The Short Circuit

Newsletter of the Arctic Amateur Radio Club

Fairbanks, Alaska — March 2013

Repeat What?

by John Slater KL1AZ

What are repeaters in Ham Radio? This is something that all licensed Hams should know and understand as this is one of the basic lessons learned when studying for your Tech licenses.

Simplest explanation is a device used to relay signals from one point to another by either simplex repeating or by duplex repeating expanding the distance of a radio signal.

Simplex repeaters receive and retransmit the signal on the same frequency, where a duplex repeater comes in on one frequency and is retransmitted on a different frequency or band.

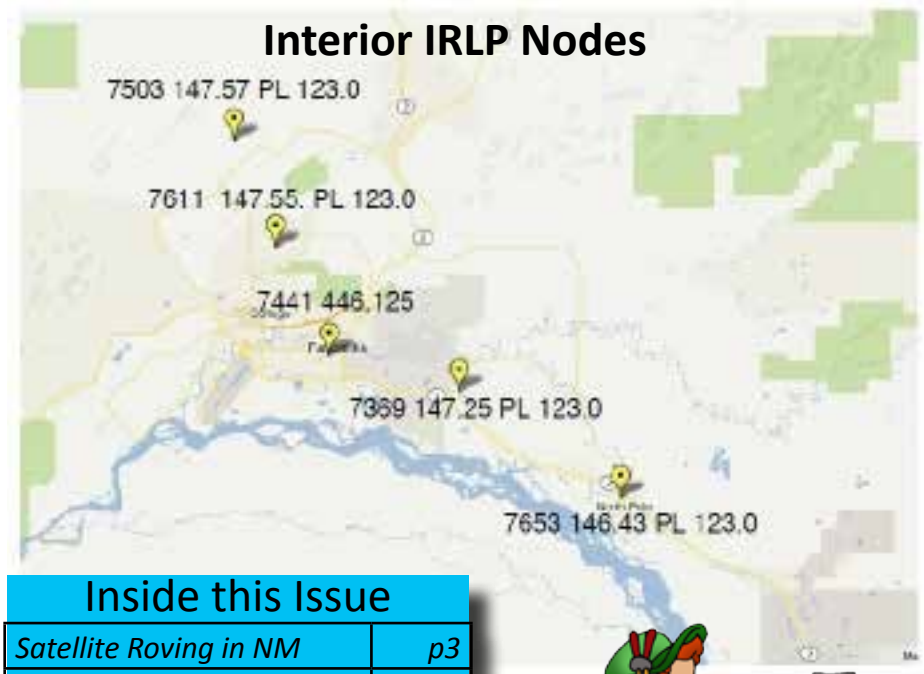
What I have to say from this point forward maybe offensive to some, some may agree, others don't care.

The Arctic Amateur Radio Club (AARC) has a very large repeater system that is now going on 25 plus years old and a great number of the repeaters are either offline or dying. Some are offline due to the Pave Paws Radar located at Clear Air Force Station. (On a side note AARC was one of the 1st repeater systems in the nation to be effected by the Pave Paws Radar system back in 2001, we are secondary users on the 70cm band).

We at AARC and Interior Alaska are faced with a very large decision on what we want for the future in regards to a repeater system and where we want them located. With the advent of Cell Phones less and less Amateurs use the system and it is in place for those who do not have cell phone coverage an as a Emergency Response system. It is common that when something happens to the Internet Cables we lose communication out side of this area (yes cell phones rely on internet connections).

Also coming online is the IRLP (Internet Radio Linking Protocol) system that uses ham radio to connect to the Internet and allows an operator to talk all over the world to other licensed hams and is a great experience for beginning hams, but once again this system relies on the Internet. We currently have 5 nodes in the Fairbanks area.

Over the last couple of years the kind folks that have allowed us to be a part of their repeater sites have come under greater *continued on p. 2*



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Alaska QSO Party On March 23rd!

Recently, Ron Keech KL7YK of Anchorage proposed the Great Alaska QSO Party. You can read about it in the December 2012 issue of the *Short Circuit*.

