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The TRIAD

"Dedicated Volunteers - In Unity Of Purpose - Serving DOD"

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Digital Signals On Navy MARS Nets

By Lee, NNN0GBL/NNN0SYS

Abstract:

This article discusses a simple method to calculate the dial setting to put a digital signal on the correct assigned frequency, using both hardware multi-mode controllers and the MixW sound card program. The article shows how to use the same dial setting for both voice and digital signals.

Introduction

On our MARS traffic nets we often use the same Assigned Frequency for both digital and voice modes. When I rejoined MARS in 1995, it seemed from discussions on the nets that everybody had to set their own special dial frequencies to make it work. I've heard a lot of discussions on the nets about what frequency a transceiver should be tuned to in order to properly receive digital signals. I'm sure It appears a bit mystical to new members. Hams don't usually worry about it, and veteran MARS members don't talk about it.

NTP8(D) Chapter 9 discusses digital modes, but doesn't mention how to tune your radio to get on the assigned frequency. Annex B talks about Frequency Assignment, and hints at setting the dial frequency to correctly transmit on the assigned frequency for a voice signal, but doesn't talk about digital signals. The key to properly tuning digital signals is buried in Paragraph 803.e.(2) of NTP8(D) which says "...the mean frequency of the two tones is the radio dial offset."

Paragraph 803 tells you everything you need to know about tuning a digital signal, at least for RTTY, Pactor, and AMTOR transmissions on HF. It works for both hardware modems and sound card software modems. If you understand what it is telling you, and your equipment meets certain criteria, you might realize that it is possible to operate both voice and digital modes without having to change dial frequency when switching modes. More about that later.

First, let's review how we tune a voice signal on our normal net frequencies.

In the example used in paragraph B421 of NTP-8(D), the Assigned Frequency is 4015 KHz. That frequency is also called the "Center of Emission Bandwidth." What that means is the frequency is the center of the total bandwidth allocated to the audio signal. The audio bandwidth of a Single Sideband signal is usually limited to about 3 KHz. The Center of Emission Bandwidth - the Assigned Frequency - of an Upper Sideband signal is one half the total bandwidth or 1500 Hz above the suppressed carrier frequency. The suppressed carrier frequency is also called the Reference Frequency and the Characteristic Frequency (NTP-8(D), para B410). For most modern transceivers the frequency shown on your dial is the suppressed carrier frequency, not the assigned frequency. In the example in NTP-8(D), the (suppressed) carrier frequency is at 4013.5 KHz and that's where we would set our dial. The actual signal extends from that carrier frequency up to 3 KHz above it, or 4016.5 KHz. (Continued on page 2).

KEEP ON MOVING ABOUT: It has been found through studies by the University of Illinois that, with age, some areas of our brain shrink, with the result that our thinking processes slow down, and there is some memory loss. Walking at least three hours a week has been determined to be a distinct help in slowing down these effects of aging. So walk as often as you can.

There are 3500 calories in one pound. Therefore, a day or two of overindulgence are not going to wreck a diet or healthy lifestyle IF one is careful to eat well most of the time. Since there are seven days in a week, just an extra calorie deficit of 500 calories a day is enough to ensure the slow, but steady loss of a pound a week.

Here's the NTP-8(D) example, redrawn to be centered on an Assigned Frequency of 4040.0 KHz:

4042.0

4041.5 ---------- Upper frequency limit of 3 KHz voice channel

4041.0

4040.5

4040.0 ---------- Center of Emission Bandwidth and Assigned Frequency

4039.5

4039.0

4038.5 ---------- Lower frequency limit of 3 KHz voice channel

4038.0

Assigned frequency 4040.0 KHz

Mode 3K00J3E Upper Sideband

Bandwidth 3 KHz

Reference frequency 4038.5 KHz

Characteristic frequency 4038.5 KHz (Suppressed Carrier)

To receive that Upper Sideband signal we tune our receiver to 4038.5 KHz. Our receiver mixes the incoming RF signal with a 1500 Hz beat tone, filters out the sum and leaves the difference frequency. The result is an audio signal between 0 and 3 KHz, exactly what was transmitted. When we transmit USB with our dial set at 4038.5, we generate two 3 Khz-wide signals internally, but our transmitter removes the lower signal (the Lower Sideband). This leaves a 3 KHz wide signal extending from our dial frequency to 3KHz above our dial frequency, or 4041.500 KHz. That puts the center of emission right where we want it on our Assigned frequency of 4040.0 KHz. If we had used Lower Sideband, we'd tune our dial to 4041.5, and our signal would extend from there down to 4038.5, exactly as before, but "upside-down."

