RAC affiliated MISSISSAUGA amateur radio club VE3MIS

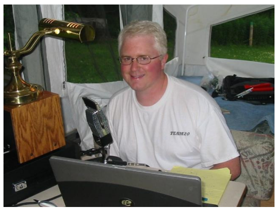
THE COMMUNICATOR

VOICE OF AMATEUR RADIO IN MISSISSAUGA

RAC

VE3MIS/VE3RCX Vol 13.03 March, 2010

From the Gavel…



Well, we're in the home stretch heading into spring. Winter reminded us last week that it was still around, what, with the 15+ cm of snow dropped in the area. But the days are definitely getting longer, the sun is passing higher in the sky and every now and then you can catch a whiff of "spring air"! Another sign the season is drawing to a close was the recent completion of the 21st Winter Olympics in Vancouver. By all accounts it was a huge success for everyone involved, especially for our Canadian athletes who took home 14 gold medals! An outstanding achievement and a first for a host country to grab so much gold. Congratulations Team Canada, you did us proud!

Speaking of grabbing gold… well… actually copper, solder and iron, our Special Projects Group held its first meeting a couple of weeks ago. As I mentioned in the last Gavel, the current – and first – project is building a switchable band filter. Michael TKI, Ed TPV and Robin VVS lead a group of almost a dozen eager builders through some initial instruction and discussion of the project at hand. I understand the ferrite cores have been passed out and the students' homework is to do some winding. Sounds like they're making good progress and we'll check in periodically to see how things are coming along.

Now that we're into March, the BIG event coming up in a little over three week's time is Ham-Ex being held on Saturday, March 27 at the Brampton Fairgrounds. Rick IMG and his team and their PARC counterparts have been working and preparing for several months and soon it'll be show time. Many positions still need to be filled. In particular, Rick is looking for vendor assist volunteers. These people help the vendors bring their wares in to the flea market hall and help direct them to their assigned tables. It's a very important job and I urge you to sign up and help out. Lorne CXT is also selling raffle tickets. This year it's a $1000 Radioworld gift certificate, perfect for adding some more goodies to the shack! See Lorne at the club meetings and plunk down some cash, $5 each or three for $10. Please remember that next to membership dues, Ham-Ex is THE most important fundraiser for MARC. The benefit to the club is enormous and the proceeds help promote and improve various aspects of the club including repeater maintenance, Field Day site rental and so on. I hope YOU will sign up to help.

Speaking of Field Day, Lorne recently convened a meeting for those interested in participating this year. The event will be held at Meadowvale Conservation Area on June 26-27. We'll have the same cordoned-off area for us including on-site parking (thanks to Tom TWG for organizing that aspect). The next meeting is scheduled for Wednesday, March 10, at the club station at 7:30 pm. Please mark it in your calendar and plan to attend.

One final note is to think about the MARC elections that will be coming up in April. A nomination committee will be formed and their job will be to solicit potential candidates for positions within the club. Think about getting involved and stay tuned to future general meetings for more details.

That about wraps it up for this month. Remember, less than three weeks to go until both the first day of spring and Ham-Ex, less than two months until MARC elections and less than four months until Field Day. And don't forget the various fundraising walks. Lots of activities coming down the pipe!

73 --- Jeff Stewart VA3WXM

This Month

Sunday Brunch

Sunday brunches are held on the first Sunday of each month. Time is 9:30AM at Shopsy's, 6986 Financial Drive Unit 5 Mississauga (at the corner of Mississauga Rd and Derry Rd). All are welcome to come out and have an opportunity to chat in an informal setting.

Club Nets

2 Metre Tuesday Night Phone Net Join in on the chatter starting at 8:30PM every Tuesday on the club repeater. Hosted by various net controllers. 145.430MHz Tone 103.5 Minus (-) offset. Contact our VHF Net Manager, **Lorne (VE3CXT)**, if interested in becoming a net controller.

75 Metre Sunday Night Net Starts at 8:30PM every Sunday. Hosted by various net controllers. Contact our HF Net Manager, **Michael (VE3TKI)**, if interested in becoming a net controller.

Commentary

February is over and spring is only a few weeks away. Winter is a time for indoor projects which some of our club members have busily been doing.

In An Experiment With A Solid State Relay, Ki Hup Boo, VA3PEN, shares with us his experience in using the Fairchild Semiconductor HSR412 solid state relay to key a linear amplifier.

In this issue of The Communicator, Michael Brickell, VE3TKI, gives us a description of last summer's Mississauga Simulated Emergency Test exercise.

Be sure to read The Technical Web Site of the Month column which this month is about propagation. See this article for a link to Carl Luetzelschwab, K9LA's, web site devoted entirely to the topic of propagation, a timely read with the increasing sun spot activity.