Plans have finally shaped up, and Alaska hams will take to the air on HF **March 23rd at 1800Z (10 AM local)** for 24 hours of all-mode fun. Contacts should exchange serial contact number, call sign, name and grid square. If you don't know your grid square, you can calculate it online by entering your latitude and longitude at http://www.k3dn.org/grid.htm. Scoring is easy: One point per contact with additional bands per contact being a two-point contact. Logs must be submitted two weeks after the event ends.

Visit http://kl7yk.us/akqso.htm.

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government oversight and we are updating formal paper work to be authorized on the sites. Some of these sites are not accessible by any means other than helicopter and we depend on the good nature of the site owner for the occasional ride there and back. We are also fortunate to have Ham Radio operators as part of that agency be it Government or Private, so when they go to the site to maintain the official site they do a quick check on the amateur repeater system and if time allows fixes the issue or lets the club know what the problem is.

Now for want works and what doesn't:

Ester Dome (the brain of the entire network): currently working but major issues with the controller. This needs some re-programming and repairs or a new one bought and installed which will require all new cabling be built for the different connections.

Nenana: Offline and currently located in Fairbanks, site is no longer accessible to us and is in need of power. In addition to the lack of power, a new building is needed which is available to us and is sitting in North Pole. The property that the current building and current tower are sitting on is also in question. Part of the existing site is possibly located on a road right-of-way. This will require a great deal of paperwork to sort. The cost of AC power would become a monthly expense.

Healy: Taken offline back in 2001 due to interference issues with Pave Paw Radar at Clear Air Station along with inter mode issues with the local translator for TV. Has since been removed from Mt. Healy and now located in storage in Fairbanks.

Denali Park: Working well and is a stand alone in the Denali Park area.

Cantwell: Currently offline and needs new radio installed. This site uses a Kenwood mobile 2mtr/220mtr radio to link back to Fairbanks. Club has new radio and is awaiting the mods to be completed and summer to bring back online.

Eielson: Site was moved a couple of years ago and also relocated into a different building on the back side of Eielson. Currently the repeater cannot hear anything coming in and is deaf. Access has gotten difficult due to secure site that it is on.

Chena Dome: Currently offline due to intermod issues with the new State repeater system. The site owners are working closely with AARC to get the repeater back online in the earliest possible time frame.

Cannon Creek: Working but has some intermod and level issues.

Donnelley Dome: Originally disconnected from Ester Dome due to interference issues on 70 cm, then power issues. Currently will be put back online this summer as a stand alone until we can test the approved 70cm connection back to Ester Dome so we do not interfere with Pave Paw Radar at Clear Air Station.

Dot Lake: Currently working as a stand alone, has intermod issues when trying to link back to Cannon Creek/Ester Dome.

Northway: Status unknown was working approx 6 mths ago but does not link back anymore. Current plan is to pull site and move equipment back to Fairbanks and be used to repair other sites.

Mt. Fairplay: No longer linked/working. Plan is to retrieve equipment and use for repair on other sites. Retrieval date unknown as this requires air transport to the site or ATV/hike effort.

Mt. Eldridge: No longer linked/working. Plan is to retrieve equipment and use for repair on other sites. Retrieval date unknown as this requires air transport to the site. Neal is working with DNR to see if they can retrieve the equipment on a regular schedule maintenance flight.

Manley: Not Working due to a possible antenna problem at Ester Dome. Awaiting new antenna and cable along with good weather to repair.

Eagle Summit: Currently working but needs repair. Needs both a new housing unit along with new batteries. Possible repair date this summer.

Now to the BIGGEST QUESTIONS OF ALL!

1-Who is willing to assist with these repairs?

2- Do we as an organization and users want these repeaters/repairs?

3- If so what are we willing to maintain and how?

4-What kind of upgrades do we want (i.e. what bands do we want on the system and how do we want them linked)?

5-Do we want a good system built on the KISS model? (I just love this term: Keep It Simple Stupid) Or do we want a very complex system that requires a lot of technical expertise to maintain?

6-How much coverage do we want?

The above are very hard questions to answer at this time. We need to look toward the future of VHF/UHF in the Interior of Alaska along with the possibility of a Natural or Man made disaster. We as Amateur Radio Operators will be in the middle of any communications that take place during these events; it is already proven that a lot of the new government mandated communication systems relay on the internet/cell phone towers to work and if they go down we are the back up communications for that agency.

