



FOX CITIES AMATEUR RADIO CLUB, INC.

QSO'ER



P.O. Box 5233 Appleton, Wisconsin 54912

www.fcarc.us

• **CQ CQ CQ**

Volume 19, Issue 12
December 2006

Dayton Bus Trip 2007 Information!

Send me an email at my call (kb9lrd) at new.rr.com for more information or a signup.

We still need to contact the local bus Co. to determine an actual cost per person. We anticipate a bus capacity of 30 members. We'll also send a note to the Ham groups that might be interested in a ride along.

No alcohol or smoking will be allowed during travel time. The bus will make several stops during the journey south to Dayton, Ohio and the return trip north to the fox Cities.

The bus will depart Thursday May 17th and return Sunday May 20th, 2007.

More information will be handed out as a meeting supplement with more details. Also see the posting here on this site for updates!

Please be prepared to make a full non-refundable payment for the transportation and lodging. Meals and shuttle transportation will be disclosed as well. We will also determine a total cargo space on the bus's and bay doors limitations.

FCARC Officers

- *President— Brian Long (KB9LRD) 730-8485*
- *Vice-President— Dave Sprangers (ND9DW)*
- *Treasurer— Karen Long (KC9BMH) 730-8485*
- *Secretary— Mike Smith (N9IAT)*
- *Membership Co-ord— Jim Wierzba (WB9OJE)*
- **Members At Large—**
- *Andy Palm (N1KSN)*
- *Rick Kosiorek (W9RIC) 735-9565*
- *Tony Mach (AB9IO)*

This spot is reserved for you!

If you have an announcement that you would like to let everyone know about just send it in an email to mike@n9iat.com.

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September Meeting Minutes

Fox Cities Amateur Radio Club, Inc.
General Membership meeting
Agenda for November 20th, 2006



Board of Directors FCARC

President: Brian, KB9LRD; Vice-President: Dave, ND9DW; Treasurer: Karen, KC9BMH

Secretary: Mike N9IAT; Membership Coordinator: Jim WB9OJE

Members at Large: Andy N1KSN, Tony AB9IO, Rick W9RIC

"Rick Kosiorek is our 2005 "Ham of the Year"

Presiding: President; Brian KB9LRD

Quorum count: Vice President; Dave Sprangers ND9DW

Call to Order: 7: 00 PM

Introduction of Members, Roll Call!

New Members: John KC9JZH, Richard K9GAD, William N8JQC, Brad W9HAN

Renewed Members: Jim WB9OJE, Gary KB9AIT, Jim K9OQO, Dolores KB9IRD, Dan WB9QFX, Dave KA9NMK, Bob N9LDA, Jeff KB9BYP, Martha N9JAD, Dave KB9WAF, Diane KC9HRD, Dave W9RAG, Hal NQ9F, Steve N9SGG, Randy KB9SGO

Old Business:

Event coordinators, please provide club member names who contributed to your event for the annual Awards Banquet in February.

B.) Motion FCARC 111306-01 passed by the Exec. Board on 11/13/06.

Advance the Repeater Committee funds of \$400.00 to purchase a used repeater and a used repeater antenna.

C.) Motion 111306-02 passed by the Exec. Board on 11/13/06.

The FCARC shall sponsor a bus trip to the Dayton Hamvention in 2007.

New Business:

A.) The web site committee will consider a launch of a beta version of Joomla. The Joomla program will provide additional tools for the Web Administrators of the FCARC web site!

B.) Dayton Hamfest Bus will be promoted by the FCARC for 2007. Early signups are encouraged; the bus may currently have 10 to 12 of 30 seats taken. An occupancy database will be developed and available for your view on the FCARC web site. Look for more details on the FCARC web site!

Hal Report: Andy NIKSN Battery voltage cell module

Committee Reports:

Announcements: Hamfest Chairman election December's meeting

Christmas Party December's meeting: bring a dish to pass!

Accepting nominations for "Ham of the Year" during December's and January's meetings!

