KG4KTW

Green Radio Round-Up

Take a manpack radio out into the woods. What your military radio lacks in bells and whistles it makes up for in cool.

Philip A. Neidlinger, PE, KA4KOE

The sheer breadth of things to do in Amateur Radio is amazing. As is to be expected, there are distinct subcultures within Amateur Radio, each dedicated to a particular facet of the hobby. One group, HFpackers, as they call themselves, is dedicated to the realm of portable communications. These individuals take to the field with their radios in order to get some exercise and communicate with their like-minded brethren. HFpackers hike, ride bicycles, canoe or simply set up their gear on picnic tables in a park for an enjoyable afternoon in the great outdoors. An even smaller subset of the HFpackers is comprised of those who enjoy operating military manpack radios. They refer to themselves as "milpackers."

I too have sampled from many of the sub-interests in the hobby. My seven year old son, Jordan, has a keen interest in all things camouflage and army. The devious inner workings of my mind began to churn… "What could be more exciting than running around in the woods with my son with a real green army radio?" I thought to myself. The idea germinated, and I decided I needed to acquire a green radio for myself.

Further justification came in the guise of several record-breaking hurricanes smashing into the US coastline during 2004 and 2005. A couple of those monster storms came uncomfortably close to our home on the coast of Georgia. If we ever had to evacuate, we would need a portable, self-contained HF radio that would be tough enough to survive immersion in water. If we had to evacuate, I wanted to remain connected.

True, I could have acquired a portable radio from one of the big manufacturers, but the coolness factor was simply not there. Cool is very important in this household. Every radio in my collection has a pet name given to it by my two children.

The Right Mindset

Acquiring a green military radio requires a certain mindset. In my opinion, you can't go halfway and get whatever new do-it-all portable "Swiss Army Knife Radio" the big manufacturers are offering. You gotta get a real radio. A heavy radio…A milspec waterproof radio…A radio that will survive the storm surge when you won't…A radio that reminds you what it's like to be mortal as your body aches as you trudge down the forlorn path with it strapped to your middle-aged carcass.

But, let's be honest. If you are expecting a VFO knob, RIT, bandpass tuning or any other number of nice, convenient operating features, then you will be disappointed. Typical power output is usually limited to about 20 W on average, with some units providing up to 50 W. Military radios are built for one thing and one thing only: provide reliable tactical or regional communications under severe conditions in the field. Manpacks usually can be immersed in water or survive being dropped. Once you get past the supposed shortcomings and come to grips with what these radios were designed to do, then the pure fun of operating in the field will more than make up for the lack of features.

Finally, the talk power of most of these rigs is enhanced by very aggressive speech processing. That 20 W radio signal will get through under adverse band conditions with a reasonable antenna attached. This is no surprise, since that's what manpacks were designed to do.

Green Radios to Look For

Finding that green radio is going to be tough if you have to start from scratch. Here are some rigs to look out for that become available from time to time. This list is by no means complete, as I am sure there are some radios that may be personal favorites to the reader. Most of these radios can be heard in use on the HF pack frequencies.

PRC-47

This is a Vietnam era radio manufactured by Collins. Be advised, however, that the radio only does USB, FSK and CW unmodified. The radio operates in the range of 2 through 12 MHz. It's a little heavy, however, to be characterized as a manpack. Be careful tuning it up into an antenna, as its vacuum tube finals are not protected by any special circuitry. If you fry the finals, be advised they are almost impossible to replace. The rig is rated at 100 W maximum output and will operate from either 24 V dc or 115 V ac, 400 Hz. An internal antenna tuner will enable the rig to load up a 15 foot whip or wire antenna. A '47 will occasionally come available on eBay or in the various Amateur Radio classifieds. Fair Radio Sales still had some PRC-47s the last time I checked.