Roving vs. Collecting Grid Squares on Satellite

by Dale Pelzer KL7R

After seeing Andre, KL7AC, with his Arrow Antenna and dual-band hand held in Northway, AK in 2010 I've been hooked on Low Earth Orbit (LEO) satellites. My satellite operations are all portable. No home base station. The idea that I could carry all my gear in my backpack still intrigues me.

We keep score of our contacts above 50 MHz with Maidenhead Grid Squares. I wasn't interested in collecting them and just enjoyed working the satellites from the many places my job took me to in Alaska with the FAA. But others do collect Grid Squares, so I am sending out QSL cards for the rare grid squares where I make contacts to the lower 48.

My wife, NL7DU, and I are spending some time down in Arizona this winter. We took a trip to Santa Fe and on to Taos, New Mexico, to visit an old friend of Chris's. Along the way we stopped to work satellite contacts in new roving grid squares.

The first one was a 4-way crossing near Hollbrook, AZ, where for a single contact the folks get credit for 4 grids. The awards committee sets some stringent requirements for proving where I was. Pictures, videos, WAAS enabled GPS, and all operations must be located within 20 feet of the grid lines. No problem since I'm strolling with all my gear anyway.

We drove to within 1000 feet of the 4-way crossing on a dirt road. I walked the rest of the way with the GPS to the exact spot. Chris took all the pictures to document the location.

To make sure I have someone to work, I have a list of folks whom I email prior to going so I can work at least one station. Frank, K4FEG, is my main contact and he needed this grid. DM44 45 54 55: This time I snagged Hector, CO6CBF, in Cuba for a new grid for him.

We went on to work nine new grids in New Mexico and Arizona on this three day trip. Pictures are on my website at http://www.kl7r.com.

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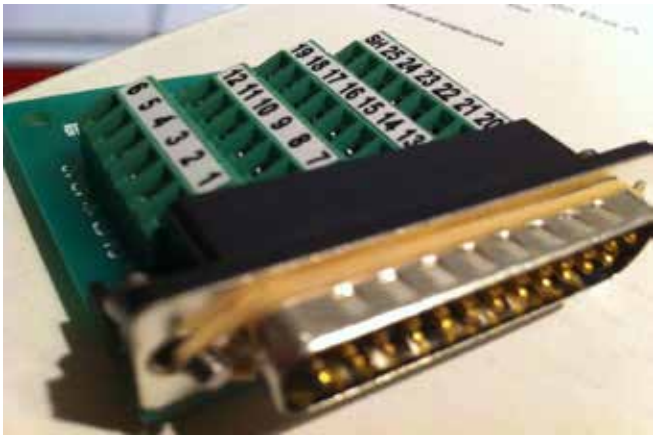
Field Terminations Make Data Connections Easy

With the computer ubiquitous in amateur radio, you will inevitably face the challenge to connect that PC to equipment. While serial (COM) ports have all but disappeared from computers, many accessories still use 9- and 25-pin connectors. So-called field terminations bring a great deal of convenience to experimenters and technicians faced with the challenge of repairing or troubleshooting data connections. No soldering is required. Just strip the wires, insert the bare ends into the labeled slots, and cinch the clamps with a small screwdriver. Every shack and "go kit" should have some of these, which are available in various DB, RJ, and USB configurations. Check out Winford Engineering (http://www.winfordeng.com) under Breakout Boards.



Putting A Crimp in Ham Radio - Part I

by Larry Ledlow, Jr. N1TX

If you surveyed the equipment at your operating position -- the transceiver, accessories, switches, and computer -- you could probably count at least a two dozen different connector types. You have the SOs, PLs, Ns, BNCs, SMAs, RJs, DBs, Fosters, Molexes, Cinches, DINs, ad nauseum. Often we're faced with some complicated choices when it comes to putting it all together so the gear will play as it should. In many cases, you can buy ready-made cables to suit your purposes. This is especially true for standardized configurations; e.g., short RF cables with PL-259s on each end or TNC-radio interface cables with a DB-9 on one end and a six-pin mini-DIN on the other. Prices may run $10-20 each, depending on length, configuration, and cable specs.

