

SouthEast Iowa Technical Society

# The Technical Journal

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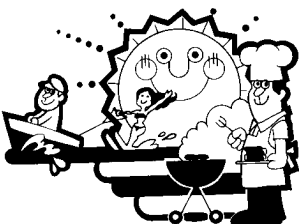
## SEPTEMBER MEETING

The next meeting is Saturday, September 6, 1997, at the Feed Bin Resturant in Mt. Pleasant, Iowa. Lunch is at noon with the meeting starting at around 1 pm.

The agenda will consist of:

1. A review of the Modulation Meter project and an update on where we stand and what comes next.
2. An update on the Keokuk Link project.
3. A pep talk on the upcoming elections!
4. A scheduled introduction to the basic ideas incorporated in the early draft of a SEITS Constitution and Bylaws.

Hope to see you on Saturday!  
KE0BX



## PRESIDENTIAL NOTES

*by Dave Metz, WA0AUQ*

Another ham radio month has whizzed by. Like last month, most of our work has been quiet and slow. I hope many of you made it to the "Cedar Rapids" hamfest. The new location at the Amana Colonies is much better than the old one at the Union hall in C.R. Plenty of parking at Amana! I just hope next year is a little cooler. Lucky for SEITS, the Hamfest Committee provided us with a air conditioned meeting room. By the time we met, the air conditioning was well appreciated by all of us.

## METER PROGRESS

The Modulation Meter project is still making good progress. Frank Apple, W0GWK, has finalized the design of the PLL frequency synthesizer. This is a major milestone for the project. The part that still amazes me is that we can build this portion of the circuitry for a fraction of what it would have cost us even two years ago when we started. This is all

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## FM TUNE UP PART IV

*by Dave Metz, WA0AUQ*

Last month we began a discussion on tuning up the antenna and feedline for best performance. Here we go with the rest of the discussion!

## FEEDLINE

We solved the feedline problem in true ham tradition. Just like my early days on six meters, we used what we had for feedline. In this case we used 75 ohm 1/2" cable television (CATV) coax. I quickly consulted the Antenna Handbook and looked up a Smith Chart to compute what the SWR would be with a 50 to 75 ohm mismatch. I was please to discover it would be a low 1.5:1.

Now this was good news because SWR's that low are hard to come by on UHF. No baluns are needed or wanted. We're talking very low loss here. I made up a set of modified "N" connectors for the TV line and it was installed the next week. It has worked perfectly ever since. SWR is exactly 1.5:1 as predicted be the Smith Chart.

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## PRESIDENTIAL NOTES

due to some wonderful new LSI IC's that Motorola is making for the cell phone industry.

Dave Helton, KD0YU, has the microcontroller for the monitor completely finished. He is now working on a graphical display with bar graph meters. This is in response to one of the worst problems we have had with project, finding panel meters. Panel meters are just not available surplus (read affordable) like they once were. Since we have to buy a LCD display, and a microcontroller anyway, Dave decided to see if the display could serve as the meters.

The preliminary tests and software are completed. So far it looks like he can give us a qualified "yes." He has a bar graph working on the LCD and a A/D converter with eight multiplexed inputs. This means we can meter up to eight voltages in the unit. That is, frequency error, modulation, battery voltage, RF output level, etc. Now all Dave needs to do is wear his fingers to the bone writing up software to do all of this!

My own work is primarily on the RF output section that makes the Monitor a signal generator. SEITS member Adam Kanis, N2BRT, came to our aid when he discovered some surplus step attenuators for sale. These are seven decade units made for Pasternak that sold originally for \$200 each. Adam got me a complete unit plus parts for two more for \$30. They were worth it just to see how they were

made.

I plan to build up one of them as a six decade unit for the 120 dB output attenuator for the Monitor. The construction is very simple and cost effective using chip resistors and simple push button switches. The key to the design is the double sided PC board and some clever shielding. This is another wonderful case where we found the right cost effective technology at just the right time!

Another breakthrough has been made in the RF chassis. I was able to come up with an auto-leveling circuit for the RF output circuitry. What this does is automatically compensate for the changes in output level that occur as you tune across the band. What is really nice about this simple circuit is that it eliminates a front panel control, several parts and an extra step in setting up the monitor.