The article Multiband HF Antennas, Part 2 continues the discussion of the G5RV and ZS6BKW antennas and gives some guidance in how to tune this type of antenna for best performance. Additionally, three other popular types of balanced multiband antennas are discussed.

The Communicator is one of MARC's methods for communicating information to club members and is your newsletter. Let me know what you would like the newsletter to be and what you would like it to include. I solicit your input on topics for articles i.e. antennas, kits you have built, great operating experiences, operating tips, book reviews, etc. for consideration by the technical committee.

Without your constant support in the form of ideas, suggestions and article submissions, we would not have such a fine newsletter month after month. I look forward to hearing from all you budding or aspiring authors. Your experience is what makes amateur radio what it is. Let's hear from you.

I can be reached at any club meeting or via email at va3tpv @ rogers.com (remove spaces).

73, Ed (VA3TPV)

Executive Directors

President	Jeffrey Stewart, VA3WXM
1st Vice President:	Rick Brown, VE3IMG
2nd Vice President:	Ki-Hup Boo, VA3PEN
Treasurer:	Scott Gregory, VA3NMI
Secretary:	Asim Zaidi, VE3XAP
Past President:	Rick Brown, VE3IMG

Club Managers

Membership Manager	Dave Harford, VA3DFH
Education Manager	Earle Laycock, VE3XEL
House / Visitor Host Manager	Murray Yewer, VE3JMY
Newsletter Editor	Edward Spingola, VA3TPV
Net Managers HF Net	Michael Brickell, VE3TKI
VHF Net	Lorne Jackson, VE3CXT
Repeater Manager	David Shilling, VE3XDS
Assistant	Michael Brickell, VE3TKI
Assistant	Sheldon Pimentel, VE3SPJ
Assistant	John Lorenc (Sr), VA3XJL
Trustee	John Duffy, VE3DRZ
Club Station Manager	Rick Brown, VE3IMG
Assistant	Stefan Bejusca, VA3OBR
Assistant	Asim Zaidi, VE3XAP
Field Day Joint Chairman	Lorne Jackson, VE3CXT
Joint Chairman	Thomas Godden, VE3TWG
FSV Manager	David Malar, VA3MLR
Assistant	John Duffy, VE3DRZ
Program Manager	Thomas Bernard. VA3TMB
Assistant	Lorne Jackson, VE3CXT
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Assistant	Rick Brown, VE3IMG
Legal Consultant	Lorne Jackson, VE3CXT
Public Info/ Media Relations	Tony Champion, VA3QC
Education Basic Course Prime	Earle Laycock, VE3XEL
Advanced Course Prime	Thomas Bernard, VA3TMB

Audit Committee

Auditors Coordinator	Basil Burgess, VE3JEB

Public Service

ARES Emergency Coordinator	Dan Goodier, VE3NI
Assistant	Thomas Bernard, VA3TMB
Assistant	Michael Brickell, VE3TKI
Assistant	David Malar, VA3MLR
Assistant	Bob Boyer, VE3XBB
Assistant	John Duffy, VE3DRZ
CANWARN Manager	Peter Mosher, VA3PKM
Special Events / Walks Manager	Bob Boyer, VE3XBB

Special Interest Groups

Contests Manager:	Asim Zaidi, VE3XAP
Assistant	Rick Brown, VE3IMG
QSL Manager	Michael Brickell. VE3TKI

CLUB CALENDAR FOR 2010

March, 2010
01 Mon Morse Class 8
01 Mon Advanced Class 9
02 Tue VHF/UHF - 2 Meter Net
04 Thu Exec Meeting
05 Fri ARRL International DX Contest - SSB
07 Sun Sunday Brunch – Shopsy's
07 Sun HF – 75/80 Meter Net
09 Tue VHF/UHF - 2 Meter Net
10 Wed Field Day Meeting
11 Thu Club Meeting - Speaker's night
14 Sun HF – 75/80 Meter Net
15 Mon Advanced Class 10
16 Tue VHF/UHF - 2 Meter Net
18 Thu ARES Meeting
20 Sat Russian DX Contest
21 Sun HF – 75/80 Meter Net
22 Mon Advanced Class Ex
23 Tue VHF/UHF - 2 Meter Net
25 Thu Club Meeting - Speaker's night
26 Fri CQ WW WPX Contest - SSB
27 Sat Ham-Ex
28 Sun HF – 75/80 Meter Net
29 Mon Advanced Class Ex
30 Tue VHF/UHF - 2 Meter Net

April, 2010
01 Thu Exec Meeting
03 Sat SP DX Contest
04 Sun Sunday Brunch – Shopsy's
04 Sun HF – 75/80 Meter Net
06 Tue VHF/UHF - 2 Meter Net
08 Thu Club Meeting - Speaker's night
11 Sun HF – 75/80 Meter Net
13 Tue VHF/UHF - 2 Meter Net
15 Thu ARES Meeting
17 Sat Ontario QSO Party
18 Sun HF – 75/80 Meter Net
20 Tue VHF/UHF - 2 Meter Net
22 Thu Club Meeting - Speaker's night
25 Sun HF – 75/80 Meter Net
27 Tue VHF/UHF - 2 Meter Net