In many circumstances you will simply have to construct a custom cable yourself, because of oddball combinations of connectors and/or non-standard pin-outs. Most of you know how to solder, and soldering is the natural first choice for many applications. But this is where we can make a right mess of things either through rusty skills, improper tools, or by trying to improvise parts. Then there is the matter of tiny pins and high-density arrangements being wholly incompatible with a soldering iron in shaky hands connected to a controller with poor eyesight.

Enter crimps. For much of my career and past-time activities working on electronics, I dismissed crimps as inferior to soldering in every way. Experience eventually overcame my solder-snobbery. I have become a big fan of crimping for a lot of common applications, especially for power and data connections inside the shack. Crimped RF connectors are great in the shack, too, but for outdoor and mobile installations as well as at high-flex and twisting connections, I still suggest solder.

To get started in crimping, you will need the right tools, cable, pins and connectors. You absolutely cannot improvise or compromise on any of these if you want a reliable connection. Let me discuss tools first. You have to cut your cable to the correct length before doing anything else. A proper cable cutter is essential, lest you end up with ragged or damaged ends. ChannelLock makes some dandy cable cutting pliers (Model 911) useful for quick, clean cuts on electrical, coaxial, or multi-strand cables. I have seen them advertised for $20-30 online, at home improvement stores, and even through Wal-Mart. Also, check the electrical tools section of your favorite hardware store.

Whether you solder or crimp, there is some careful preparation needed for the wires, so make sure you invest in a good wire stripper designed for your purpose. I have four different types of wire strippers, and they cost from less than $4 to nearly $40. Each is good at a certain range of tasks and dealing with different types of wire.

One of my favorite general purpose strippers is a spring-loaded, self-adjusting tool that makes short work and leaves precise, consistent lengths of bare wire after the job is done. It basically works by pinching the wire some distance back from the beginning of the strip edge and pulling off the end of the insulation with a pair of wedge-shaped clamps. DX Engineering sells one similar to mine from Summit Racing (SUM-900031) for $17.95, and it handles 10-24 ga. wire.

When you start working with 22 gauge and smaller wire, stripping it can become problematic with a self-adjusting tool, because the clamp-and-pull motion can actually break the wire itself. The material can be very delicate, or the tension of the tool may be less than optimal. The absolute best I have found is often referred to as an automatic wire stripper. It has several sizes of precision blades on one end, and one side of the mechanism clamps the wire like the self-adjusting stripper. Place the wire through the right blade slot, then squeeze, and a neat, clean cut is made around the insulation, which is then pulled off. Ideal Tools' Stripmaster has blades available for 8-30 ga. wire. The Stripmaster 45-098, which comes with 20-30 ga. blades, retails for $35-40. Other models are available for different ranges of wire sizes. Once you buy one Stripmaster tool, you can buy different blade sets and swap them out as needed.

Crimp tools themselves have very

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specific purposes, and this is where it pays to think carefully about your needs before your purchase. The part of the tool actually making the crimp is called the die. In many cases, you can buy one tool "frame" and die sets for various applications. A single-purpose crimper may be relatively inexpensive, but if you can afford it, buy a frame with the possibility for interchangeable die sets.

Something like the Paladin 8000 frame (about $50) has a number of die sets available for just about everything imaginable, including wire lugs, RJ45 (modular) connectors, data pins (DB-9 and DB-25), and coax. Die sets cost about $25 each. on amazon.com. If you think your work will involve fabrication of power cables with Anderson Powerpoles, look at the TRIcrimp tool available from powerwerx.com. It costs $40 and comes with dies for crimping 15, 30, and 45 amp contacts to insert in the Powerpoles. You can also purchase an additional six-die set for $55 suitable for insulated and uninsulated terminals, coax connectors, and more.

Another thing to look for in a good crimp tool is a ratchet mechanism. As you squeeze the handles, a ratchet keeps the tool from springing open until the crimp is completed. This is especially useful for holding a small pin or lug in place while you insert the wire. A simple pliers-type crimper will work, but remember: proper, consistent pressure is required for a reliable connection. Also, if you have small hands, arthritis, or other weakness, a ratchet crimper will be much easier to operate. Both the Paladin 8000 and TRIcrimp mentioned above are ratchet-type, and I have one of each.