HERB TATE, AA9GC

Collins PRC-47

PRC-70

The PRC-70 was manufactured by Cincinnati Electronics starting around 1964. The radio operates in the range of 2 to 76 MHz using USB, AM, FM and CW with a maximum power output of around 40 W, depending on the supply voltage. LSB can be implemented via a fairly simple modification. Supply voltages are specified from 20 to 32 V dc. You must be careful that the supply voltage does not drop below the minimum specified or the rig may be damaged. The radio has an internal automatic antenna tuner that will work with a variety of antennas. If you're in good shape, you might be able to heft one of these babies onto your back. The PRC-70 was

FEDERICO BALDI, IZ1FID

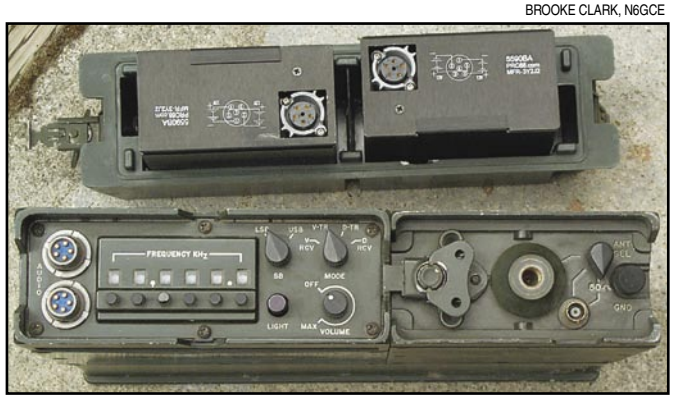
Cincinnati Electronics PRC-70

designed to bridge the gap between the frequency ranges covered by the classic VHF PRC-25/77 and the HF capable PRC-47; in other words, two radios in one box. I have seen a couple of these on eBay in recent months for under $2000.

PRC-104

Manufactured by Hughes and various other contractors in the mid 1970s to late 1980s, the PRC-104 is still in limited use by the US military. Upon its acceptance by the US military, the '104 and its various accessories were referred to as the Improved High Frequency Radio System (IHFR). This is a simple, no-nonsense radio. A friend of mine, K6ERO, swears by them. He claims one of his examples was dragged through the surf by US Navy Seals and still works as well as the day it came off the assembly line. Average power output is 20 to 30 W. The radio runs on 24 V dc, and covers the frequency range of 2 to 30 MHz utilizing USB, LSB and CW. The PRC-104B version has a digital display. All examples of this radio have a very wide range internal automatic antenna tuner that will handle a variety of antennas. The PRC-104 averages around $2000, depending on the version, and can be found on eBay from time to time.

BROOKE CLARK, N6GCE



Hughes PRC-104

PRC-138

Perhaps the premiere green radio sought after by collectors is the Harris PRC-138, which is currently in use today by the US military, and is part of the Improved Special Operations Forces High Frequency Manpack Radio System. It covers 1.6 to 60 MHz. RF power output is selectable at 1, 5 or 20 W. The '138 has a full DSP IF chain with selectable IF bandwidth and DSP derived AGC. Transmit audio is also digitized and processed via DSP. Some units have LPC-10 digital voice built in as well as ALE (automatic link establishment), which is becoming popular with hams. Built-in encryption is also an option, but obviously amateurs cannot use this legally under Part 97 rules. This is a sophisticated, expensive radio occasionally available on the used market. Working examples fetch in the neighborhood of $2500 to $7500. Ouch! These little gems weigh in at 8.9 pounds.

MIKE FRYE, KM6AB

Harris PRC-138

PRC-132/M50B

Both versions of this radio were manufactured by Loral/Terracom with Special Forces operations in mind. The '132 will survive immersion in deep water up to 100 feet. The radio will operate in the frequency range of 1.6 to 50 MHz from a 12 V dc supply. The available modes are USB, LSB, CW, AM and data. The radio is designed to work with a base loaded "screwdriver" type manual antenna tuner that bolts to the side of the unit. It is a tough, unusual looking radio. Used examples fetch from between $2500 and $3500.