May, 2010
02 Sun Sunday Brunch – Shopsy's
02 Sun HF – 75/80 Meter Net
04 Tue VHF/UHF - 2 Meter Net
06 Thu Exec Meeting
09 Sun HF – 75/80 Meter Net
11 Tue VHF/UHF - 2 Meter Net
13 Thu Club Meeting - Speaker's night
16 Sun HF – 75/80 Meter Net
18 Tue VHF/UHF - 2 Meter Net
20 Thu ARES Meeting
23 Sun HF – 75/80 Meter Net
25 Tue VHF/UHF - 2 Meter Net
27 Thu Club Meeting - Speaker's night
28 Fri CQ WPX Contest - CW
30 Sun HF – 75/80 Meter Net

June, 2010
01 Tue VHF/UHF - 2 Meter Net
03 Thu Exec Meeting
04 Fri Bread and Honey Festival
06 Sun Sunday Brunch – Shopsy's
06 Sun HF – 75/80 Meter Net
08 Tue VHF/UHF - 2 Meter Net
10 Thu Club Meeting - Speaker's night
13 Sun HF – 75/80 Meter Net
15 Tue VHF/UHF - 2 Meter Net
17 Thu ARES Meeting
20 Sun HF – 75/80 Meter Net
22 Tue VHF/UHF - 2 Meter Net
24 Thu Club Meeting - Speaker's night
26 Sat ARRL Field Day Event
27 Sun HF - 75/80 Meter Net
29 Tue VHF/UHF - 2 Meter Net

NOTES
1. Meetings start 7:30PM at St. Thomas A Becket Church Hall, 3535 South Common Court unless otherwise noted.
2. Brunch is at 9:30AM unless otherwise noted.
3. Classes are from 7:00PM - 9:00PM at Meals On Wheels at 2445 Dunwin Drive

Visit our website: http://www.marc.on.ca for any updates of the calendar.

An Experiment With A solid State Relay

By Ki Hup Boo, VA3PEN

This article is about my experiment in applying a solid state relay, the Fairchild Semiconductor HSR412, to building a soft-keying circuit for an old tube type linear amplifier.

While old linear amps seem to be still widely in use, there is a problem when one tries to key it for transmission using a modern solid state transceiver. I bought a 40 year old tube type linear amp, of which the keying circuit has negative 160 volts and its closed circuit current is about 15mA. This is a bit much for modern solid state transceivers to handle. If you connect your solid state rig to this keying circuit directly, chances are the rig might end up being damaged miserably. If not, you could consider yourself lucky.

There are some commercial sources who sell soft-keying interfaces mainly targeted for the Heathkit SB-2XX series linear amps market. They cost over $40 and require an external 12V DC power supply to operate. This is not very convenient and I decided to build one myself.

Since I did not have any experience in solid state relays, I decided to try out one of those and bought an HSR412 for $1.50 on eBay. The following is the description of the relay quoted from the HSR412 specification sheet. Here is a schematic of the HSR412.

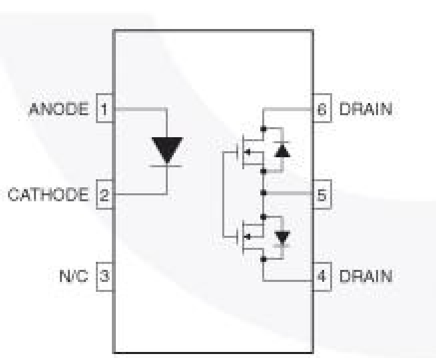

Figure 1: HSR412 Schematic

The HSR412 device consists of a AlGaAs infrared emitting diode optically coupled to a power MOSFET detector which is driven by a photovoltaic generator. These devices are housed in a 6-pin dual-in-line package. The HSR312L and HSR412L employ an active current limit circuitry enabling the device to withstand current surge transients.

The HSR412 features include

- 4,000 VRMS Isolation
- Wide operating voltage range
- 400V (HSR412, HSR412L)
- Solid-State Reliability
- Bounce-Free Operation

In summary, per the HSR412 specification sheet, the HS412 can be activated at around 1.5 volts DC (I could activate it using a 1.3 volts battery) and can switch the secondary up to 400 volts DC/AC.

The following is the two design goals for the interface:

- To be able to key below 12 volts and 20 mA
- To be self contained - i.e. to not use an external power supply

In this article, I used approximate values.

