By Author Callsign" box at https://mikeyancey.com/73mag/index.php for more good issues of 73 Magazine to download.

- W6AJF/SK was the Ultra-Short Wave Editor of Radio Magazine. Issues are available for download at: http://www.americanradiohistory.com/hd2/IDX-Site-Early-Radio/Archive-Radio-IDX/search.cgi

- All the of the **QST** articles mentioned in the story are available to ARRL members via http://www.arrl.org/arrl-periodicals-archive-search. In my opinion, it's worth joining for a year just so you can pillage their article archive.

- There are also some other issues of <u>73</u> you should have in your collection:

https://archive.org/details/73-magazine-1965-07 – VHF Special Issue
https://archive.org/details/73-magazine-1964-07 – VHF Special Issue
https://archive.org/details/73-magazine-1969-06 – VHF Special Issue
https://archive.org/details/73-magazine-1970-05 – Page 80, Postage Stamp Transmitter for 6, by K1CLL
Page 40, Intelligent Use of 2 Meters FM, by by K1ZJH
"Repeaters are self-defeating." - Ed Tilton, W1HDQ/SK
https://archive.org/details/73-magazine-1962-06 – VHF Issue
http://archive.org/details/73-magazine-1985-02 – Page 22, CB to 6, by KB5LF
http://archive.org/details/73-magazine-1961-11 – Page 16, TV Tuner Receiver, by W0RQF
Page 30, Quick & Simple Mobile Rig, by K5JKX/6
Page 48, A Quad for Six, by W3TBF/0

– Page 10, 6M Double-Sideband AM Transmitter, by K8AOE & K8MSB Page 20, ARC-5 VHF, by WA2FHC

There is much more good information you can find in the back issues of **73** and **QST**. For example, towards the end of **73's** publication run, there was a series of articles on how to convert more modern TV tuners into receiver front ends. There was a large number of articles in the 1960s and 1970s about converting CB gear to 10 meters. I have also deliberately left out W6AJF/SK's articles from **QST** and **73**. He published 5 articles from 1933 to 1959 in the former and 11 articles from 1966 to 1971 in the latter. You know where to look for them.

When the balloon goes up, appliance operators, especially those of the 2m/440 Baofeng and DMR categories, will find themselves left out in the cold and be left behind. Those who can homebrew their own radios, and who understand older EMP-resistant technology (tubes) will be able to remain on the air. This list of articles is a good start, but it is only a start. Get your bench together, scrounge parts, talk with like-minded-individuals, and start rolling your own radios.

Confessions Of a Broke Lab Lizard

Reprinted from back issues of Signal-3
By Anonymous

Introduction

You don't know me. I'm a politically conservative "small l" libertarian who's not a member of any militia group. Every "militia group" I've come across was full of, and run by, a bunch of whiny assclowns. I own three guns, and neither of them are black or in a military caliber.

But I'm not here to talk about guns, militias, or whiny assclowns. I'm here to talk about what I've been doing lately. I like to tinker with electronics. I've started doing it in high school, but have been out of it until very recently. This has been hampered by a lack of hobby cash since the economy around here has gone to shit, but I manage.

First Entry – August, 2015
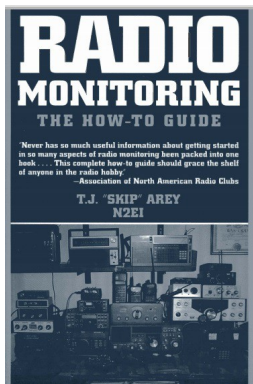
It started about a year or so ago when I found the book at a library sale. It only cost me a couple bucks.[4] One of my hobbies is checking out library sales, used bookstores, flea markets, tag sales, pawn shops, and antique stores. Ninety percent of what I by is from these sources. A few weeks later, the local ham club had a swap meet and I found a well-used 1980s vintage copy of the ARRL Handbook for Five Bucks. By checking these places out you can put together a good "poor man's" electronics/science lab. You would be surprised at what you can find! Here are a few things I've found for my lab.

I was at a tag sale one weekend and found this old AM/FM/SW/PB multiband radio (the one on the left) for ten bucks. It works perfectly! The cops around here run a digital radio system, but the local ham repeater, volunteer fire department, and search and rescue team do not. This radio covers their frequencies. That was my first inexpensive radio acquisition.

My next radio (the one on the right) cost me the princely sum of $25

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4 This book can now be downloaded for free from http://www.naswa.net/journal/areybook.

from a flea market vendor. It's newer than the Lafayette I first bought, and covers some extra frequencies like aircraft and UHF. I can't hear digital systems on these radios, but I can still pick them up and analyze them somewhat.

A trip to Harbor Freight got me a cheap soldering iron, VOM meter, and some electronic tools I didn't already have (or find cheap elsewhere). The radios I bought are cheap and simple enough that after learning a bit from the ARRL Handbook I was able to modify the radios to do a little extra. I then got lucky at a ham radio swap meet last Fall and found this old Oscilloscope (Heathkit) and Grid-Dip Meter. I like the old Heathkit gear because the manual comes with schematics and you can fix it when it breaks.

I found this old Wavetek Cable TV SAM (signal analysis meter) at a pawn shop. It was used to test Cable TV systems, and became obsolete when TV went digital. It's really a rugged wideband receiver with 4-300 MHz. frequency coverage. It cost a bit ($50), but I can hook up my O'Scope to it and have a spectrum

analyzer. That's pretty useful. The only other item that cost me that much money was a brand new copy of the ARRL book **Experimental Methods in RF Design**. However, I couldn't find one used (I don't have Internet. It's as bad as TV) and it was worth it because I'll save money rolling a lot of my own gear and test equipment now.

My "research library" consists of the following books. Most of them were purchased used at flea markets, hamfests, and used book stores. Only a couple were purchased new. They are:

- Radio Monitoring, by Skip Aery

- ARRL Handbook, 1982 edition. Published by ARRL.

- Radio Science Observing, Volumes 1 &2, by Joseph J. Carr

- Impoverished Radio Experimenter, Volumes 1-6, published by Your Old Time Bookstore[5]. https://www.youroldtimebookstore.com/

- Voice Of the Crystal, by H.P. Fredrichs. http://www.hpfriedrichs.com/index.htm.

- Experimental Methods in RF Design, Published by ARRL.

- Assorted issues of QST and CQ VHF Magazines, picked up at various hamfests.

- Various old (1950s and 1960s) radio and electronics books downloaded from the Net and printed out; mostly from www.tubebooks.org.

My local Radio Shack went out of business, but before they did I cleaned out their stock of electronics parts: resistors, capacitors, transistors, ICs, et al, solder, and some

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5 https://archive.org/search.php?query=The%20Impoverished%20Radio%20Experimenter

small tools at 50-90% off. There don't seem to be very many electronic experimenters around here, so there was a lot of stock there. One the best purchases from Radio Shack was this small red desoldering bulb used to remove components. I look for thrown-out electronics on the curb during trash day, grab them, and remove whatever components I can from them. Old picture tube-type TVs (not flat screen) and "boombox" stereos seem to have the best parts, and are the easiest to scrounge parts from. Old microwave ovens are good for high-voltage stuff. I usually don't waste my time with thrown-out computers because the ones I found were truly junked, but I did find a working 1980s vintage TRS-80 Color Computer once.

So far I think I may have spent maybe $300-$500 on my radio experimenter's lab, most of it bought used from local places. I cleaned up a corner of the attic, got one of those light socket adapters, and ran an extension cord from the attic light bulb to my "bench". It looks like something from the OSS in World War II. I do a lot of "New World Order"-type radio research up there. All my antennas are homebrewed from wire and coathangers. So far I've found some interesting things on the airwaves, but I'm still doing more research on them. As time and money permits, I'm going to expand the frequency coverage of the lab. I found a couple old radar detectors at a tag sale, and am going to see how useful they may be in experiments. My point to all this is that it doesn't take a lot of money to put together a lab where you can do good research.

Second Entry – May, 2016

Since my last article, I cleaned up an even bigger corner of the attic, and replaced that light socket adapter and extension cord with some Romex going to an outlet at my bench. I do a lot of "New World Order"-type radio

research up there. I keep finding interesting things on the airwaves that leave me with a lot of questions to answer. Like that dude from **Blade Runner**, I've seen and heard things you wouldn't believe.

I went to a tag sale a couple weeks ago, and found a few things for my lab cheap. A "Bearcat 250" police scanner and Heathkit tube tester for five bucks each, and an old Readers Digest Atlas for 25 cents. I found some VHF frequencies using my tunable receivers, and now have something that'll let me listen to more than one at a time.The tube tester I picked up because tube-type radio gear is better protected against stuff
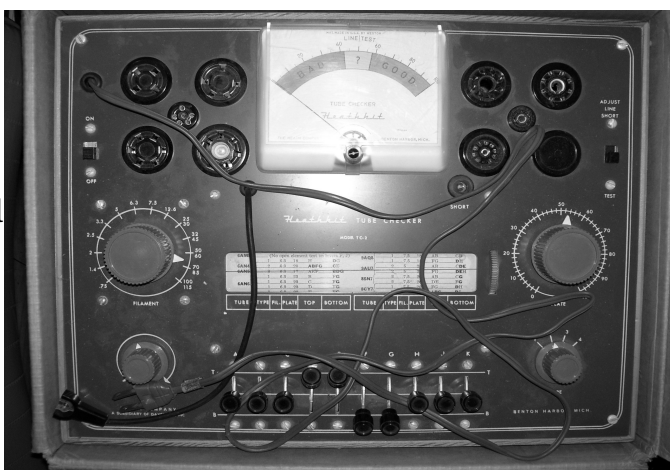
like lightning and EMP, and the tester will help me keep any tube radios I get running. The atlas is nice to see just where and how far out I'm listening on the shortwave and lower VHF bands.

All you fellow broke lab lizards should be hitting up your local tag sales, flea markets, auctions, antique stores, and pawn shops. You'll find a lot of good stuff at those places that you can use. At auctions, tag sales and flea markets you should be looking in all the cardboard boxes that have electronics in them. That's where you'll find stuff. Hamfests are also good, but you might not find many that are within reasonable driving distance. You should also go through the science, technical, and DIY sections of your local bookstores,

especially the ones that sell used books. I've found some nice titles for less than what you would have paid on Amazon.

Don't worry about what you can't hear. Work on the signals you can pick up with the gear you have on hand. I was corresponding with a friend and fellow broke lab lizard who is finishing up his prison term for something that shouldn't even be a crime in my opinion. All he has access to is this Sony AM/FM Walkman-type radio that he can buy at the commissary. By tweaking the tuning coils this way and that he is able to listen above the AM broadcast band to pick up shortwave communications at night, and listen above the FM broadcast band to pick up VHF aircraft communications. Plans for doing this have been circulating the underground for decades. I have a photocopy that someone gave me from the 1990s that was printed in underground zines like "Full Disclosure" (Issue #30) and "Cybertek" (Issue #9). If some guy locked up in prison can do this, then you should be able to do the same or better. Stuff like this is important because you can pick up old Walkman-type AM/FM radios for a couple Bucks apiece, mod them, and hand them out to people who want to stay informed.

There is this old (1979) book you might be able to find called Communications Monitoring, by Robert B. Grove (ISBN 0-8104-0894-0). He is the dude who founded the old "Monitoring Times" magazine. I got mine at a recent hamfest in a box of old radio books and magazines. It has a lot of good info in it, including directions on how to mod out an AM/FM transistor radio to cover the VHF aircraft band, and how to mod tunable weather-band radios to receive radio signals down in the 150 MHz. range.

While I'm writing this, a line of thunderstorms just passed to the South of my QTH. Some AM band country music station from God knows where is playing Glen Campbell's song "Wichita Lineman," and I found a few

electric company frequencies that are busy with crews cleaning up the mess. Interesting listening. The freq ranges I'm scanning are 37.46-37.86 MHz. & 47.68-48.54 MHz. Give them a listen when the electric companies within a hundred miles of you have a reason to be out working. Sometimes the weather conditions will let you hear signals out even farther than that The old Bearcat 250 is perfect for this job, and fifty channels is more than enough for now.

Bearcat 250

I've also been spending a lot of time listening to 25-33 MHz. I'm sure you know that the regular CB band in the US is 26.965-27.405 MHz., and the 10 Meter Ham Band is 28-29.7 MHz., but there are all these radios out there that people can buy that go from 25 to 30 MHz. or higher. Some of the brand names are "Galaxy", "Magnum", and "Stryker." I have also seen old army surplus radios that can tune 20-76 MHz. All this gear with similar frequency ranges means there will be people and small groups simply picking a frequency and using it for a little while before switching to another. The frequency ranges 25-27 & 27.4-28 MHz. (above and below the US CB band) see a lot of use among these hobbyists known as "freebanders," although I've heard some tactical-type communications that didn't sound like radio hobbyists rag-chewing.

A little birdie told me that I should be paying more attention to 54-88 MHz, especially 54-76 MHz. TV stations

originally on channels 2-6 went to higher frequency ranges when they went digital. Now these frequency ranges are not being used. So far I haven't seen any analog pirate TV stations on the lower channels, but there are still all these TV modulator boxes and old VCRs out there that operate on Channels 2 & 3, or 3 & 4. Even Wal-Mart still sells them. Military surplus PRC-25, PRC-77, and RT-524 radios will go up to 76 MHz, and there are plenty of them still around. Some of my cheap multiband portable radios were made to tune in the audio from the old analog TV channels. No good for TV reception anymore, but they'll still pick up audio in those frequency ranges. There are also a lot of small FM audio "Mr. Microphone" type transmitters that work from around 87 MHz. into the low end of the FM broadcast band. All the good FM stations (in my opinion) are below 92 MHz, and the interesting stuff is a bonus.

So as you see, even though you might not running the latest, greatest gear, you can still find cheap stuff that will let you do a lot of "research," and that's what's important.

Third Entry – April, 2017

The Income Tax refund is coming in soon, and there are a few used laptops in decent condition at a local pawn shop that'll take Linux so I can get one of those cheap RTL-SDR receivers[6] up and running with Gqrx. I haven't done much with computers since high school, and that was a long time ago. From where I'm sitting, it looks like Linux is like a revival of all the hacking that was done in the 1980s with Ataris, Commodores, Apples, etc. I found Linux magazines at my local Barnes and Noble, and most come with a CD that lets you try it out on a laptop before installing it. I also found another good computer magazine, one that goes back to the 1980s, on the rack. It's called **2600: The Hacker**

6http://www.rtl-sdr.com/

Quarterly[7]. I subscribed to that one. I found a "tablet" device on clearance for under $40 at an electronics store, and discovered that the local library has free Internet access. What prompted getting myself online was Sparks31's mention of the Five Meter Liberation Army[8] story, and all the references to old 73 Magazine articles, which you can download free off the Internet[9]. I also hear that there are some Android applications for that RTL-SDR receiver.

Tag sale, flea market and auction season is coming up soon. I've got my eye out for old CB gear, especially ones that can be tricked out to get on the 10 and 6 meter ham bands.

Fourth Entry – July, 2017

I finally got a gun in a military caliber. Received it in exchange for some electrical work one of my neighbors needed. There is a good story behind this that might help you, the reader. When I started getting back into electronics and building my attic lab, I needed to improve the electrical wiring up there. I couldn't afford to pay an electrician to do it, but wanted to make sure it was done right. The local Wal-Mart, hardware, and ag stores sell basic electrical parts for do-it-yourself types. I have used some of that stuff to make antennas for my lab. They only had an old copy of the NEC (National Electrical Code) at the library, but a trip to the local used bookstore found me a copy of **Wiring a House**, by Rex Cauldwell, and reading it taught me enough to get the job done without burning the place down.

A couple weeks later, I was talking with my neighbor who is retired, in his 90s, and has limited funds. He was telling me how he needed a few electrical fixtures and switches replaced, but couldn't afford what an electrician

7 https://www.2600.com/
8 https://chainsawprivacy.files.wordpress.com/2018/01/frank_and_the_fmla.pdf
9 https://archive.org/details/73-magazine

wanted to charge him. He knows I'm into electronics stuff, and has an old Panasonic receiver that he uses for listening to shortwave and Coast-to-Coast on the AM band. We often talk about what we heard on the latter. Replacing fixtures is not difficult if you know what you're doing, and I told him I could do it. Since cash is in short supply around here, we both knew it was going to a barter deal for a couple hours worth of work. Turns out he has this "deer rifle" he had no further need for after he stopped hunting a few years back. We made an agreement, shook hands, I did his electrical work, and got myself a rifle.

The rifle is a "sporterized" Lee Enfield #4 in .303 British caliber. The forward part of the stock was cut back to lighten it up and make it look more like a civilian hunting rifle. My neighbor said they used to sell them that way for a couple bucks extra back when you could buy guns though the mail. It's got a 10 round removable magazine and a really quick bolt action. It came with a box of ammo, but I found my local gun store has this Privi-Partisan stuff that's cheap (less than $20 a box) and shoots well. They also had a set of reloading dies for it that I bought so I can feed it even cheaper. There is this survivalist author on the web by the name of Jim Dakin[10] who is a big fan of them, and in the 1990s a lot of late-coming militia-types started buying these when AK-47s, AR-15s, and SKSes started drying up and becoming expensive. The .303 Brit is a good deer cartridge, and I hear our neighbors to the North use them on even bigger animals, "mouse to moose" they say…

The lesson behind this story is that by learning the things you need to know for technical and survivalist needs/hobby, you can become good enough that you can get the odd job here and there in the underground economy in exchange for cash or barter. I've got no desire to become an

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10 http://bisonprepper.blogspot.com/

electrician because apprentices make less than I do right now, and I couldn't afford to take the cut in wages for even the few years I'd need to be an apprentice. I can though do a quick and simple wiring job for some extra cash. As things keep getting worse in most parts of the country, expect the underground economy to grow. If you got some good skills, you'll be able to get in on this, and maybe get by a little easier with the odd extra job you find here and there.

I got a letter from my friend who is incarcerated for something that shouldn't even be a crime in my opinion. I mentioned previously how all he has access to is a Sony Walkman-type radio which he modifies for listening to shortwave. He told me that the radio is a Sony SRF-39. An online search of "Hellonized Sony SRF" will get you some good mod info. Another model you want to look for is SRF-59. The radios are big with some collectors, and that has jacked up the prices for them online. I bet you'll find them dirt cheap at tag sales, flea markets, and junk shops. I talked about the book **Communications Monitoring**, by Robert B. Grove (ISBN 0810408940) in #2 of my articles.[11] He is the dude who founded the old "Monitoring Times" magazine. It contains directions on how to mod an AM/FM transistor radio to cover the VHF aircraft band, and how to mod tunable weather-band radios to receive radio signals down in the 150 MHz. range. Those cheap slide-tune radios are all pretty much alike inside, and dirt cheap. The mods on how to slide them up and down in frequency will work on most, if not all, models.

I talked about in my first article how I picked up some old radar detectors cheap for experimentation. Thanks to Sparks31's mention of the **73 Magazine** back issue collection at archive.org, I was able to find an article "Radar

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11 You can download a free PDF copy at
https://archive.org/details/CommunicationsMonitoring

Detector to Microwave Receiver Conversion" in the February, 1991 issue. There seems to be a lot going on in the X-Band (10 GHz.), and being a line of sight band anything you hear is definitely going to be local.

I went to this little hamfest that a local ham club was having. It had about 10 tables. I didn't find any radios, but I did find this Lindsay Publications reprint of the **1934 Shortwave Radio Manual**.[12] I already got Lindsay's **Impoverished Radio Experimenter** books, and they are good. The thing that made be buy this book is that Lindsay added an additional chapter on how to adapt the old tube radio circuits over to the more modern transistor technology. I've got a pretty good collection of solid state electronic parts from when the local Radio Shack went under, and from grabbing old consumer electronics stuff off the curb the night before trash day.

As I talked about before, my local police department is on this digital radio system, and I don't have the 400 bucks to go buy a scanner that will pick it up. OK I suppose I could save up the $400 to buy one, but don't feel like it when that $400 could get me a car trunk full of old radios and electronics that I can do more with and be able to mod and fix. What I did instead was get one of those cheap RTL-SDR radios and a used laptop from a local pawn shop. My original plan was to put Linux on it, but the laptop already came with a recent version of Windows on it so I've just been running Linux off the CD that comes with the magazine for learning purposes. The reason is because I have found more programs for the RTL-SDR that run under Windows than I did under Linux. I know there are programs like WINE that let you run Windows programs under Linux, but I'm still learning this stuff, and want to first learn the software

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12 Download for free at
https://archive.org/details/1934OfficialShortWaveRadioManual

under its native OS than have to screw around with the extra things that using an emulator throws at you.

Two of the Windows RTL-SDR programs I've been playing with are DSD+ (DSDPlus) and Unitrunker. DSD+ decodes digital voice like the P25 that the local PD uses, and Unitrunker decodes the control channel data that a trunked radio system uses to talk back and forth with the radios on the system. You can take the two of them and use them to listen in on a digital trunked radio system the same way you would with one of those digital trunk-tracker scanners.

Now I know a couple of scanner listeners in town who have bought those digital trunk-tracker scanners, mostly from when the local Radio Shack closed down and was selling them for $250 each (which at the time was $200 more than I had to spend on hobby stuff). I compared their scanners to my laptop and RTL-SDR setup, and found out that the RTL-SDR/laptop combo works better than a scanner for listening to trunked radio systems (as well as being cheaper). The reason why it's better is because with the Unitrunker software you see a lot more of what's going on with the system than you do with a scanner. You can see radio IDs of the users on the system, and then listen to find out who they actually are. You can then tell who the supervisor, detective, and other interesting units are. You can also use the radio IDs you see on new, unknown, and encrypted talkgroups to get an idea of what the talkgroup is being used for. Finally you can set up priority listening for specific radio IDs and talkgroups so you don't miss certain traffic you're interested in.

International Morse Code (ICM)

It hasn't been a requirement for an amateur radio license for some time, but still maintains popularity with a

fair number of ham radio operators. You should earn ICM. You don't have to be proficient to 20+WPM (words per minute) like some of the old timers, but getting to around 10 WPM is well within the capability of the average person. The old entry-level Novice license standard was 5 WPM.

ICM is used in Continuous Wave (CW) radio transmission. CW is the radio mode. ICM is what you are sending. There was also an American Morse Code that was used by telegraph operators back in the old days. Some of the letters are different than ICM. Enough to cause confusion, but it brings up an important point about the usefulness of ICM. You don't need a radio to send ICM.

ICM can be sent with flashlights, signal flags, tapped out with two rocks, blown on a whistle, sent with blinks of the eye out like Admiral Jeremiah Denton Jr. did to send the word "torture" during his television "interview" while a POW during the Vietnam War. An old-time telegraph system can be made with junk-box electric parts and whatever wire you find. That's because there are only two components to an ICM signal, a short period "." known as a dit, and a long period "-" known as a "dah" which is about three times longer than a dit. If you can use whatever method to send a sequence of dits and dahs in the correct order, you can send ICM with it.

For those of you who are getting into Amateur Radio, ICM, which is generally referred to as CW in the context of the hobby is one of the least expensive and easiest modes to get into, especially when building your own radios. You can get into a build-it-yourself CW transceiver for under $100 that will fit with all its accessories in a field jacket pocket and run forever on a small 12V gel-cell battery. When conditions are right you'll be able to communicate around the globe with it, and even when the bands are dead you'll

still be able to keep in touch with your tribe locally. I'll talk more about this in a future chapter.

There are a number of online resources to help you learn CW, You can download free software for learning CW from http://www.justlearnmorsecode.com/. There are also resources for learning CW from the American Radio Relay League, the US national association for amateur radio. That website is at http://www.arrl.org/learning-morse-code.

QRPme

Two Tinned Tunas (EZ Build)

Price: $30.00   http://www.qrpme.com/

If you don't like the way they make 'em in the city
Cause the taste too strong the dang paper ain't pretty
Roll your own
-Roll Your Own, by Mel McDaniel (and sung by Hoyt Axton)

Vignette: The Receiver

3Z3438
KEY J-38
1 EACH
3272-P-52-02
MCELROY MFG. CORP.
LITTLETON, MASS.
DATE PACKED 9 / 52
METHOD O

The little brown box taunted him from its perch atop the old Hallicrafters at the antique store. He heard stories about them, the aether surfers, communicators from the outer regions who used archaic electromagnetic methods to reach one another outside normal channels. And sitting there right in front of him was a piece of their kit. He wondered what strange signals he might be able to receive from the Outlands, and if he could go all the way and actually participate with them. He pulled the two items off the shelf, brought them to the counter, asked if there was anything else like it in the store. The owner gave him a knowing look, went to a shelf, pulled a thick digest-sized tome from its perch, and handed it to him. "ARRL Handbook" it said on the cover. He took all three items. The Hallicrafters barely fit on his bike rack. He wrapped it carefully in a camouflage army poncho. The J-38 Key and ARRL Handbook went into his knapsack, another military relic, canvas, circa World War II. Mounted his old Schwin and went home.

His parents were Neo-Luddites, a reactionary movement started in the early 21st Century against the constant digitization and connectivity of humanity in "developed" countries. Some obscure niche writer created it. Their battle cry, if it could be called that, was one simple

word: "analog." They sought out implements and devices that were not equipped with microprocessors, and often preferred the mechanical to the electric. They had no Internet connection, instead preferring to browse used bookstores. Bookshelves lined the walls of their home. An old tube-style RCA TV graced the living room, thin flat black cable snaking out the back and up to the roof where an antenna was pointed at the local PBS station.   His family's only concession to the digital world was a converter box that they had to buy when analog TV broadcasts were discontinued. If there wasn't a PBS station within reception range, the old TV would have likely became parts in his father's workshop. His father's library contained books on microprocessor design from the late 20th Century. Artifacts from a previous career before finding religion. He gets off his bike, unwraps the poncho from around the radio, and walks in. His father is inside reading the newspaper, notices the old Hallicrafters, and says "Your granddad was a ham radio operator. I got into computers instead, and got a job at IBM. Let's haul that boatanchor inside your room, and get it set up. I think we can find the stuff for an antenna in the shed."