Simple FSK digital modes

Now for our digital modes. Paragraph B420(e) of NTP-8(D) states:

If a given transmitter is switched between modes, such as SSB and DATA, its frequency must be adjusted so that both emissions are centered on the assigned frequency.

That tells us that no matter what mode we use, our Center of Emission Bandwidth must be on the Assigned Frequency, even if we have to adjust our dials to make it happen. The solution for many people is to keep two dial frequencies in the memories of their transceivers: one for voice, one for digital modes.

Let's briefly review the FSK method of digital signaling. To make a digital character, we use combinations of binary digits or bits, usually represented by ones and zeros or pluses and minuses. On radio, for the RTTY, AMTOR and Pactor modes, we send those digital bits by shifting the transmitter between two frequencies. One frequency represents a one, and the other is a zero. We most commonly shift frequency by 170 Hz or 85 Hz either side of a center frequency. Some modems use 200 Hz shift, and a much older RTTY standard used a shift of 850 Hz. This method of signaling is called Frequency Shift Keying or FSK. (Some modern publications will call it Binary Frequency Shift Keying or BFSK, to differentiate it from Multi-Frequency Shift Keying or MFSK.)

Rule #0 *Use the same frequency shift as everybody else is using.*

This seems pretty obvious. You can violate Rule #0 a bit. The filters or frequency discriminator in you modem are probably not very sharp, so using a 200 Hz shift when everybody else is using 170 Hz may cause you a little difficulty but you should be able to make it work, either by "straddle" tuning or favoring one side or the other.

More complicated systems are used for other signaling methods such as MT63 or Clover, but the tuning concepts are similar to what we are describing here. Check out the ARRL's book "HF Digital Handbook" or the "ARRL Handbook" for more information about how these digital modes work. For a lot more detail on how FSK works, take a look at the excellent article from Watkins-Johnson you can download from http://www.wj.com/pdf/technotes/FSK_signals_demod.pdf

True direct FSK, the simplest case

Ideally, if your transmitter is capable of direct 170 Hz shift FSK, you will be able to switch to FSK (sometimes called 'RTTY') mode and transmit AMTOR FEC directly on 4040 kHz. Your actual carrier signal would be shifted between 4039.915 and 4040.085 KHz. That's what your goal should be, because it puts your signal in the same place as it would be if you were transmitting a voice signal.

To receive FSK, a common method is to convert the signal to audio (speaker output), and then send the audio through a couple of very narrow bandpass filters. This is called AFSK (Audio Frequency Shift Keying), since it is done at audio frequencies rather than directly at radio frequencies.

In this method of receiving AFSK, one filter is tuned to the Mark audio frequency, and the other to the Space audio frequency. If a Mark tone is received, the Mark filter would give the larger output and vice-versa for the Space filter.

Circuitry in the modem compares the filter outputs and makes a decision about which filter has the greater output at a given instant of time and calls the output a “one” or a “zero”. It doesn't matter too much which tone is Mark and which is Space, as long as you are consistent. Modems often have a “Normal/Reverse” switch if you got them backwards. Other circuitry puts the characters back together, and sends them to your screen or printer. Sound card detectors might do a similar function in software. To learn more about this process, I again refer you to the excellent article at http://www.wj.com/pdf/technotes/FSK_signals_demod.pdf

In order for all this to work, you want to tune your receiver so that the Mark and Space tones end up centered in the bandpasses of those two filters.

So, the first question we want to answer is “What dial setting do you use to receive a digital signal which being transmitted on an assigned frequency of 4040.00 KHz?” The transmitter is shifting frequency 85 Hz either side of 4040.00 KHz. Suppose you use a receiver set to USB mode. Here's where it gets tricky.