To achieve the second goal, I looked for the internal power source from the linear amp and found its grid supply voltage is controlled/regulated at 140 volts. To use this voltage source and satisfy the first design goal at the same time, my choice was to build a voltage divider. The control current range of the primary (infrared emitting diode) of the solid state relay is between 3 mA and 25 mA. I targeted to flow the total current of 14 mA (the relay will flow less than this of course). At the mid-range temperature, the current reaches 7.5 mA when the driving voltage goes beyond 1.25 volts. So, at the room temperature, if I supply 1.25 volts, the current will be between a minimum of 7.5 mA and a maximum of 14 mA. This will satisfy the operating range of the relay.

To start simple, if I limit the current below 25 mA, then the voltage across the primary would not exceed 1.6 volts and the relay would not burn out. On the other hand, I did not want to draw too much current from the linear amp. So, if I set the total current of the voltage divider to 14 mA, and make the primary voltage just around or above 1.6 volts, it would be working within the HSR412's specification.

From the specification, the primary will be consuming 7.5 mA so the rest of 6.5 mA will be flowing to the second resistor of the voltage divider. Note that even though I increased this voltage higher, the current will not exceed the maximum of 14 mA and the relay will be protected. But I would not want to increase the voltage beyond 12 volts to safe-guard the keying circuitry of any type of modern transceivers.

From the specifiction, the primary will be consuming 7.5 mA so the rest of 6.5 mA will be flowing to the second resistor of the voltage divider. Note that even though I increased this voltage higher, the current will not exceed the maximum of 14 mA and the relay will be protected. But I would not want to increase the voltage beyond 12

volts to safe-guard the keying circuitry of any type of modern transceivers.

It was time to start building the keying interface. I cut out a small piece (2x3 cm) of copperclad board, drilled holes for the components, carved out the circuit patterns using a drill bit, then gave it a finishing touch with a round tip Dremel bit to smooth out the patterns.

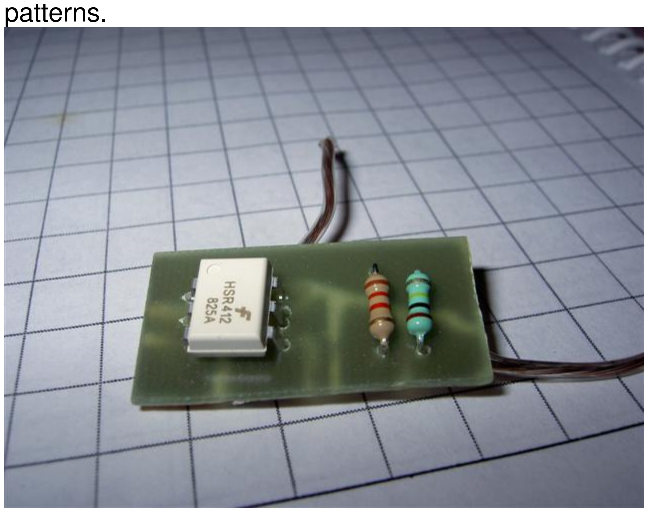

Figure 2: Finished Keying Interface

I re-wired the keying circuit of the amp so that it connects to the load control (secondary) of the interface, and attached the interface input (primary) to the place where the original keying circuit was. In other words, the interface is placed between the transceiver and the keying terminal of the amp.

After the interface was installed inside the amp, I did a smoke test. Voila, it worked. No smoke!

One more enhancement that could be made is to use a low voltage (e.g. 10V) zenor diode in the voltage divider where the primary voltage is obtained. With this, the driving voltage will not exceed enough to destroy the relay input no matter what happens to the 140-volt source.

This solid state relay operates very fast, switches silently, has a very low operating voltage, and no surge voltage when it switches off.

Now, this was an interesting experiment and it gave me confidence that I could apply the solid state relays to many other projects in the future. My thanks to Ed (VA3TPV) for giving me his advice based on his professional experience on the power supply design. Any comments and advices from those who have an experience in the solid state relay are welcome.

Hopefully, this article will inspire you to try solid state relays in your projects.

Technical Web Site of The Month - Propagation

By Ed Spingola, VA3TPV

Last month Michael, VE3TKI's, excellent presentation on Propagation was sure to inspire the interests in this topic.

In keeping with Michael's enthusiasm, I present here the following web site devoted to propagation. Carl Luetzelschwab, K9LA's, writes the monthly Propagation column in WorldRadio Online. Carl's personal Web site, http://mysite.verizon.net/k9la/ , is devoted entirely to propagation resources. Here you will find everything from articles about propagation from his monthly Propagation column in WorldRadio (now WorldRadio Online, which is available for free at www.cq-amateur-radio.com/WorldRadio.html) and from contributions to other Amateur Radio publications. These propagation articles are grouped by Timely Topics, Basic Concepts, Tutorials, General, 160m, HF, VHF, and Contesting. Just click on the link on the left to navigate to these areas. Additionally, the PowerPoint files from Carl's PVRC webinars are included on the last link.

