The Open Feed Line

Volume 9, Issue 3 Friendship, Community service & Advancement of the Hob*by* Nov-Dec 2000

Club Elections

It's that time of year once again, when we, the MARA membership, nominate and elect new officers to the board. This year we're continuing what we started last year: including in this issue of the Newsletter, you'll find a combination nominating and voting ballot. Starting this coming Thursday, November 9th, we'll open up the nominating procedure and accept nominations through the December meeting, when we'll vote. You can nominate any member you wish and likewise, you can vote for anybody you like. Your vote counts here. But instead of just nominating, why don't you seriously think about serving on the board. It's not an insurmountable task, you really don't have to be a rocket scientist or a politician Just a keen interest in helping your club through changes and reaching goals is all that is required. You'll have help if you want it, so you won't have to learn all the ropes by yourself. But the important thing is to want to help your fellow members out. Give it a thought and we'll wait to hear from you. After this Thursday's meeting, the club secretary will have a list of folks already nominated at that meeting for you to chose from.

UP COMING HAMFESTS

12/3/00	L'Anse Creuse Arc Donna Luh KA8QBD
1/21/01	Hazel Park ARC Tom Krausnick WC9F
2/3/01	Hiawatha ARA Bill Beitel N8NRG 906-226-2779
2/18/01	Livonia arc Neil Coffin WA8GWL 734-261-5486

PSK31--Has RTTY's Replacement Arrived?

By Steve Ford, WB8IMY

(The following excerpt is taken from Steve Ford's article of the same name, which appeared in ARRL's journal QST May 1999 PP41-44)

So What is PSK31?

First, let's dissect the name. The "PSK" stands for Phase Shift Keying, the modulation method that is used to generate the signal; "31" is the bit rate. Technically speaking, the bit rate is really 31.25, but "PSK31.25" isn't nearly as catchy.

Think of Morse code for a moment. It is a simple binary code expressed by short signal pulses *(dit*s) and longer signal pulses *(dah*s). By combining strings of dits and dahs, we can communicate the entire English alphabet along with numbers and punctuation. Morse uses gaps of specific lengths to separate individual characters and words. Even beginners quickly learn to recognize these gaps--they don't need special signals to tell them that one character or word has ended and another is about to begin.

When it comes to RTTY we're still dealing with binary data (dits and dahs, if you will), but instead of on/off keying, we send the information by shifting frequencies. This is known as Frequency Shift Keying or *FS*K. One frequency represents a *mark* (1) and another represents a *space* (0). If you put enough mark and space signals together in proper order according to the RTTY code, you can send letters, numbers and a limited amount of punctuation.

The RTTY code shuffles various combinations of five bits to represent each character. For example, the letter A is expressed as 00011. To separate the individual characters RTTY must also add "start" and "stop" pulses.

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The Open Feed Line is published 4 times a year. It is the official journal of The Michigan Amateur Radio Alliance. You may freely reprint any material in the Open Feed Line, but please credit the Open Feed Line, the original author, and the original publication, if given.

Membership information

The Michigan Amateur Radio Alliance, an American Radio Relay League affiliated club, was created to provide opportunities for friendship, community service, increase technical knowledge and upgrading our skills in the hobby of amateur radio. Annual dues to MARA are $20. Family memberships are also available. Persons aged 70 and over have the rate of $5.00. Memberships expire on December 31 and club dues are due on January 1st. MARA membership is open to all interested persons.

Everybody is encouraged to submit original articles to the editor on disk, fax or by mail. The deadline for submission is the end of the 2nd week of February, May, August and November. Please send change of address information and membership applications to the club secretary.