Adjourn: (Accepting a motion to adjourn) WB9OJE (2nd) AB9IO (V: M)

D: /word/ham/agenda/2005/AGENDA 11_06.doc KB9LRD

• Membership Renewal Reminders

As a reminder only—following is a list of the membership renewals coming up this month and the following few months. If you have already renewed—thank you. If not, you can renew with Karen (KC9BMH) at the next club meeting.

- 11/1/2006 N9RJZ
- 11/1/2006 KC9EYA
- 11/1/2006 AB9AH
- 11/1/2006 KF6CHG
- 11/1/2006 N9QLP
- 12/1/2006 KB0DKD
- 12/1/2006 K0TIW
- 12/1/2006 W9HM
- 12/1/2006 KC9IKV
- 12/1/2006 N9BPO
- 12/1/2006 KC9IPU
- 1/1/2007 KC9HWF
- 1/1/2007 KC9BMH
- 1/1/2007 KB9LRD
- 1/1/2007 WB9LBE
- 1/1/2007 ND0L
- 1/1/2007 W9ZC
- 1/1/2007 KC9IBG
- 1/1/2007 K9RFI
- 1/1/2007 KC9IKS

Elmer's Contact List

This is a listing of HAMS who are willing to help other HAMS out in special areas. Feel free to contact these fellow HAMS with any questions:

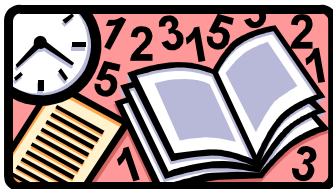
Call / Name	Specialty Area	Phone #
N1KSN– Andy	CW	720-0617
W9ZC– Bob	Tech. Code	725-7974
N9OEQ– Chuck	HF & VHF Digital Modes	788-5497
N9TNW—Bill	HF & Satellite	739-6827
N9LVS—Dan	FCC Personal Data Changes	205-4899

Have something Ham related to sell? If so, contact Mike (N9IAT) at mike@n9iat.com to arrange for it's insertion in the next issue of this newsletter. We will run it in the newsletter and on-line at www.fcarc.us

•Upcoming Events

VE Testing Dates

Interested in Amateur (HAM) Radio?
Need to upgrade your license? The
FCARC can help you with both of
these.



With the exception of the November
test date, all testing is done at the Red
Cross Building at 1302 E. Wisconsin
Ave. in Appleton. Test check in is from
8:00 am until 8:30 am. The cost is
\$14.00.

Here are the dates for 2007:

Feb 17, 2007.

Wednesday 2 Meter Net

Net Control Operator schedule

Dec 6	N9LT Guest Net Control
Dec 13	N1KSN
Dec 20	KC9IKS
Dec 27	N9YMC

Fox Cities Amateur Radio Club (W9ZL)
invites everyone to tune in on Wednesday
evenings at 7:30 PM on 146.76/R 100hz
PL to hear the *Newsline* broadcast.

Then stick around to check into the net
immediately afterwards. This is an open
forum net and anything can be discussed,
including; technical questions, equipment
review and for swap and for sale items.

•Upcoming Events

Mon. Dec 11	Exec Board Meeting at Goodwill Comm. Center
Mon. Dec 18	FCARC Monthly Club Meeting / Christmas party
Sat. Feb 17, 2007	VE Testing - American Red Cross building
May 17, 2007	Bus leaves for Dayton Ohio

No other events on the calendar for 2007 yet

Join me in welcoming the following new members to the club!

John KC9JZH, Richard K9GAD, William N8JQC, Brad W9HAN

Renewed Members:

Jim WB9OJE, Gary KB9AIT, Jim K9OQO, Dolores KB9IRD, Dan WB9QFX, Dave KA9NMK, Bob N9LDA,
Jeff KB9BYP, Martha N9JAD, Dave KB9WAF, Diane KC9HRD, Dave W9RAG, Hal NQ9F, Steve N9SGG,
Randy KB9SGO

Estimating Characteristic Impedances of Transmission Lines

By: Frank Livermore, N9LT

Ever thought of building your own feed line but didn't know where to start? Or maybe figure out what an unknown cable's impedance is? It's usually printed on the transmission line or is commonly recognized but what if it's not. How can you figure this out the layman's way having no knowledge of the line itself? With a tape measure, a sharp eye, and a calculator of course! If you happen to have a micrometer handy you should, by all means, use it for these measurements!