Several articles on this web site caught my interest: Propagation Planning for Contests – Using Propagation predictions to Develop a Band Plan, Propagation Planning for DXpeditions, and An Introductory Tutorial to W6EL Prop. Many other articles may be of interest to others.

With sunspot activity increasing, now is the time to learn how to maximize our valuable HF frequency resource.

Mississauga ARES Report

By Michael Brickell, VE3TKI

In late August 2009, the Mississauga ARES group was invited by City of Mississauga Emergency Management staff to participate in a City simulated emergency test planned for a Monday morning in September. Our role would be to provide emergency communications via amateur radio.

The simulated emergency was a major construction accident at a condominium, resulting in a need to evacuate building residents to a shelter. A library in Mississauga served as the condominium, and a community centre was used as a shelter. The shelter was staffed just as it would be in a real emergency. The

Canadian Red Cross, Salvation Army, Works Ontario, Peel

Regional Police, St John Ambulance, Regional paramedics, Mississauga Animal Control, Mississauga Transit, and other groups performed the roles they would take in such a situation. In a major emergency, the City would activate its Emergency Operations Centre (EOC) with staff from various departments. The personnel who would normally be located in the EOC were pressed into service as role playing evacuees.

Mississauga ARES set up communications in a room at the community centre shared with the paramedics. As well, we activated a mobile station with associated hand held radios at the library, and located the Field Services Vehicle (FSV) in the Community Centre parking lot to use as a proxy for the Red Cross Ontario Zone office

The Mississauga ARES members involved in the exercise were Bob VE3XBB, Bill VA3NWW and Bryan VA3BLJ at the library; John VE3DRZ and Murray VE3JMY in the FSV; and Peter VA3PKM, Daniel VE3NI, Ed VA3TPV and Michael VE3TKI in the community centre.

For ARES, the morning began with a message received from the "disaster site" to say that the City buses had left with the evacuees. This message was passed on to the site manager by a runner. Later in the morning we were asked to transmit other status messages to and from the "disaster site", and also some requests regarding "lost" children.

We had decided to use one of the yellow case ARES radios in the community centre. This proved to be a surprisingly difficult exercise, as none of the operators were familiar with the radio. After about 20 minutes of frantic thumbing through the manual, we were able to get it on the air. In the interim we used Peter VA3PKM's handheld as a backup. We set up our antenna, one of the club J poles, on a tripod in front of one of the exterior windows.

The FSV was powered by a generator set up in the parking lot.

This exercise was a learning experience for us. It was the first time we had participated with the City in a full scale exercise, in a "real" shelter situation. These were our main learning points:

- It is very important to become familiar with the radio equipment to be used. The yellow case radio problem at the community centre was a case in point. We need to develop tip sheets for each radio model being used, to minimize confusion in set up.
- We should use headsets, especially in noisy environments. At the community centre shelter, we shared a room with the paramedics. It was difficult to hear the radio in this environment.
- It is desirable to use external antennas if possible. The J pole in the radio room performed reasonably well but it would have been better if we had been able to put it outside the shelter.
- It is important to establish clearly who the contact person in the shelter is; i.e., we need one person only to hand received messages to.
- We need to be able to work with our served agency contact people to prepare short messages to be transmitted, preferably less than 25 words long, rather than the very long ones we were asked to send. In the circumstances, we decided to send the messages verbatim.

On the whole, we considered the exercise to be a success from the ARES point of view. We learned what it is like to work in an environment which pretty closely modeled the operation of a real life emergency shelter. In spite of initial radio problems, we were able to meet the communications expectations of the served agencies.

Multiband HF Antennas, Part 2

By Ed Spingola, VA3TPV

In the first part of this series on Multiband HF Antennas, we had a look at the physical construction of the G5RV and its cousins the W5ANB and the ZS6BKW multiband HF dipoles. In this Part 2, we will look at the VSWR curves for the G5RV and ZS6BKW and suggest procedures for optimizing these antennas.

The SWR plots in this article were produced by the EZNEC[1] Antenna Software program by Roy Lewallen, W7EL.

Figure 1 shows the VSWR curve for the G5RV over the frequency range from 3.5 MHz to 30 MHz. Although these SWR values and frequencies may not seem optimal for the amateur HF bands, the antenna modeling study with EZNEC has indicated some interesting results.

The G5RV has acceptable SWR values on only two bands indicating that an antenna tuner is required for successful operation with the G5RV. This was previously stated by Louis Varney, G5RV.