Despite its age, the address in the book remained unchanged. Two or three weeks later, a thick manila envelope arrived from the Newington, Connecticut. He studied his old ARRL Handbook, and called the local contact of his local club. They would be having a test in a month and a half. He hoped he would have enough time to study. Being home-schooled, his parents added electronics to his curriculum. Knowing full well that it also encompassed such topics as physics and mathematics. The old Hallicrafters was used to enhance his education in social studies.

He arrived that Saturday morning ten minutes before the appointed time. The old gentleman in the safety orange jacket looked at his birth certificate and took his test fee. He

sat down at the table among about a half-dozen others, and was given his test. Confusion set in as only a couple of the questions looked like they were from his book. He flagged the gentleman in the orange jacket over. "Sir," he started, "None of these questions look like they're from my book." He received a look of disbelief. "The questions are all from the test pool." orange jacket replied. "What book were you studying?" The boy reaches into his backpack and pulls out the old ARRL Handbook. "You studied out of this?" The boy nods in the affirmative. The old-timer looks pensive for a moment. "Give me a minute." After consulting with his fellow examiners, the old-timer returns. "That book is great for teaching you real ham radio, and building radios from scratch. It's almost useless for helping you pass a ham test. Since my friends and I got our tickets from back when you studied that book to take the test, we're gonna make an exception for this time. We're gonna ask you a few questions, and if we like the answers, we're gonna make like you passed all three tests. Just do us a favor, don't tell anyone, and learn all the up to date rules so you don't get in trouble." An hour later, the boy walked out of the building with a certificate saying he passed all three Amateur Radio tests, and a more recent copy of the ARRL Handbook. The examiners would fondly recall this particular testing session for the rest of their lives.

There were probably some decided advantages to working with a text that dated back to the LBJ administration. Equipment was definitely more homebrew and DIY back then. Hobbyists were expected to build their own gear and maybe even some test equipment. With a well-written and authoritative text as a guide, there were no worries of self-appointed "experts" telling you that you were doing it wrong. Armed with a shopping list of pieces and parts, the boy walked into the old TV repair shop looking to build his first CW transmitter to go with the Hallicrafters.

Amazing that such a place still existed in the age of planned obsolescence throw-away consumption devices, but there it was. He handed the owner his list. The owner looked at it, knitted his brows, and looked at the boy. "Nobody builds or fixes things any more." the owner said. The boy replied "I do." The owner led him to the back of the shop to a shelf of old tubes and TV parts. "See what you can find here." the owner said. "I'll probably be closed for good in a month of two. Better take anything you think you might need. The cost for your parts is Ten Bucks, cash." The owner gestured towards the back door of the shop. "There are some empty boxes over there if you need any." The boy started searching through the shelves, filling two boxes full of parts and tubes. He came across a radio in a yellow metal case, marked with a red, white, and blue "CD" logo and a badge bearing the name "Gonset." He asked the owner "How much for the radio?" "That'll be another Ten Bucks."

The classic Gonset Communicator, aka "Gooney Box". Available in six and two meter band versions. A popular Cold War-era Civil Defense radio.

Start Here

Where you start depends on what you want and need. You need to get news and information about happenings and events in your local area. You might also want to be able to hear about stuff going on elsewhere. You might have family in a particular place, like parents in your home state or a child at a distant college. I grew up in New York (the state not the city), still have family and friends there, and despite being 2000 miles away like to keep track of what's going on there. You may also want to look at the big picture on a nationwide or worldwide basis. That crosses over to a need especially when it concerns nations and international non-state actors who the US might not get along with and/or have nuclear weapons aimed at our country. If you homeschool, you should be up to speed on current events to better teach your kids social studies: history, geography, political science, et al. If you don't homeschool, you should still be up to speed so you can double-check what the school is teaching your kids.

If you are part of a tribe, whether it's just your immediate family, or an association of like-minded friends, you will need to be able to stay in touch with them, especially when there is a problem that shuts down Internet and wireless phone service. Most of the time, they will be local to you. However since some of you may have a distant "bug-out" location, you will need to communicate with the caretaker to let them know you're on the way, and update them with your progress. Just like anything else preparedness related you should follow PACE and have a primary, alternate, contingency, and expedient means of communicating with everyone. Depending on your community, there may be a public communications network, such as a branch of AmRRON that you should join. If you

decide not to actively participate in the network, you should at least be monitoring it regularly.

The operating environment you are in, or will be in, has a lot to do with selecting your communications systems. Right now, from a technical and social standpoint, the US is a pretty permissive environment for communications, even for political activists. However, there are active state and non-state OSINT and SIGINT elements taking advantage of that permissiveness, collecting and analyzing information. This should be of no surprise to anyone who has read a US military manual on intelligence operations. How that affects you depends on what you're doing. Using a set of half-watt FRS radios on your 10 acre homestead when you need help getting a goat's head untangled from a fence is a different than using communications when engaging in non-mainstream political activism. Both are different than a combat zone where keying up for more than a few seconds on a squad radio gets an artillery or air strike on your position.

In the end, your most important need is education. Your second most important need is the improvement of yor skill set. By expanding your knowledge base, you can figure out what you need, get it, and work on improving your skills and techniques to accomplish what you need to do. Regardless of what your requirements are, in the end what matters is that you are able to collect information to make effective decisions, and be able to communicate with members of your tribe regardless what the situation throws at you.

Information and Intelligence

One of my pet peeves is when some yahoo on the World Wide Web, usually on Facebook, posts up some video or (usually photo-shopped or blurry/grainy) picture and calls it "Intel" or an "Intelligence Report." They are wrong, and that is not Intelligence. Rather than calling them out as either nutballs or idiots, I will instead be charitable and simply say they are ignorant, because ignorance can be corrected by those willing to learn. In this instance, the lesson that needs to be imparted is the difference between Information and Intelligence. It is important that you, the reader, is able to discern between the two.

One of the best military manuals I have been able to acquire is ***FM 30-5 Combat Intelligence***. My copy dates from 1973. Older military manuals, up until the late 1980s or so, are always useful as they were written in an easy to understand manner, typically 8th Grade level for the time they were published, and contain useful and practical information. For example, this particular gem of advice, circa 1973, takes on particular relevance in light of recent events at Malheur, Oregon:

> *"the potential tactical advantages to be gained from jamming hostile radio transmissions must be weighed against the possible loss of SIGINT* (Signals Intelligence)"[13]

Now you don't have to wonder why mobile phone and Internet service wasn't shut down during the event, but I digress. What the ignorant parade around as intelligence, or "intel" in 3per coolspeak, is actually just information.

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13 FM 30-5 Combat Intelligence, U.S. Army, 1973, pg. 9-9

"Information is unevaluated material of every description including that derived from observations, communications, reports, rumors, imagery, and other sources from which intelligence is produced. Information itself may be true or false, accurate or inaccurate, confirmed or unconfirmed, pertinent or impertinent, positive or negative."[14]

As a friend of mine once said, *"It is what it is,"* and as Mr. Natural used to say, *"It don't mean shit."* And truly, information is pretty much useless unless it is evaluated in a certain context to produce intelligence, and the best intelligence comes from evaluating as many pieces as information as possible. What then, is intelligence?

"'Intelligence' is the product resulting from the collection, evaluation, and interpretation of information which concerns one or more aspects of foreign nations or of functional or geographic areas, and which is immediately or potentially significant to the development and execution of plans, policies, and operations."[15]

In order to produce the **product** known as "Intelligence", you have to define a functional or geographic area, and what you need to know in order to be able to operate effectively in that area. Keep that in mind the next time you see some yahoo on Facebook posts up an "intel report."

We are at the point in this country's social and political situation where the ability to collect information from all sources, evaluate it, and turn it into proper

14 FM 30-5, pg. 2-1
15 FM 30-5, pg. 2-1

intelligence is becoming a matter of life or death. In times like this, do you trust pundits who have been paid off to promote and pursue some agenda that might not be in your best interests, or do you trust yourself, your skill-set, and your gear to do it the right way?

Since the release of the previous edition, a Facebook user posted up a video, presumably taken in the Denver, Colorado area, of a freight train transporting a quantity of armored vehicles. A screen capture of said video is shown at left. Disregarding the poor video quality and vague information provided with the video (typical of many "militia" and "3per" "intel reports"), routine monitoring of broadcast stations would have brought up this recent story from KKTV, a CBS affiliate TV station in Colorado Springs, CO:

Image capture from video of freight train in Denver, CO area carrying armored vehicles. Unattributed Facebook post.

http://www.kktv.com/content/news/Inside-Fort-Carson-soldiers-training-at-Armys-National-Training-Center-392529521.html

Further research showed that this news story was the first in a series about soldiers from Ft. Carson who are presently training at NTC. If your area of operations included Colorado Springs, that would be a good news story series to watch and record for later detailed analysis. Because that's what you do when you want to know what's going on around you.

As an individual or member of a small group, you have several intelligence disciplines you can use and take advantage of to find out what's going on around you. In this previous instance you would be using OSINT – Open Source Intelligence. You might also be able to acquire HUMINT – Human Intelligence. In essence, that's listening to people and asking questions. Done properly, pictures and videos are how you collect IMGINT – Imagery Intelligence. Chapters in this book talk about SIGINT – Signals Intelligence, COMINT – Communications Intelligence, and ELINT – Electronic Intelligence.

SIGINT is intelligence provided by electromagnetic signals. SIGINT can then be further divided into COMINT and ELINT. COMINT is intelligence provided by intercepting communications, that is traffic from one party to another. A real world example would be a conversation between two police units about the crime level in a neighborhood, or a county 911 dispatch center dispatching responders to an accident or hazmat incident. In this case, the former would be classified as strategic COMINT, and the latter as tactical COMINT. ELINT is intelligence provided by the emitter itself. Using a radar detector to alert you about speed traps would be a form of ELINT, specifically tactical ELINT. An example of strategic ELINT would be the long-term recording of the ADS-B IDs from aircraft flying in your locale, or cataloging radio IDs on a trunked system.

In most cases, you are interested in tactical intelligence because that will be help determine a more immediate situation that requires your attention, like a speed trap or brush fire just upwind from your home. Strategic intelligence is also important to establish baselines and determine long-term trends. Start with tactical, and the strategic will come to you in time.

Communications Monitoring

I'm going to start with basic news and information gathering. You need to know what's going on out there before you can figure out how it's going to affect you, and what you should do about it. There are three questions that have to be answered, and they are:

- Where do you get your news and information from?

- How do you know it's accurate?

- What should you be looking for?

The "how" is the easy part. These are what the Grey Man uses to get news and information. The two receivers on the right are police scanners. The receiver on the left is a AM-FM-Shortwave receiver. All three were purchased from Radio Shack. You'll probably be out of luck trying there, but you can find them used elsewhere.

Communications monitoring is the one most important electronic capability you should have in your skill-set tool box. Listening is more than twice as important as transmitting. Accuracy of information is easier if you think. A statement is either true, or it's not. If it is true, then how relevant is it to your existence? How does that piece of information, combined with others, affect you? **That** is the hard part that most people have problems with.

Recent Developments

There have been a few developments since the release of the last edition that affect communications monitoring in both a positive and negative manner, and it all has to do with digital.

The first is that within the past three years, inexpensive USB "dongle" SDRs such as the RTL-SDR along with free software such as DSD+ are offering features to monitoring hobbyists that were previously only available in high-end expensive receivers. RTL-SDRs are available from a number of of online retailers starting at $20 each. At that price there is no excuse to get one and experiment with it. When used with the DSD+ digital speech decoding software, you can decode several digital voice modes that you previously had to spend around $400 for the capability to monitor.

The second is that increasing numbers of public safety and business/industrial land mobile radio (LMR) users have switched over to digital voice. This trend will continue now that standard system types have been adopted in both the public and private sectors, and the price of digital radios continues to go down.

Encryption

The newest digital radios also feature software-based encryption without the additional cost that was previously incurred when ordering secure radios. A consequence of this switch is that you will see an increase in the use of encryption on LMR systems.

It is illegal to intercept encrypted communications in the United States as per federal law, specifically the Electronic Communications Privacy Act provisions of the

Communications Act of 1934. Interception is defined as the deliberate extraction of information from a received radio signal. Interestingly enough, the same law also acknowledges that if it's unencrypted and transmitted in a common communications mode, then it's fair game for interception.

The same law also makes it a crime to "profit" from the interception of radio communications. That's a hold over from the days when business transactions were regularly sent out over CW on the MF and HF bands, and meant financial profit. It is also illegal to disclose the content of intercepted communications to another party who was not privy to the communication. Incident notification services used by independent reporters, photographers, and news buffs have circumvented this by not repeating verbatim what is heard, and by just providing a brief indication of interesting traffic on a particular frequency. Again, this law is an obsolete holdover from the 1930s.

In times of war or other military action, intelligence organizations deal with encryption by applying cryptanalysis techniques to "crack" the encryption, and bribing or blackmailing technical personnel to provide crypto keys or "back door" access into a system. Encrypted communications systems may be selectively jammed or otherwise disrupted to force the opposition to run "in the clear." Finally, if signals intellgence (SIGINT) is not capable of providing the needed intelligence ionformation, organizations may instead concentrate their efforts on other disciplines such as human intelligence (HUMINT).

From the standpoint of this work, in addition to being illegal to intercept, the average encryption algorithms used for public safety and business/industrial communications on the LMR bands are likely beyond the cryptanalysis capability of the average reader. Low-grade cipher systems

such as those created by private groups with little cryptographic knowledge and possibly (illegally) implemented on CB and other personal communications systems could be within the cracking capability of someone who has studied basic cryptography and can competently perform such basic cryptanalysis tasks such as a Kasiski Analysis. In a similar vein, a good crypto system poorly implemented can be as bad as no system at all. Using a code to refer to something, and then providing supplemental data in the clear will provide an astute listener with enough information to crack the code.

Many digital communications systems that support encryption for the voice signal will provide signal ling data in the clear. Radio IDs, talkgroup IDs, and network access codes (NACs) can still be collected and traffic analysis performed on the data. This data can also be cross-referenced with data collected from unencrypted channels used by the target. Encrypted radio signals can also be RDFed[16] to provide location data, and the general level of activity monitored to provide a baseline from which unusual events can be determined from detecting a deviation from the baseline. In said instance, alternative communications channels could then possibly be monitored to help shed light as to what might be happening.

Figuring Out What You Need

To figure out what equipment you will need for communications monitoring, you need to figure out what agencies you want to monitor, what systems they use, and if you can monitor the systems. This is a pretty easy thing to do, and you just need your local knowledge and access to the Internet.

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16 Radio Direction Finding

You start by figuring out the extent of the area you want to monitor. If you live in an incorporated area, you start with your local and neighboring towns, villages, or cities. Next would be your local county, and neighboring counties if you live close enough to them where something might spill over. Then there's your state. Finally some areas will have a notable federal presence due to nearby national parks, national forests, Indian reservations, or BLM land.

In your area you will have police, fire, EMS, and public works/highway departments . Law enforcement services can be provided at local, county, and state levels. The same applies to public works/highway departments. Fire and EMS will be handled at the local and/or county level depending on where you are.

In addition to the state police/highway patrol, the state will also have an agency or agencies to handle fish and game, conservation/environmental protection, state park management, and similar functions involving outdoor recreation and state lands. Similar coverage will also apply to federal property with the BLM, US Forest Service, National Park Service, and US Army Corps of Engineers among other agencies.

A good beginning rule of thumb is to take a map and draw a 10-30 mile radius circle around your location. That represents the average reception range of your typical polcie scanner receiver with its stock antenna. The shorter limit would be more suitable for urban areas, and the longer limit for rural. Use that to see what's around you. What towns, villages, and cities are in that range? What counties? What state or federal lands? Are they any military bases or correctional facilities? How about airports and railroads? Write up a list. Now think about what radio users are in the area that you want to monitor. For example, where I live there is one county, two cities, BLM land, a National Forest,

an Indian Reservation, state hunting and recreation land, an honor farm (corrections facility), two small uncontrolled airports, and a rail line.

After you have a list together, you can then visit radio scanner pages on the Internet. The two biggest ones are radioreference.com and interceptradio.com. Look in their databases at your area, and read your state's forum. See what radio systems the agencies and departments are using. Chances are your monitoring interests will be using either FM or P25. If they are using the latter they might also be encrypted. That's important, because if the P25 user(s) of interest are encrypted, then there is no point to spending $400+ on a P25 scanner that won't be able to monitor them. At that point, your monitoring needs will be served just fine with a basic analog scanner you can get for $100 or less at any hamfest.

Depending on the number of unencrypted P25 users in your area, you still might not need the scanner. Free computer software such as DSD+ and Unitrunker will let you monitor trunked and conventional P25 systems with a laptop computer and a $20 USB SDR dongle.

VHF/UHF Communications Monitoring (Police Scanners)

An RTL-SDR is $20. Older analog police scanners are under $50 at hamfests. A new police scanner that will receive the latest digital voice modes is over $400. If the majority of digital systems in your area are encrypted, there is little point to spending $400+ on a scanner that will be mostly worthless for where you are. If you have only one unencrypted digital system you need to monitor, the $20 RTL-SDR with the right software will do just as good a job as the $400 scanner. Cheap analog scanners are always useful, as regardless of where you live you will want to keep an ear on such things as CB, ham, MURS, GMRS, FRS,

Marine, and low power business/industrial band channels. Public safety mutual-aid, dispatch, and interoperability frequencies, shared by a number of different agencies in your region, will also likely be analog.

Portability and travel are also other factors. Desktop units and SDRs attached to PCs work better for fixed listening posts. If you will be operating primarily in the field, then you will want more portable and handheld equipment. If you travel extensively, you will want receiver models that come with a preprogrammed nationwide database like the Uniden Home Patrol. Similarly, if you are tasking non-technical people with monitoring radio traffic, the Home Patrol scanners are less complicated and easier for them to use when monitoring digital systems. You might want a monitoring operator to simply sit on one frequency, in which case a fleamarket $5 multiband portable would suffice. Such receivers are also good for rapid sector and band searches in their frequency coverage range, which is something I discuss later on in this chapter.

The first thing you need to do is figure out who is using what systems in your area. Fortunately, in the United States LMR license data for non-Federal Government users is public information and available online directly from the FCC via their General Menu Reports web page. This web site will tell you everything, but goes into little detail of actual use and activity level. For that level of detail you will need to visit hobbyist websites such as Intercept Radio and Radio Reference. If you live in a heavily-populated area such as the Northeast, Northwest, or California there will be a number of hobbyists who have already posted information. If you live in a sparsely-populated area like Wyoming there will be much less information. In the latter case you will need to do your own research.

When I first moved to Wyoming, I found most state, county, and local agencies used a (mostly) statewide VHF P-25 Phase 1 trunked radio system managed by the state government. The programming bandplan on Radioreference was incorrect. Using a combination of Trunk88 with an RTL-SDR and Pro96.com along with my PRO-96 scanner, it took me an evening of casual listening to get the right band plan. At the time of this writing, there were still talkgroups in need of identification, but that's the nature of hobbyist SIGINT in one of the country's least populated states.

More recent models of scanners have the standard VHF trunking plan programmed into them, but you can buy a used PRO-96 that'll handle any Motorola, P-25, or EDACS system for half the price if you program it with a $20 piece of software. Older P25 Phase 1 scanners such as the Uniden Bearcat BC-250D (with its optional P25 card) and the Radio Shack PRO-96 can be had for about half the price of a new unit if you need a standalone portable. Otherwise, a $20 RTL-SDR and some free software will do the job, and provide you with a lot more information about system activity.

Shortwave Listening (SWL)

Shortwave broadcasters used to be an excellent alternate source of news and information. That, unfortunately, is no longer the case. Many of the overseas standard bearers such as the BBC and Radio Deutsche Welle are no longer on shortwave. The majority of US shortwave broadcasters have not much more than religious and conspiracy programming from perverts and con men. Ironically, the better quality shortwave programming is now coming from places like Cuba and China. To further compound matters, we are at present (2018) hitting the

bottom of the 11-year sunspot cycle which makes for poor HF conditions. That means reception is going to suck.

Any recent model HF ham radio transceiver will have receive capability from 1.8 to 30 MHz., and can be used for general purpose shortwave listening. So if you have an HF rig, you can listen to shortwave on it. For those of you without an HF rig, there are several inexpensive options available for you to check out the current shortwave broadcast offerings.

Good to 60 MC!

My present primary shortwave receiver is an Icom IC-R75 tabletop unit. It features 30 KHz. to 60 MHz. frequency coverage. It's totally overkill for the beginner who is only interested in listening to shortwave broadcasters, but does an excellent job of doing so. I use it for LF propagation studies, VHF-Low Band Dxing, and keeping an ear on 5 Meters for when the FMLA starts back up. Don't buy a receiver of this caliber right off the bat, unless you want to start getting seriously into other aspects of shortwave listening besides broadcasters, or into some of the specialty monitoring areas.

Multiband Portables For Shortwave and Other Bands Reception

Most of the time when I'm playing informal dial roulette on HF, I'm using something that'll let me band scan though the spectrum in a minute or so to quickly check for activity. For these purposes I like cheap simple analog receivers, with good sensitivity and somewhat broad selectivity. What I'm talking about are slide-dial multiband portable radios from made from the 1960s to the 1990s or so. I find them for under $30, and often under $10, at hamfests and flea markets.

These portables are battery operated, and often have an option to use an AC "wall-wart" power supply. They are designed to have decent receive performance with short antennas. Hooking up a "full-size" (resonant on HF) antenna usually overloads the front end and decreases performance. Many also have VHF and UHF band reception capability, making them useful for spot monitoring an analog signal in those bands. Finally, for those worried about EMP, they are inexpensive enough to be used as a sacrificial unit.

There are a few considerations, perhaps even requirements, that I keep in mind when buying these units. The first is price. Some sellers have an overinflated sense of value with some of these units, in particular the Realistic Patrolman SW-60. I wouldn't spend more than $30 on a multiband portable. Most of the time I keep the price under $20 unless it's a really nice one in mint condition. Often I spend $5-$10 on one. The second is mechanicals. I look for ones that are simple in construction with no weird switches that'll be next to impossible to replace if they break. Third is extra frequency coverage. In addition to shortwave, multiband portables usually come with AM broadcast, FM broadcast, VHF-air and/or -high band LMR, VHF low, UHF LMR, CB, and TV. The latter is from when TV stations used analog NTSC video with frequency moduation for the audio. Now TVs in the US are all digital, but having 54-88, and/or 174-219 MHz. frequency coverage could be handy for finding covert stuff hiding in between the channels, or the occasional TV pirate if there are any still left doing that sort of thing. They will typically have "TV1" for Channels 2-6, "TV2" for Channels 7-13, and "UHF TV" for Channels 14-83. The frequency ranges break down as follows:
Channels 2-6: 54-88 MHz.
Channels 7-13: 174-216 MHz.
Channels 14-83: 470-890 MHz.

These receivers can be used to check for clandestine "white space" activity, and communications above 54 MHz. where the VHF-Low coverage on many police scanners ends. Also note that the former UHF channels 59-83 are now allocated for land mobile and common carrier radio use.

I recall having a conversation with this homeless-looking dude at a prepper convention who claimed to have been a "marine corps medic," and specialized in "logistics." The idiot claimed that he bought a quantity of surplus British Clansman radios for his group to use when the big WROL TEOTWAWKI Zombie Apocalypse™ happens.

Ignoring for a moment that no US Navy corpsman would ever say he/she was in the Marine Corps, and the sheer stupidity of buying radios one could not legally use (and practice with) until that fantasy WROL TEOTWAWKI Zombie Apocalypse™ thing happens, such radios are in the surplus market, and I would not be surprised if some groups bought them and are bootlegging on the air with them.

Much like their US military tactical radio counterparts, the Clansmans I've seen for sale have a frequency range of 30-76 MHz., with the low-tier models having a range of 37-46 and 36-57 MHz. Online prices start at $130 each, which is cheap enough that some groups might seriously consider them. Ham radio hobbyists in the US would be able to use some models in the 50-54 MHz. 6 Meter band, which is not a bad place for prepper-oriented hobbyists to set up communications. What you should take away from this is that analog 30-75 MHz. reception capability is something you should have.

Six meters, by the way, is a VHF band you should be paying attention to if you are interested in amateur radio from a preparedness standpoint, but I'll get to that later.

Here is an example of a pretty decent unit that cost $5 at a hamfest. It is a 1960s or 1970s vintage Lafayette Guardian 5000. It does AM, FM, shortwave, VHF-low, VHF-high, and shortwave. The most complicated part on the radio is a multi-position rotary switch that could be easily scrounged without too much hassle from an electronic carcass. It's a good unit for the price.

This "Passport" multiband portable was closer to the $30 price point from an antique store. However, it receives lots of frequency bands. It, however, has a mechanical weakness with the complicated push-button switch bank on the top of the radio. That will be very hard to jury-rig a replacement if it breaks (which this one did). Regardless, it was a pretty good performer RF-wise with good band coverage.

Radio Shack had at least dozens of different multiband portables over the years. This one has no shortwave coverage, but does AM, FM, VHF-air, VHF-high, and VHF TV bands (2-13). Note the dial and band switch in regard to VHF-air and VHF-high. That tells me the receiver has separate AM and FM detectors for the same frequency range. A lot of multiband portables only have an AM detector and force you to slope-detect FM signals. It works, but not as well as having the

proper circuitry. This was in a box of random electrical stuff that sold for $1 at an auction. It sees use in the shack for spot monitoring the local ARTCC frequency.