Answer: It all depends on the audio frequencies the Mark and Space filters in your modem are tuned to.

Refer again to paragraph 803e of NTP8(D). One standard is Mark = 2125 Hz, and Space = 2295 Hz. The shift is 170 Hz. (2295 - 2125 = 170 Hz.)

The filter center frequency is 2210 Hz. (2125 Hz + 2295 Hz)/2 = 2210 Hz

However, you are using USB for receiving. That automatically means a dial shift of 1500 Hz, as I noted before. You might think you should tune to 4038.5, but that won't work. Your modem filters are centered on 2210 Hz, so you should offset your dial 2210 Hz from the Assigned Frequency, which is 710 Hz lower than your dial setting for a voice signal. (2210 Hz - 1500 Hz = 710 Hz)

That's exactly what paragraph 803e tells you. It just doesn't explain why.

So, instead of setting your dial at 4038.5, you set it to 4037.379 Khz and the signals will be correctly centered in your Mark/Space filters.

4040 Khz - 2.21 Khz = 4037.379 Khz
Here's what the spectrum looks like centered on 4040.0 KHz, with modem filters at 2125 and 2295 Hz, and your dial set to 4037.379.

4042.0

4041.5

4041.0

4040.5

4040.79 ---------- Upper frequency limit of 3 KHz voice channel

4040.085 ---------- The "Space" Frequency

4040.0 ---------- Center of Emission Bandwidth and Assigned Frequency

4039.915 ---------- The "Mark" Frequency

4039.5

4039.0

4038.5

4038.0

4037.79 ---------- 2210 Hz from 4040.0 Khz AND Lower frequency limit of the 3 KHz voice channel By shifting your dial 710 Hz lower than you would use for USB voice, you move the center of the modem filters, 2210 Hz, over the center of the emission bandwidth. The downconverted audio should be properly centered in the M/S filters.

That's really all there is to it. If all I was going to do was to tell you how to set your dial to receive an FSK signal, I would be done. But there's more. (Continued on page 4).

NNN0SYS NC has spent a lot of time researching and writing this article, which he titled, ***How To Properly Set Your Dial To Send And Receive Digital Signals On A Navy MARS Traffic Net.***

When he proposed sending it for publication in **The TRIAD**, we suggested it be serialized. However, that did not seem feasible if continuity was to be kept intact. At that time a February issue of **The TRIAD** was not scheduled; so in order to keep this article intact for one publication, it was decided to print this article in a February issue, and that would essentially be the whole of the February issue.

This is a **one-time** project of having an issue of the newsletter devoted exclusively to one subject. All future issues of **The TRIAD** will be as before, with articles for the edification and entertainment of all Navy-Marine Corps MARS members in the Central Area. This Central Area newsletter will be able to continue only as long as you contribute articles to it.

Lee, NNN0SYS NC, has gone out of his way to work up this article and contribute it to **The TRIAD.** His efforts in doing so are very much appreciated. We have some members who contribute articles fairly often. However, they cannot be expected to contribute articles every month. We need input from more of **you**, and **you** are encouraged to send in articles for **your** newsletter!

Our sincere thanks to Lee, NNN0SYS NC for his input that made possible a February issue of **The TRIAD**.

You have also moved the 3 Khz bandwidth of your receiver's USB bandpass filter down. You can see that the 2125/2295 tone pair is relatively close to the 3 KHz upper edge of the SSB bandpass filter in your receiver. In fact, the bandwidth of your SSB bandpass filter may be more like 2.7 or 2.6 Khz. The upper tone is getting a little close to the upper edge of the filter. You may only be receiving the signal on one of your modem's filters! It works, but is very prone to errors. It would be nice to have the modem filter tones a little lower so they were more centered in the receiver's bandpass filter.

Another filter pair standard, commonly used in Europe, is 1275 and 1445 Hz, still a 170 Hz shift, but a center frequency of 1360 Hz.