Figure 2 shows the SWR plot for the ZS6BKW which has acceptable SWR values on five out of eight HF bands. This antenna can be used with out a tuner providing that the band segments where the SWR is 2:1 or less is where you

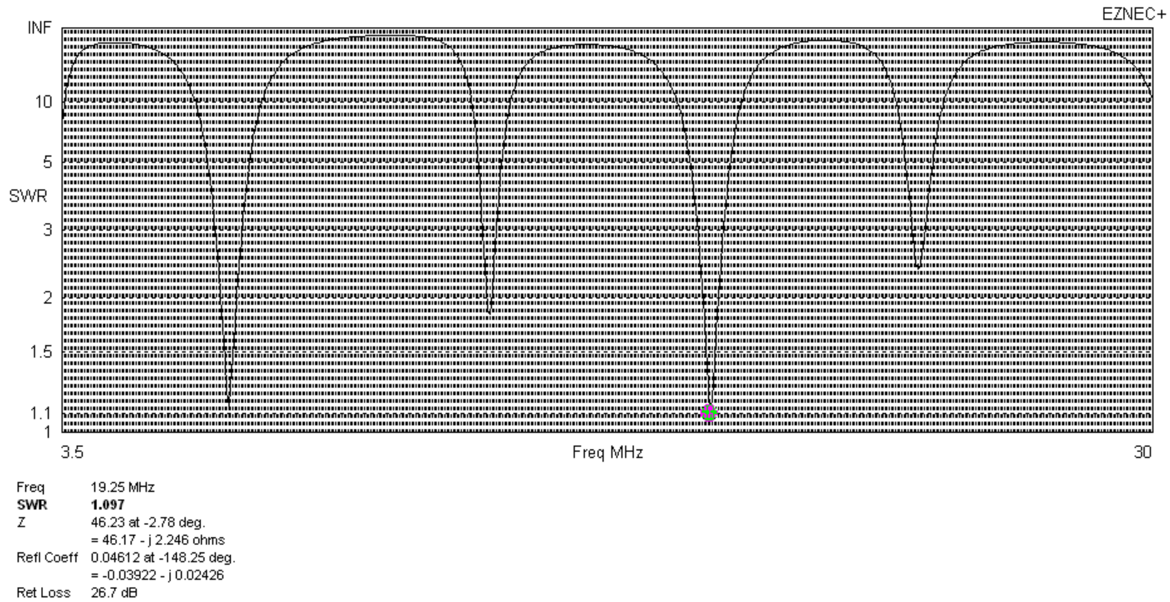

Figure 1: G5RV SWR Plot - SWR minimums are located at 7.1 MHz, 14.15 MHz, 18.2 MHz, and 24.9 MHz.

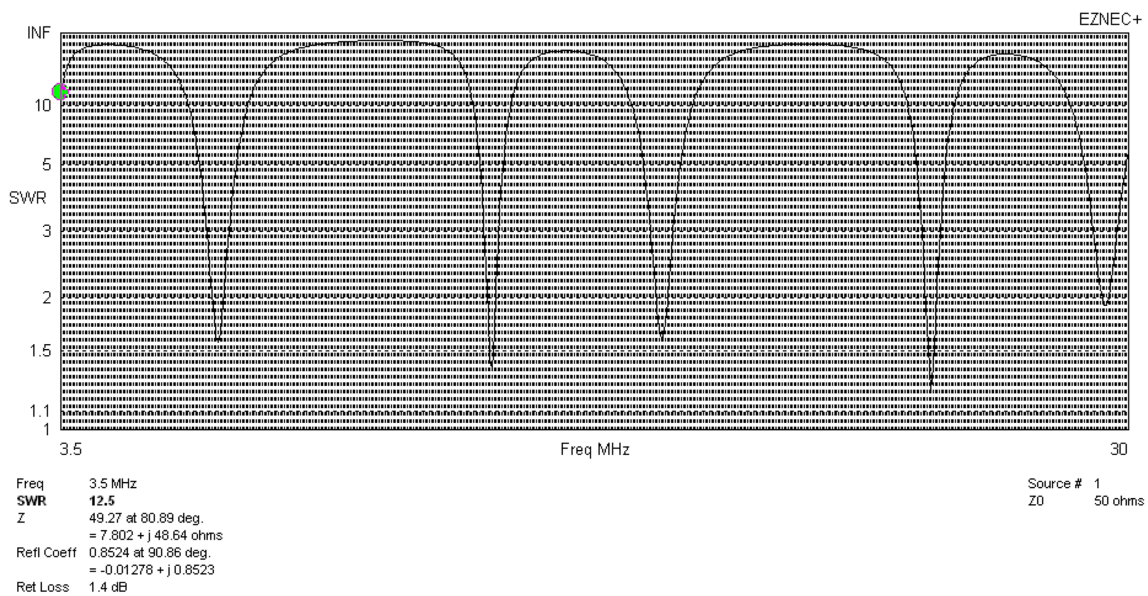

Figure 2: ZS6BKW SWR Plot - SWR minimums are located at 7.0 MHz, 14.1 MHz, 17.9 MHz, 24.7 MHz, and 28.6 MHz.

want to operate. An antenna tuner would make this antenna truly universal.