## KEOKUK LINK

All of this has been great fun. Even better, it is now certain that the entire basic unit will work. All of the major design problems have been overcome. Dennis Hoffman, KB0UKA, reports that work continues on the Keokuk link. As reported last month, all of the hardware has been secured. Dennis has been working with local officials to obtain final permission to locate the antennas on the county water tower. This has been granted and the fire department has volunteered to put up the antennas as a training exercise.

There are still two barriers to

completion. First Dennis must obtain a liability waiver from an adjoining property owner so the fire department can work off his property. Next we are STILL waiting for the frequency coordination from our state coordinator. Things on that front seem to have ground to a complete stop for the summer. Several messages, letters, and calls to the state coordinator have gone unanswered.... I want to assure all of you that the move to Keokuk will go on as planned. SEITS has always been a strong supporter of the Iowa Repeater Council and frequency coordination. The officers of the club will continue to try to get the coordination completed.

## UPCOMING ELECTIONS

On a different note, club elections are coming up again! There are three basic offices in SEITS: President, Vice President and Secretary/Treasurer. In practice the president writes this column every month, presides over meetings and provides leadership on the club projects. The VP position under Michael Muldoon, KE0BX, has grown to what may be an even more difficult position. Michael edits and sends out the club newsletter, does the web page and fills in for me when I'm not able to attend a meeting. Mary Beth Penne, NO1JP, our Sec/Treas, does all of the club accounting, record keeping and plans, the agenda and location of the monthly meetings. That is also a huge and often thankless job. All of us put a lot of

time into our positions. The number of hours will surprise you, as will the phone bills and email! At this point I hope I have not totally scared you out of seeking office. The point I'm making is that for our club to function at the level it has, it takes a great deal of work and responsibility. If you are interested in running for office, don't be shy about asking! We need some serious nominations.

Remember that some of these jobs are not elected positions. If you are interested in working in one of these areas, let us know. There is plenty of work for everyone to go around and all of the officers would love some help.

At the next meeting, there will be the usual progress reports and maybe some show and tell of the latest work on the Monitor. Michael has been hard at work on the new club constitution and he may have a preliminary report on that work. Who knows what else will come up!

73s de Dave, WA0AUQ  
davemetz@muscanet.com



#### *TUNEUP, Pt. IV*

The lesson here is that you do not need expensive heliax for your repeater feedline. You don't need to use high loss RG-8 type coax. CATV coax is cheap (as in free) and it is very low loss. We get ours by asking the local cable companies for tail ends off of the big reels they use. Often they have pieces 200-300 foot long for the asking.

You are going to see 75 ohm CATV coax in two sizes and jacketed and unjacketed. The 1/2" size is the most common. There is also a 5/8" size that is also 75 ohm. In the past CATV coax did not have a jacket. Now to protect it from corrosion a version is available with a tough plastic jacket. If you can get it, this is the best type.

CATV coax has a solid aluminum shield. It is about as flexible as you would expect an aluminum tube to be: that is, not very. It is very easy to kink and thus ruin this coax. Be very careful when installing it. Keep the radius of any bends to three foot or more. If you need to zig-zag the feedline around at the ends, use short "pigtails" made from RG-8. Special cable type female "N" connectors are made just for the purpose of making up these jumper cables.

You DO NOT need to have 75 to 50 ohm baluns. I have read a great deal of worrying on this subject on the news groups. Put your mind at ease, if you check the math, you will discover that the loss from the mismatch (at 1.5:1 SWR) is less than the losses caused by the balun itself

and its connectors. Also note the these baluns being resonate line section devices they have a narrow band width. In other words, you are better off without them.

If you absolutely have to use matching baluns, you can find plans for them in the old edition of the RSGB VHF handbook. You will need access to a lathe to manufacture them.

#### CONNECTORS

Connectors have proven to be only a minor problem for 75 ohm CATV coax. The common 1/2" line is no problem at all for PL-259 connectors. All you need to do is visit your local plumbing supply store and buy some brass copper tubing compression couplings. You want a fitting that is used to couple two pieces of 1/2" flexible copper tubing together.