Note: Make the math easier by measuring in 1/16th inches (or better), then convert to decimal.

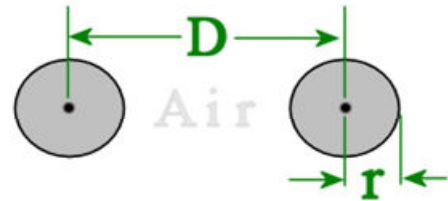
Open-Wire Transmission Line

Open-wire calculations are pretty straight forward. The following equation sums up the characteristic impedance of open wire transmission lines (with air as the dielectric). The dielectric constant of air (1.0006) has been factored out of this equation because it is a square root function in the denominator of a fraction resulting in $\frac{276}{\sqrt{1.0006}}$. This is very negligible and need not be included for the purpose of estimation.

$$Z_o = 276 \log \frac{D}{r}$$

Where

- Z_o = characteristic impedance
- D = distance between conductors
- r = radius of one conductor



Example: You come across some homebrew open-wire that has the following physical properties. Measuring the distances you discover that D is $\frac{3}{8}$ inches (or .375") and the diameter of the conductor is $\frac{1}{16}$ inches (or 0.0625"). You must **half** the diameter of the conductor because we need the radius (.03125"). So $\frac{D}{r}$ is $\frac{.375}{.03125}$ and gives us a $\frac{D}{r}$ ratio of 12. To calculate the log you enter 12 on your calculator and then press the log key. Your result should be 1.079. So...

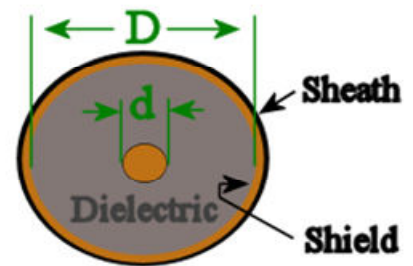
$$Z = 276 \log 12 \rightarrow 276 (1.079)$$

$$Z = 297.85 \Omega$$

Safe to say this is 300 Ω line!

Coaxial Cable Transmission Line

The math behind coaxial characteristic impedance is one step harder because we are dealing with a dielectric that is based on something *other* than air. It could be any number of non-conductive materials. A vacuum has a dielectric constant of 1.0 whereas Teflon is 2.0. Generally the dielectric constant for commonly used materials in coax is between 1.2 and 2.8. The following is the equation to determine the characteristic impedance of coaxial cable. You'll notice a slight change to the equation as well as an additional variable to compensate for the dielectric material.



$$Z_o = \frac{138}{\sqrt{\epsilon_r}} \log \frac{D}{d}$$

Where

- Z_o = characteristic impedance
- ϵ_r = relative dielectric constant of the insulating material
- D = inside diameter of the outer conductor (shield)
- d = outside **diameter** of the center conductor

This equation differs from open-wire primarily because it takes into account dielectric constants. If the coax is air dielectric the equation can be simplified to $Z_o = 138 \log \frac{D}{d}$ since ϵ_r would be near 1. With an air dielectric the equation begins to resemble the open wire equation.

Example: You find some unknown coax and it appears to have a foam dielectric inside. You look up the specs on some foam dielectrics and decide the dielectric constant is likely around 1.4. Measuring the distances you discover that D is $\frac{8}{16}$ inches (or .50”) and the diameter of the center conductor is $\frac{3}{16}$ inches (or 0.1875”). So $\frac{D}{d}$ is $\frac{.50}{.1875}$ and gives us a $\frac{D}{d}$ ratio of 2.67. To calculate the log you can enter 2.67 on your calculator and then press the log key. Your result should be .4265. So....

$$Z_o = \frac{138}{\sqrt{1.4}} \log \frac{.50}{.1875} \rightarrow \frac{138}{\sqrt{1.4}} \log 2.67 \rightarrow \frac{138}{\sqrt{1.4}} (.4265) \rightarrow (116.949)(.4265)$$

$$Z_o = 49.88 \Omega$$

Nice find, some 50 Ω feed line!