This has the advantage of being more centered in the bandpass of a SSB receiver. Using the same logic as we used before, we would tune our receiver to 4038.64

kHz to center the signal in our filters and properly receive the signal. This can be calculated by subtracting the center frequency of your modem filters from the Assigned Frequency

4040.0 Khz - 1.36 Khz = 4038.64 Khz

4042.0

4041.5 ---------- Upper frequency limit of 3 KHz voice channel

4041.36 ---------- 1360 Hz above 4040.0 - the LSB

4041.25

4041.0

4040.5

4040.085 ---------- The "Space" Frequency

4040.0 ---------- Center of Emission Bandwidth and Assigned Frequency

4039.915 ---------- The "Mark" Frequency

4039.5

4039.0

4038.64 ---- 1360 Hz below 4040.0 Khz

4038.5 -- Lower frequency limit of 3 Khz voice channel

4038.25

4038.0

But if that works, **what if we could set it up so that you could use the same dial setting for both SSB and Digital modes?**

A 1360 Hz center frequency works nicely, but it would be even more convenient to have a filter pair which would allow us to receive a properly sent FSK signal without having to change frequency from our voice dial setting. A filter pair with a 1500 Hz center would be ideal.

When I first started thinking about all this, sound card systems were not available. However, I was fortunate to own a Hal Communications PCI 4000 multi-mode modem. It turns out that the Hal PCI 4000, and the later DSP4100, have tunable filters. So does Hal's less expensive DXP38. For more information, see http://www.halcomm.com/. The modems made by SCS (see http://www.scs-ptc.com/)also have this tunable filter capability. I haven't investigated anyone else's capabilities, so I can't speak for them. I did check the Kantronics website (http://www.kantronics.com/), and the KAM-XL is capable of having its mark and space filter frequencies changed, so this idea would apply to the KAM as well.

A 170 Hz shift (ie, + or - 85 Hz from the center frequency) centered on 1500 would be 1415 and 1585 Hz. The center frequency is also nicely located within the bandpass of the SSB receiver. I set the filters to 1415/1585 and, except for some minor adjustments to account for different dial calibrations, *I rarely have to change my dial frequency from the SSB mode setting to receive anybody else.*

4042.0

4041.5 ---------- Upper frequency limit of 3 KHz voice channel

4041.0

4040.5

4040.085 ---------- The "Space" Frequency

4040.0 ---------- Center of Emission Bandwidth and Assigned Frequency

4039.915 ---------- The "Mark" Frequency

4039.5

4039.0

4038.5 ---------- Lower frequency limit of 3 KHz voice channel

4038.0

Compare that with the Voice tuning diagram at the beginning of this article.

The Central Area Newsletter, **The TRIAD,** is published for the enjoyment and edification of Navy-Marine Corps MARS members. The contents **do not** reflect official Navy positions. EDITOR: Ben NNN0JQC/NNN0ASG EIGHT. 3301 Shannon Rd, Albany, GA 31721-1541. E-Mail: nnn0jqc@navymars.org. Central Area Director NNN0ASG IL: (Vacant). Deputy Director Central Area: Dave NNN0ASG ONE MI. Director Region Four: Jack NNN0AS4 GA. Director Region Five: Tim NNN0AS5 MN. **This is your Newsletter.** In order to keep it going your input is needed and encouraged.

What does all this mean?

The bottom line of all this is that it is easy to calculate the frequency you need to tune to in order to properly receive an FSK signal on your USB receiver or to transmit on the Assigned Frequency.

You need to know the center frequencies of the passbands of your audio filters. Add them together, divide by two, and you get the center frequency of the pair. This is for Upper Sideband. Add them together if you are using Lower Sideband.

The rule is:

Rule #1 (For USB) *Set your dial to the Assigned Frequency minus the Modem Filter Center Frequency*

DF = AF - FC

Where:

DF = Dial Frequency

AF = Assigned Frequency

FC = Filter Center frequency

If you only know the two frequencies of your bandpass filters, you calculate the filter center frequency with:

FC = (MF + SF)/2

Where:

FC = Filter Center frequency

MF = Mark Filter frequency

SF = Space Filter frequency

Transmitting using AFSK

How about transmitting? If you don't have direct FSK capability, you will have to use Audio Frequency Shift Keying (AFSK). You'll be shifting audio tones and probably feeding them into your microphone input. You'll be using USB again. It doesn't take a lot of thought to see that you would transmit on the same frequencies as you would use to receive. That is, if the assigned frequency is 4040 kHz, you would use 4037.79 if your filter pair was 2125/2295, 4038.64 for 1275/1445, and 4038.5 for 1415/1585. If you use the correct offset for your filter pair, your signal will be centered on the assigned frequency.