This is a pretty old Arvin unit that was another antique store find. It does AM, Shortwave, and Longwave bands. When you look inside a radio to see transistors in sockets, you know it's from the era of "they don't build them like that anymore." The shortwave coverage is missing the higher bands, but this one was intended for Longwave reception and other lower-frequency experimentation.
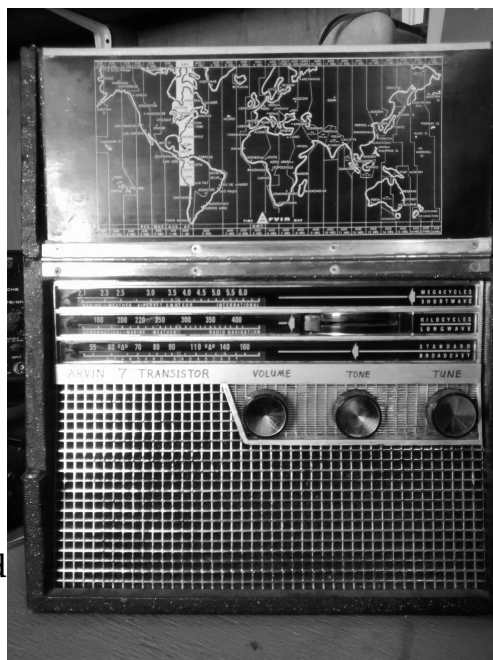
Basic Communications Monitoring Techniques

Search Techniques

There are three basic techniques you use when searching for communications activity. They are **spectrum searches, band/sector searches,** and **point searches**. Each has it's own advantages, disadvantages, and applications.

Spectrum Search

A **spectrum search** is the detailed exploration and mapping of the entire frequency coverage range of a particular receiver. I recommend you do this at least once,

and periodically afterwards. Spectrum searches take a long time to do properly, but they will provide the most detailed picture of what you can receive at your monitoring post.

A variation of the spectrum search is the **near-field search** using the Close Call[17] function on a police scanner. This is a spectrum search that is limited to signals in your nearby area, about a couple hundred feet for portable radios. Nearby signals, regardless of their frequency, are always a matter of concern until their identity and nature is ascertained.

If you can safely get within visual range of the target, use a Close Call scanner. This item replaced frequency counters for all of us who liked to do "on scene" signal sleuthing. The target will key up, and within a second you will have the emitter's frequency and be hearing their communications. Expect a detection range of 100 feet for a 1W portable, 250 feet for a 4W portable, a half mile for a 25W mobile, and a few miles for a 100W base station.

Band/Sector Search

A **band/sector search** is similar to a spectrum search, but only covers part of the receiver's frequency coverage range. Since spectrum allocation data is public information in the United States, this is the second most common search method you will be using to to discover frequencies for specific targets.

Covert frequencies are often (but not always) on the same band as the target's licensed frequencies. If your local police department's dispatch channel is on VHF-high band, then it is a good bet their unlisted tactical channel is also there. Using allocation data available in Part 90 of the FCC

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17 "Close Call" is what Uniden calls it. Also known as "Signal Stalker" in Radio Shack models and "Spectrum Sweeper" in Whistler/GRE models.

Regulations (47CFR90), you can perform a band/sector search of the proper band.

Frequency bands can also be determined by looking at the antennas on vehicles, unless the vehicle has a disguised antenna, and on handheld radios.

Frequency Band By Mobile Antenna

- VHF-low band
  60 to 100 inch whip.
  35-inch whip with a 5-inch coil on the bottom.

- VHF-high band
  18-inch whip.
  40-inch whip with a 3-inch coil on the bottom.

- UHF band
  6-inch whip.
  35-inch whip with a plastic band in the middle.

- 800 MHz.
  3-inch whip.
  13-inch whip with a "pig tail" coil in the middle.

Frequency Band By Handheld Antenna

- VHF-low band
  Roughly one foot long.

- VHF-high band
  About six inches long and about as thick as your index or middle finger.
  NB: There exist "stubby" VHF-high band antennas that can be confused with those of higher frequency ranges.

- UHF band
  6 inches long and slender compared to the VHF-high

band antenna.
3 inches long.

- 800 Mhz.
   About 1.5 inches long.
   About 1 foot long with two different thicknesses.

*** It is strongly suggested that you order the catalogs of various antenna manufacturers to get a visual idea of what antennas on each of the bands look like.

Ideally, when doing a band/sector search you should search a range that covers three to five seconds, and with the scanner's fastest speed. This seems to be the average duration for a radio transmission. Let us say you are searching the VHF-High band with a scanner that does 50 steps a second. Channel spacing for VHF-high band is 5 KHz. You should search your target areas in sweeps of 750 KHz. to 1.25 MHz. Search a range for one to two weeks at different times, to catch everything in that range.

Point Search

A **point search** is the long-term monitoring of specific frequencies. License data for non-Federal Government users is public information, and available online. This is the method you will be using the most, as you will be able to acquire 90% of your targets' frequency data ahead of time.

In the United States, most radio license and allocation data is public knowledge. The FCC maintains a list of all non-federal government license holders with frequency data, and it is supplemented with more specific data from hobbyist sites such as Radio Reference. There are two websites that you should bookmark:

http://fjallfoss.fcc.gov/General_Menu_Reports/
FCC General Menu Reports. Contains FCC license data.

http://www.radioreference.com/
Radio Reference. This is one of the most popular scanner hobbyist websites.

Between those websites, you will find 90% of the data you need to conduct a monitoring exercise in the United States. It is simply a matter of looking up the information for the area you are operating in, and programming your equipment.

Spread Spectrum

Certain users use encrypted or spread spectrum (frequency hopping) communications. Until recently, it was thought that receiving spread spectrum communications (FHSS) was beyond the ability of the average hobbyist, but with the right equipment and under the right conditions it is possible to detect and monitor FHSS communications.[18] The Ticom Zine article predated the availability of inexpensive USB RTL SDRs, so I would expect that the difficulty level of monitoring spread spectrum communications will continue to go down.

I made an observation while using the spectrum scope on an AOR AR8200 in the 902-928 MHz. band. There is a lot of FHSS activity in the 902 band. I noticed that the spectrum scope was registering consistent hits on certain frequencies in the band. Upon monitoring the frequencies in question, I would consistently hear a quick "pop" on them. This is indicative a FHSS signal momentarily landing on a frequency. I have not tried this on other wideband receivers

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18*"Experiments in Spread Spectrum Interception"*, Technical Intelligence Communications (TICOM) Zine, Issue #1 -
http://gbppr.dyndns.org/2600/TAP/cybertek/TICOM_Zine_1.pdf

with a spectrum scope, but it shows that FHSS activity can at least be detected at a distance.

More recently, I had the opportunity to test an Optotlectronics Scout frequency counter against a Motorola DTR650 handheld. It did an excellent job of detecting the signal and providing individual frequencies of the hop set out to about 100 feet.

In urban or suburban terrain, spread spectrum communications on certain bands, such as Part 15 or ISM, are commonplace. Even in rural terrain utility companies use FHSS on the 902 band for telemetry and SCADA applications, but with directional antennas. In these instances, the detection of FHSS activity on certain bands is not a cause of major concern. In wilderness terrain where there is no apparent infrastructure that needs such support, the detection of FHSS communications in their usual parts of the spectrum is more interesting. Regardless of where you are, detection of FHSS signals in the 30-88, 138-144, 162-174, or 225-420 MHz. bands is a matter of serious interest.

Encryption

Encrypted communications present a low to almost impossible technical difficulty in regards to cracking them, and are also illegal to intercept under the Electronic Communications Privacy Act. Encrypted communications system users will sometimes have equipment difficulties and operate in the clear. A patient listener will wait for this opportunity. One can also determine what unencrypted entities work with the encrypted system user and monitor them to get a picture of what might be going on.

Listeners in areas where the agencies of interest encrypt will often program in the mobile (input) frequency of an encrypted system to provide them with an indication that

something is going on nearby. This is an example of ELINT as opposed to COMINT.

Introduction to Signal Analysis

I will assume that you, in the course of your communications monitoring endeavors, have come across a genuine unidentified ("unid") user while searching the spectrum. You've checked all the scanner frequency lists, e-mail lists, web sites, and online forum postings and have come up with nothing. You wish to identify the unid, and determine the extent of its communications network. To do this, you ask the following questions:

- Frequency (or talkgroup if monitoring a trunked system)?

- PL/DPL tone, if any? Single PL/DPL used, or multiple?

- NAC if digital?

- Encrypted or clear? Type of encryption: digital or analog?

- How many stations do you hear?

- How do they identify themselves?

- Signal strength of stations communicating?

- What are they talking about?

The first four characteristics are noted as soon as you discover the unid. You will have some initial information about the others, but as time goes on you will acquire more information. What you should be doing now is noting what information you do have on the unid. Some people like using a computer database, others like 3x5 index cards. The more info you have, the easier it'll be to identify the unid.

The frequency in question can help tell you the approximate range, extent and purpose of the unid's communications net. For example, the VHF low-band would likely be used for regional communications between base stations and maybe mobile units. UHF on the other hand, would be for short-range tactical-type communications between several mobiles and portables. UHF portables are limited to a few miles. A VHF low-band base station can communicate a few hundred miles under the right circumstances. What other identified users operate on nearby frequencies?

Talkgroups on trunked systems are often created with some amount of logic behind them. Typically, a county or agency will have their talkgroups in the same range, such as 5000-6000. If all the identified talkgroups in your county are 4 digits long and start with a 5xxx, then an unid talkgroup in that range probably belongs to the county in question. Similarly, if all the sheriff talkgroups in said county begin with 50xx, then something you come across in that range will likely belong to the sheriff.

PL/DPL tones and NACs are other identifiers. Knowing the PL/DPL tone or NAC of an unid enables you to cross-reference it to other frequencies. If a police department uses a certain PL on their repeater, and an unid with surveillance activity is noted on the same band with the same PL, then it's quite possibly an unlisted channel for that police department. Knowing how many different PL/DPL tones are in use on a given frequency tells you approximately how many different nets, or distinct groups of communicators, are active on that freq. On a low-power portable frequency such as 154.600 MHz., users will use a "unique" PL/DPL tone so they don't have to hear everyone else. There are only a limited number of PL/DPL tones however, so duplication by different nets is inevitable. Other

users won't want to spend the extra money for radios with PL/DPL capability, run without it, and tolerate the other users on the channel breaking their squelch. If you hear an unid running DPL, then you can be reasonably certain they are running real "commercial land mobile" equipment as few ham rigs have DPL. NACs serve the same purpose as PL/DPL for P25 radio systems. Of interest is the fact that even on an encrypted P25 system, the NAC is unencrypted.

Some radio communications businesses maintain commercial trunked radio systems and the occasional community repeater. The license for the system is in their name, and they rent airtime to various businesses and organizations. The individual users will not be licensed, instead running under the radio shop's license. Each subscriber will be assigned his or her own talkgroup on the system, or PL/DPL tone on the repeater. Motorola sold all their commercial SMR systems to Nextel who took them off the air and replaced them with iDEN (digital) systems. This prompted many radio users to seek out alternatives to Nextel. Many radio shops have set up LTR trunked systems, which have replaced their community repeaters for the most part. LTR is an open protocol. This not only means a wide availability of equipment for the business offering these services, but equipment for the monitoring enthusiast as well. There are also a few commercial SMRs running the GE/Ericsson EDACS system on 800 MHz. Each system can have several dozen users on it, making them a nice challenge for the monitoring hobbyist who wishes to map them out.

If an unid is encrypted, you will at least know whether or not the encryption method is analog or digital. If they are using a simple single-frequency inversion method, then it is possible, although illegal, to decrypt their communications and proceed. If they are using something

advanced such as DVP, DES, or Rolling Code then you will not be able to monitor the actual communications. You will still at least be able to note how often the frequency sees activity, and the signal strengths of the stations communicating. Voice encryption is often subject to failure, and you might catch a station operating in the clear if you monitor long enough. DIY-types should note that single band frequency inversion is the same system used in the now-discontinued Ramsey Electronics SS-70A.

At this point, you have all the immediate characteristics of the unid noted down. The rest is just a matter of time. The remaining questions you have in identifying the user are:

- How many stations do you hear?

- How do they identify themselves?

- Signal strength of stations communicating?

- What are they talking about?

All these will eventually answer the main question, "Who am I listening to?" The best thing to do at this point is take a receiver and dedicate it to the given frequency. You can acquire basic 16-50 channel scanners for almost nothing at flea markets, pawn shops, and hamfests for this purpose. If you want 24 hour monitoring of the frequency, attach a VOX-operated tape recorder to the scanner. Many scanners come equipped with a "tape out" jack for easy connection. Otherwise, go to Radio Shack and pick up one of the suction cup telephone microphones. This is attached to a telephone receiver by the earphone to record phone calls. Attach it near the speaker of the scanner. Experiment to find the best place to attach it to the scanner. For those of you who really want to get into things, the late Bill Cheek's Scanner Modification Handbooks contain a wealth of information on

modifying your scanner to make communications monitoring easier. You can add event counters to see how many times the frequency breaks squelch, time-stamping for monitored communications, and a whole host of other enhancements.

You will be able to initially discern IDs used on the frequency and the signal strength (even if approximate) of the stations on the net. You will also know what they are saying if it's in a language you can understand, although you might get a little tripped-up on any specialized jargon. Log it all down. Eventually you'll also be able to recognize the voices of the various people on the frequency, and match them to IDs. The signal strength of each user will tell you how approximately how far away they are from your location, and whether they are base or mobile/portable stations. Consistent signal strength will indicate a base station or repeater. Mobile and portable stations will have varying signal strengths and often "mobile flutter" on their signal.

Channels are often given identifying names such as "TAC1" or "SO-2". Public safety dispatchers usually have a handful of channels on their consoles they have to communicate on, and the channel icon on the screen will have the ID of the particular channel. Mobile units, when communicating with dispatch on a seldom-used secondary channel will often state the channel they are on so the dispatcher knows where to reply. They'll say something like "S23 to dispatch on SO-3." If you know the identified channel names for the sheriff's office are "SO-1" and "SO-2", there's a good chance that "SO-3" belongs to the sheriff's office.

When listening to an unid with the intent of identifying it, two things you should listen for are locations and specialized trade jargon. They can be cross-referenced to assist in identifying the user. Street maps of your nearby

locales are good reference to have. I don't advocate "call chasing", going to the site of an incident that you've heard on your scanner. This can be dangerous, and complicates matters for public safety personnel who are working the incident. However, if you've determined you are listening to an obviously civilian unid on a trunked system or community repeater who was just sent on a service call to a location that's a few blocks away from you, it would be a different matter. It would be worthwhile to take the dog for a quick walk to see who you are listening to. On that note, information you discover on community repeaters or trunked systems is transitory in nature. The talkgroup or PL may belong to a different business next month.

If you listen long enough and pay attention to the communications you are receiving, you will identify the user. The amount of time will vary with the nature of the user, and how often they are on the air. Once you identify the user, the rest is up to you. You can become quite intimate with the operations of a business by monitoring their communications. Monitoring local public safety communications will often give you a better handle on what's going on in your community than the local newspaper. The possibilities are endless. As an intellectual exercise your communications monitoring endeavors will be delving into such diverse areas as electronics, geography, sociology, research skills, and current events. At any rate, communications monitoring analysis is far better a pastime than sitting in front of the television. Chances are you'll have some questions regarding communications systems or activities in your locale that could be answered by using communications monitoring analysis. Some questions that might come to mind are:

- What are high crime areas in my community?

- What are the most common crimes in my community?

- What is the reliability of the local utility infrastructure (electrical, telephone, CATV, gas)?

- "X" is obviously employing radio communications, but no license is listed for them. What's their frequency?

- What frequencies and/or radio systems are the local public safety agencies using other than the publicly listed ones?

Communications Monitoring Notes

- Police department traffic on the main channel is frequent, mundane, and for the most part of no consequence to you. What you will want to listen to are the car-to-car, mobile, tactical, and surveillance frequencies. These communications will be nearby, and therefore of greater interest. Even if the traffic is encrypted, you'll still get an indication that something is up. You will also want to listen to the regional mutual-aid and interoperability frequencies. These frequencies are used when multiple jurisdictions are involved in an incident, and are a possible indicator of something widespread and interesting.

- Fire Department channels are usually silent until a call happens, and they are first responders to any type of HAZMAT incident. The fire dispatch frequency will likely be where you will hear about something you have to worry about. If you are lucky, your county or region will have a combined dispatch center and single frequency for all the local jurisdictions.

- Emergency Management Agency frequencies are generally silent unless there is either a drill or incident that requires the agency's activation. This is another frequency you'll want to keep an ear on.

- Emergency Medical Service (EMS) frequencies can get busy, and most medical calls are non-disaster related. Around here, the regional EMS dispatch frequency is one of the busiest frequencies on the airwaves, but the traffic is routine medical calls. This changes during a disaster. Keep this frequency locked out until something happens. Also keep in mind that your local EMS dispatch agency might have a specific alternate frequency set aside for disaster operations. That will be the one you'll want to monitor.

- Public Works, Highway Departments, and Utility Company frequencies are similar in nature to EMS in that most of their traffic is routine and mundane until a disaster hits. They too might have specific frequencies set aside for disaster operations.

- In many places, some form of emergency medical services dispatch is done on 462.950 and 462.975 MHz. which are also known respectively as MED-9 and MED-10. Due to the myriad of commercial ambulance services and community EMS agencies all using different radio systems, the MED channels will probably remain analog FM for some time. In most medium-sized and larger cities, there is a constant stream of traffic on EMS channels. Most of it consists of routine calls.

- Due to the variety of communications systems that could be used by various public safety and emergency services agencies in a region, mutual-aid, interoperability, and emergency management agency frequencies are generally analog and unencrypted. These frequencies generally remain unused unless there is a major incident occurring, so they good indicator frequencies.

- Volunteer fire departments and ambulance corps whose members carry voice pagers will have their dispatch channel analog and unencrypted. This is because members also have scanners in addition to their pager that they listen to for call-outs. Fire departments in general have been slow to adopt P25.

- Fire departments are a useful monitoring target as the frequencies are only active when something is happening, and they are first responders to any disaster situation. Many areas maintain a regional/county dispatch center that handles all departments in a locale on a common frequency. Mutual-aid/intercity frequencies are useful for indications of incidents requiring multiple department response. Response and mitigation operations are often moved off to tactical/"fireground" frequencies.

- VHF aeronautical and marine band frequencies are analog and unencrypted. They are often a good indicator of an incident involving aircraft and nautical craft. The two primary frequencies of interest are the aviation emergency/"Guard" channel of 121.500 MHz. and Marine Channel 16, which is the calling and emergency frequency, at 156.800 MHz.

- Many bus and taxi companies still operate on conventional analog systems. They are useful for indications of incidents on the roads. Taxi drivers are especially known for making various comments over the air about interesting things they see on the road. Taxi companies in urban areas are often concerned with their calls getting stolen by the competition, so encryption and the use of mobile data services is not uncommon.

- Public works departments and utility companies generally consist of routine traffic until something happens. Then they are full of information about disaster response, and services recovery. I personally find that the routine traffic of utility companies provides an interesting picture of the local infrastructure. Public works departments and utilities are required monitoring after many types of heavy weather.

  Public works departments are generally slow to upgrade their equipment, and often reuse surplus radios from their municipality's police and fire departments. This means that in most cases you'll be able to monitor them with you basic analog, non-trunking police scanner. While FCC licenses can be looked up for specific localities, they traditionally operate in the following frequency ranges:

    33.20 – 33.10 MHz. (20 KHz. spacing)
    37.90 – 37.98 MHz. (20 KHz. spacing)
    39.06 – 39.98 MHz. (20 KHz. spacing)
    45.00 – 46.00 MHz. (20 KHz. spacing)
    47.00 – 47.40 MHz. (20 KHz. spacing)
    150.9950 – 151.1375 (7.5 KHz. spacing)
    153.7400 – 154.1225 (7.5 KHz. spacing)
    154.9850 – 155.1525 (7.5 KHz. spacing)
    155.7150 – 156.2400 (7.5 KHz. spacing)
    158.745 – 159.2025 (7.5 KHz. spacing)
    453.0000 – 454.0000 (12.5 KHz. spacing – Paired with mobiles at 458.0000-459.0000 MHz.)

- Most utility services in the US, especially in rural areas, are still on VHF low-band due to having a need to communicate over distant regions. This enables you to monitor a large area with just a few frequencies,

provided you have an adequate antenna. Try searching through these frequency ranges:

37.46 - 37.86 MHz. (20 KHz. spacing)
47.68 - 48.54 MHz. (20 KHz. spacing)
153.4100 - 153.7325 MHz. (7.5 KHz. spacing)
158.1300 - 158.2725 MHz. (7.5 KHz. spacing)
451.0000 - 452.0000 MHz. (12.5 Khz. spacing - Paired with mobiles at 456.0000 - 457.0000 MHz.)

- Police departments are probably the least desirable monitoring target. Many agencies are sensitive to being monitored and are encrypting their system. Even on unencrypted systems, most of the radio traffic is mundane. Your best bets for PD monitoring before and during a disaster are the interoperability and mutual-aid frequencies as they are only active during a major incident.

- If your police department is running encryption, monitor the frequencies used for car-to-car, surveillance, and repeater input. If the usage for specific frequencies is unknown, monitor what's listed for mobile/portable operation in their FCC license. You may not be able to hear what's being said, but you will at least have an indication something is going down in your neighborhood when you hear traffic. Also keep in mind that encryption sometimes fails or gets accidentally shut off.

- The Internet is a great source for scanner frequencies. A quick Google search should find what you need, or check the frequency database at Radio Reference[19].

19See http://www.radioreference.com/.

Portable Radio Frequencies

This list contains frequencies that are assigned by the FCC for low power or itinerant users, license free frequencies (FRS, MURS, and Part 15), and other frequencies that have been reported to usually have low power communications on them. Frequencies often identified by a common designation (i.e. "dot" frequencies) are so noted. The "dot" designators come from the practice of equipment manufacturers putting little colored circle or star stickers on radios that are equipped with certain common frequencies. Consequently, the "dot" frequencies are among the more active ones on the list.

VHF-Low

In the VHF low band we have a few business/low power channels, two itinerants, and the classic 49 MHz. Part 15 frequencies. The 49 Mhz. frequencies were originally the domain of cordless phones, .hands-free. walkie-talkies, and baby monitors. Judging from the phones on sale at local department stores, cordless phone have all migrated to the 1.9 GHz license-free PCS band using DECT 6.0. The walkie-talkies have been supplanted by the superior FRS radios. Baby monitors are also DECT 6.0.

30.84	43.04 – Itinerant
33.12	49.830 - Part 15
33.14	49.845 - Part 15
33.40	49.860 - Part 15
35.02	49.875 - Part 15
35.04 – Itinerant	49.890 - Part 15

VHF-High

The VHF-High and UHF Business bands are where most portable radio activity is these days. These are

frequency bands of the license-free MURS and FRS radio services, and of all the inexpensive Ritron and Motorola "job site" portables available from Home Depot and Grainger. There portables operating on GMRS repeater output frequencies available from places like Wal-Mart and Target Stores for $50/pair. While licensing is required to operate on GMRS, it is thought that many users of these radios neglect to do so. There are also a few frequencies in the 169-172 Mhz. range that are used for wireless microphones. **These are the most active frequency ranges for portable radios.**

Not listed, but also of definite interest are the VHF Marine Band frequencies between 156.25-157.425 MHz. Despite being a violation of FCC regulations, many individuals use VHF Marine portables on land, especially if they are more than 100 miles or so from a navigable waterway. If you are near a navigable waterway, the non-commercial and government channels often carry interesting traffic.

151.505 – Itinerant	151.925
151.5125	151.940 – MURS
151.625 - Itinerant, Red Dot	151.955 - Purple Dot
151.655	152.885
151.685	152.900
151.700	152.945
151.715	153.005
151.745	154.490
151.775	154.515
151.805	154.5275
151.820 – MURS	154.540
151.835	154.5475
151.865	154.570 –MURS/Blue Dot
151.880 – MURS	154.600 - MURS, Green Dot
151.895	158.400 – Itinerant

158.4075
169.445 - Wireless Mics
169.505 -Wireless Mics
170.245 - Wireless Mics
170.305 -Wireless Mics

171.045 - Wireless Mics
171.105 -Wireless Mics
171.845 - Wireless Mics
171.905 -Wireless Mics

UHF

451.1875
451.2375
451.2875
451.3375
451.4375
451.5375
451.6375
451.800 – Itinerant
452.3125
452.5375
452.4125
452.5125
452.7625
452.8625
456.1875
456.2375
456.2875
456.3375
456.4375
456.5375
456.6375
457.3125
457.4125
457.5125
457.525
457.5375
457.550
457.5125

457.5625
457.575
457.5875
457.600
457.6125
457.7625
457.8625
461.0375
461.0625
461.0875
461.1125
461.1375
461.1625
461.1875
461.2125
461.2375
461.2625
461.2875
461.3125
461.3375
461.3625
462.1875
462.4625
462.4875
462.5125
462.550 – GMRS
462.5625 – FRS1
462.575 - White Dot-GMRS

462.5875 – FRS2	466.1375
462.600 – GMRS	466.1625
462.6125 – FRS3	466.1875
462.625 - Black Dot-GMRS	466.2125
462.6375 – FRS4	466.2375
462.650 – GMRS	466.2625
462.6625 – FRS5	466.2875
462.675 - Orange Dot-GMRS	466.3125
462.6875 – FRS6	466.3375
462.700 – GMRS	466.3625
462.7125 – FRS7	467.1875
462.725 – GMRS	467.4625
462.7625	467.4875
462.7875	467.5125
462.8125	467.5625 – FRS8
462.8375	467.5875 – FRS9
462.8625	467.6125 – FRS10
462.8875	467.6375 – FRS11
462.9125	467.6625 – FRS12
463.2625	467.6875 – FRS13
464.325	467.7125 – FRS14
464.4875	467.750
464.500 -Itinerant/Brown Dot	467.7625 - J Dot
464.5125	467.775
464.5375	467.7875
464.550 –Itinerant/Yellow Dot	467.800
464.5625	467.8125 - K Dot
464.600	467.825
464.700	467.8375
464.825	467.8625
464.9125	467.850 - Silver Star
466.0375	467.875 - Gold Star
466.0625	467.8875
466.0875	467.900 - Red Star
466.1125	467.9125

467.925 - Blue Star	469.5125
469.2625	469.5375
469.4875	469.550
469.500	469.5625

800 MHz.

The 800 MHz. land mobile band is mostly home to public safety agencies (both conventional and trunked), and a small number of business/industrial users. The entire 851-856 MHz. region has potential for portable use, especially in urban areas. The 902-928 MHz. band is not only a license-free band, but is also an amateur radio band. In addition to cordless phones (that are moving up to 2.4 and 5.8 GHz.), you will also find baby monitors (including .two way. ones), wireless headsets/microphones, fast-food restaurant order window systems, wireless cameras (now mostly at 2.4 GHz.), wireless data systems, toll-road transponders (ITS systems), amateur radio operations, and who knows what else.