Great Lakes Award

Send inquiries regarding the Great Lakes Award to the Awards Manager Brian Scholten KC8DOC c/o MARA
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Comstock Park MI 49321-0670
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Club activities

MARA holds their weekly 2 meter Net on the MARA W8USA repeater, 145.410 MHz -600Khz PL. 94.8., every Thursday, at 8 PM,except the 2nd Thursday of the month. MARA holds their monthly meetings on the 2nd Thursday of the month at Saint Adalberts Benevolent Society Aid Hall, located at 5th Street and Davis NW. We meet at 7:30PM upstairs. All are welcome. (* Indicates temporary filled)

Velocity Factor in Feed-line

This is the second article in a series about antennas and feed-line. If you missed the last one, please check the September 2000 issue of The Open Feed Line. The article is entitled "AC Theory".

The speed of a radio wave, in space, is 186,000 miles per second, or what is known as the speed of light. Of course, radio waves, and light, are slowed down when they travel through something other than space. "Velocity" means about the same thing as "speed". The loss of speed in feed-line is expressed as "velocity factor". Radio waves are slowed down about 5% when they travel through 450-ohm window-type ladder line. We say that this type of feed-line has a 95% velocity factor. However, when radio waves travel through coax, the speed drops much more. So when a radio wave travels through coax with a .66 velocity factor, it only travels 122,760 miles per second. (186,000 X .66 = 122,760) Let us assume that this radio wave is at a steady, unchanging frequency, usually expressed in millions of cycles per second (megahertz). So if the cycles per second stay the same, but the distance per second drops, then the wave will complete a cycle in less distance.

The formula, as given in "Now You're Talking", for determining the wavelength of a radio wave, in space, is 984 divided by the frequency (in megahertz). However, the formula for determining a one-wavelength antenna is different, i.e. 936 divided by the frequency. The reasons for the difference are many; including ground effects, end effects, diameter verses length ratio, and sometimes even velocity factor.

If and when you want to cut a coax to a certain electrical wavelength, you start with the 984 number. Let's say that you want your coax to be ½ wavelength long on 28.350 MHz. We divide 984 by 28.350, and we get one-wavelength at 34.7 feet. Next, let's divide that in half to get a half-wavelength at 17.35 feet. Finally, we have to include the velocity factor for the type of coax that you are using. If your coax has a velocity factor of .66, then your length will be 17.35 X .66 = 11.45 feet. If, however, your coax has a velocity factor of .78, then a half-wavelength will be 17.35 X .78 = 13.53 feet.

So you can see that velocity factor makes a big difference. Many of the more exotic antenna designs require a ¼ wave piece of feed-line for an impedance transformer, but seldom do they explain how to determine the length. There are many other things that you can make with particular lengths of coax; such as baluns, filters, etc.

I should add that velocity factor does not indicate quality. When shopping for coax, other properties, such as attenuation, are much more important indicators of quality.

Thanks and stay tuned for next time.

73, Jim ki8jd

(Jim is MARA's Education chairman)

Northern Exposure

By Terry Francis WB8ZNO

Finally things are happening here up north. I am now treasurer of the world's smallest club. Not much happening there, but we are going to try and get more members involved by writing some letters and sending them out to all that we can find in the area. The bad part is that most are retired and really don't want to get involved in anything that means they have to move from their front porch.

I have joined ARES that is located in our southern county and they cover both our county and theirs. Mainly because they just will not get off their duffs.

I have already taken one course through "FEMA's Home Study program" and have one certificate and am working on one called "Hazardous Materials" at this time.

We had a fellow come down from Sault St. Marie, across the straits and taught a "S.A.R. training class". S.A.R. means search and rescue. It was a 7 hour class and was very informative and worth while to take.

(Terrible Terry writes from his retirement cottage up north. This is part one of a two part article that will conclude in the next issue)

For PSK31 Peter devised a new code that combines the best of RTTY and Morse. He christened his creation the *Varicode* because a varying number of bits are used for each character. Building on the example of Morse, Peter allocated the shorter codes to the letters that appeared most often in standard English text. The idea was to send the least number of bits possible during a given transmission. For example:

E is a very popular letter on the English alphabet hit parade, so it gets a Varicode of 11.