Slide the coax in one end, and the body of the PL-259 in the other. Trim the center conductor for proper fit with the PL-259 and tighten the coupling with a pair of wrenches. All that is left is to solder the center conductor and your done! If you really want to do a professional job you can silver or gold plate the compression couplings. I would recommend this if the connector is to be used outdoors.

Attaching "N" connectors to 1/2" CATV coax is a little more difficult. There are two methods. The simplest uses a modified "N" connector. A better method uses a connector fabricated from a compression fitting and a "N."

The only drawback of the

simple method is that the connector may not be water proof and it is difficult to get them tightly attached to the coax. You start by choosing a Male N connector that has a center pin made for 9913 style coax. The center pin has a slightly larger inner diameter to fit over the larger diameter center conductor used in the new lower loss cables. These will press fit over the center conductor of 1/2" CATV line.

Start by using a tubing cutter to cut off a small piece of the CATV coax's aluminum shield. The length will be determined by the style of "N" connector you are using, so you will have to experiment. Split this ring on the side so it can be slid back over the outside of the shield. This will be used as a compression ferrule inside the connector to tighten the bushing onto.

Next take the bushing and clamp it in a vise. Using a spiral flute reamer or a cone cut drill, bore the hole in the bushing out to 1/2". You are now ready to trim the length of the inner conductor and shield to fit your "N" connectors body. Be very careful to get the center pin correctly positioned and the right length. Examine a cut off connector from the Hamfest or check the assembly drawings in the ARRL Handbook for a guide.

When you are sure of your dimensions, solder the center pin. Be sure you get all the dielectric foam cleaned off the center conductor prior to soldering. Assemble the

connector by placing the bushing on the cable first, then the homemade ferrule and if you have it, the rubber "O" ring for sealing. If the ferrule is the right length, you should be able to make the connector a tight fit when the bushing is tightened.

I used this method to make the connectors for the UHF hub repeater installation. It took some adjustment to get them on tight, but they did work and have continued to work well.

A much better way to fabricate connectors is to solder a Male "N" to a copper compression fitting. Mark Atherton, N0RXD, and I spent some time mystifying the clerk at a local hardware store while we went through almost the entire inventory of fittings. It turned out that a 1/2" compression to 1/2" female NPT adaptor works well. The compression side fits the coax perfect. The NPT side will accept the "N" connector body after its inside is turned out slightly on a lathe. The threads are turned out to the outside diameter of the "N" for a depth of .2" into the adaptor. The connector is press fitted into the NPT end of the adaptor and soldered. I used ordinary solder with some extra flux (NOT soldering paste or acid!). To keep the rubber seal in the "N" from being damaged I set the assembly upright on a brick and filled the end of the connector with water. I very carefully heated the assembly with a small flame from my propane torch, all the while keeping the water replaced as it boiled out.

OK, it was touchy, but I got the job done. As soon as the solder joint was finished I cooled the assembly off by dropping it in a can of water. The result is a solid water proof connector. After silver plating these homemade connectors are as good as any commercial ones.

## SAFETY FIRST

One last "tune up" reminder. In the name of safety and sanity always tune your antennas on the ground. If your vertical's radials or decoupling section really works, the antenna will tune on the ground just like it will up on the tower. Just place it on a metal post a few feet high and tune it. Try to keep at least twenty feet from any large metal objects that could affect the pattern and thus the tuning. Beams can be tuned by simply sitting them on their reflectors and pointing them straight up in the air. The first time I saw this done I had a hard time believing it would work, but it does. As long as the antennas reflector is doing its job, the proximity of the ground seems to have little affect on tuning.

Just to be on the safe side I usually sit the antenna on a small wooden box and support it a vertical position using twine tied to two stakes. It looks odd at first, but it is very easy to work on beams in this position. Plus you can't fall off the tower.

One last hint is if you are using a conventional SWR bridge, install the bridge as close as possible to the feed point of the antenna. Never install the

bridge on the transmitter end. You will not get an accurate reading if the feedline is accidentally a harmonic length.

To test your setup, make up a short jumper coax that is not a even or odd 1/4 wave length long. Check the SWR and log

the reading. Then insert the jumper into the feedline with a barrel connector. Check the SWR reading again. If it goes up, then your SWR meter was accidentally at a standing wave null point. Retune the antenna for minimum SWR with the jumper in place.

73 de Dave WA0AUQ