JOHN COOK, K6ERO

Loral/Terracom PRC-132

PRC-319

The PRC-319 is a late 1980s vintage rig manufactured by Philips-MEL in England for use by their special forces. The radio is fairly sophisticated with a built-in message keyboard for crypto and burst modes, which are unusable due to amateur regulations. Frequency range of operation is from 1.6 to 40 MHz, continuous, with a selectable power output of 5 or 50 W. Although the radio is not capable of operation on LSB, this is another tough rig that can withstand water immersion to 6 feet. By all accounts, the receiver is fairly sensitive. With a full load of batteries the '319 maxes out at 25 pounds. Expect to pay a premium price for a used '319, as they are difficult to find.

PAUL SIGNORELLI, W0RW

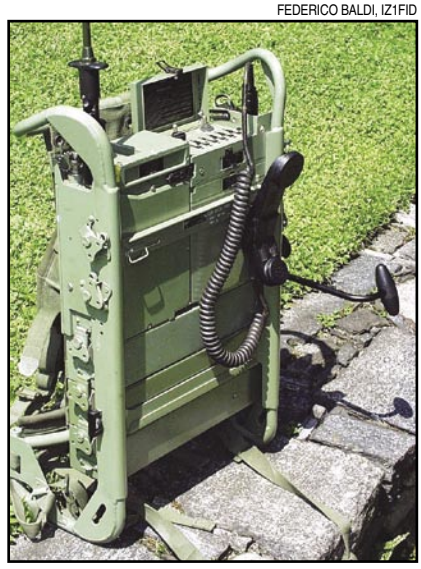
Philips-MEL PRC-319

PRC-515, RU-20

The PRC-515 was produced originally to compete with the somewhat smaller PRC-104. It was designed and manufactured by Collins Canada and

later produced by Collins International. The design was also licensed to Yugoslavia and other countries. The radio's frequency range is 2.0-30 MHz, USB, LSB, AM and CW. Maximum power output is 20 W. The '515 requires 20-32 V dc to operate. The automatic antenna tuner contains a motor driven coil. The "WHIRRR" you hear when you key up on a new frequency is dramatic. This is a neat piece of radio kit that is distinguished by its extremely low current draw during receive. Occasionally, the Yugoslavian versions of these radios will show up on eBay. They are easily distinguishable by the foreign words labeling all the controls. Prices range from $1000 to $1600. Are you in good shape? That's great: the radio with batteries weighs in at around 22 pounds.

FEDERICO BALDI, IZ1FID

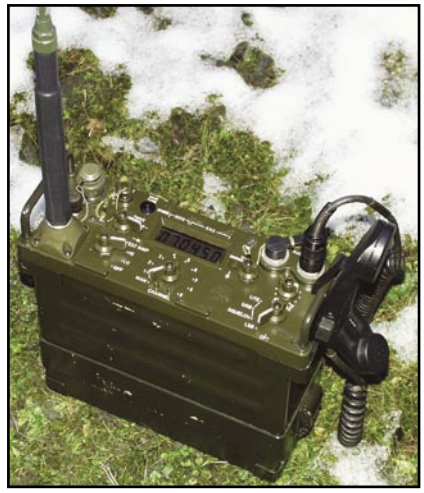


PRC-515, RU-20

PRC-1099/1099a

The PRC-1099a is still being manufactured by Datron/Transworld. Brand new, these radios (the "a" version) go for around $6000 from the manufacturer...way too expensive for the average ham. As a very good incentive, Datron still services these radios. Accessories such as antennas, handsets, headsets and batteries designed for the PRC-25/77 will work with these radios, as they utilize standard US connectors. The radio operates from 1.6 to 30 MHz with a maximum power output of 20 W. The internal automatic antenna tuner is fairly wide range, but a series connected outboard doorknob capacitor is recommended for long random wires. The rig operates from "ham friendly" 12 V dc. These rigs are still used extensively by Third World nations and by US personnel at the South Pole McMurdo Station. Used examples can go from between $1500 and $2500, depending on condition. My personal manpack is a '1099.