Z sees relatively little use, so its Varicode becomes 111010101.

As with RTTY, however, we still need a way to signal the gaps between characters. The Varicode does this by using "00" to represent a gap. The Varicode is carefully structured so that two zeros never appear together in any of the combinations of 1s and 0s that make up the characters.

But how would the average ham generate a PSK31 signal and transmit Varicode over the airwaves? Peter's answer was to use the DSP capabilities of the common computer sound card to create an audio signal that shifted its phase 180° in sync with the 31.25 bit-per-second data stream. In Peter's scheme, a 0 bit in the data stream generates an audio phase shift, but a 1 does not. The technique of using phase shifts (and the lack thereof) to represent binary data is known as Binary Phase-Shift Keying, or *BPS*K. If you apply a BPSK audio signal to an SSB transceiver, you end up with BPSK modulated RF. (If you want the gory details, read the PSK31 software Help files.) At this data rate the resulting PSK31 RF signal is only 31.25 Hz wide, which is actually narrower than the average CW signal!1

Concentrating your RF into a narrow bandwidth does wonders for reception, as any CW operator will tell you. But when you're trying to receive a BPSK-modulated signal it is easier to recognize the phase transitions--even when they are deep in the noise--if your computer knows when to expect them. To accomplish this, the receiving station must synchronize with the transmitting station. Once they are in sync, the software at the receiving station "knows" when to look for data in the receiver's audio output.

Every PSK31 transmission begins with a shFrom BPSK to QPSK

Many people urged Peter to add some form of error correction to PSK31, but he initially resisted the idea because most error-correction schemes rely on transmitting redundant data bits. Adding more bits while still maintaining the desired throughput increases the necessary data rate. If you double the BPSK data rate, the bandwidth doubles. As the bandwidth increases, the signal-to-noise ratio deteriorates and you get more errors. It's a sticky digital dilemma. How do you expand the information capacity of a BPSK channel without significantly increasing its bandwidth?

Peter finally found the answer by adding a second BPSK carrier at the transmitter with a 90° phase difference and a second demodulator at the receiver. Peter calls this quadrature polarity reversed keying, but it is better known as quaternary phase-shift keying or *QPS*K.

Splitting the transmitter power between two channels results in a 3-dB signal-to-noise penalty, but this is the same penalty you'd suffer if you doubled the bandwidth. Now that we have another channel to carry the redundant bits, we can use a *convolutional encoder* to generate one of four different phase shifts that correspond to patterns of five successive data bits. On the receiving end we have a *Viterbi* decoder playing a very sophisticated guessing game. Operating PSK31 in the QPSK mode will give you 100% copy under most conditions, but there is a catch. Tuning is twice as critical with QPSK as it is with BPSK. You have to tune the received signal within an accuracy of less than 4 Hz for the Viterbi decoder to detect the phase shifts and do its job. Obviously, both stations must be using very stable transceivers.

(This article concludes next month-how to get on)

MICHIGAN AMATEUR RADIO ALLIANCE

Nominating – voting ballot.

Instructions: Simply fill in the names of the persons you would like to see fill the offices listed below. Be sure your penmanship is legible and include your name. Only paid up members can vote. Fill in the names and sign this form and mail it, or bring it with you to the December 14th club meeting. The nominating procedure starts at this coming Thursday night club meeting, November 9th and continues till we vote at the December 14th club meeting. If you decide to mail your ballot, be sure you give it sufficient time to reach our Post Office Box. The box will be checked no later than December 14th. Any ballots arriving later will not be counted.

Mail this to: MARA
P O Box 670
Comstock Park MI 49321-0670

I, ____, hereby nominate and

cast my ballot for the following people for the board of MARA for the year 2001.
(all of these offices are for one year terms)

For President: ____

For Vice-President:____

For Treasurer:____

For Secretary:____

Signed: ____
(you sign here)

Date:_________________