851.0125
853.4875
853.9875 - Public safety mobiles and portables. The entire 853-854 MHz. section sees use.
902-928 - Part 15

Got Visual?

If you have a visual on the portable radio user, use a police scanner with Close Call. As long as you are within 250 feet or so, the near-field detection function will acquire the frequency in a couple seconds. If you don't have even a basic scanner with Close Call, pick one up. The Close Call will also detect mobiles and base stations at a longer distance.

Icom IC-R5 Wideband Receiver and TL-29 knife. A popular combination with SOT-A types.

The Bubba Detector

Credit for the name goes to MSG Dan Morgan who ran one of the first survivalist/3per communications blogs[20]. The Bubba Detector is a small, portable wideband communications receiver that is programmed up with every conceivable VHF/UHF portable radio frequency. That includes my portable frequency list, CB, MURS, FRS, GMRS, and VHF Marine Band. The Icom and AOR portable radios are a popular model used for this application. These receivers have at least 1000 memory channels which is enough to program in the necessary frequencies.

While a Close Call scanner can perform a quick spectrum search and acquire a signal within a second or two, it has the disadvantage of being limited to a range of a couple hundred feet for detecting portable radios. By doing a point search of all known common portable radio frequencies with a wideband receiver, that detection range can be extended to a couple of miles, or even greater if a gain-type antenna is used. The smaller Icom (R-2, R-5, R-6) portable receivers are the more popular models for this application.

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20 http://danmorgan76.wordpress.com/

Close Call vs. Bubba Detector

I've been asked this question a few times during the 3%/Grid-Down Communications Course. Both are intended to alert you to nearby radio activity. The difference is in the frequency range and detection distance. Generally speaking, a Close Call scanner works best in urban areas, and a Bubba Detector is best for rural areas.

A Close Call scanner will detect any narrow-band (FM/AM) radio activity within its spectrum coverage range out to a nominal distance of 1000 feet, and actually close to 200-300 feet for portable radios. A receiver configured as a Bubba Detector will detect portable radio transmissions out to a couple of miles, and possibly even further depending on the terrain, but is limited to the frequencies programmed into the scanning memories.

Ideally you should have both capabilities, as when it comes to detecting "nearby" RF activity, you want maximum frequency coverage and detection distance. You could buy a used Radio Shack PRO-83 or Uniden BC-92XLT, program in 200 of the "Bubba Frequencies", and have something resembling a combination of a Bubba Detector and Close Call scanner. However you will have to miss something. There are 188 potential common portable frequencies, (including MURS, FRS, and GMRS) on the VHF and UHF LMR bands, 40 for CB, and 60 for VHF Marine Band for a total of 288 common portable and/or license-free radio frequencies. If you go this route, you will want to make sure the scanner you use for this dual-function detector has enough scanning memories, and is capable of simultaneously scanning memories and running close call. The Radio Shack "Signal Stalker II" models will not do this.

Uniden Home Patrol

The Uniden Home Patrol is the best scanner for the novice. It comes preprogrammed with a nationwide frequency database from Radioreference.com. All the monitor has to do is enter in their zip code, and the scanner will monitor 80-90% of what they need in their area. A GPS receiver/antenna can be attached to the scanner, and it will self-program according to the location data it receives. The Home Patrol also has a discovery mode that will search the spectrum for activity to determine its location, and program itself accordingly.

I recently had the opportunity to try one on a trip from Riverton to Casper, WY. Although the scanner did not have the optional GPS system, I was still able to enter in a county with a couple of screen taps to get up and running in a few seconds. The discovery mode was found to be very quick and accurate, successfully figuring out where I was in a few seconds and loading in a comprehensive list of local frequencies.

The frequency database is taken from the information found on the Radioreference.com web site. While Radioreference is for the most part an accurate database, it is still only as good as the people contributing to it. Areas with a larger contributor base will have more accurate and up to date information. With that said, I had no problems with the frequency information provided for a state that ranks among the lowest in population and population density. The scanner programming can be updated and customized via computer software as newer information for an area becomes available.

Among beginner monitors, the biggest problem involves programming their scanner, especially when it comes to trunked radio systems. The biggest problem among experienced monitors is going into an unknown area where frequency data has not been previously researched. Both of these problems are solved with the Uniden Home Patrol, giving monitors 80-90% of the frequency data they need within a few seconds of arriving into an area.

More experienced and technical monitors will want greater programming flexibility in their receivers, the ability to conduct spectrum and band/sector searches with their receiver, and near-field detection capability. If you are at this level, I would not immediately recommend the Home Patrol. If you are a beginner, non-technical, or find yourself traveling extensively, then the Home Patrol would be a satisfactory tool for your purposes.

Commercial Broadcast Monitoring

After moving out West, the poor nature of Internet connectivity led me to look for alternate sources of media. Being an RF hobbyist, one of the first things I did was break out a multi-band radio, and do a band search of the AM and FM broadcast bands.

Commercial news sources are all biased, and selective in what they report. Their bias is based upon the network owners' personal political belief systems, the perception of the beliefs of their market/target audience, and how the latter affects station revenue. With that said, the news you receive will be mostly/generally accurate, albeit colored with the source's particular bias.

The commercial news sources you will encounter on the AM, FM, and TV bands can be broken down into two broad categories. The categories are traditional right-wing

and traditional left-wing. They are split down the traditional "right-wing conservative"/Republican, and "left-wing liberal"/Democrat political lines. On the "left" side are ABC, NBC, CBS, and NPR/PBS. On the "right" side is FOX. These are the traditional Amerikan corporate broadcasters, and each has their expected bias.

From a strategic dystopian present-state standpoint, observation of broadcast media is a useful tool to gauge current and future majority trends. This is important as your status as a minority group means you need to keep an eye on certain things the masses are thinking and worrying about. In particular, the things that might affect you. Also, certain potentially interesting and/or useful memes can be detected and used to your advantage, provided you have the skills to do so.

For example, I was recently watching a show on PBS that featured individuals who were disconnecting from their electronic tethers (aka cellphones). Intelligence information of such a nature can always be exploited to an advantage by those with the right training. Psychological operations and propaganda are beyond the scope of this work, but as the well-known axiom states, "Keep one's friends close and one's enemies closer."

A basic station setup capable of AM, FM, VHF-WX, and Shortwave reception. All items procured either via clearance sales or via used equipment sources. 1960's vintage Arvin AM/LW/SW receiver, Grundig AN-200 Loop Antenna, Radio Shack AM/FM/AIR/VHF-WX receiver. Photo by author.

Consider suspect anyone who disparages the act of monitoring mass media broadcasts, often along with

throwing out the term "brainwashing". You cannot be brainwashed by watching PBS or listening to NPR, especially when you already know their sociopolitical bias. The worst it might do is make you check some premises, which as a survivalist is not a bad thing.

Let me clue you into a little secret. Sometimes your biggest problems come from people who claim to be on "your side." I have seen more outright lies, fake news stories, and bogus "intel reports" from web sites who claim to be patriot, militia, and three-percenter than I have seen from CNN, PBS, ABC, NBC, ABC, CBS, and Fox combined. I have also noticed that the more vocal sites are the worst offenders, and that "liberal" Wyoming Public Radio is more politically conservative than some East Coast Republicans I know.

Since you know everything is biased right from the start, you listen with a skeptical ear, choose a number of different sources, and aggregate them to get an idea of what's going on. I listen to a combination of NPR, AM broadcast "talk radio", overseas international shortwave broadcasters, and the occasional domestic shortwave broadcast to provide me with a wide enough variety of "news" to properly aggregate and analyze. The one mistake most people, especially "preppers", make is not have enough variety of sources to do a proper analysis. Alex Jones and Glen Beck are not enough. If you can't listen to an opposing view because you're afraid it's going to somehow "brainwash" you, then you won't be worth much in the long run.

With that said, the first pieces of equipment for your monitoring post are items you might already have. They are an AM/FM portable radio and small TV set. If possible, both should be hooked up to good quality external antennas to maximize reception capability. FM broadcast band (Broadcast Band) and TV antennas are available via Wal-

Mart, or most home improvement-type stores (Home Depot, Menards, etc.) Portable radios come with an internal ferrite antenna for AM Broadcast Band reception which works adequately, but for distant reception, I use a Grundig AN-200 loop antenna, especially when trying to isolate two stations on the same frequency. Loop antennas have excellent directional characteristics.

The primary stations you are trying to reach are your local PBS and FOX affiliates, as they are your best bet for broadcast news media coverage on the two sides of the nominal political spectrum. In most places, an omni-directional antenna should work to receive both stations, but I recommend you install a directional "fringe reception" antenna for reasons I will disclose later. On FM and TV broadcast, a good setup should enable you to receive stations out to a 60 mile radius depending on your location and antenna arrangements. AM broadcast will have a shorter reception range during the day, and start crossing state lines to offer regional-plus coverage at night. AM Broadcast Band DX reception at night is the nature of the beast. TV and FM Broadcast Band reception range will generally be line-of-sight unless the VHF/UHF bands are experiencing some form of enhanced propagation.

Don't bother with getting cable or satellite TV service. It is an added monetary expense, and you probably have better things to spend the money on. I live in the region that is among the furthest in the Continental United States from any Interstate highway, and am able to get the necessary TV stations off the airwaves for free. If I can do it here, you should be able to do it where you are.

Setting up a modern TV for reception is trivial. You turn it on, and have it scan the channels. It will find local stations that are on the air, and identify them for you. All

you then have to do is check the schedule for the times of news and "current affairs" shows that interest you.

AM/FM is a little more involved. You will have to tune the dial through the broadcast spectrum, identify what's transmitting in your area, and then check schedules for the times of news and "current affairs" shows that interest you. First scan both the AM and FM bands during the day, then after dark scan the AM band again. The reason you should scan the AM band a second time at night is because signals in that frequency range travel much farther at night, and you will be able to hear stations way beyond your local area.

Nighttime AM talk radio is home to fringe shows that provide information of an interesting nature, but remember to verify what you might hear. No mention of nighttime AM talk radio would be complete without mentioning the Coast-to-Coast AM show, a paranormal news/talk show originally created by the late fellow desert rat and ham radio enthusiast Art Bell, W6OBB/SK. It's now hosted by George Noory (weeknights) and George Knapp (Sundays), and is on every night from 1AM – 5AM Eastern/10PM – 2AM Pacific time. If you are up late one night, give it a listen. At the very least you'll be entertained.

Your best bet when starting out is seeing how many of the "big guns", the Class A high-power unlimited clear channel AM stations, you can hear from your location. Here is a list of all Class A AM Broadcast stations in the United States. You can do your own search via the Internet at https://www.fcc.gov/media/radio/am-query#block-menu-block-4 for a more updated list.

Class A AM Broadcast Stations:

Callsign	Frequency (Khz.)	Location
KYUK	640	BETHEL, AK
KFI	640	LOS ANGELES, CA
WSM	650	NASHVILLE, TN
KENI	650	ANCHORAGE, AK
WFAN	660	NEW YORK, NY
KFAR	660	FAIRBANKS, AK
KDLG	670	DILLINGHAM, AK
WSCR	670	CHICAGO, IL
KBRW	680	BARROW, AK
KNBR	680	SAN FRANCISCO, CA
KBYR	700	ANCHORAGE, AK
WLW	700	CINCINNATI, OH
WOR	710	NEW YORK, NY
KIRO	710	SEATTLE, WA
WGN	720	CHICAGO, IL
KOTZ	720	KOTZEBUE, AK
WSB	750	ATLANTA, GA

Callsign	Frequency (Khz.)	Location
KFQD	750	ANCHORAGE, AK
WJR	760	DETROIT, MI
KCHU	770	VALDEZ, AK
WABC	770	NEW YORK, NY
KNOM	780	NOME, AK
WBBM	780	CHICAGO, IL
KGO	810	SAN FRANCISCO, CA
WGY	810	SCHENECTADY, NY
KCBF	820	FAIRBANKS, AK
WBAP	820	FORT WORTH
WCCO	830	MINNEAPOLIS, MN
WHAS	840	LOUISVILLE, KY
KOA	850	DENVER, CO
KICY	850	NOME, AK
WWL	870	NEW ORLEANS, LA
WCBS	880	NEW YORK, NY
KBBI	890	HOMER, AK
WLS	890	CHICAGO, IL

Callsign	Frequency (Khz.)	Location
KOMO	1000	SEATTLE, WA
WMVP	1000	CHICAGO, IL
KDKA	1020	PITTSBURGH, PA
KVNT	1020	EAGLE RIVER, AK
WBZ	1030	BOSTON, MA
WHO	1040	DES MOINES, IA
KYW	1060	PHILADELPHIA, PA
KNX	1070	LOS ANGELES, CA
KOAN	1080	ANCHORAGE, AK
KRLD	1080	DALLAS, TX
WTIC	1080	HARTFORD, CT
KAAY	1090	LITTLE ROCK, AR
WBAL	1090	BALTIMORE, MD
WTAM	1100	CLEVELAND, OH
KFAB	1110	OMAHA, NE
WBT	1110	CHARLOTTE, NC
KMOX	1120	ST. LOUIS, MO
WBBR	1130	NEW YORK, NY

Callsign	Frequency (Khz.)	Location
KWKH	1130	SHREVEPORT, LA
WRVA	1140	RICHMOND, VA
KSL	1160	SALT LAKE CITY, UT
WWVA	1170	WHEELING, WV
KFAQ	1170	TULSA, OK
KJNP	1170	NORTH POLE, AK
WHAM	1180	ROCHESTER, NY
KEX	1190	PORTLAND, OR
WOAI	1200	SAN ANTONIO, TX
WPHT	1210	PHILADELPHIA, PA
KSTP	1500	ST. PAUL, MN
WFED	1500	WASHINGTON, DC
WLAC	1510	NASHVILLE, TN
WWKB	1520	BUFFALO, NY
KOKC	1520	OKLAHOMA CITY, OK
KFBK	1530	SACRAMENTO, CA
WCKY	1530	CINCINNATI, OH
KXEL	1540	WATERLOO, IA

Callsign	Frequency (Khz.)	Location
KNZR	1560	BAKERSFIELD, CA
WFME	1560	NEW YORK, NY

One of the best radios for AM reception can be had cheaply at your local junkyard, tag sale, or flea market. Look for a stock OEM car radio, preferably from AC Delco. Due the vehicle environment they need to work in, they are equipped with exceptionally good noise suppression circuitry. They run off of 12V DC, which makes them good for off-grid types, and are also designed to work with shorter antennas.

Other broadcast stations of particular interest would be small non-profit "community" stations. They usually operate in the FM broadcast band between 88 MHz. and 92 MHz., although I have heard some on AM. This is also the same part of the band where you will usually find college stations and NPR. This stations usually feature non-mainstream programs, and air time can often be purchased for a nominal fee for an individual or small group to produce their own radio show. The extent and nature of these stations will vary widely from region to region, and your best bet, as always, is to scan the band to see what you can hear.

I mentioned in a previous paragraph that I recommended installing a high-performance "fringe reception" antenna for FM and TV broadcast reception, even if it's not needed for local stations. The reason is because you should always aim for maximum performance out of your monitoring post as there may be times when you need it, especially when trying to listen to lower-power stations that feature non-mainstream programming, or when something happens to your local broadcast station(s).

On September 11th, 2001 there were 12 different TV stations broadcasting on top of the World Trade Center in New York City. Only one station, WCBS Channel 2, had a backup transmitter located on the Empire State Building. There was also a smaller community station which had their primary transmitter on ESB. When the towers collapsed, all 12 stations went off the air. My friend "Craig Johnson" who was living in Queens at the time recalled to me in a conversation how he was picking up adjacent channel and co-channel TV stations in New Haven, CT and Philadelphia, PA at his monitoring post when WABC Channel 7 went off the air (it was located at WTC). As a stopgap measure, many of those stations relocated to Armstrong Tower in Alpine NJ, 18 miles north of the city. Viewers in Woodlawn might have had better reception, but the same wouldn't have been the case for those in Rockaway Park. Having that extra reception capability comes in handy when a station goes off the air, and you have to receive their back-up location, or a station that's located in another distant city.

Armstrong Tower, Alpine, NJ. Photo by "ww2censor" via Wikepedia - CC SA 3.0

Broadcast band reception is a good place to start, as you probably have most, if not all, of everything to proceed, and the monetary investment to upgrade the capability is minimal. Installing an FM/TV reception antenna is a good beginner project that helps prepare you for more advanced work, and the same applies to AM and FM band-scanning, especially AM since it has some nice DX characteristics at night.

Another item you will want to get is a NOAA weather/all hazards radio. This is a receiver that listens to the NOAA broadcasts on 162.400-162.550 MHz. Many receivers are equipped with a decoder (SAME – Specific Area Message Encoding) that puts the radio in standby mode until an alert is received. All VHF/UHF police scanners will receive the NOAA broadcasts, but not all of them have a SAME decoder. NOAA receivers are useful because they will alert you to the most common disaster situation you will have to face, historically speaking, which is weather. They will also, thanks to SAME, remain silent until an alert is generated for your area.

So far I have mentioned broadcast media intended for the general public that is available with commercial off the shelf consumer electronics equipment that you could pick up at Wal-Mart or anywhere else. An AM/FM radio, TV, and NOAA weather/all-hazards radio will give if nothing else but an adequate overview of general news, sociopolitical status of your local region, agenda direction of your local establishment, and warning of approaching hazardous weather conditions. All of that is important to help you put together a picture of what's happening around you, and what you might have to worry about in the future.

Shortwave Listening

Sadly, the state of shortwave listening is not what it was thirty years ago. A lot of the overseas regulars I listened to are now gone, and the US shortwave broadcasters are mostly perverts and con men backed by some "christian" religious sect of their own making. However, The the few overseas broadcasters operating on shortwave are better providers of news regarding international affairs than domestic sources in the U.S., and lack domestic political bias when reporting news about this country.

The Shortwave bands (1.7-30 MHz.) offers worldwide communications capability, yet many emergency communications concerns (like Amateur Radio ARES/RACES, and state/federal emergency management agencies) use it for regional communications via NVIS (Near Vertical Incidence Skywave) propagation when VHF/UHF communications are unable to do the job. Shortwave is also the home to a variety of international broadcasters from across the globe. These stations provide yet another news viewpoint, one that is different from what you'll get from domestic broadcasters. This is important because no single source of news/information will give you the complete picture, and all sources will have a particular slant or bias. By collecting news from multiple sources you can eliminate the bias/slant factor and actually get an idea of what's going on.

If you plan on listening to more than international shortwave broadcasters, make sure you get a shortwave receiver that has the capability to receive Single Sideband (SSB) communications. SSB is a narrow-band voice communications mode used by amateur radio operators and government/business "utility" stations on shortwave. You will also need SSB capability to monitor the various digital modes used by amateur radio and utility stations. Many inexpensive low-end receivers will only demodulate AM signals used by shortwave broadcasters. You can tell if a receiver has SSB capability by looking for the word "sideband" or letters "SSB" on the mode switch, or by looking for a BFO (beat frequency oscillator) control on the radio.

I advise you to get the best shortwave receiver you can afford, because you should/will be spending a lot of time listening to this frequency range. A good receiver will cover from the AM broadcast band (or below) up to 30+ <MHz. This includes every HF amateur radio band, international

broadcasters, "utility" stations run by military and government agencies, assorted clandestine stations that show up anywhere on the spectrum, and CB communications.

Shown above is the excellent Icom R-75. It's a good radio, and one that I would recommend. It's total overkill for a beginner, is an easy to use unit, and has enough room for you to grow into. It receives AM, SSB, CW, and FM from 30 KHz. to 60 MHz. This starts way below the AM broadcast band, and goes into the VHF low-band and past the 6 meter ham band. It is the last of the analog architecture (non-SDR) Icom shortwave receivers. Icom recently discontinued this radio, but they are still available new for around $600. You can find one used for under $300 if you look around and don't act like an asshole. Otherwise they sell in the $400-$500 range.

I like the R-75 because not only is it a really good performing receiver for the money, but it also covers up into the VHF low and mid-bands that are used by the military for tactical communications, and by public safety and industrial users for regional interoperability. Military tactical radios operate from 30-88 MHz. in 25 KHz. steps. When not in ECCM (frequency hopping) mode they typically transmit with a PL/CTCSS tone of 150 Hz. (the standard

151.4 Hz. tone will decode it just fine). Also, a lot of clandestine radio users typically operate using AM, FM, or SSB from 25-33 MHz. for local and regional communications using modified 10/11 Meter ham rigs or "export CB" radios. These are the usual terms used to identify radios originally designed for the 10 Meter ham band or the 11 Meter CB band that have been modified to operate on the "uppers and lowers", the frequency ranges above and below the bands. Such CB hobbyists are known as "freebanders", "Hfers", or "skip shooters".

Any recent vintage (within the past 30 years) HF amateur radio transceiver should also have "general coverage receive" capability from ~1.7-30 MHz. If you eventually plan on getting an amateur radio license and operating on HF, you may want to purchase one instead. Many survivalist types have been happy with the Icom IC-718 and Yaesu FT-857 transceivers. What you get is not as important as getting something and practicing with it. However, if you really have no plans of getting on the air with HF amateur capability, you might save some money by simply getting a good used receiver.

Different frequency ranges in the SW band offer better reception depending on the time of day. As a rule of thumb, the frequency range between 1.7-6 MHz. best propagates at night, 15-30 MHz. are daytime frequencies, and 6-15 MHz. works adequately 24 hours a day.

Your best bet for starting out listening are international shortwave broadcasters. They run AM mode, and operate on fixed frequencies and schedules. The US domestic broadcasters are the easiest of the lot to hear, but most of them are all religious cult programming done by perverts and con men. The best, and perhaps most entertaining, US domestic broadcaster is WBCQ[21], "The

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21 http://www.wbcq.com/

Planet", out of Maine. Their motto is "Free Speech Radio." It is run and operated by former pirate broadcaster Allan Weiner of Radio NewYork International fame. They operate on 7.490 MHz., 9.330 MHz., 5.130 MHz., and 3.250 MHz. The best time to listen is on the weekends. To find information on other shortwave broadcasts, visit the following sites:

- Prime Time Shortwave - http://www.primetimeshortwave.com/

- Shortwave Schedules Around The World - http://www.shortwaveschedule.com/

- Glen Hauser's World of Radio - http://www.worldofradio.com/

The Shortwave bands are also used by state and federal government agencies for long-distance communications. These communications are referred to as "utility" stations, as opposed to "broadcast" stations. State emergency management homeland security agencies are among the most prolific users of HF, and every state maintains a communications network. When voice is utilized, communication will in Upper Sideband mode (USB). You can use the FCC General Menu Reports web site to find frequency data for your particular state.

HF Public Safety Frequencies In the American Redoubt Region

Frequency (MHz.)	States
2.3274	Montana, Wyoming, Idaho
2.4154	Wyoming, Idaho

Frequency (MHz.)	States
2.4204	Wyoming
2.4404	Montana
2.4644	Montana
2.4724	Idaho
2.5364	Idaho
2.8054	Montana, Idaho
2.8134	Montana
5.1364	Montana, Idaho
5.1414	Montana, Idaho
5.1964	Montana, Wyoming, Idaho
7.4784	Montana, Idaho
7.4814	Montana Disaster & Emergency Services
7.8064	Montana, Wyoming, Idaho
7.9334	Montana, Wyoming, Idaho
15.5050	Montana (Fish-Wildlife-Parks)

Amateur radio is another major user of HF communications, and you will want to monitor the various ARES, RACES, disaster response, and Skywarn nets in your region. A Google search will be able to find your specific frequencies. You will also want to take note of AmRRON,

The American Redoubt Radio Operators Network. Their website is at http://www.ammron.net/.

VHF Low-Band and Repurposed RF Gear

Many HF receivers (and all police scanners) have reception capability up into the 30-50+ MHz. range. This is known as the VHF-Low Band. It is a transitional part of the spectrum that has been less utilized as of late. Many of its characteristics that caused former Low Band LMR[22] users to move up in frequency make it useful for survivalist types, especially in rural areas. Most of the time Low Band is line of sight propagation, with the advantage of handling hilly terrain better than higher frequencies. When propagation conditions are favorable, world-wide communications become possible. Its disadvantage is that the lower frequency makes proper antennas longer in length than the VHF-High or UHF bands. The longer wavelength also means decreased propagation and more difficult communications in urban terrain. VHF-Low Band is really for for rural and wilderness use when infrastructure needs to be minimal and "line of sight" communications range longer. Keep this in mind for future reference.