The EZNEC analysis indicated that the frequencies of minimum SWR values are affected by, the antenna height, the dipole length, and the ladder line length. This indicates that some in situ tuning of the antenna dimensions is required to obtain an optimum antenna configuration This optimization will be the topic of the next section.

Optimizing the G5RV Dipole and Feed Line

Whether your G5RV is a flat top dipole or an inverted-V, both configurations will benefit from optimization. The G5RV dipole is electrically three half waves in length at 14.15MHz. The physical length of the dipole will depend on its height above ground, the nature of the ground, inverted-v angle, proximity of nearby structures, trees etc.

Similarly, the actual physical length of the section of parallel wire transmission line that is electrically one half wave in length at 14.15MHz will depend on the Velocity Factor of the line. The Velocity Factor is dependent upon the line construction and may vary from around 0.65 to 1.00 for true open wire line.

Step 1 – Tuning the G5RV Transmission Line

The G5RV transmission line must be an electrical ½ wavelength long when measured at 14.15 MHz. This is important since it affects the tuning of the dipole.

In tuning the transmission line to ½ wavelength at 14.15 MHz, we will use the fact that the impedance as measured at the input of a ½ wavelength transmission line will be the same as the impedance at the output of the line when the test frequency is the frequency where the transmission line is an electrical ½ wavelength long.

- Cut the length of transmission line required or use the recommended length, but leave the line an extra foot longer.
- Connect a 50 ohm resistive dummy load to the far end of the transmission line.
- Suspend the transmission line away from ground and any near by objects.
- Connect an MFJ-259B or similar antenna analyzer to the near end of the transmission line through a current choke.
- Slowly sweep the MFJ-259 frequency to determine at which frequency the impedance measures 50 ohms. If the measured frequency is lower than 14.15 MHz the transmission line is too long. If the measured frequency is higher than 14.15 MHz the transmission line is too short. Adjust the length of the transmission line accordingly until an impedance of 50 ohms is measured at 14.15 MHz.

Step 2 – Tuning the G5RV Dipole

The G5RV dipole must be electrically three half waves in length at 14.15MHz.

- Cut the length of dipole required but add a few extra feet.
- Attach the parallel transmission line.
- Raise the antenna to its final operating height. Remember that the resonant frequency of dipole antennas is dependent upon their height above ground.
- The feed line should droop vertically from the antenna.
- Connect the MFJ-259B or similar antenna analyzer to the near end of the transmission line through a current choke.
- In this step we are tuning for a minimum SWR in the 20m band. Slowly sweep the MFJ-259 frequency to determine at which frequency the SWR is a minimum. If the measured frequency is lower than 14.15 MHz the antenna is too long. If the measured frequency is higher than 14.15 MHz the antenna is too short. Adjust the length of the antenna accordingly until the minimum SWR is measured at 14.15 MHz.

- Antenna and feed line tuning are complete.

Optimizing the ZS6BKW Dipole and Feed Line

The ZS6BKW antenna is a little more difficult to tune than the G5RV. This is because the dipole length for the ZS6BKW is 1.35 wavelengths long and the transmission line length is 0.62 wavelengths long on 20 meters.

Step 1 – Tuning the ZS6BKW Transmission Line

- Cut a length of transmission line 43 feet 6 inches in length.
- Connect a 50 ohm resistive dummy load to the far end of the transmission line.
- Suspend the transmission line away from ground and any near by objects.
- Connect an MFJ-259B or similar antenna analyzer to the near end of the transmission line through a current choke.
- Slowly sweep the MFJ-259 frequency to determine at which frequency the impedance measures 50 ohms.

Note: Wavelength = Velocity/Frequency where Velocity = 3 x 10^8 m/s, wavelength is in meters, and frequency is in Hertz. Therefore a 43 feet 6 inches (13.3m) length would equate to a ½ wavelength frequency of 11.27 MHz.

- The Velocity Factor of the transmission line is the ratio of 11.27 MHz to the measured frequency.
- Re-cut the transmission line according to 43 feet 6 inches (13.3m) x Velocity Factor.

Step 2 – Tuning the ZS6BKW Dipole

The ZS6BKW dipole must be electrically 1.35 waves in length at 14.15MHz.

- Cut the length (93 feet 6 inches) of dipole required but add a few extra feet.
- Attach the parallel transmission line.
- Raise the antenna to its final operating height. Remember that the resonant frequency of dipole antennas is dependent upon their height above ground.
- The feed line should droop vertically from the antenna.
- Connect the MFJ-259B or similar antenna analyzer to the near end of the transmission line through a current choke.
- In this step we are tuning for a minimum SWR in the 20m band. Slowly sweep the MFJ-259 frequency to determine at which frequency the SWR is a minimum.
- If the measured frequency is lower than 14.20 MHz the antenna is too long. If the measured frequency is higher than 14.20 MHz the antenna is too short.