Now a few words about wire and contacts/terminals/pins. Wire sizes are usually specified in terms of American Wire Gauge (AWG), or simply gauge. It refers to the cross-sectional area (thickness) of a wire. The smaller the number, the greater the thickness. Eight, ten, and 12 ga. wires are commonly used for power connections. Data, network, or telephone connections usually use 20 ga. or smaller.

Something else to remember is that crimp connections are really designed for stranded wire. You can use solid conductors for crimp connections, but strictly speaking, they should also be soldered after crimping. Solid conductors do not compress like a group of stranded ones. Soldering ensures electrical integrity as well as to reduce the likelihood of corrosion or oxidation at the crimp, which could cause significantly increased resistance and loss.

Although this will seem obvious to many, I want to emphasize that wire gauge must be matched to the terminal. Terminals are designed to accept a certain size of wire, or maybe even a small range. For example, a 15-amp Powerpole contact is designed to accept either 16 or 18 ga. stranded wire. A "crimp and poke" pin for a DB-9 or DB-25 connector may be designed for 24-28 ga. Anything larger or smaller than the specified ranges of the terminal will likely compromise the effectiveness and durability of the crimp.

Crimp terminals basically boil down to two different types: open and closed barrel. The terminology refers to the shape of the metal crimped around the wire. With an open barrel, the wire is laid into a U- or V-shaped trough before crimping. In a closed barrel, which is a closed cylinder, the wire is inserted through one end. You can (and will) use either. Open barrel terminals are very common in mass production, because it is easier to automate the process.

In the next installment, I will discuss actually making the crimps for several common applications around the shack and your home.

More Broadband Wireless at 5 GHz?

On February 20, the FCC released a Notice of Proposed Rulemaking (NPRM) in ET Docket No. 13-49, seeking to revise the Part 15 rules governing unlicensed national information infrastructure (U-NII) devices in the 5 GHz band. These devices presently operate in the frequency bands 5.15- 5.35 GHz and 5.47-5.825 GHz. They use wideband digital modulation techniques to provide a wide array of high data rate mobile and fixed communications for individuals, businesses and institutions. Slightly different rules apply to 5.825-5.85 GHz. Among the changes being proposed are two additional bands totaling 195 MHz for unlicensed operation: 5.35-5.47 GHz and 5.85-5.925 GHz. The Amateur Radio Service has a secondary allocation at 5.65-5.925 GHz, including an Amateur Satellite Service uplink allocation of 5.65-5.67 GHz and a downlink allocation of 5.83-5.85 GHz.

The FCC notes in the NPRM that since it first made available spectrum in the 5 GHz band for U-NII in 1997, it has gained "much experience" with these devices: "We believe that the time is now right for us to revisit our rules, and, in this NPRM, we propose to modify certain technical requirements for U-NII devices to ensure that these devices do not cause harmful interference and thus can continue to operate in the 5 GHz band and make broadband technologies available for consumers and businesses."

Credit: ARRL

Single-Site, Multi-Radio Operation

by Larry Ledlow, Jr. N1TX

Field Day is just around the corner. If you've been to a Field Day site with two or more HF stations on the air, you likely noticed interference between them. The same problem applies to contest stations, emergency operations centers, and even a home station; i.e., anywhere you try to operate on two or more bands simultaneously. (Never try to operate two transceivers on the same band, or you could seriously damage one or both!)

The issue arises largely because modern transceivers have little or no pre-filtering at the the front end and are open to practically the entire spectrum across the operating range. In addition, transmitters can generate very broadband noise. even though this noise may be very low level compared to the intended transmission, a nearby receiver's sensitivity can be compromised by the increased noise floor.

The key solution, then, is to add good filtering just before the coax enters the radio. Many older radios used to have a "preselector", which created a very narrow bandwidth around the operating frequency. External bandpass filters designed to reject signals received or transmitted outside the intended band of operation are readily available off-the-shelf, or you can build your own. Filter design theory can seem esoteric if not downright magic, but fortunately there are ready examples where the design work is already done for you. Just search the internet. If you can follow a recipe, solder, and have a friend with some test equipment, you can build and tune a bandpass filter.