For our monitoring purposes, many regions use VHF-Low Band for regional mutual-aid and intersystem networks. With a proper antenna, communications can be monitored over a greater distance than on higher frequency bands. Since these frequencies are for mutual-aid and intersystem use, they are only active during system tests or a major incident.

Due to the large amount of military and commercial surplus out there, the frequency range of 20-76 MHz. should be considered a priority range for monitoring and band

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22Land Mobile Radio

searches. Within that range, 25-32 MHz. has the most priority due to the ready availability of off-the-shelf CB radios, 10 meter ham radios, and modified "freeband" versions of both. Expect to see AM, FM, and SSB modes in use. In this part of the spectrum, one can normally expect to hear communications up to 20 miles away or more depending on terrain and band conditions. When conditions are optimal, worldwide reception is possible.

Tactical FM manpack and vehicle sets of 1950s and 60s vintage (PRC-8, PRC-9, PRC-10, RT-66, RT-67, RT-68, RT-70) are capable of operation between 20-58.4 MHz. More recent FM tactical sets (PRC-25, PRC-77, RT-524) are capable of operation between 30-76 MHz. A lot of these radios, particularly the older models, have made it to the surplus market and remain in operational condition. The military and federal agencies are significant users of this spectrum, with operations concentrated on the frequency ranges of 30-30.55, 34-35, 36-37, 38-39, 40-42, 46.6-47, and 49.6-50 MHz. Many TV broadcasters have moved off the lower channels (2-6 or 54-88 MHz.) with the transition to digital, leaving broad swaths of unoccupied spectrum that may be exploited for clandestine communications. The author recalls many a night during down-time on an FTX tuning his Humvee's RT-524 above 54 MHz. to hear the audio of a local TV station during the 10/11 O'Clock news broadcast. Alas, such a technique is no longer viable with the digital transition. Yet, the way the spectrum is these days you never know what you might come across by tuning though these presumably dead spaces.

A typical police scanner would cover the following ranges: 25-54, 108-174, 216-512, 806-824, 849-869, 894-960, 1240-1300 MHz. Notice the gaps. 54-108 MHz. is the TV (Ch. 2-6) and FM broadcast bands. 174-216 MHz. is a TV (Ch. 7-14) band. 512-806 is UHF TV and a new land mobile

band that took over the top few channels (many newer scanners will go down to 760 MHz.). 824-849 & 869-894 MHz. are cellular phone bands. 960-1240 MHz. contains point to point links and radiolocation/navigation stuff. Those missing ranges don't contain any single-channel licensed users, unless they're operating clandestinely. Remember the frequency range of those surplus military tactical radios using regular FM modulation?

Back in the day, I was driving past this electronics repair place in Southern New England, and noticed two odd-looking CB (quarter-wave) ground plane antennas on the roof. What was odd about their appearance was that they were shorter than a regular CB ground plane. Upon inquiry I was told they were the remains of a European wireless telephone system that operated on a 40/70 MHz. split. It was a full-duplex system, and the owner had modified the two CB ground plane antennas to work with it. This would have been a trivial act, as all that was required was shortening them to resonate on the correct frequencies. The owner claimed a 90 mile range on the system, and ran it until 800 MHz. cellular phone service became active in the area.

What makes this story more interesting is that with the movement of cellular phone service from analog IMTS to digital systems, there still remains a quantity of "obsolete" surplus phones and base stations that use analog FM on a 824-849(mobile)/869-894(base) MHz. split. These are just a couple examples of obsolete technology made to last longer than the system it works on, and older legacy equipment showing up and often being re-purposed.

VHF Low-Band Frequencies Of Interest

Frequency	Use
25.04	Business/Industrial, Hazmat Response
25.08	Business/Industrial, Hazmat Response
27.49	Business/Industrial, Itinerant
27.51	Business/Industrial, Low-Power
27.53	Business/Industrial, Low-Power
33.12	Business/Industrial, Low-Power
33.14	Business/Industrial, Low-Power
33.40	Business/Industrial, Low-Power
34.90	Military
35.04	Business/Industrial, Itinerant
36.25	Business/Industrial, Hazmat Response
36.71	Military
36.89	Military
37.60	Power Utility, Intersystem
38.50	Military, Common National Guard Frequency
39.46	Police, Mutual-Aid
40.50	Military

Frequency	Use
40.71	Business/Industrial, Hazmat Response
42.98	Business/Industrial, Low-Power
43.04	Business/Industrial, Itinerant
45.86	Police, Mutual-Aid
45.88	Fire, Mutual Aid
47.42	American Red Cross
46.30	Fire, Low Power/Mobiles

Meatspace Communications

It all begins, and ends, with meatspace. Non-virtual reality. Everyone should invest the nominal amount a year, and get a PO Box in a nearby town that they visit at least once a week. If possible, find one that has 24-hour access to boxes. Use this for correspondence with your friends, acquaintances, and other people you want to communicate amongst in a quality manner. I always welcome correspondence via U.S. Mail, and will reply in kind. Some of the best information I receive, such as ***Dwelling Portably*** zine[23] and the periodic dispatches from my friend Wildflower, comes via this route.

I will share something with you, my readers, about communications that I have discovered a while back, and confirmed when I moved out here to God's Country after living in the Land Of the Dead for 45 years. This goes beyond survivalism/"prepping", the organized miltia/3%er scene, and all that related bullshit.

Think about all the "news" stories you hear from both sides of the fence. Most of it is heavily distorted or outright fake, and when you look at it serves little to no useful

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23 Send $5 or so to Lisa Ahne, POB 181, Alesa, OR 97324. Please let her know that Tom from Wyoming sent you.

purpose when it comes to self-reliance and preparedness. Some of the worst offenders are "patriots" who release "intel reports" that cannot stand up to even the most basic vetting and confirmation processes.

Internet media is well suited for this form of attack because it enables the perpetrator, whether they are willfully or unknowingly acting, to send mass amounts of static to a mass audience. The massive static also acts to drown out smaller, more truthful voices, or at least blunts their usefulness.

Think about the information that you really need to assess current situations and to survive if matters worsen… Now think about recent news stories… The biggest news stories I head on the InterNET before writing this piece were ABSOLUTELY IRRELEVANT to my operations out here, basically showed that the status quo has not changed one iota in the Land Of the Dead, and that like-minded individuals who still live in those zombie zones are grossly outnumbered to the point where they will get eaten when matters get worse over there. It doesn't take weatherman to tell you which way the wind is blowing, nor a pundit or a prophet to tell you the barn will burn down if the fire isn't put out. With that, you damn well should know by now that Mrs. O'Leary's cow has kicked the lantern over, and things are about to get interesting.

The best form of communications is in **meatspace**. Your group should meet once a week at a designated time and place. That's the time to discuss local observations and relevant news stories, work on projects, etc. Leave your cellphones, tablets, and laptops at home. You should have no need for them at the meeting, and their absence acts as a surveillance countermeasure. If you need your phone on the road, before you leave turn it off, stick it in a anti-static bag and toss it in an ammo box that's in your car's trunk. The

cellphone network will think you are still at the location where you turned off the phone.

Don't bother with emailing members who missed a meeting, because most people glance over or ignore their email due to all the spam that they receive. Type up a quick one or two page summary of what went on, stick it in an envelope, and send it to their PO Box. That is assuming you can't see them in the next day or two to tell them about what they missed. You should also set up rally points and contingency plans in the event something happens that requires them to be used. Setting up a few dead drop locations where you can leave a note wouldn't hurt either.

Nine times out of ten, when a disaster happens your best bet is to get home and stay there. For the other ten percent of the time you need a safe place that you can get to with no more than a half tank of gas. There be "meeting tree" locations that can serve as rally and message drop points.

On public hiking/backpacking trails, there are bulletin board locations where hikers can post messages. Overnight shelters located along the Appalachian Trail have log books where visitors can make an entry during their stay. Next to the door of my workshop is a covered shelf made out of an old enamel oven roasting pan. There is a sign under it which says:

*If at home you do not find us,
Leave a note that will remind
us.*

On the shelf is a small notepad and a pencil. Many years ago, when telephones were connected to wires in homes, people would visit each other more frequently

than they do now. One of my neighbors at my childhood home had a notepad holder next to his home's entrance with that saying printed on it. I found this profound enough that when I finally moved someplace worthy of it, I made a similar message holder of my own for my homestead.

For those of you who want something more portable or covert to leave messages, there are key safes that look like rocks, planters, and small statues that have enough space for you to secrete a small note for later retrieval. There is also nothing stopping you from putting together a simple code system. "Joe's place" would mean nothing to anyone coming across the message, unless they were clued in to what the code means. "Joe's garage" might mean something else, and then there might be "Tom's place." Now we have four words we can use to create a simple code system to signify four different locations.

	Joe	Tom
Garage	Location 1	Location 2
Place	Location 3	Location 4

"Joe's garage" is the location one. "Tom's place" is location four. Some of you preppers might have noticed that you can use PACE (Primary, Alternate, Contingency, Emergency) with four different code meanings. Codes like this are simple, unbreakable, and can be used with any communications from written notes to radios.

Crypto

One-Time Pad Generation

To properly generate a One-Time Pad (OTP), you need a source of random numbers. There are electronic random number generators, but the cheapest way to generate randomness is to *"roll the bones"* as Geddy Lee and Neal Peart would say. For our purposes, the **easiest** way to do this is by using 10-sided dice. They are also known as "D10" dice. Those of you who used to play Dungeons and Dragons, or some other role-playing game, or board-type wargame in the 1980s know what I'm talking about (and still probably have a bag of assorted dice packed away somewhere). For the rest of you, a 10-sided die looks like this. Buy at least five of them. Make sure all your friends have some too. An Internet search of "10-sided dice" or "D10 dice" will find all sorts of sellers. There was one seller on Ebay that has a package of 100 for $15+shipping. If you find a hobby shop that caters to gamers, D10 dice will cost you about a buck each in small quantities.

For our purposes, the **best** way is to buy a set of **new casino** dice (6-sided or "D6"). They start at $10 for a set of five. They are precision made to a tolerance of 0.0006 inches, are serialized, and come sealed in a foil package. Do not buy retired or "canceled" dice. Casinos will often retire a set of dice by drilling a hole in the die that can affect the randomness. Casino dice will be more random than D10 gamer dice. Whether the added cost for the extra randomness is worth it is up to you.

If you are using D10 dice, you can roll them five at a time to get a five-digit random number. A single page in a OTP is typically 50 groups of five digits. To make it easier on yourself you can use five different die colors, or just take the results from left-to-right, front-to-back, or whatever. If you are using D6 dice:

Use one black and one white die and assign a value to each of the 36 combinations, taking in account the order/color of the dice (see table below). This way, each combination has a .0277 probability (1 on 36). We can produce three series of values between 0 and 9. The remaining 6 combinations (with a black 6) are simply disregarded, which doesn't affect the probability of the other combinations.

TRUE RANDOM 0 TO 9 WITH BLACK AND WHITE DICE

BW	BW	BW	BW	BW
11 = 0	21 = 6	31 = 2	41 = 8	51 = 4
12 = 1	22 = 7	32 = 3	42 = 9	52 = 5
13 = 2	23 = 8	33 = 4	43 = 0	53 = 6
14 = 3	24 = 9	34 = 5	44 = 1	54 = 7
15 = 4	25 = 0	35 = 6	45 = 2	55 = 8
16 = 5	26 = 1	36 = 7	46 = 3	56 = 9

THROWS WITH BLACK 6 ARE DISCARDED

You could also assign the letters A through Z and numbers 0 through 9 to all 36 dice combinations, again taking in account the order/color as in the table above. This way, you can create one-time pads that contain both letters and numbers. Such one-time pads can be used in combination with a Vigenere square, similar to the one described above, but with a 36 x 36 grid where each row contains the complete alphabet, followed by all digits. This will also produce a ciphertext with both letters and numbers. An advantage is that your plaintext can contain figures.

Above from

Place the dice into a plastic cup, give them your best James Bond casino shake, and roll them out onto a padded surface that has some "bounce" to it. Keep doing this until you have generated enough random numbers for your OTP needs. As dice are used, they will begin to wear and become less random. Casinos typically use a set of dice for an 8 hour shift and then retire them. After a set of dice you are using has 8 hours of wear on them, retire them from operational use, and use them for deceptive communications.

Do not record your random numbers on a computer. By doing so, you will make your OTP vulnerable to compromise. OK, I might transcribe them on to an ancient 8-bit Atari 800 for printing on a 9-pin dot matrix printer of similar vintage, provided I bought both items at an out of state flea market with cash ten years ago and have not let them leave my sight since then. Anything newer runs a good risk of compromise. Instead, do what the Hipsters and Germans are doing. Find yourself an old typewriter and purchase a package of carbon paper. **Do not use a word processor or anything else that has a CPU in it!!!** Those of you who like a nostalgic touch can find an old Clark Nova. More realistically you will probably find a more recent vintage electric typewriter such as an IBM Selectric with a small pitch font. When you are done recording your numbers, take the ribbon and carbon paper you used and put a blowtorch to them until they are either ash or a melted unrecognizable blob. Ideally, you will only use this typewriter for making OTPs, as individual typewriters can be traced via forensics. I will refer readers to **ASTM Standard E2494-08** for more information. Perhaps, after you are done generating OTPs for a while, you can donate the typewriter to Goodwill or sell it at a distant flea market

to some Hipster who voted for Hillary. You will have OTP sheets that look something like this:

98634 78493 09873 20563 24384
48243 18343 02539 12043 10345
10509 06782 12345 10367 10235
10324 03867 73825 46813 97616
54321 93265 12309 73654 73544

You will have two copies of a OTP. One for the sender and one for the receiver. To use a OTP, you first have to convert your plaintext to a simple numeric code such as this:

A=11	B=12	C=13	D=14	E=15
F=16	G=27	H=28	I=29	J=30
K=31	L=32	M=43	N=44	O=45
P=46	Q=47	R=48	S=59	T=60
U=61	V=62	W=63	X=64	Y=75
Z=76	0=77	1=78	2=79	3=80
4=91	5=92	6=93	7=94	8=95
9=96				

Let's now take the message "USE PLAN ALPHA7" and encode it.

USE PLAN ALPHA7
61-59-15-46-32-11-44-11-32-46-28-11-94

Now take the numbers from your OTP.
98-63-47-84-93-09-87-32-05-63-24-38-44

And add the two. If the answer is greater than 100, then subtract 100.

        61-59-15-46-32-11-44-11-32-46-28-11-94
      +98-63-47-84-93-09-87-32-05-63-24-38-44
      =59-22-62-30-25-20-31-43-37-09-52-49-38
        ⇑This is your ciphertext.⇑

To decode, take your ciphertext and subtract the numbers from your OTP to get the numeric code. If the answer is a negative number, add 100.

        59-22-62-30-25-20-31-43-37-09-52-49-38
      - 98-63-47-84-93-09-87-32-05-63-24-38-44
      = 61-59-15-46-32-11-44-11-32-46-28-11-94

Finally, convert the numeric code to plaintext.
61-59-15-46-32-11-44-11-32-46-28-11-94
U-S-E-P-L-A-N-A-L-P-H-A-7

Remember to remove and destroy the sheet off the OTP after you use it. Reuse of OTPs will compromise the message.

Another Unbreakable Lo-Tek Crypto System

This story occurred over 25 years ago, and is an excellent example of adapting off-the-shelf systems into a secure communications network. The last active person involved in the organization died over a year ago, and the crypto system remains unbreakable from a technical standpoint to this day. It used totally off the shelf components, and was capable of being implemented via just about any medium. It was originally used with one-way common carrier paging systems, and later with radio systems. It was one of the best lo-tek systems I've ever put together by accident. For all I know, one of the original principals involved might have passed it along to another organization. It wouldn't matter, as it's flexible enough to remain technically secure, even after this disclosure.

The basis of this system was a $5.00, 3 ½ by 5 ½ inch, 200 page book found in the reference section of a local Barnes & Noble. It was titled **Pager Power**, by Ted Strauss[24]. It was published in 1994, and is now out of print.

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24 ISBN 0-89815-625-4

There were a couple copies available on Amazon the last time I checked, at >$40 each. I wasn't really looking to implement a crypto system. The bookstore visit was a routine weekly search operation in which all potentially relevant sections were checked for items of interest. <u>These operations took at least one hour to properly perform.</u> In this particular instance, the unusually small size and word "pager" were the flags that caused this book to be noticed.

Pager Power is a code book. It's filled with two and three digit numbers that represented words and phrases. For example, the number "223" represented the phrase "I don't have the time," "308" stood for "I'll accept the consequences," "556" was "on the way", and "762" was "the worst that could happen." Interestingly enough, "419" was the code for the phrase "It'll be over soon," and "912" was "why didn't we." You looked up the words or phrases you needed to convey, called the pager number of the person you wanted to communicate with, and sent out the applicable numbers with your touch tone phone. The book itself was obscure enough that the organization could have used it as-is for their communications, but security via obscurity goes only so far. They initially started out by taking the last digit of the day and adding that to the number of the phrase they wished to send. That increased the security of the code significantly. Later on, they combined it with the use of one-time pads to encrypt the plaintext numeric messages. At that time the system became totally secure from a technical standpoint.

Sometime after adopting this system, the organization had acquired radio communications gear that was equipped with DTMF generation capability, and small handheld DTMF decoders. The crypto system moved seamlessly from the paging network to the new radio communications network, and later to the Nextel communications network.

This system remained the perfect application because it was inexpensive, used common off-the-shelf equipment, was secure, was easy to use, and could be used over different communications mediums.

This extremely successful crypto system came about from regular and frequent search operations of potential sources in **meatspace**. You always need to be on the lookout for stuff like that. You also need to have an extensive and well-rounded background (informal education) in order to recognize items of potential usefulness. That's how the game works, and that's what you need to do to become successful at it. You start by talking to any experts you can find who are willing to share with you. Ask questions and take extensive notes. You then hit knowledge sources. Libraries and used book stores are among the best. You see something even remotely interesting, you check it out, read it, and take notes. Those hardback composition books from your school daze can be purchased at Dollar stores. Get a couple, fill them, get a couple more, repeat. Any book that you find interesting and think is reasonably priced should be purchased and added to your library. Your tribe/group should allocate funds for this purpose. Stockpiled books, carefully preserved and guarded, will become the basis for the reconstruction after the reset finishes. Start with *A Canticle For Leibowitz,* the four volume *How Things Work* series, and *The Knowledge*, by Lewis Dartnell. Include some Muir, Emerson and Thoreau. Nourish and free your mind. Ignore the garment-rending pundits on both sides of the artificially-created fence, and instead seek your own freedom.

> *"I have no means. I make understanding my means. I have no designs. I make ʹseizing opportunity by the forelockʹ my designs."*
> - Samurai Creed, circa 1300

Telephone Stuff

One of the best ways to ways to reduce your electromagnetic signature and improve COMSEC (Communications Security) at for internal fixed location communications at your retreat, homestead, wherever is by using field phones. Wire communications have the advantage of not going over the airwaves and generating an RF signal that can be intercepted and DFed. Their disadvantages are that you are limited to where you can run wire, and that unless they are used in a secure AO, they are subject to interception (wiretapping) and disruption (wirecutting). Despite that, they are a viable means of secure communications for a group or small community.

The Phones

This is a US TA-1 voice-powered field phone. It requires no batteries to operate. It has a range of about 4 miles. The trade-off is that it has the shortest range and poorest voice quality of all the commonly available field phones. However, in a long-term grid-down scenario it may wind up being the only option available for communications in a community until restoration of more modern technology occurs. This one is by far the favorite choice of of long-term down-grid prepper types. They are also getting difficult to find.

I think the US TA-312 is a better model. It uses 2 D-Cell batteries and has a range of 14-22 miles. Older versions are known by the nomenclature TA-43. These phones are also becoming hard to find. If you come across any, you would be wise to get them. It can also run without batteries in sound-powered mode, but is limited to about a 2-4 mile range.

US field phones used to be very common on the surplus market, but have dried up. However European military surplus seems to enjoy good availability at present. This Czech TP25 field phone is a post-WW2 copy of a German model, and is compatible with US field phones. It runs on 1 D-Cell battery and has a range of 16 miles. These phones are presently available through a number of surplus dealers.

Like many other things, US military WD-1 Commo Wire has become hard to find. If you happen to find rolls of the stuff, and can afford it, snap it up. Otherwise, just about any other type of paired wire can be used. Civilian telephone wire, intercom/thermostat wire, or electrical lamp cord will all work for you.

I would check local military surplus and army/navy stores to see if they have any field phones or commo wire in

stock. Then there is Ebay. Quarter-mile spools of WD-1 commo wire are running about $25. TA-1 phones range anywhere from $25 each to $200/pair. TA-312 phones are averaging about $100 each. Your mileage may vary, but at least you have an idea now of what to expect in costs. Electrical supply and hardware stores will have spools of phone and other usable wire. 250 feet of 4 conductor Station Wire is $15. 1000 feet of the same is about $90. Try to get something that is outdoor rated (CMX) and in a dark color.

Back in the late 19th and early 20th centuries, neighboring ranchers set up community phone systems using the barbed wire off their fences. In this instance, the top wire was

Figure 10–1. Expedient Ground return circuit.

insulated and an earth ground was used as the other side of the pair. This was shown in the communications chapter of US Army Field Manual **FM 31-20 Special Forces Operational Techniques.**

One disadvantage of this system is it's more vulnerable to eavesdropping via inductive means. This was done by the Germans in World War I to the single-wire systems used by the British. The Germans called their eavesdropping apparatus a "Moritz Device", and very little historical information is available on it. Online research found one anecdote of interest:

When I was in the Explorer Scouts in the late 1960s, we had a war-surplus field telephone system providing communications across the grounds of the big scout camp nearby, and it was of the type you mentioned, single wire with ground return. I remembered something my grandfather told me and tried it there:

We pounded two copper-plated ground rods about 100 feet apart in a marshy area not far from the path of the overhead telephone wire. We then connected both ground rods via insulated wire to the input of a high-gain audio amplifier and listened happily to a noisy but not connected representation of what was being said on the wire.

-   http://www.secretscotland.org.uk/forum/m-1369085947/

Such a device as described by the former Boy Scout would be easy enough to duplicate with modern off-the-shelf consumer electronics, and would be an interesting item of research for those inclined. From the COMSEC side of the house, a 1917 report from the British noted the following precautions the Germans took to avoid telephone eavesdropping:

(a.) Prohibition of any but the most urgent messages from or to the front line by telephone, and an extended use of visual signals.

(b.) Replacement of the telephone in forward trench systems by speaking tubes.

(c.) Careful maintenance and insulation of telephone circuits.

(d.) Use of codes to conceal the important portions of messages.

- SUMMARY OF RECENT INFORMATION REGARDING THE GERMAN ARMY AND ITS METHODS.
GENERAL STAFF (INTELLIGENCE), GENERAL HEADQUARTERS.
January, 1917

Tools

Your basic electronics hand tools should suffice for your telecom needs. Shown at left is the standard US Military issue TE-33 Linemans Tool Kit consisting of a 2-blade TL-29 Electricians Knife and a pair of TL-13-A linemans pliers. You can do pretty much everything with those two.

In addition to basic electronic hand tools, there are some specialty items you will want to get in order to work on phone systems.

Linemans Test Sets (Butt Sets)

The standard tool for phone work is the lineman's test set, or "butt set". This is a ruggedized one-piece telephone

with alligator clips. You can find them on Ebay starting around $20, and they will talk to field phones when you provide talk battery with a "Fox" tone generator. Butt sets can be found on Ebay, and occasionally at hamfests. They are also available at larger home improvement stores such as Home Depot and Lowes.

Fox and Hound Sets

A "Fox and Hound" set consisists of a tone generator (Fox) and inductive amplifier (Hound). The tone generator sends an audio tone signal on a wire pair, which allows it to be traced and located in a bundle down by the line by the inductive amplifier. The tone generator can also do a rudimentary continuity check and provide talk battery to let a butt set communicate with another unit on the other end of the pair. You may find a pair at a hamfest, but they are readily available on Ebay, and at Home Depot and Lowes.

Wire Codes

When working with phones, you will typically find two types of phone wire. The first is common station wire that has been used in homes since the Bell System days. It consists of either 2 or 3 pairs of wires (four or six conductors), and will be colored as shown. Older wiring will have only the first two pairs, and more recent wiring may have six.

Pair	Colors
1	Red/Green
2	Yellow/Black
3	White/Blue

The telco outside plant, business phone systems, and more modern 4-pair phone wiring (Ethernet cable) uses a system of ten colors as detailed below:

	Blue	Orange	Green	Brown	Slate
White	1	2	3	4	5
Red	6	7	8	9	10
Black	11	12	13	14	15
Yellow	16	17	18	19	20
Violet	21	22	23	24	25

Those of you who have run Ethernet cable will recognize the colors of the first four pairs. This system is also expandable. By using bundle wraps with the same color scheme, cables of greater than 25 pairs can indexed. In this color scheme, a pair will have stripes consisting of the two colors, for example the first pair would be blue-white/white-blue.

Phone Systems

The phone company has changed greatly since I first explored it. No longer is there always a solid copper pair going from your house to the phone company's central office. Usually the copper now only extends out to the "last mile" from customer's demarcation point to a Remote Terminal (RT), where it is then multiplexed onto a fiber optic circuit with thousands of other phone lines before going to the central office. Certain markets are eliminating copper altogether by bring a fiber directly to the customer. An interface box is then provided to the customer so they can plug in their telephones. I mention this because there has

always been talk among some of the more technically inclined preppers about re-purposing the phone company's outside plant after TEOTWAWKI[25] once we reach that hazy future state known as "WROL"[26]. I suspect that if we ever reach that point where such activity could occur without legal repercussions, the outside plant will have evolved to a point where it won't be possible with the level of technology available to even a technically-inclined prepper, because the easy to hook into copper pairs will be replaced by fiber optics. That doesn't mean that techie preppers should abandon old-school phone techniques. Post-collapse there should be enough material to scrounge and re-purpose in order to rebuild small-scale phone systems, ala barbed-wire phones, for a small group of homesteads located in close proximity to one another.