FEDERICO BALDI, IZ1FID



Datron-Transworld PRC-1099/1099a

PRC-2000

The PRC-2000 "Callpack" is another late 1980s rig manufactured by Philips-MEL. Examples of these rigs were used by British forces during the Falklands war. The radio is relatively simple to use, and is approximately 25 pounds with the battery box full of D cell NiMH batteries (13 total). The PRC-2000 will output 20 W high/4 W low, USB, LSB, CW or digital modes. The internal automatic antenna tuner is designed to work with a standard 10 foot whip and is not intended for use with random wire aerials. The transmit audio is very distinctive and has the classic military sound to it. Some may find the transmit audio objectionable as it is very punchy. Combat Radio in the UK has these from time to time, but they are getting increasingly hard to find. From all reports, it appears to be a reliable radio. Prices range from $1800 to $2200.

FEDERICO BALDI, IZ1FID

Philips-MEL PRC-2000

TRA-931/Syncal 30

Several versions of this radio were manufactured by Racal in England during the 1970s. A sizable number of these rigs on the used market today were apparently seized during the fighting in Iraq and have found their way onto eBay and other outlets via a mechanism that remains largely unknown. The radio operates from 1.6 to 30 MHz, AM, USB, LSB and CW with a selectable power output of 3 or 30 W. The internal antenna tuner is a manual type. You must turn a knob until an indicator light on the front panel goes out, indicating a match. Working examples of the '931 can be found on the used market for less than $1000.

JOZE HEBAR, S55E

Racal TRA-931

Vertex/Standard VX-1210

I am including this radio in case the prospective milpacker wants a new rig with a 3 year warranty coupled with excellent performance. By all accounts the '1210, although black wrinkle finished and *not* green, performs well. The internal automatic antenna tuner is wide range and is reputed to be able to load up the proverbial "wet noodle." Just throw a wire over a tree, string out a counterpoise, press the PTT, and you're on the air. The radio operates over the spectrum of 1.6 to 30 MHz at a power level of 5 or 25 W. The 500 memory channels are easily programmable. The biggest plus is that unlike its military cousins, the '1210 only weighs 7 pounds with the 4 Ah lithium ion battery installed. The VX-1210, with the usual accessories, retails for around $2000.

WILLIAM TERRY, K4BYR

Vertex-Standard VX-1210

Operating Notes

Let's be frank: If you plan to walk and talk at the same time with one of these radios on your back, it helps to be in reasonably good shape. Not many of us are accustomed to hiking with a 20 to 30 pound pack. After a few weekends with a military manpack, however, you *will* be in good shape. If you have your radio kit installed in a proper pack, however, then the weight should not be too uncomfortable. I use a British DPM camouflage pattern radio backpack obtained from a surplus dealer on eBay.

The most commonly used antenna is the US military AT-271. This is a 10 foot long, 7 part sectional whip with an internal spring and cord that breaks down in seconds to a very small package. The '271 is used in conjunction with a rubber shock absorber that screws between the antenna and the radio. Contacts can be made quite easily on the 20 meter and higher bands. However, things get difficult as the radiation efficiency drops off as the operational frequency is lowered. If you plan on using 40, 60 or 80 meters for instance, you may want to consider some sort of wire antenna that can be easily stowed. Contacts are possible on the lower frequency bands, but they are more difficult to come by when only using a 10 foot whip while running 20 W.

It is essential that some sort of dragging wire counterpoise be provided — unless you like talking to yourself and feeling foolish. Remember: You're using a short whip resonated by the internal antenna tuner in your manpack to the electrical equivalent of a ¼ wave radiator. Connecting an approximate ¼ wavelength wire to the grounding post of the rig will usually increase signal strengths 10 to 15 dB. These values have been determined empirically in the field. Your mileage may vary. Due to interactions between the earth and the wire, the lengths are somewhat shorter than one would expect. Ground conductivity will also have an effect.