Here at the KL2R contest station, we use bandpass filters purchased from Array Solutions (http://www.arraysolutions.com). Several years ago we bought individual W3NQN filters for 80, 40, 20, 15, and 10m. The W3NQN filters are widely regarded as some of the best available, and they have proved extremely effective to virtually eliminate interference between our two radios. The W3NQN filters are spendy ($105-125 each as of this writing), but some more affordable choices are the Array Solutions' AS-10, -15, -20, -40, -80, and -160 ($65 each) and Dunestar Model 300 filters ($73 each) from http://www.dunestar.com.

The only disadvantage the contest team found was having to manually swap the filters each time we changed bands. In a contest, every minute counts, so I began to look for better methods. Array Solutions also manufactures a switch matrix (Model FM-6). When combined with individual filters, you can select the right filter by applying +12 VDC to the correct pin on a DB-9 connector. (In a future article, I will describe how to do this automatically.) It is not pretty, but it works like a champ. A dozen short jumper coax cables make the assembly look like an octopus fighting with itself (see photo below). You can use any filters of your choice.

One solution almost invariably begets other problem-solving opportunities. With the W3NQN filters tied up with the FM-6, only one operating position was covered, so a second set of bandpass filters was needed. After considerable research, I settled on the AS-419 Bandpasser sold through Array Solutions but developed by Hamation (http://www.hamation.com/). The book-sized black box of filters covers the non-WARC bands from 160 through 10m, and it can be manually operated with push buttons on the front panel or automatically switched with an external controller. Dunestar also makes an all-in-one box (Model 600) worthy of consideration, too. Also, don't discount finding some ICE filters on the used market. (Mike AL7F told me at the Christmas party he had one for sale.)

Important: Every filter I have mentioned so far is only rated to 200W maximum power, and they are intended to go between your transceiver and any amplifier. For high-power bandpass filters, see http://www.4o3a.com. You can buy a complete set for about $1600!

Keep in mind that, while bandpass filters are an essential part of the story here, harmonic filters may be required to reduce the effects of a nearby high power station. W3NQN makes them for 160, 80, 40, and 20m, and they can handle 2 kW. Designed to be placed at the output of a linear amplifier. They provide at least 80 dB reduction in signal in the next higher band. Expect to pay several hundred dollars for each.