Outside Plant Infrastructure

The outside plant starts at your residence's demarcation (demarc) point. This is where your wiring ends and the phone company's wiring begins. It is the first test point you should try getting a dialtone at to see if a phone issue is your problem or the phone company's problem. This would be done by disconnecting your wiring from the demarc and hooking up a phone at the same place.

Here are two older demarcation (demarc) points found on the sides of residences. They are used to bring a single pair into a residence, and were used up until the late 1980s or so when the increase in the use of computer modems and fax machines necessitated the addition of second phone lines into many residences and businesses. These styles have a plastic cover that is usually marked "Bell System", "Telco Property", or something similar. The covers on older ones just pulled off. Newer ones will require

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the use of a can wrench which is a 7/16" nut driver. Can wrenches also have a 3/8" nut driver side for the binding posts on the demarc.
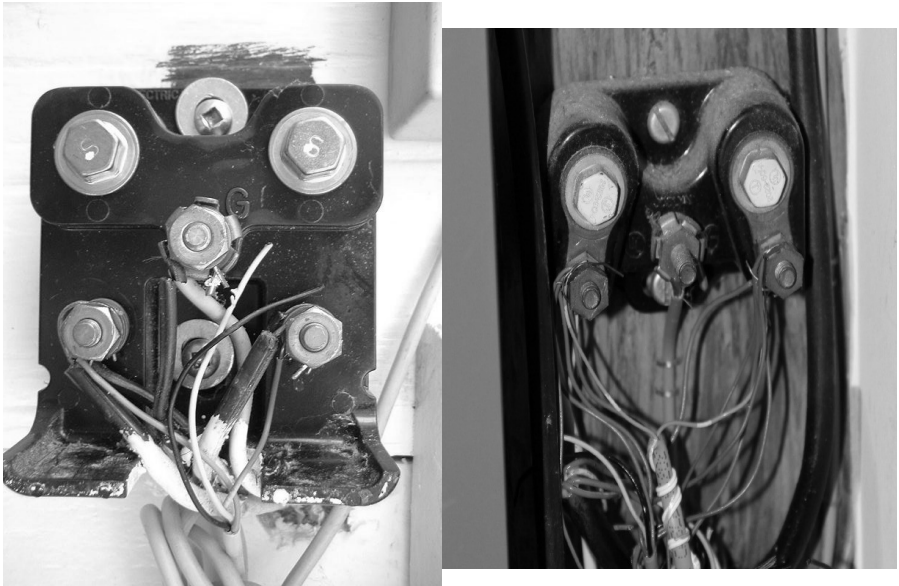

This is what a can wrench looks like:

Never demarc points look like this (below). They can accommodate up to 12 pairs, and also support CATV feeds.They are divided into two sections. The section on the right is the customer side. It is accessed with a regular screwdriver, and has modular plugs so the customer can test at the demarc with any regular telephone. The side on the left is the Telco/service provider side. It requires a 5/32" tamper-proof allen wrench. That is an allen wrench with a hole drilled in the middle to accommodate the pin in the center of the fastener. This can be seen on the right side of the enclosure on the left picture. Every down-grid techie should have a 1/4" multi-bit screwdriver with a complete set

of tamper-proof bits because there are way too many items that are "secured" with "tamper-proof" fasteners.
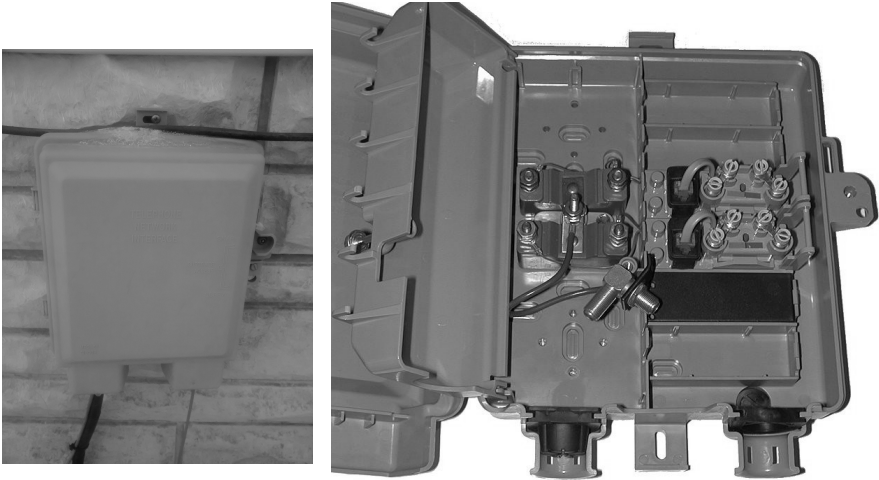
Going beyond the demarc at the customer premises are Serving Area Interfaces (SAI), also known as cans, cross(-connect) boxes, b-boxes, cabinets, or pedestals. They are typically opened up with a can wrench, although there has been an increasing practice of locking them or using more esoteric proprietary fasteners, especially if they house expensive electronics. Some SAI examples are shown below.

The SAI on the left would act as a test and connection point for a number of blocks in a neighboorhood, and can easily have a few hundred phone pairs in it. The one on the right would service a few houses next to each other, and would typically be the SAI just before a pair goes to a demarc point.

Now let's say the TEOTWAWKI Zombie Apocalypse™ occurs, the phone company goes off-line permanently, and we have WROL. One could attach the tone generator of their fox and hound set to their residence's demarc and trace a pair down to the first SAI which would be on their neighborhood's block. They could also do the same with their like-minded prepper neighbors. Once the lines in question were located, they could splice them together, attach field phones, and have a neighborhood phone network. They could also trace the pairs down the road to the next SAI, which might be a good location for an observation post.

Being that this is simply a TEOTWAWKI Zombie Apocalypse™ intellectual exercise, one could trace pairs all the way down to the Remote Terminal or Central Office and get an entire section of town wired up into a community party-line phone system provided they could gain entry into said facility and it wasn't vandalized or otherwise damaged beyond repair.

Anyone who has an interest in odd phone and computer stuff should get a subscription to **2600: The Hacker Quarterly**. Information is available on their website at http://www.2600.com/.

Other Radio Communications Services

There are a number of radio communications services available for communications. Some require you to get a license from the FCC, while others are license-free. The licensed bands are:

- GMRS (General Mobile Radio Service)

- Amateur Radio

The license-free bands are:

- CB (Citizens Band)

- FRS (Family Radio Service)

- MURS (Multiple Use Radio Service)

There are also additional provisions under Part 15 of the FCC Regulations that allow for limited license-free operation. This is the reg that permits such things as FM Wireless Microphones, Baby Monitors, Cordless Phones, 902 MHz. Band, and Low Frequency Experimenter (LowFer) hobbyist communications.

When we went to BCT (Basic Training for your civilians) in the Army, we learned several basic, yet important, tasks relating to communications. We learned the phonetic alphabet, how to use an SOI (Signal Operating Instructions) which is a list of frequencies and codes, basic radiotelephone procedure, and how to operate field phones and the squad radio, which at the time was the PRC-77. That was the "communicate" part of the "shoot-move-communicate" trinity that gets hammered into your head throughout BCT. Now this was in Basic Training, so **everyone** who was in the Army learned this.

After basic training, we went to AIT – Advanced Individual Training. That's where you learn the skills specific to your MOS – Military Occupational Specialty. Your MOS is your job in the Army. Those of us with Communications-related MOSes learned more specific and advanced communications skills, whether you were doing single-channel, multi-channel, field wire, or maintenance. However, even if you were an clerk or a truck driver you still had learned those basic communications skills during your stay in BCT.

The point to all this is that while everyone should have some commo basics down, not everyone is going to be, or is cut out to be, an uber commo operator. However, there are some things that I'm not an expert at which is why we form a team of people with different skill sets to complement one another. On that note, I have to recommend Don Paul's[27] books Everybody's Outdoor Survival Guide, and Great Livin' In Grubby Times. It all depends on what you want to do, and what your resources are.

CB – Citizens Band

There was a time when the only option for legal license-free communications was Citizen's Band. Those of us who were seriously into communications went the extra mile and acquired our ham licenses, but even after getting the ticket we still used CB for its de-facto "jungle telegraph" capability. On the highway, it was unlikely that you would ever get a speed-trap report on 146.52 MHz, but all you needed to do was listen on Channel 19 and the information would usually come to you unsolicited. Mobile and base CBs provide some decent communications capability. Depending on your location, you can routinely

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27 http://www.survival-books.com/

achieve a 20-mile range communicating between a base station and mobiles with good antennas.

According to the FCC, CB is "a private, two-way, short distance voice communications service for personal or business activities of the general public." CB uses forty channels around 27 MHz. in AM or SSB mode with power limits of 4 watts carrier power on AM, or 12 watts peak envelope power on SSB. Any ham who has worked the 10 meter band will tell you that 12 watts on sideband is more than enough to achieve world-wide communications when the band is open. Just recently, the FCC eliminated the unenforced rule against "skip-shooting", and at times when the bands are open there is more activity on 11 meters than there is on 10. The channels are as follows, along with the accepted mode and common uses for particular channels.

1) 26.965 – AM, Northeast USA and Canadian Maritime Providence Truckers.

2) 26.975 - AM

3) 26.985 – AM, American Redoubt Radio Operators Network (AmRRON)

4) 27.005 – AM, Popular with 4x4 vehicles when off-roading.

5) 27.015 - AM

6) 27.025 - AM, "Superbowl" AM DX Channel

7) 27.035 - AM, "Survival 7" Old Prepper Channel.

8) 27.055 - AM

9) 27.065 – AM, Emergency Channel

10) 27.075 – AM, Regional Roads

11) 27.085 – AM Calling Channel

12) 27.105- AM

13) 27.115 – Common Marine/RV usage.

14) 27.125 – Popular with handheld units.

15) 27.135- AM

16) 27.155 - AM

17) 27.165 – AM, Alternate Highway Channel in some places. (West Coast N/S Highways)

18) 27.175 - AM

19) 27.185 – AM, Highway Channel.

20) 27.205 - AM

21) 27.215- AM

22) 27.225 - AM

23) 27.255- AM
24) 27.235- AM
25) 27.245- AM
26) 27.265- AM
27) 27.275- AM
28) 27.285 - AM
29) 27.295 - AM
30) 27.305 - SSB
31) 27.315 - SSB
32) 27.325 - SSB
33) 27.335 - SSB
34) 27.345 - SSB
35) 27.355 - SSB
36) 27.365 - SSB
37) 27.375 - SSB
38) 27.385 – SSB DX Calling Channel
39) 27.395 - SSB
40) 27.405 - SSB

Most of the time on the SSB channels, LSB is used, but that is not always the case.

Even if you are a lone wolf with absolute minimal interest in RF transmitting capability, you should have at least one decent 12V capable base/mobile rig with a decent antenna, preferably one with SSB capability. The ready availability, lack of individual license requirement, sheer number in circulation, and significant range advantage over FRS handhelds will make this the post-TEOTWAWKI communications mode of choice for the average person.

11 Meter "Freeband"

The "Freeband" refers to the frequency ranges just above and below the standard CB band channels, or 25-26.965 MHz. and 27.405-28 MHz. Despite being a violation of FCC Regulations in the US, this band is very popular with radio communications hobbyists who want to get off the the regular CB channels. Typically, the following equipment is used:

1. Modified CB radios.

2. Ham "10 meter" SSB radio with expanded frequency mod.

3. Export CB SSB radio. These look like regular CB radios, except that they have an "ABCDEF" Band switch.

4. Ham HF radio with "MARS/CAP" mod.

5. Commercial land mobile, Marine, or Aeronautical HF SSB radio.

6. Military surplus HF SSB radio/HF manpack transceiver.

I am aware of at least one group of survivalists who use 11 Meter Freeband for their communications, although I would not recommend operating on Freeband in times before WROL despite the apparent lack of FCC enforcement activity. However, the capability is easy enough to acquire, and I would definitely advise having some gear that covers this frequency range. Just use it only for listening.

FRS – Family Radio Service

FRS (Family Radio Service) is "a private, two-way, short-distance voice and data communications service for facilitating family and group activities."[28] If your group is in need of inexpensive, short-range, intra-group communications, you can pick up FRS radios for about $20 each in quantity. FRS radios are plug and play. You insert batteries, select a channel, and start talking. FRS uses the following frequencies with power limits of 500 Milliwatts or 2 Watts, depending on the frequency.

Channel No.	Frequency	Power
1	462.5625	2 W
2	462.5875	2 W

Channel No.	Frequency	Power
3	462.6125	2 W
4	462.6375	2 W
5	462.6625	2 W
6	462.6875	2 W
7	462.7125	2 W
8	467.5625	0.5 W
9	467.5875	0.5 W
10	467.6125	0.5 W
11	467.6375	0.5 W
12	467.6625	0.5 W
13	467.6875	0.5 W
14	467.7125	0.5 W
15	462.5500	2 W
16	462.5750	2 W
17	462.6000	2 W
18	462.6250	2 W
19	462.6500	2 W
20	462.6750	2 W
21	462.7000	2 W
22	462.7250	2 W

Two watts is pretty respectable for a UHF handheld, especially if you are on a mountaintop or working in flat terrain.

I use FRS radios as working radios around the homestead. They are cheap, fairly rugged for consumer-grade gear, easy enough for a child to use, and non-tear shedding if one gets dropped in the goat run and crushed under hoof. Typically I stick to the low power channels with a DCS "privacy code" so I don't have to hear any co-channel

users who might be nearby. The half-watt RF output power is more than adequate to cover the whole property, and enables longer battery life. The FCC states the planning range on FRS is up to a half-mile on the low-power channels, and longer on the high-power channels. My work with FRS has found that this is a realistic range estimate. For those who want longer range without having to pass a ham test, there is a higher-powered version ofg FRS called GMRS.

GMRS – General Mobile Radio Service

Channel	Notes
462.5500	Shared with FRS.
462.5625	Shared with FRS.
462.5750	Shared with FRS.
462.5875	Shared with FRS.
462.6000	Shared with FRS.
462.6125	Shared with FRS.
462.6250	Shared with FRS.
462.6375	Shared with FRS.
462.6500	Shared with FRS.
462.6625	Shared with FRS.
462.6750	Shared with FRS.
462.6875	Shared with FRS.
462.7000	Shared with FRS.
462.7125	Shared with FRS.
462.7250	Shared with FRS.
467.5500	
467.5675	
467.5750	
467.6125	Shared with FRS.
467.6000	
467.6625	Shared with FRS.

Channel	Notes
467.6250	
467.7125	Shared with FRS.
467.6500	
467.5875	Shared with FRS.
467.6750	
467.6375	Shared with FRS.
467.7000	
467.6875	Shared with FRS.
467.7250	

GMRS requires a license, but it's just a matter of paying the license fee. GMRS is a high-power version of FRS which shares some channels with that service. GMRS also has its own exclusive frequencies. The FCC states the planning range of GMRS is 5 to 25 miles.

MURS – Multi-Use Radio Service

MURS is an interesting animal with a lot of potential. MURS operates in the VHF-high band on 5 frequencies: 151.82, 151.88, 151.94, 154.57, and 154.60 MHz. The last two were once low-power business band frequencies that were part of a group known as "color" or "dot" frequencies. The freq of 154.57 was "blue dot", and 154.60 was "green dot". This scheme is from manufacturers placing little circle-shaped stickers on the radio to indicate common low-power frequencies. The 154 MHz channels see regular traffic from previously licensed users, and others. The 151 MHz. channels have seen some increase in activity over the years, but are still fairly quiet for the most part, especially in rural areas.

MURS handhelds are on the market starting at about $100 each. In spite of it having only 5 frequencies, there are

some nice things you can do with it. MURS is allowed 2 watts output, which is really about the same as CB. You can run external antennas like CB, and a ¼-wave antenna is only 18" long instead of 104". This makes nice high-gain antennas on MURS much more manageable than on CB. That 45" whip antenna that only performed moderately on CB is now a 5/8 wave on MURS that gives you 3 dB of gain; doubling your radiated power output. You can also adopt some of the tricks hams use on their two-meter band (144-148 MHz.) to squeeze extra range out of those two watts of RF.

Here is where things get complicated. FCC regulations specify that radios must be specifically type-certified for MURS (47CFR95) to be legal. The currently available MURS-legal radios such as the Motorola RMM2050 and Dakota Alert M538-HT all have fixed rubber-duck style antennas. Operating reprogrammed business-band (Part 90) or "MARS/CAP" modified 2 meter rigs is technically illegal. Some of you who have frequented the communications sections of certain survivalist forums have undoubtedly been told this by some of the forumns' more hamsexy denizens.

The FCC created MURS in response to the complaints they were getting about unlicensed users on the blue dot and green dot frequencies, much the same way they they eliminated individual licenses for CB when the number of unlicensed users exceeded licensed users. Consequently, it is the opinion of many that active enforcement of MURS regulations has a very low priority with the FCC. Many MURS users have been observed running surplus LMR or modified ham gear, often in excess of the 2 watt power limit imposed on MURS by the FCC. An online search of FCC Enforcement actions at the time of this writing showed one Notice Of Apparent Liability For Forfeiture issued against a

business in California for selling non-certified radios advertised for use on MURS. Go figure.

One MURS item of interest is the Dakota Alert[29] MAT (MURS Alert Transmitter), shown here with their MURS HT. It is a passive infrared sensor that transmits on the MURS band. If you've listened to the frequencies, you've probably heard them announce "Alert Zone One."

The MAT can be programmed for any of the five MURS frequencies with any of the 38 standard CTCSS tones. It has four different zone messages. The MAT also has an external BNC jack for its antenna connection. You could hook up a small Yagi antenna to increase your range and add some directionality to the signal. This could be a handy item for monitoring activity in a remote location, especially if your group uses MURS for intra-unit comms.

The FCC states a planning range of a few miles with MURS under normal circumstances, with a planning range of up to 10 miles if external antennas are used.

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29 https://www.dakotaalert.com/

902-928 MHz.

The 902 Band as I call it is a relatively new addition for license-free wireless communications. It is also known to ham radio operators as the 33cm Band. It covers the frequency range of 902-928 MHz. and is shared by many different users. In this band you will find ham radio operators, older cordless phones, wireless cameras and microphones, baby monitors, older wireless networking and data communications equipment, RFID, other FCC Part 15 stuff, and various users in the Industrial Scientific & Medical (ISM) radio service. Over the years, the 902 Band has become a catch-all for any number of different radio users.

Motorola makes the "DTR" series of handheld radios that operate in the 902 Band using Frequency Hopping Spread-Spectrum (FHSS) communications. Instead of a radio channel being a single frequency as it is on FRS, GMRS, MURS, or CB a spread-spectrum channel is actually a group of frequencies that the radio hops through in a predetermined algorithm. This means that police scanners, including the near-field Signal Stalker type units, will not be able to intercept the signal from these units. There are three models available. From low to high-tier they are DTR-410, DTR-550, and DTR-650. The two you should look for are the DTR-550 and DTR-650. You should also look for the optional keypads that connect to the radios for extended text messaging capability. They are a solid, mil-spec, easy to use radio that requires no license.

Field performance of these radios is very good, although 900 MHz. favors urban and suburban terrain over rural. The average range in rugged terrain with stock antennas was a quarter mile. That's still the distance of 4 1/2 football fields. Car to car from inside the vehicle was a mile. Inside a building, we managed to communicate 50 floors before the signal degraded. That's exceptional considering Motorola specs the range to 30 floors. Out in open flat suburban terrain we managed a two mile range with these radios. These radios far exceeded my expectations, and I would not hesitate to use them if my AO was predominately urban.

The DTR-550 and DTR-650 have detachable antennas. The stock rubber duck antenna can be substituted with a mobile or base antenna for increased effective radiated power. Since the 902-928 MHz. band sees a lot of point-to-point telemetry and control applications, there is a plethora of antennas available. One of the more interesting examples for this radio would be the PC Board yagi and log-periodic antennas made by Kent Electronics.

Also on the 902 Band are data transceivers used for SCADA and other telemetry communications in utility and industrial applications. While these units use proprietary hopping schemes and data protocols that are unique to each make and model, their user interface is usually either standard Ethernet or RS-232. For secure data applications, especially if supplemented with encrypted communications software, they would be useful for point-to-point applications between base locations and offer greater communications range than 802.11 WiFi equipment. They are something you should keep your eyes open for at hamfests.

Title 47: Telecommunication -
PART 97—AMATEUR RADIO SERVICE
Subpart A—General Provisions
§97.1 Basis and purpose.
The rules and regulations in this part are
designed to provide an amateur radio service
having a fundamental purpose as expressed in
the following principles:
(a) Recognition and enhancement of the value of
the amateur service to the public as a voluntary
noncommercial communication service,
particularly with respect to providing emergency
communications.
(b) Continuation and extension of the amateur's
proven ability to contribute to the advancement of
the radio art.
(c) Encouragement and improvement of the
amateur service through rules which provide for
advancing skills in both the communication and
technical phases of the art.
(d) Expansion of the existing reservoir within the
amateur radio service of trained operators,
technicians, and electronics experts.
(e) Continuation and extension of the amateur's
unique ability to enhance international goodwill.

"We have discussed this before," continued Frank
in a tautological tone as he pocketed the Colt. "You
are to keep that sort of thing out of my world." "If
you chose to do otherwise, you can go back to
pawnshop C.B.s."
FMLA XII -- Frank Noir

Every time I hear about some prepper-ham buying a Baofeng, some geriatric fucktard on 75 or 20 Meter sideband, or the "patriot nets" that come and go with each Democrat administration, I go back to 47 CFR 97.1, and Chapter 12 in the FMLA story line. **Amateur Radio is a technical service**. I don't care that you can memorize the test pool from Technician to Extra and pass all three tests in one session. That just proves you can keep enough answers in your short term memory to fake knowing the material. I don't care about your political views, and even if I agree with them I don't want to hear them on the air. That's not what the hobby is about, and doing so makes you sound like an idiot. If you feel that preparing to fight a government gone totally despotic is necessary, advertising such on the air is known as "telegraphing intent." In the real world it does not scare off a determined enemy. It just helps said enemy make sure his first shot doesn't miss, both figuratively and literally. That also falls into the category of stupid. Buying poor quality gear is also a dumb move. "But it's cheap!" is not an excuse even if it's all you can afford. I find good late model 2 meter HTs and QRP HF rig kits at hamfests for less than what you paid for that new Baofeng. Even in the middle of Wyoming. Enough ranting. Let's get to work.

When I started the Sparks31 brand, I always advocated that preppers, 3pers, and other like-minded individuals get a ham ticket because it is a useful thing to have. I don't do that anymore. My new advice is to forget for the moment any reasons you might have for getting a ham license. Read the first part of Part 97, the section I quoted at the beginning of this chapter. Now ask yourself, "Am I on board with that?" If you are, that's great. If you aren't, then go pick some other personal radio communications service. You can use CB, FRS, MURS, or GMRS and it'll work fine for you. Just stay the hell off the ham bands.

Steps To Success

1. Study for Technician and General tests. Pass them.

2. Get a radio, power supply, tuner, CW key, etc.

3. Build antenna and set up station.

4. Put together your library.

5. Get your test bench squared away with tools and test equipment.

6. Study CW.
   Free software for learning CW:
   http://www.justlearnmorsecode.com/ Other CW resources from the ARRL:
   http://www.arrl.org/learning-morse-code

7. Get a buddy across town to set up an HF rig and sked with you.

8. Get on the air and practice.

9. Repeat. Maybe get your Extra.

Seriously folks, those steps are all you need to do.

The best source of information for getting your amateur radio license comes from the American Radio Relay League (ARRL).[30] Their website is goldmine of information for anyone interested in getting their ham ticket. The license structure has changed significantly since I was first licensed thirty years ago. Proficiency in Morse code (CW) is no longer required for any class of license, and there are only three classes of license: Technician, General, and Extra. The entry-level Technician class offers some HF CW and all VHF, UHF, and microwave ham band operating privileges. The next level is General class, and offers the majority of

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30 http://www.arrl.org

shortwave (HF) bands. Extra class is the highest level, and offers the remaining portions of the HF bands not open to General class. The pool of test questions for each class is published and available online. If your recall is good enough, you can simply memorize the test pool questions for all three tests and walk away from having no ham license to an Extra in a single sitting. Most people however require a few weeks of studying per test. In my wife's case, she took a week of studying to pass the Technician class, and three weeks after that for her General.

Getting Your First Rig

So now you've got a bunch of knowledge thats great for passing a few tests, and almost adequate for getting on the air. Start studying and get a rig. I mean an HF rig, because 2 meters and 70 cm FM are basically VHF and UHF CB. In fact, we have VHF and UHF Part 95 services. They are called MURS, FRS, and GMRS. Hopefully by now you've found a mentor, what hams call an "Elmer." Despite probably being the usual 100 Watts and a wire appliance operator, he'll still have some decent opinions about radio gear and 9/10 times it'll be one of three choices: Kenwood, Yaesu, or Icom. If it's not one of those three, then it'll probably be Ten-Tec or Alinco. I've run all three of the Japanese models, and know people who have Ten-Tecs and Alincos. All four are good choices in that one doesn't suck any worse than the other. My appliance preference, for the record, is SGC, Yaesu, and Icom in that order. That first one is no longer in production.

So your elmer will have an appliance preference, and probably know where a good, clean used rig can be found. That's good for you because you can go to the ham who's selling it, give it a receive test, check the power output, and get a new ham price break if the guy isn't an asshole, and

you don't come across as one either. If not, you'll have to find one at a hamfest or buy it off Ebay or one of the ham sites. I've never been burnt buying at a hamfest, but I know what to look for, and never pay above salvage price. Your safest bet would be to find an elmer, take him to the hamfest, get his help, and buy him lunch afterwards in appreciation.