- If the measured frequency is other than 14.20 MHz adjust the length of the antenna accordingly until the minimum SWR is measured at 14.20 MHz.

- Antenna and feed line tuning are complete.

Using the above procedures you can optimize your antenna installation. The benefits are a better SWR, wider bandwidths, less stress on your antenna tuner if you use one, and no tuner on five bands if you employ the ZS6BKW.

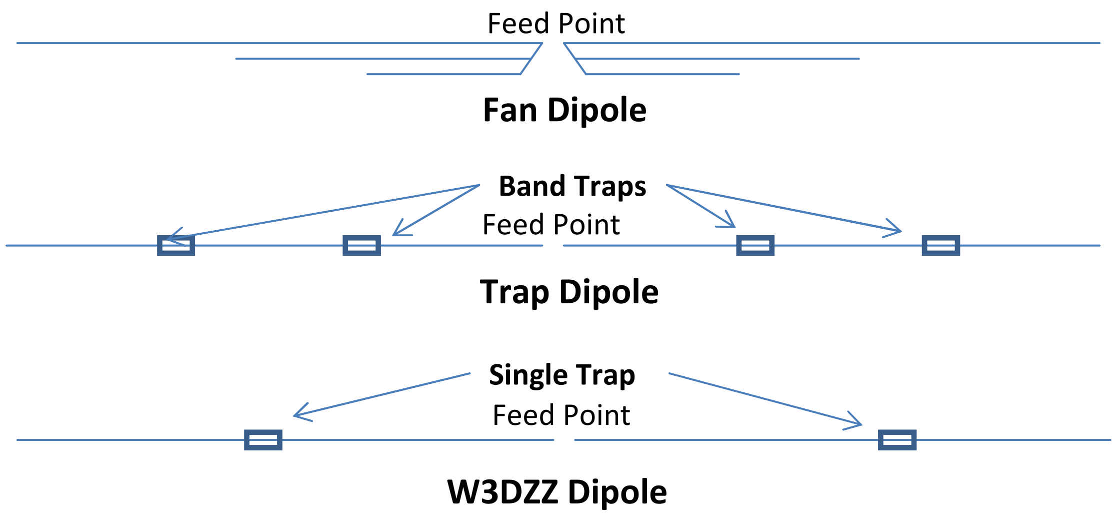

Figure 3: Alternate Multiband Dipole Configurations

Other Multiband HF Antennas

There are three other types of horizontal multiband HF wire antennas feed with coaxial transmission line which are true performers requiring no tuner. All of these antennas may be erected in either the horizontal flat top or inverted-V configuration.

The first antenna is an arrangement of dipoles connected in parallel on the same feed line. This antenna type is termed the fan dipole[2] or parallel dipole. An example of which is the classic Alpha Delta DXCC antenna. This antenna is a resonant antenna on the bands 80m through 10m and presents an antenna impedance of 50 to 75 ohms depending upon the antenna height. The fan dipole since it is resonant on each band gives the widest bandwidth on the bands of operation. If fine pruning of the antenna elements are required to obtain the desired operating frequencies, start the pruning with the lowest frequency of operation first. Then proceed to the next lowest frequency and so forth until the 10m wire is pruned.

A second antenna[3] structure, pioneered by C. L. Buchanan, W3DZZ, in 1954, uses a single trap to obtain multiband operation.. By a careful selection of the inductance and capacitance values in the trap, the antenna may be made to operate on multiple bands with only a single trap. This technique was later extended by Al Buxton, W8NX, with the use of coaxial traps[4,5]

A third system used for multiband operation uses multiple traps along a single wire to obtain multiple bands. These raps act like switches to connect or disconnect subsequent sections of the antenna wire with changes in frequency. The drawback of this type of construction is the added weight and wind loading to the antenna structure due to multiple raps. The use of traps also results in reduced bandwidth on each band of operation.

Information on these later three types of antennas may be found in most editions of The ARRL Handbook[6] and The ARRL Antenna Book[7].

Notes:

1) EZNEC Antenna Software, Roy Lewallen, W7EL http://www.eznec.com/index.shtml

2) Fan Dipole http://www.hamuniverse.com/multidipole.html

3) C. L. Buchanan, W3DZZ, The Multimatch Antenna System, QST, March 1955.

4) Al Buxton, W8NX, Two New Multiband Trap Dipoles, QST, August 1994.

5) Al Buxton, W8NX, An Improved Multiband Trap Dipole Antenna, QST, July 1996

6) The ARRL Handbook, 2010 Edition, Chapter 21

7) The ARRL Antenna Book, 21st Edition

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