Ideally, in a multi-radio station you want to have antennas separated as

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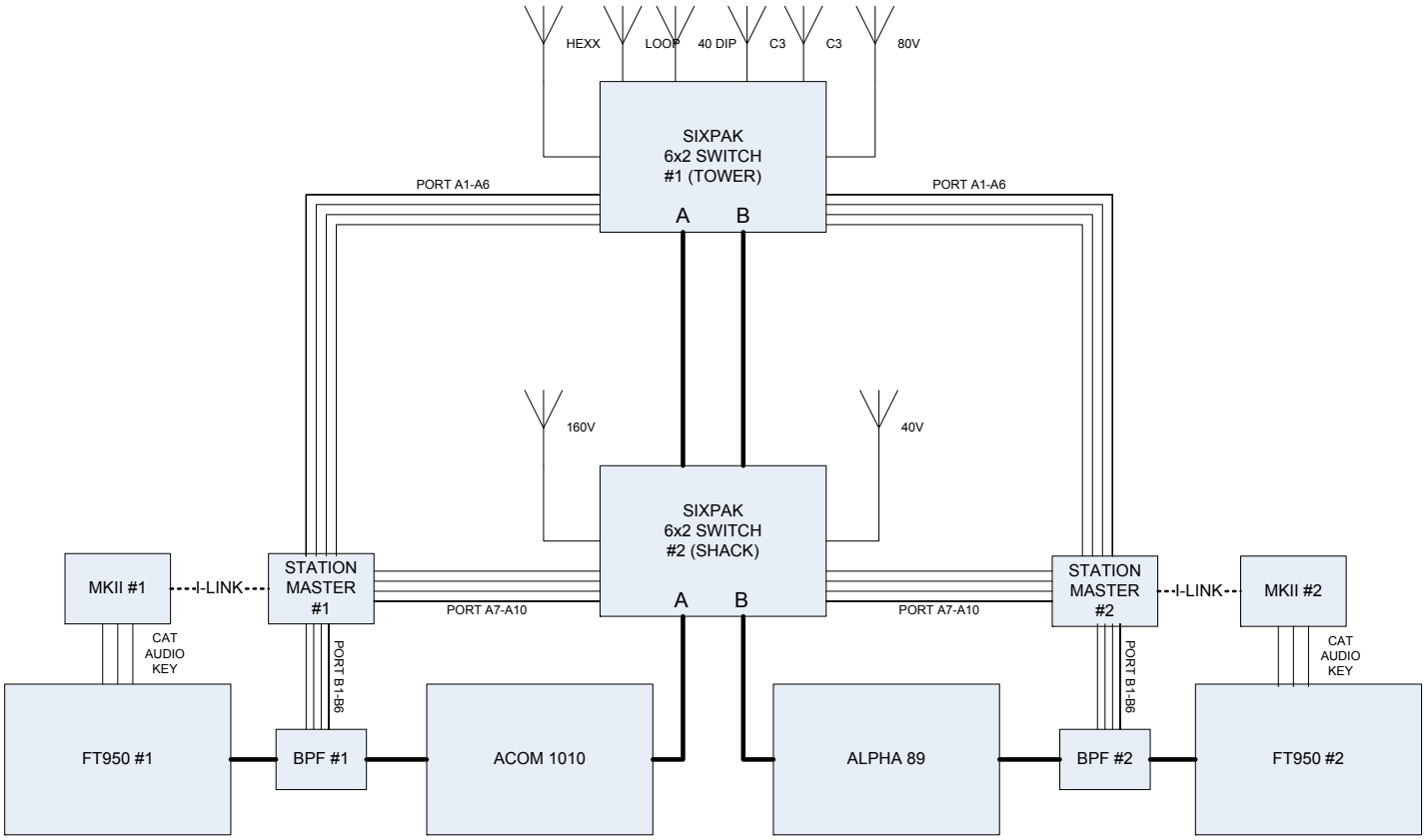
far as possible. That is not always practical. Moreover, what do you do when you want to run multiple radios but have only a single antenna? It is quite conceivable you could find yourself working from, say, an emergency operations center where two or more bands are needed for complete coverage. Maybe a log periodic or triband antenna is all that's available.

Commercial HF stations share antennas all the time, but the hardware needed is exceptionally expensive. However, if you're running 100 watts or less, you may be in luck. Many of you are familiar with diplexers and triplexers used in VHF applications such as repeaters or using two or three radios on a multi-band antenna. A diplexer has two inputs (from the radios) and one output (to the antenna). A triplexer has three inputs and one output. Each input is filtered for a particular range of frequencies.

There are several 20/15/10m triplexers available to hams at decent prices. These will permit two or three transceivers to share a tri-bander or log periodic antenna covering 14-29 MHz. Multi-band verticals and trap dipoles can be used, too. Gary Gordon K6KV wrote an excellent article about this topic in June 2010 *QST*. See pages 37-40. Note, however, the antenna impedance on each band must be around 50 ohms. The VSWR should be less than 1.5:1. In other words, your G5RV is out. Also, any unused radio port on the triplexer should be terminated with a 50-ohm load. That dummy load gathering dust on your shelf is perfect. Finally, you will still need to add bandpass filters to the output of your radios. The triplexer does not obviate the need for them.

These triplexers are perfect for Field Day. The Dunestar 333 is one such unit rated for 200W and runs around $200. A $400 package including bandpass filters is also available. INRAD (http://www.inrad.net) sells one for $325. It is much more expensive, but the adjacent band rejection is significantly better. 4o3a.com has hardware to build high-power triplexers, but of course it is very expensive.

While I realize a very few of you will ever see a *need* any of this stuff, having it gives you many more options for radio fun. Build yourself a robust EMCOMM station. Get busy on the air in contests with a two-radio setup. Set up a multi-band digital gateway. Or maybe just enjoy Field Day like you never have before. Whatever your interests and current capabilities, inspiration and innovation should always be aspirations.



Here's how we do two-radio operations at KL2R. Bandpass filters (BPFs) are critical to resolve any interference between the two stations running high power. The Microham Station Masters automate switching.