I always get asked "Is XXXXX a good radio?" I don't fucking know. I've only owned about a half-dozen HF rigs in the past thirty years, and maybe had the opportunity to play with a half-dozen or so more. What I do know is how to teach you to make your own decisions. Let's say you come across an HF rig in decent shape, and by reading the ID plate you determine it's a Kenwood TS-140S. The guy is asking $250 for it. Since you have your smart phone on you, you can check Ebay and see how much they sell for.

Kenwood TS-140S HF Transceiver
8 viewed per hour

Item condition: **Used**
Time left: 29d 02h 12/11, 11:15PM

Price: **C $350.00**
Approximately US $263.73

7 watching

Buy It Now

Add to watch list
Add to collection

Longtime member

Shipping: C $40.19 (approx. US $30.28) Canada Post Expedited Parcel - USA | See details
International items may be subject to customs processing and additional charges.
Item location: Winnipeg, Manitoba, Canada

This one is $263.73 plus $30 shipping from Canada. You find a few other completed/sold auctions and determine the average price is around $250 plus shipping so the guy did his research too and isn't being unreasonable. Is it considered a good rig? That's what Eham reviews are for. You surf over to site, and see what other hams said about it. You're in luck, and find a good number of positive reviews about the model.

| Reviews Summary for Kenwood TS-140/680		
Reviews: 48	Average rating: 4.2/5	MSRP: $1,190.00
Description: 100w, 160-10m HF SSB/AM/FM/CW rig		
Product is not in production.		
More info: http://www.rigpix.com/kenwood/ts140s.htm		

You can write your own review of the Kenwood TS-140/680.

Eham has it rated 4.2/5 stars with 48 reviews. That's pretty good. Based on what you found, you might want to offer $200 or so and see what he does. If he knows you're a new ham, isn't an asshole, and you don't act like one either, he'll probably meet you half-way at $225 or so. If not, you can always pay $250 and not feel like you've been burnt, or go look at some other tables.   My hamfest advice to take a nice walk around the entire 'fester with your elmer before you buy anything. I see more late model HF rigs staying on the table than going home with a new owner at the end of the day, and you might find something better a little further down the asile. Now I like Icom and Yaesu radios, and there is a plethora of good information available about both brands at http://www.ab4oj.com/icom/oldicom.html and http://www.foxtango.org/ respectively. However, I know a few hams who are in love with their Kenwood hybrids, and there is nothing wrong with them either. I'll get into that later.

After you get your transceiver, add a CW key. Old straight keys can be found for $30 and under at hamfests. The most I ever spent on one was $35 for a US Military Korean War-era J-38 that was new in the

box. The J-38 is a good straight key that has served radio operators well for decades. Don't bother with bugs, iambics, or the like until you get comfortable with a straight key. Then feel free to try something else. Straight keys are the easiest to improvise if you have to for whatever reason, so make sure you know how to use one.

It has often been said by old-time hams that *"Marconi spins in his grave every time a ham buys an aerial instead of building it."* It is true that HF antennas can be homebrewed for less money that offer the same performance as those that are purchased. While I endorse purchasing a recent copy of the **ARRL Antenna Book** for antenna building information, realistically your first HF antenna is going to be either a dipole or an end-fed Zepp because you can slap one together out of whatever scrap wire you have laying around, especially if you decide to use a balanced (twin-lead) feed instead of coaxial cable.
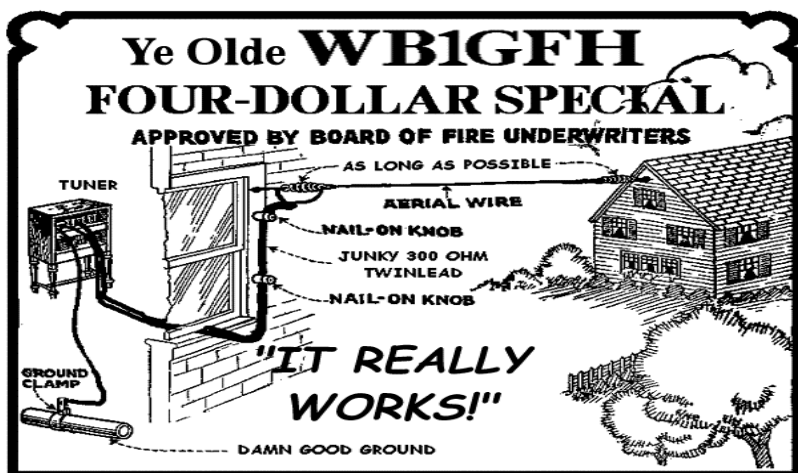
Here is what I presently use at the shack. It was found online and written by WB1GFH, who is a well-known Elmer in New England Ham circles. This is an End-Fed Zepp, and yes it really works. I have used this antenna from New England to the Rocky Mountains, and it has always

done well for me. The antenna does require a tuner, but those are also available inexpensively via hamfests or by inquiring through the grapevine. If you're using this antenna, make sure it is a balanced line (ladder line, twin-lead) capable tuner.

Most new hams have, since I started in the hobby, turned to MFJ[31] for accessories. While not the most elegant, their stuff does work most of the time, and they are very good at honoring their warranty. The standard go-to tuner for portable/QRP work is the MFJ-971. It retails for $130 new, and used ones can be found for $50-$80.

Older MFJ tuners are also readily available at hamfests and on Ebay. You can, for example, find a perfectly good and usable original MFJ-941 for $30-$50 if you look around. Both of these tuners have a 4:1 baun for balanced feedlines, and are capable of handling 300 watts. The MFJ-971 also has a low-power meter setting for QRP work.

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31 http://www.mfjenterprises.com/

If you want to upgrade your tuner, find an old Johnson Viking Matchbox or one of the MFJ-974HB. Viking Matchboxes start at about $70-$100 at hamfests, and the MFJ-974HB is $230 new.

The Tech Library

I prefer hardcopy books, but have found plenty of PDF versions of books in my library at http://www.archive.org and elsewhere on the net. This is especially useful for older, out of print works. There is a lot of educational information available via the World Wide Web. Some of it is really good, a lot of it is bad, and most of it is pretty indifferent. The problem with all this information is that you, at a beginner level, don't know what's good information and what's bad information. If you have an elmer (mentor) you can at least get a viewpoint of what was worked in the elmer's experience. While it may be limited, it will at least be a valid start. Those of you who like to lone-wolf it won't have that useful tool, and will also be suffering from ignorance bias. That's why amateur radio now has a bunch of prepper hams with a Technician class license, cheap piece of junk Baofeng HT, and absolutely no clue whatsoever.

When you put together a reference library of printed books, you accomplish a couple important things. First, you know the information, especially with books from major publishers like Radio Shack and the ARRL, has been vetted accurate. Second, you now have the information in permanent physical form that requires no e-readers or electricity to read. You don't need to have a large library, just a few books. Most of these you can find cheap at hamfests. I am presenting you a list of books that I've found to be among the most useful in my technical library. I would consider this list to be a good start, but it's far from exhaustive. I've always been asked "Is such and such a good

book?" Chances are, unless I've read it, I have no idea. So my answer is this: If you like the book upon leafing through it, the information doesn't conflict too much with the info in this starter library, and the price is reasonable, then buy it. You'll at least learn something new from it.

The Sparks31 "Top Shelf" Library List

- **<u>1934 Short Wave Radio Manual</u>** – Lindsay Publications (now Your Old Time Bookstore)

- **<u>ARRL Antenna Book</u>**

Any recent edition will work. The older ones that were digest-sized with a black and red cover have some good old-school antenna info in them. Stuff you don't learn by memorizing the answers to the Extra test.

- **<u>ARRL Handbook For Radio Amateurs</u> (Radio Communications), 1982 edition**

I only mention the 1982 edition because it was the first one I received. It was a gift from one of my Elmers. Being my first edition, it's the one I usually reach for when I need to look something up. I used to have an extensive collection of ARRL Handbooks, but have since trimmed down the collection to years that have some personal significance.

Most people get through their Amateur Radio exams by memorizing enough questions in the test pool to where they can achieve a passing grade. While that approach is effective from a test-passing standpoint, it leaves the recently-minted ham radio operator with little in the way of practical knowledge. Where do you start? With a copy of the <u>ARRL Handbook For Radio Communications</u> (previously the Handbook For Radio Amateurs). Every ham shack, electronic repair shop, and station engineer's bench I have

ever visited has had a well-thumbed through copy of this book within easy reach. The most succinct write-up I ever heard about this book was on a TSCM mailing list by the late surveillance guru Steve Uhrig of SWS Security, who said:

> *"I would recommend any issue in the last 10 years of 'The Radio Amateur's Handbook' published by the American Radio Relay League aka ARRL. http://www.arrl.org/. This is a universal handbook covering everything about communications theory from the very beginning to the most modern. Virtually everyone has one around for reference, formulas, charts, etc. Since theory doesn't change, yet they publish the thing annually, it doesn't much matter which issue you get. I think my newest one is a 1972 and I have one which belonged to my dad from 1942 which was before I was born.*
>
> *The later editions have more about microwave and satellites and modern stuff, and older ones have more about stuff like teletype, vacuum tubes and earlier theory. Ideally you would want an older and a newer one, but for now anything you can find will be adequate. Check ebay for older ones. Don't pay collector's prices, though. You don't want an antique, you want a beat up reference book with coffee stains on it, for a decent price (like $20-$25 max). You want the hard copy edition, NOT the CD. Nothing beats being able to carry the book to your bench, or photocopy a chart, or read it sitting on the potty."*

Start by getting an edition from the 1970s or 1980s, then one within the past 10 years or so, then get one from the 1950s or 60s. The 1970s and 1980s editions had projects portrayed in solid state, thru-hole PCB construction before extensive SMD use, and thus are the best for a beginner. The later ones start getting more into SMD and digital technologies, where the earlier ones concentrate on vacuum tube technology. Each edition had different projects in it, based on the amateur radio zeitgeist of the previous year.

- **Engineer's Mini-Notebooks – Electronic Sensor Circuits & Projects**, by Forrest M. Mims III

- **Engineer's Mini-Notebooks – Science and Communications Projects**, by Forrest M. Mims III

These two have some very interesting schematics in them. They were my subsequent purchases at Radio Shack after buying **Getting Started In Electronics.**

Part of the usefulness about learning electronics is being able to build various handy devices. Once you learn the basics from Getting Started in Electronics, you'll be able to start doing this. Between these two volumes you will be able to build, out of common electronic parts (most still available at Radio Shack), various simple, yet useful, projects including telegraph and lightwave communications systems, sensors that detect different events and phenomena, and switching devices that trigger relays upon receiving information from a sensor.

- **Experimental Methods in RF Design** – ARRL

This book was written by three hams who build their own gear and then take it into the field to operate while camping or engaging in other outdoor activities. Their radio gears bears names such as "Micro-Mountaineer" or "Trail-Friendly Radio." One of the gentlemen, Rick Campbell

KK7B, uses a small sailboat as a test-bed for maritime mobile amateur radio experiments. It begins with Getting Started: Experimenting, "Homebrewing," and the Pursuit of the New, explains different circuits that can be combined together to make a radio system, talks about measurement equipment (some of which you build) and ends with Field Operation, Portable Gear, and Integrated Stations. This book is long, technical, contains a massive amount of references, and is the essence of down-grid radio communications.

- **Getting Started in Electronics**, by Forrest M. Mims III

    This is the book that got me started. I bought my first copy at Radio Shack in 1984. If there is a Radio Shack still open within driving distance of your home, and it's not located in a shopping mall, they still might have copies in stock. While you are there, check the section where they sell electronic components and buy any of the bulk packs of transistors, resistors, capacitors, et al that they have left. It is the absolute best book for a beginner. This book is only 128 pages long, and will teach you plenty to get started in the more practical aspects of electronics. If you can't find it at a Radio Shack (or find a local Radio Shack), you can get it from his website at http://www.forrestmims.com/.

- **How to Build Hidden Limited-Space Antennas That Work**, by Robert Traister

    This is in my opinion the best book I've seen on covert antennas. It's out of print, and the Amazon sellers have it overpriced as is often the case. You'll probably find one at a hamfest if you look long enough, or don't buy that next case of ammo and get one off Amazon.

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- **Impoverished Radio Experimenter 1-6** – Lindsay Publications (now Your Old Time Bookstore)

Taking a few steps back to the early days of radio, the Impoverished Radio Experimenter series was originally published by Lindsay Publications and is now available from Your Old Time Bookstore. The series can be purchased at https://www.youroldtimebookstore.com/category-s/1904.htm. It starts with vacuum tube substitutions, inexpensive power supplies, and grid-leak detectors (the next step up from crystal detectors found in Voice Of The Crystal), then goes into test equipment, shortwave reception converters, higher-performance receivers, antennas, and finally transmitter experiments. Early tube gear is important from a down-grid standpoint because it is simple, inexpensive, and since it dates back from a time when most of the United States did not have grid-power, runs on DC batteries. Keep in mind that a lot of that early radio gear was DIY-built "stone tools and bare hands" style.

- **Low Power Communication** – ARRL

Low-power communication, aka QRP, is one of those genres of Amateur Radio you will want to get involved in. QRP not only involves using low transmitting power, but also operating in remote field locations with alternative power, portable (often homebrew) gear, and improvised DIY antennas. That's about as down-grid as you can get. Low Power Communication is the ARRLs guide to the art and science of QRP amateur radio. It's also one of the better offerings that the ARRL publishes. The current (4th) edition is $28.00 from the ARRL, and they have a pretty good deal where you can get the book and an MFJ Cub 40-meter CW transceiver kit for $106.00.

This is considered an easy kit to build. You will learn a lot from the experience, it will improve your technical skill

set, get you on the air in proper down-grid style, and not cost you a lot of money. Despite being overlooked by many new hams, the entry-level Technician class license does have CW privileges on the HF amateur bands, including 40-meters.

Unlike that Baofeng HT, this inexpensive 2-watt HF radio is more reliable, easily repaired with common & inexpensive parts, tools, & test equipment (that you should have as a technical specialist), provides a true educational experience, and will enable you to communicate a lot farther with the same amount of power.

- **New Sideband Handbook**, by Don Stoner

- **QRP Notebook** – ARRL

Another W1FB/SK classic that seems to have achieved collectible status among some hams. Like **Solid State Design**, it's a good book that's often horribly overpriced on Amazon. Try not to spend a lot of money on it when buying one.

- **Radio Amateur's VHF Manual, The** – ARRL, 1972 edition

Technician class license holders can operate on all Amateur Radio bands above 50 MHz., or 6-meters and down. What most new Technician class hams don't realize is that there is older gear and other communications modes that are are much more suitable for down-grid type communications in the VHF/UHF bands than 2-meter and 70cm FM with an HT. VHF/UHF "weak signal" operations provide better performance on an individual down-grid station basis than does FM, especially when using repeaters (3rd party infrastructure). Towards this end, th best book I've found is the 1972 edition of the Radio Amateurs VHF Manual once published by the ARRL. It's out of print, but copies can be found for a couple dollars at hamfests. The 1972 edition was

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the last one published, and concentrates more on solid state equipment than the older editions. This book contains a wealth of VHF radio, antenna and test equipment projects from a time when hams built VHF/UHF amateur radio stations rather than going out and buying an HT made in China. VHF/UHF weak signal continues to be a popular genre of amateur radio, with hams DIYing their stations into the microwave ham bands. For the new Technician-class ham however, homebrew 6-meter and 2-meter gear is well within the realm of possibility, and such gear will be more reliable, repairable, and higher performance than that Baofeng. That is the essence of down-grid communications.

- **Radio Science Observing** – Volumes 1 & 2, by Joseph Carr

- **Scanner Modification Handbook**, by Bill Cheek (three volumes)

I have always maintained that listening is >2X more important than transmitting. Back in the 1990s, electrical engineer and writer Bill Cheek authored three volumes of the Scanner Modification Handbook. These books detailed various modifications to increase the performance of VHF/UHF police scanner receivers of that era. Such scanners are now available cheap from various used sources. With the information contained in these books, you can modify and use these inexpensive receivers as the basis for a high-performance monitoring station. They are all out of print, but used copies can be found for reasonable prices on Amazon.com.

- **Screwdriver Expert's Guide to CB Repairs and Modifications, The**, by Lou Franklin.

Chances are you'll probably get into CB as a wireless communications system upgrade before you get into ham

radio, and this book acts as a stepping stone between the basic electronics books and the more complicated aspects of communications electronics you'll find in amateur radio publications. From a basic troubleshooting standpoint, there is no difference between a CB base station and an amateur radio station, so that information in this book is applicable to both. If you decide to not get involved in amateur radio, this book will help you maximize your CB station for optimal performance. You can order it directly from the author at http://www.cbcintl.com/.

- **Single Sideband For the Radio Amateur** – ARRL, 1970 edition

- **Soldersmoke**, by Bill Meara

- **Solid State Design For The Radio Amateur** – ARRL

This is the predecessor to EMRFD. I have found that this book complements the material in EMRFD, and thus is worthy for inclusion as part of my top-shelf library. This book is out of print. Sadly (and annoyingly) this W1FB/SK classic has achieved collectible status among hams who don't know better. I have noticed that copies for sale on Amazon and Ebay are overpriced. Try not to spend $50 on this book on Amazon. I found mine at a hamfest for $5.00. It is organized similar to EMRFD, starting out with Semiconductors and the Amateur, and finishing with Field Operation, Portable Gear, and Integrated Stations.

- **Spread Spectrum Sourcebook** – ARRL

- **Those Great Old Handbook Receivers** – Lindsay Publications (now Your Old Time Bookstore)

- **VHF Handbook**, by Orr and Johnson

- **Voice Of The Crystal, The: How to Build Working Receiver Components Entirely From Scratch**, by H.P. Fredrichs

    This is another good beginner level book that concentrates on making crystal radios with the proverbial stone tools and your bare hands. In the words of the author, the book is *"185 pages of practical information on the fabrication of electronic components suitable for use in building crystal radio sets. Basic theory and simple analysis is combined with dozens of examples of historical practice, work by contemporary experimenters, and construction details for many instruments fabricated by the author himself."* As a survivalist-type you should be able to discern the usefulness of easy-to-make primitive radios that require no electrical power to operate. You can get more information and order this book from http://www.hpfriedrichs.com/.

- **W1FB's Design Notebook** – ARRL

    This sleeper was written after Solid State Design, and is often overlooked by many in favor of the earlier book.

    If you assembled the library mentioned in the previous section, and applied yourself, you will be off to a good start with basic electronics, circuit building, radios, and antennas. The reader may have noticed that I have heavily advocated what are considered very advanced topics by the majority of the amateur radio community. There are several reasons for that, but the biggest is that Amateur Radio is a technical service. There is a lot more to the hobby than buying a radio and talking on the air with it.

    Being able to build and fix your own gear, regardless of whether it's electronics or farm equipment, is an important part of self-reliance and preparedness; the down-grid lifestyle. Provided you are willing to invest some time

and effort into learning about electronic communications, you can build field-type, down-grid, "adventure radios" out of commonly available components that will cost you less and work better than manufactured equipment. Regardless of what gear you have and may lose, applied knowledge is a powerful thing that they can't take away from you.

Your Work Bench

Set aside a spare room, room corner, basment or attic space. Get a small bookcase. Find an old door or countertop and a couple of two-drawer filing cabinets. Make sure the filing cabinets are the same height. That becomes your workbench. Get a comfortable stool or chair that lets you sit at the right height for your workbench.

If you've been reading the books I've recommended you might have a good idea of what you need for tools and test equipment, but here is a start:

- Soldering iron, 25 watt or so

- Soldering gun, 100 watt or so

- Desoldering equipment (solder-wick or solder-sucker)

- Volt-Ohm meter/multimeter (2)

- LCR meter

- Dummy load

- SWR/Watt meter

- Frequency counter (at least 1300 MHz.)

- Grid-Dip Meter/Antenna Analyzer

- Oscilloscope (at ;east 50 MHz.)

- Signal Generator (at least 225 MHz.)

- 12 Volt regulated power supply (at least 30 amp)

- Electronic hand tools

I would look for this equipment used at a hamfest, and go find a local trading post for the tools. I recommend finding used American-made tool brands in good condition. You should not spend much more than a new set of tools made in China or wherever the cheap stuff is made in the future. If you can't find good used American-made tools than run with whatever you can afford right now. You can always upgrade later.

Ham Radio Activities

Ham radio is a multi-facted hobby, and there are some facets that you'll want to concentrate on. One of the easiest facets to start with is EMCOMM[32] through RACES[33], ARES[34], or Skywarn. In most places, all three organizations are handled by the same club. RACES is an actual official government function sponsored by an area's emergency management office for emergency disaster communications via ham radio. ARES is similar, but operates through the ARRL as opposed to the local government. Skywarn is sponsored by the National Weather Service and ARES for severe weather reporting. I have found that many hams involved with these three functions are not only a wealth of information on disaster communications, but are also often survivalists. RACES, ARES, and Skywarn are organizational as opposed to technical facets of amateur radio. There are also technical aspects of the hobby that are well suited for survivalists.

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32 Emergency Communications
33 Radio Amateur Civil Emergency Services
34 Amateur Radio Emergency Services

QRP is one of the aspects of the hobby that falls into our criteria for communications. QRP is an aspect of ham radio in which hams communicate using low power (under 5 watts) radios. QRP equipment can be small, battery operated, and often home-brew. One of the most notable characteristics of QRP operation is the extensive use of CW. When I got my Novice ticket in 1984, CW proficiency was a requirement for an amateur radio license. I did a little CW operating after first getting my ticket, but at the time it held little interest for me. These days I've been slowly dusting off my extremely rusty CW skills as I find myself increasingly interested in operating QRP. CW is no longer a requirement to get any level of ham license, but knowing how to send and receive code is very useful as a survivalist skill, since you could fit an entire QRP station in the pockets of a field jacket. You can put together a QRP station that fits in two tuna cans for under $100[35]. I have used the "Tuna Tin" transmitters, as they are called, as a test with survivalist newbies to see who is serious about communications. Individuals who fail to see the utility of an inexpensive pocket-sized transmitter-receiver combination that runs off of a couple of 9-volt batteries automatically fail the test.

Many survivalist hams are fond of older tube-type equipment, known affectionately as "boatanchors". Boatanchors do have some features that make them suitable for survivalist communications. Schematics for them are readily available. Every boatanchor manual I've examined included a full schematic of the radio in question. The technology is easily repairable with hobbyist resources. A workbench of basic test equipment and tools is all that you need, along with some spare parts and RF knowledge. Tube gear is also more resistant to effects of electromagnetic pulse (EMP) which is a concern among some survivalists.

35 Website at http://www.qrpme.com/

While disaster communications is a major aspect of amateur radio, certain survivalist-related aspects of the hobby remain a minority form of specialization. Most EMCOMM types put together a basic HF and 2-meter VHF station, erect nominal antennas, and concentrate on the operation and public service aspects of EMCOMM. Survivalist-oriented aspects of the hobby such as QRP, CW, boatanchors, and home-brew electronics don't enter into their participation of the hobby. One of the (few) nice things about the Internet, especially as it relates to ham radio, is that you can interact with a greater variety of fellow hams than you would if you were limited to your local ham club, as I was back in the mid 1980s. For example, I know of one local ham who plays with military surplus radios, and his specialization is different than mine as he focuses on older military aircraft rigs. There are however numerous lists catering to the military radio enthusiasts, and on one such list I found about a dozen members who hail from New England and get together regularly at NEAR-Fest[36] (formerly Hosstraders). Some of them have been getting together at Hosstraders long before I was licensed twenty-five years ago.

So where does this bring the new ham, and what should you do? Get in with a local EMCOMM-oriented club. Get a technical library together. Pick yourself up some basic gear. Learn CW. Get up on HF, 2-meters, and 6-meters. Get your EMCOMM practice with your club during disaster drills and public service events. This is all stuff you'll need no matter where you decide to go in the hobby afterward, if anywhere. Once you've done all that, if you want to expand to other aspects of the hobby, pick something that piques your interest.Use the Internet to do research, make contacts with hams who have the same interests, and go from there.

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36 This is the best hamfest in New England!!! Their website is at http://www.near-fest.com/.

Thoughts and Recommendations

- I would recommend you learn CW as it is a reliable digital mode that only requires your ears and brain to decode. Building CW rigs for frequencies up to 2 meters is well within the means of the average ham who has followed my book and test equipment recommendations.

- For VHF work, I would concentrate on Six meters (50-54 MHz.) because it's the best VHF band out there. SSB and CW would be the obvious modes of choice, along with AM due to it being the easiest voice mode to homebrew.

- After you get your basic rig squared away, look at homebrewing our own radios. Start with solid state, and then work your way up to vacuum tubes. Concentrate on simple portable gear you can take into the field.

- Find an old NTSC picture tube type TV built before 2000. Take it apart and salvage the components. There will at least be a 3.579 MHz. colorburst crystal you can use for an 80 Meter CW transmitter on the old Novice CW section. It's a good place to practice your CW. Also remove the 45 MHz. SAW filter and make a pin out of it for your lapel or hat.

- Grab any old CB you can find for free or almost free if it still works. Use the *Screwdriver Expert's Guide* book and the back issue "CB to 10" articles in 73 Magazine as a guide. Modify it to get on 10 Meters. Now get one up on 6m.

- Participate in at least one VHF Contest on as many bands that you can scrounge, beg, borrow, or homebrew a rig for.

- Find one ham radio book that interests you, and was not on my list. Get it and read it.

- Ultimately, I would go for older vacuum tube and early solid state rigs that run on 12V DC because you can repair them and keep them running when the power-grid goes down. Repeaters are not likely to stay up for very long after TSHTF for the last time, so I would concentrate on ham bands that don't need repeaters to extend their communications range. This means that the highest band you'll be using is two meters. Six meters actually works better than two when working simplex, but more hams are on two.