This is a quick and easy way to estimate the characteristic impedance of a transmission line. This is also a severely abridged version of transmission line impedance. Entire books have been written on this subject but the quick and dirty know-how can be handy.

Approximate dielectric constants of materials

Vacuum	1.0	Air	1.0006	Teflon	2.0
Paraffined Paper	2.5	Rubber	3.0	Mica	5.0
Glass	7.5	Polyethylene	2.5	Distilled Water	75.0
Soil (dry)	2.8	Wood (dry)	2.7	Styrofoam	1.03

Conclusion

The resultant impedance of feed lines, whether they are open wire or coaxial, depends greatly on the separation and size of the conductors as well as what’s between them. In open wire it’s feasible to make 600Ω feed line with a distance of 6 inches between wires if you use AWG 12 or 14 wire¹. In fact you could construct your own open wire with your own impedance and a maybe use a balun². AWG charts can be found online for wire diameter if you know the gauge³.

For coax the same considerations are made to ratio except coaxial cable is typically made with a dielectric other than air and it becomes necessary to account for the dielectric mathematically.

¹ A good article on 600Ω feed line construction can be found in QST - December 2006, Pg. 55, ACØAX

² N5ESE constructs 450Ω feed line for portable/QRP portable: <http://www.io.com/~n5fc/openfeed.htm>

³ Wikipedia’s chart for determining wire diameter: http://en.wikipedia.org/wiki/American_wire_gauge

From the President:

Hello everyone,

2006 was kind to us at the FCARC; we had a great year as a club and as individuals. We can all be thankful for each other in 2006, our friendships, our camaraderie and our success as the FCARC is dependent upon all of us.

2007 will be a great year and a year to remember as well!

A few major developments will take place in 2007. The FCARC will greatly be advantaged with additional repeater inventory for local communication. This new asset will ensure that the FCARC will continue to set the bar with our quality and high profile repeater assets.

With the adoption of the latest revised By-Laws we'll be assured to refine our political and governing structure to fit our needs as we grow in membership in the years to come.

Our financial statements have indicated a steady healthy increase in revenue and a downward trend in expenses. We'll be undertaking additional fund raising events in 2007, not only to add to the bottom line, but to ensure we're diversified in generating revenue to attain our goals and have a solid financial base for our continued success as the FCARC.

The FCARC will be focused on community service that will impact more non-profit charitable organizations. We have many to choose from each year for those who enjoy these events, as 2007 approaches, more will added to our list.

The FCARC membership will continue to rise as the year 2007 develops from projections based on our enrollment patterns over the last few years. We'll be taking more steps to ensure the growth of membership, as well as our participation in events as we add more numbers to our ranks. We are a very strong and successful community service organization as our event list indicates and we have a generous amount of volunteers that is making this success possible.

The FCARC executive leadership is well seasoned in running the affairs of the FCARC and more are being added to ensure the best possible solutions to issues when they arise for the FCARC. Your Executive leadership is proud to serve you and the FCARC. We will always encourage you to consider an Executive Board position to help evolve and create a positive environment for you and the membership. Any position on the FCARC staff will be worthy and provide a positive memorable experience for you.

I'm looking forward to the changes that 2007 will bring, I hope you all can enjoy the same spirit and excitement that I do. I have enjoyed the time I've had as your representative with the FCARC. I'm also looking forward to serving the FCARC in the future, beyond 2007.

May God bless each and every one of you!

Happy holidays to all!

Sincerely,

Brian KB9LRD

Brian J. Long KB9LRd

President, Fox Cities Amateur Radio Club, Inc.