Again, these lengths are best determined empirically, but 10% shorter is a good starting point. Use the formula L (in feet) = (234/freq in MHz) × 0.9. It is also important to use an alligator clip or equivalent as a safety disconnect in case the dragging wire gets hung up on something or is simply stepped on. Teflon-insulated small-gauge wire is a good choice, as it will not snag as easily as other types of wire. Finally, the dragging counterpoise will impart directivity to your radiation pattern. Here's a helpful hint: walk away from the station you are communicating with. In this manner, the counterpoise will be pointing at the other station. Sounds funny, doesn't it? Well, it works wonders for improving signal strengths on both ends of the path.

KA4KOE

AT-271

HFpack and Milpack operators congregate on a variety of frequencies. The most commonly used frequencies are 5.3715 MHz, 14.3425 MHz and 18.1575 MHz. Even if you don't intend to acquire a green radio, drop by for a visit. It's always helpful to have a fixed station on hand since some people seem to have trouble hearing the low powered radios, as they aren't 20 dB over S9 with 4 kHz wide audio bandwidths! For additional frequencies and net times consult the HF Pack Web site.

Finally, you should at least be familiar with electronic troubleshooting to the component level. Many of these rigs are no longer being manufactured, with the exception of the Harris PRC-138, Datron PRC-1099/1099a and the Vertex-Standard VX-1210. At the very least, it is a good idea to have a junker radio lying around for spare parts. Given the nature of these over-engineered, tough-as-nails radios, however, reliability should not be an issue.

Conclusion

Operating a manpack radio in pedestrian mode is fun! My first contact with my manpack was with a Belgium station from my backyard on 17 meters. It is definitely addictive and can be likened to QRP operation on steroids. The user, however, should always carry their license with them if away from home. Given the current world terror situation, you should refrain from operating a manpack near an airport or other sensitive installation unless you enjoy spending lots of time chatting with not-so-friendly law enforcement types and possibly having your gear confiscated. It should also be noted that exporting manpack radios is not permissible under current US law. See the list of links in the accompanying sidebar if you decide to try and acquire a military manpack. The Internet is a great place to start your search. Have fun and be safe!

Philip Neidlinger was licensed as KA4KOE in 1979 at the age of 16. He is a registered Professional Engineer in the State of Georgia, where he has practiced electrical engineering with DWG Inc, in Savannah since 1991. He is married to Sheri Neidlinger, KG4KTW. They have two children, Sarah and Jordan. The children's name for Philip's manpack is "green bean." He has written numerous articles for eHam, which include the long running "Dead Electrical Dudes" series, currently airing monthly on the bulletin service "This Week in Amateur Radio." He has recently begun studying and playing the theremin, a terribly difficult electronic instrument. You can reach the author at 103 Lazy Lagoon Way, Savannah, GA 31410; **ka4koe@arrl.net**.

Internet Links of Interest

American Milspec — **www.american-milspec.com**
Army Radio Sales — **www.armyradio.com**
Army Radios Yahoo Group — **groups.yahoo.com/group/armyradios**
Brooke Clarke's PRC-68 site — **www.prc68.com**
Columbia Electronics — **www.columbiaelectronics.com**
Combat Radio, UK — **www.combatradio.org.uk**
Fair Radio Sales — **www.fairradio.com/backpa.htm**
Helmut Singer Electronik — **www.helmut-singer.de**
HFpack — **www.hfpack.com**
John Cook, K6ERO — **www.muttmotorpool.com/k6ero/Milpack.html**
Mil Pack Yahoo Group — **groups.yahoo.com/group/milpack/**
MilRadio — **www.milradio.com/**
Murphy's Surplus — **www.murphyjunk.bizland.com**
Surplus Radios for Amateur Use — **www.co.missoula.mt.us/acs/radios/Radios.htm**
Toronto Surplus and Scientific, Inc — **www.torontosurplus.com**
Mil Spec Radio Gear, by Mark Francis, KIØPF, has just been published by CQ Communications, Inc — **www.cq-amateur-radio.com**