- I have a ham friend who lives in Spanish Harlem (Manhattan, NYC). Being an apartment dweller, his HF rig is an SGC SG-2020 in his car with hamstick antennas for each HF band. He's worked a lot of SSB DX with that mobile setup.

- Three watts AM (or 12 watts SSB) on 10 Meters will normally ground wave out to 20 miles when the band is not open. Six meters has a similar range. Twenty miles is a little over an hour travel time by bicycle. It's 20 minutes or so travel time if you are driving down an interstate. If you need longer communications range to talk to members of your group/tribe, then they are too far away to be of any assistance during TEOTWAWKI.

Science, Bitches: Scanning the New World Order

Prologue: Preston and the Magic School Bus

I first heard about Preston Nichols from one of the lone gunmen. He was described as this dude who drove around in an old school bus full of Watkins Johnson receivers and was into UFOs and old military bases. With an endorsement like that, how could I resist?

We were down at the New York City 2600 meeting, and one of the lone gunmen told me Preston was speaking that evening at some new-age convention downtown. Never been a big fan of new-age types. They abhor technology and in many cases intelligent thought processes. Still though, it was like watching a train wreck, that bizarre fascination that keeps your eyes riveted to the scene. I hauled myself and my bemused girlfriend down there to hear him speak.

Preston's claim to fame is being involved in some high weirdness over at the old Montauk Point Air Force SAGE Radar site out on the tip of Long Island. It's your typical paranormal story involving UFOs, space aliens, time travel, and secret government conspiracies. He even wrote a few books about it. While sadly enough we don't have men in lawn chairs hanging around MOAs with binoculars and communications receivers, the Northeast has its share of interesting activity in the skies. Two counties I've lived in have the distinction of being on the MUFON top 300 list[37] of reported UFO activity. By now I hope you realize that UFO does not necessarily mean the pilot is from way out of town. He (or she) might be a lot closer than you think[38].

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[37]http://www.ufoinfo.com/onthisday/hotspots/northamerica.html

We paid the aging hippie chick the requisite admission fee, and went to go hear Preston speak. He alluded to all sorts of high weirdness out on Long Island's tip while extensively promoting his books. The granola and quartz crystal crowd hung onto his every word like it came down off a mountain carved in stone. Sorry, wrong religious imagery for this crowd. They hung onto his every word like it was beamed down from the Pleiades. Soon it was time for questions. I raised my hand, and eventually was picked. I asked about detecting and receiving RF signals associated with paranormal activity. He actually gave me a real answer: Use an old black and white TV as a signal detector. It's an old-school trick, especially now that TVs display a blue screen of death instead of static when not receiving a signal. Hell, TV isn't even analog anymore. I use this technique all the time, especially with various frequency

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38 See http://www.sikorsky.com/ - The world's foremost manufacturer of black helicopters.

converters. Simple and works, especially for spread spectrum stuff. Maybe there's something here after all.

We found out he had a meeting every week at the home of this Reki practitioner on Long Island. We decided to check it out. We show up and listen to Preston talk about the history and latest happenings around Montauk as it relates to high weirdness. His audience was about a half dozen groupies with about three brain cells between the whole lot of them. He starts talking technical. I get interested just as the eyes start glazing over on his groupies. Vivian I think is enjoying this way too much. She has little use for "white witches", and this crowd was beyond white. They were transparent. She was fucking with this one woman who was talking way too much about her wavelengths. Jedi mind tricks. Basic PsyOps. He starts talking about the 400 MHz. frequency range and radiosondes. I find this very interesting. The frequency range from about 390-410 MHz. is known to be one of the fun places in the spectrum to check out, and radiosondes hold a particular fascination for me. Then he mentions the use of grid dip meters to check for implants. I suppose if they had a tuned circuit in them, and you had an idea of the frequency, it would work. GDMs are a useful tool by the way. You should have one in your kit.

The meeting ends, and we walk out to the magic school bus. It's filled with a battery bank, a huge inverter, and a few racks of Watkins Johnson receivers. I climb into the bus. Preston wants to show this weird signal he discovered around 900 MHz. He puts it on the spectrum display. Frequency hopping from 900-930 MHz. roughly. Hmm... 33cm ISM (and ham) band. Probably a SCADA. I tell him what he found. In retrospect, considering the crowd I was with at the time, I should have said it was a mind-control device from planet Mongo.

Around the same time I was working with a fellow writer on an article about scanning the NY metro area. I received some copies of letters written by an anonymous contributor to the contact for the local scanner and SWL net that was conducted every week on a local ham repeater. "Mr. Anonymous" had some rather detailed observations of local Milair activity and compiled a nice list of Milair frequencies in the 225-400 MHz. range. The handwriting on the letter looked very familiar. Perhaps the letters might have been written in an old school bus?

The lesson here is that there is a grain of truth in every story, and you have to investigate these interesting stories of high weirdness in order to separate the fact from fiction. The dude may have been hung up on the illegal aliens who fall under the jurisdiction of INS Division Six, but he knew his RF and apparently his COMINT TTP as well. If sorted through the more amusing ramblings, you would have walked away with some interesting hints and kinks to add to your kit.

Yours truly with "Mercenary" (RIP) of the hacker group IIRG and members of "The Lone Gunmen" NYC hacker group just outside Rachel Nevada in Autumn, 1997. Not shown are the Pelican cases full of electronics we brought.

Introduction

I have to thank BoingBoing and Western Rifle Shooters for the inspiration to write this chapter. WRSA alerted me via his blog to a story on the BoingBoing website about a gentleman who did an FOIA request to his regional DHS Fusion Center and received in his packet of materials a print out on electronic "mind control" weaponry that was downloaded from a now defunct conspiracy website.

I've seen the information on the website, and in my professional opinion (based on 30 years of investigating this topic) the information was mostly bullshit. What did it for me was that while subliminal messaging by masking the message in noise, and microwave hearing by pulse-modulating an RF signal with the audio package is pretty well-known, the author claimed that RF weaponry cannot be detected via a spectrum analyzer because it is pulse-modulated and "would only show up as an increase in the noise floor." As anyone familiar with radio electronics would know, that is incorrect. Pulse modulated signals show up just fine on a spectrum analyzer, although having one with storage capability to record peaks makes the task easier. Interestingly enough, I did discover in 2010 an ultra-wideband UHF signal that raised the noise floor 10-15 db in the region I was working, and caused reduced receive sensitivity in several UHF land mobile repeaters. After asking around, I found out it was an experimental radar system that was only turned on when a certain person was in town. Said information was merely a confirmation of what I guessed based on the characteristics of the signal and the frequency range. (A quick check of OSINT sources will readily disclose that 420-470 MHz. is used by the military and federal government for radiolocation (RADAR) and experimental systems.) This ultra-wideband signal was

detected with a common service monitor used by most RF technicians. If I had a real spectrum analyzer with a wider bandwidth resolution, I could have further characterized the signal, but even the limited spectrum analysis capability of a service monitor was enough to figure things out.

As a technical specialist, it is your job to investigate, and potentially debunk or confirm claims of electromagnetic weaponry being used in your area of operations **to protect your tribe**. You will be using SIGINT/ELINT, OSINT, and HUMINT to do this, and if you are not using all three you are doing it wrong. Since this is a technical text, I will concentrate on the SIGINT/ELINT part, and to a lesser extent OSINT.

NWO radio research will be your most difficult task as a SIGINT specialist. While the existence of electromagnetic weaponry has been known for decades, actual systems and applications remain classified, solid technical data available via OSINT is sparse, and most OSINT data is published by the mentally ill and professional conspiracy theorists. (Both of which are unreliable sources.)

Going back to the prologue, Preston Nichols was quite possibly an electrical engineer (or technician supporting engineers) of at least average skill-level and possibly with some DOD contract experience under his belt. He was a skilled communications monitoring hobbyist who owned some high-end receiving gear. He also lived in an area with a rich Cold War history, and DOD research history, including some classified electronic stuff. After what appeared to be a premature retirement, he took his technical knowledge and local government spook legends and weaved them into a multi-volume book series involving the old Montauk Point USAF radar station, UFOs, and time travel. His narrative had just enough truth to it to pass cursory

inspection and attract enough new agers and conspiracy theorists to sell a good amount of books.

With that said, whatever data you find should remain classified and only released to trusted members of your tribe. Rest assured, any information you find will be "debunked" by any number of online assholes from both sides of the fence. It also should be obvious to you by now that advertising high-level SIGINT operations of this nature is a bad idea.

I have found some interesting experimental stuff and lesser-known commercial/consumer systems over the past 30 years. I have also found some neat non-communications emitters, and discovered a lot of newer consumer electronics, particularly stuff made in China, probably does not meet FCC standards. I have not, as of yet, detected any systems I could reasonably identify as electromagnetic weaponry. My research, however, has been limited to an upper frequency limit of 24 GHz., and mostly suburban and rural locales that were not experiencing a civil disturbance. Perhaps if one would set up shop in an urban hotel within line of sight of an active protest, they might find something of interest…

When I was a young hacker during the mid 1980s, I was blessed to have come across a book titled **Report on Planet Three and Other Speculations**, by Arthur C. Clarke. **Report on Planet Three** was a collection of speculative essays by Clarke published in 1972, and reprinted in 1985. I was becoming interested in parapsychology as well as radio/electronics at the time. There were two essays in that book that struck a chord with me: "More than Five Senses" and "The World We Cannot See". At the timeI was living in a part of the Hudson Valley, NY region that is well known among paranormal enthusiasts for its mysterious stone chambers that predate

the Native American inhabitants of the area. During that time, the region was also experiencing a significant amount of "UFO" activity. This is all detailed in the book **Night Siege: The Hudson Valley UFO Sightings**, by J. Allen Hynek, Philip J. Imbrogno, & Bob Pratt, and the book **Celtic Mysteries in New England**, by Philip J. Imbrogno, & Marianne Horrigan for those who are interested.

Arthur Clarke is also responsible for saying one other thing that has had an influence on my explorations. *"Any sufficiently advanced technology is indistinguishable from magic."* Consider what an average person from the Middle Ages would conclude about a cellular phone or the HF transceiver that's in my ham shack. Someone from that era would think most of what we take for granted in the Twenty-First century as "magic". Now consider the average person today who uses a cellular phone or television. Chances are they are not familiar with the scientific and electronic principles of how those devices operate, but that does not make them incapable of using them. You should also consider the field of quantum physics. Scientists are still not too sure about it, but it's not discouraging them or causing them to disregard what they've already observed. For our purposes, this is all relevant because there are many in the new age and conspiracy theory scenes that dismiss and discourage the use of technology to investigate claims and rumors. I always laugh when one of these bozos mention some type of electromagnetic super weapon of the "New World Order", and get all bent out of shape when they are told about all the ways one could detect such a device and reproduce its function to be used against totalitarians. Scientia est Potentia.

As your tribe's technical specialist, what you need to do is raise your consciousness level through technical education, and hopefully instill a sense of investigative

exploration into your psyche. This is important because the world needs more people who have the urge to ask questions and have the proper education to find out the answers. There are a lot of entities out there that wish to obscure the truth to further their own ends; whatever they may be. Human beings are encouraged way too often to be sheeple; instead of the curious simian descendents that we were designed to be. It is beyond the scope of this work to teach you the metaphysical aspects of consciousness-raising, but you'll cross that bridge when the time is right for you. What I will try to do is start you in the right direction via technological education, much the same way I went when I was younger. Remember the Arthur Clarke quote from the beginning of this chapter.

Humans are endowed with six senses. The first five are quantifiable, and the sixth is somewhat subjective in nature. We have sight, hearing, smell, touch, and taste. The existence and potential nature of the sixth sense, also occasionally known as "Extra Sensory Perception", is subject to debate. Some believe it is the analytical function of the mind using input from the five physical senses. Others believe it is the ability to sense low frequency electromagnetic fields such as brain waves, much like an EEG. Still others believe the sixth sense detects some form of ethereal phenomena/stimuli that has yet to be quantified. Some just simply refer to it as "common intuition" and offer that some people are better at it than others. At any rate, there is enough data out there to confirm the existence of a sixth sense; it's just that we're not sure exactly what it is. The relevant senses for this discussion are sight and hearing, and potentially sixth sense.

For all they're worth to us, our sight and hearing are pretty limited. We can only see what is referred to as "the visible spectrum". We cannot see infrared (or near infrared),

ultraviolet, RF, or nuclear radiation. Our vision is pretty lousy for the most part, if there is not a sufficient amount of ambient visible light. Our hearing is limited to the general range of 20 to 20,000 hertz (Hz.). Many people cannot hear as high as 20 KHz. We cannot hear ultrasonic sound or RF waves, although some people claim that they can "feel" electromagnetic fields. Just because we cannot sense certain phenomena however, doesn't mean they can't affect us. Gamma rays can cause cancer. Ultraviolet light causes sunburn and eye cataracts. High power microwaves are known for their ability to cook food, and the U.S. Military is experimenting with microwave "pain field" weaponry, and ultra- and sub-sonic "crowd control" systems.

Fortunately, those humans with the education, common sense, and right test equipment can extend the range of their senses. Off-the-shelf equipment exists to detect nuclear radiation, radio, microwaves, (near-) infrared, and ultrasound. This opens up all sorts of exploratory and investigative possibilities. Consider the following excerpt from a NASA Technical Report on microwave hearing:

> "A decoy and deception concept presently being considered is to remotely create the perception of noise in the heads of personnel by exposing them to low power, pulsed microwaves. When people are illuminated with properly modulated low power microwaves the sensation is reported as a buzzing, clicking, or hissing which seems to originate (regardless of the person's position in the field) within or just behind the head…By proper choice of pulse characteristics, intelligible speech may be created."

The previous excerpt was not science fiction, nor someone's conspiracy rant. This is something NASA has

done work on with some success, and is based upon the "Frey Effect", discovered in 1961 by Allan H. Frey while he was working for the General Electric Advanced Electronics Center and Cornell University in Ithaca, New York. Generating a pulsed RF signal at frequencies of 400 MHz. to 3 GHz. is an easy enough task. There are ham bands at 430/440 MHz., 900 MHz., 1.2 GHz, and 2.4 GHz. The 900 MHz. and 2.4 GHz. regions are also license-free ISM bands. A microwave oven magnetron puts out a pretty hefty signal at 2.4 GHz., and there is plenty of surplus cellular and PCS equipment out there operating on the 800 MHz, and 1.9 GHz. bands. How much experimentation might be needed in order to determine the "proper choice of pulse characteristics" to get you to hear the "voices"?

Personally, if something like this could help a deaf person hear or otherwise help a fellow human, I'm all for it. Stuff like this makes you wonder though. Is that "crazy" person hearing voices in their head really "mentally ill"? Maybe they're getting a little too close to the leaky microwave oven in their kitchen? Maybe their neighbor's kid is doing an extracurricular science project? Maybe that generic-looking office building across the street is an R&D facility for the latest generation of surround-sound home theater or hearing aids? Are some people more sensitive to RF fields than others? I knew this guy who once claimed that when he got "too close" to the front of his microwave oven, he could feel a sensation on the hairs of his arm. How would you know? If I turned on the HP 612A signal generator in the lab and my ears started ringing, I'd probably put two and two together. How about your average technically ignorant person? How about his or her psychologist or psychiatrist? Does the average person have access to something like a spectrum analyzer or even a frequency counter?

Now add to this concern the fact that our society is becoming more electromagnetic every day. The computer I typed this text with emits electromagnetic energy. Wireless computer networks (802.11) emit electromagnetic energy. Baby monitors, "nanny cams", cordless phones, cellular/PCS phones, FRS radios, microwave ovens, utility meters, burglar alarms, wireless doorbells, and remote car starters are commonly encountered "consumer electronics" devices that emit electromagnetic energy in very detectable levels. I haven't even begun to mention the increasing number of "hobbyists" who are experimenting with what amount to electromagnetic weapons built from parts from those very same consumer devices. You are not able to sense any of this except in a very basic way, yet it is most likely going through your body as you read this. If you do not wish to be blind to all of this, you will need to gain an understanding of the technologies involved, and equip yourself accordingly. This entails learning about electronics (and other scientific subjects), and acquiring the necessary equipment so you can identify what is floating around you in the ether. As you become more comfortable in this netherworld, you may wish to explore its more esoteric, suppressed, paranormal realm. What might you find? Only the gods know for sure, but is certain that the truth will at least be enlightening, if not liberating.

Books

Before you start getting into this aspect of electromagnetic investigation, you should have your basic library and equipment squared away. Actually, you've followed the instructions in this book so far, you're 90% of the way there.

Knowledge of electronics beyond basic radio communications stuff is essential, but you'll only need a

little more supplemental material to fill in some gaps in your knowledge. One of the most comprehensive reads for learning about electronics is the US Navy's NEETS (Navy Electricity and Electronics Training Series). It was developed for use by personnel in many electrical- and electronic-related Navy ratings and provides beginners with fundamental electrical and electronic concepts through self-study. I used to recommend this series for a beginner. It is very good, but the fact that NEETS consists of 24 modules of 250-300 pages each turned off a lot of dilettantes. Since you are serious about this sort of thing, you have no such compunctions about the sheer volume of knowledge in this series. The series covers the following topics:

- Module 1, Introduction to Matter, Energy, and Direct Current

- Module 2, Introduction to Alternating Current and Transformers

- Module 3, Introduction to Circuit Protection, Control, and Measurement

- Module 4, Introduction to Electrical Conductors, Wiring Techniques, and Schematic Reading

- Module 5, Introduction to Generators and Motors

- Module 6, Introduction to Electronic Emission, Tubes, and Power Supplies

- Module 7, Introduction to Solid-State Devices and Power Supplies

- Module 8, Introduction to Amplifiers

- Module 9, Introduction to Wave-Generation and Wave-Shaping Circuits

- Module 10, Introduction to Wave Propagation, Transmission Lines, and Antennas

- Module 11, Microwave Principles

- Module 12, Modulation Principles

- Module 13, Introduction to Number Systems and Logic Circuits

- Module 14, Introduction to Microelectronics, covers microelectronics technology and miniature and microminiature circuit repair.

- Module 15, Principles of Synchros, Servos, and Gyros

- Module 16, Introduction to Test Equipment

- Module 17, Radio-Frequency Communications Principles

- Module 18, Radar Principles

- Module 19, The Technician's Handbook

- Module 20, Master Glossary

- Module 21, Test Methods and Practices

- Module 22, Introduction to Digital Computers

- Module 23, Magnetic Recording

- Module 24, Introduction to Fiber Optics

The NEETS series is available in PDF format and can be downloaded off various sites on the Internet. Specific site locations change over time, but a Google search of "NEETS PDF" or something similar will produce the desired results. NEETS will reinforce what you've already learned, and fill in some gaps in your knowledge.

NWO radio research is different than your typical COMINT type operations, and requires a different approach.

Your best way to start and learn is to try some more conventional radio science observing. The best book for this is the two volume **<u>Radio Science Observing</u>** Series, by the late Joseph Carr. The series starts with radio receiver basics and ends with radio science techniques and projects. The projects in this series are good for a beginner to do because they get you used to doing things the right way.

Finally, if you already haven't you should download some frequency allocation data from the FCC and NTIA. One of my favorite references is the **Federal Speectrum Use Summary, 30 MHz – 3000 GHz**, published by the National Telecommunications and Information Administration Office of Spectrum Management. Like everything else online, a Google search will find you the most recent version and its current location.

Equipment

As always, your best bet is to roll your own gear, and the reference materials you should already own by now have the information you need to do it. When it comes to off-the-shelf gear, a lot of it is designed for narrow-band digital and analog communications emitters such as those found land mobile radio systems. You want something that is designed to detect wideband emitters.

Now if you happened to come across a Watkins Johnson RS-125 stack with wide-bandwidth (>50 KHz.) IF demodulators, you should grab it. You might find one at Dayton, NEAR-Fest, or a California or DC-area hamfest. When it comes to the exotic stuff, you need to be in an area that did a lot of defense contracting, like Silicon Valley or Silicon Alley. Otherwise, you need to look for something that is sensitive, but with a broad front end.

The RTL-SDR is one of the first pieces of "new" equipment that comes to mind. They typically have a frequency coverage of ~20 to ~2000 MHz, and can provide a spectrum display of a few MHz. at a time. It's inexpensive and readily available from a number of sources.

As mentioned previously, old-school multiband portable radios are another good choice, especially if you can find them cheap at hamfests and tag sales. Do not ignore ones with "TV band" coverage. In a similar vein, old portable analog TVs are good, especially with slide-rule tuning, and when hooked up to old CATV block-converters. Analog TV signals were 5 MHz. wide, so you get a nice visual indication of a signal within that bandwidth. The tuning on these devices are all similar, and the radio mod material in Grove's **Communications Monitoring** book can be applied to most of this stuff to extend frequency coverage. Since you shouldn't be spending more than $20 each on this stuff, you can get a quantity of receivers cheap and modify each for a particular purpose. That's almost as good as rolling your own.

Spectrum analyzers are very good to have, and probably one of the best tools for this job. You can find older spectrum analyzers cheap ($100 or so) at a hamfest. You can also find test-equipment receivers such as the Wavetek SAM that can act as a spectrum analyzer front end when used with an oscilloscope.

This gear will get you up to 2 GHz. or so without much hassle. To get past 2 GHz. you will really need to roll your own. My first suggestion is to get involved in microwave "weak signal" Amateur Radio, as they routinely use cast off commercial RF gear to communicate on ham bands above 2 GHz. However, if you don't live in an area with enough hams to support this sort of thing you will have a hard time.

You can get into the microwaves on a limited basis by modifying consumer electronics equipment. Radar detectors is the first item that comes to mind. This was already discussed in the "Broke Lab Lizard" chapter. Another item to look for are the 2.4 GHz. Wavecom video senders that people used with video players to watch movies on a TV in another room. Older analog video baby cams used the same frequency range. These units can be modified for 2-3 GHz. reception range. Google it for the modification. There were also similar units that operated in the 902-928 MHz. band. A search of 73 Magazine archives should net you some information on them.

Operations

You are looking for something that may or may not actually exist. You are also looking for something that will likely be very intermittent in operation. In addition to using SIGINT, you will have to have adequate OSINT and HUMINT operations in place. Also, like many other things, location will also be pretty important. You are more likely to find something interesting in a densly-populated urban area during a "protest" than you would in rural america on a lazy weekend day.

OSINT research may help you find frequency bands that would be more particularly interesting to investigate than others, but we have determined that a lot of that information on the Internet is not very reliable or accurate. The former Soviet Union did a lot of biological electromagnetic research during the cold war era, and some of that material has found its way to the Internet. I would consider it to be more reliable and accurate than what you would find on some conspiracy web site.

Epilogue

A few of us locals hang out on 53.693 to ragchew a few times a week. Six sees almost no use around here. It's kind of sad because the local Channel 2 went to UHF after going digital, and eliminated most of the interference problems we'd have on the magic band. The league has that frequency listed for "remote control." That's kind of silly because I've never heard of any RC hobbyists on 6. Most of the time we're running CW or AM, because those modes are easier to homebrew. Appliance operators are also welcome, so we get the occasional FM and SSB on there too. Recently a few of them discovered that Alinco makes a GMSK module for their DR-06 rig. They went up a little to 53.8 so we all can keep an eye on each other with panadapters. They're a good bunch of ops even though they don't homebrew yet. The band nannies would have their final coronaries if they discovered us up here, but they still think 6 is a TVI band, and that list from the league is just a suggestion anyway. Like I said earlier, no one uses 6 around here, and transients usually stay on 50.125 or 52.525. We go down there too when there's a band opening, and want to work some DX.

The bands have been pretty quiet as of late, except for the occasional e-skip and the digital meteor scatter types. Fortunately Gqrx lets you look at the spectrum and that makes it easier to find things. It works well with those RTL-SDR dongles. The dongles are cheap enough, can hear down into the noise floor, and are a broad as a barn door. I found the schematic for a bandpass filter out of an old ARRL Handbook, dug up some components that were close enough, and that helped out the SDR's front end. I had my SDR down watching 50.06-50.08 because that's where the beacons are on 6, and it's your best place to watch for a band

opening. I've got one running about 20 miles away. Five watts on 50.069 into a dipole. Our state is one of the harder ones to get for WAS and other awards. I put the beacon up so other weak signal ops will know that the band is open to here. It also serves as a good test source for the locals who are short of test equipment. If you can't hear the beacon, then there's something wrong with your rig and/or antenna. We've been working with them on that. Which is why used copies of EMRFD are a often a PITA to find.

I'm going up through the band, and as I start reaching the top end, my panadaper shows a signal above 54. That's kind of unusual around here, because even the military stays in the federal allocations between 30 and 50. Every now and then you get a National Guard unit that just picks a random 30-88 frequency during their weekend drill, but not very often. I tune up there and find a CW signal on 57.272. Definitely not military as when they're not frequency hopping they're doing analog FM with a 150 Hz. subaudible tone or running encryption. I listen for a while. The CW is really fast, about 30 WPM. Would be too fast for my ears if it wasn't constantly repeating the same three letters over and over again. I think I know what it's sending, but I load up Fldigi to just make sure. The signal's beginning to fade, but I confirm it before it drops into the noise: VAI. VAI, Victory against ignorance. I only know of one person who would run a beacon with that callsign on Five Meters. He was the guy who was indirectly responsible for our net on 53.693. He's gotta be SK by now. If he wasn't, he'd be over a hundred years old. I'll check DXMaps to see if there were any openings noted on 6 Meters, but I wouldn't be surprised if whoever did this was running it from a boucher relay or something else exotic like that which doesn't need a band opening. I also have a few books and a Kitchin super-regen I now need to pull out of storage. Sliding it up to five is pretty trivial.