Rule #2 *Transmit on the same frequency you receive on.*

Again, if you transmit audio tones of 1415 and 1585, using USB, and set your dial to the same frequency you would use for voice transmissions, everybody else should receive you perfectly on the Assigned Frequency. This assumes that your transmitter dial offset for voice is 1500 Hz.

Rule #3 *To transmit and receive digital signals at the same dial setting that you use for voice,*

a) set your AFSK filters to be centered on the same offset as your sideband offset (usually 1500 Hz)

OR

b) use direct FSK for both sending and receiving.

What can go wrong?

Let's suppose that a station starts out with an inexpensive TNC that uses a 2000/2200 pair. That's a 200 Hz shift, and a center frequency of 2100 Hz. That's common because that pair uses tones commonly used in telephone modems, so the integrated circuits are cheap. Over time the operator somehow learns that 4037.9 dial frequency works for him. Then he obtains a different modem with a 2125/2295 Hz (CF = 2210 Hz) filter pair, but continues to use 4037.9 as his transmit frequency. If you add the filter center frequency to the dial frequency, you get 4040.11. He's 110 Hz off frequency! Receiving stations would probably just assume that the transmitting station's dial calibration is off, and adjust their RIT to fix it. No big deal except that it is a violation of NTP8(D) paragraph B521 which tells us that below 30 Mhz, our Data Frequency tolerance must be less than 20 Hz. Don't laugh about this. I have observed MARS stations with just this problem.

Now, suppose he followed the instructions I gave above and could set the new modem filters to the 1415/1585 Hz (CF = 1500 Hz) pair but he continued to transmit on 4037.9 as if his filter pair was still centered on 2100 Hz, his signal would actually appear at the Center of Emission Bandwidth of 4037.9 + 1.5 KHz, or 4039.40 KHz. That would be 600 Hz too low! This time, folks are really going to notice the error. Remember, your transmit and receive set-up have to agree. Yet again, I did observe this exact problem on a MARS net. It's actually what prompted me to create this presentation.

4042.0
4041.5

4041.0

4040.9 ---------- Upper frequency limit of 3 KHz voice channel

4040.5

4040.0 ---------- Assigned Frequency

4039.485 ---------- The "Space" Frequency

4039.4 ---------- Center of Emission Bandwidth for 1500 Hz MC

4039.315 ---------- The "Mark" Frequency

4039.5

4039.0

4038.5

4038.0

4037.9 ---------- 2100 Hz from 4040.0 Khz AND Lower frequency limit of 3 KHz voice channel

Even worse would be to assume that you could set your filter center to 1.5 Khz and then misunderstand the whole concept, and put your dial at the assigned frequency! Your signal would now appear at 4040.0 + 1.5 KHz, or 4041.5, or 1.5 KHz high.

How does this apply to Sound Cards?

How about Sound Card programs. I use a program called MixW, which is one of the few sound card programs which can do AMTOR FEC. For reception, you can get away with never changing your dial frequency or considering filter frequencies. Just point your mouse cursor at the signal on the "waterfall" display, and it will automatically be centered in the filters, regardless of where they are set.

For transmitting, however, the situation is exactly the same as if you were using a real modem. This means that if you accept the default filters, you are going to have to use a different transmit frequency for digital signals than you use for SSB signals. But, MixW allows you to change the filter settings. If, like me, you don't want to have to retune from the USB frequency when you transmit, you should make sure your filter center frequency is set to 1500 Hz.

Here's how to set up MixW

(these instructions assume you already chose AMTOR as your operating mode.)

1. Click MODE on the program's menu bar

2. On the resulting menu, click MODE SETTINGS

3. On the resulting dialog box, enter 1500 into the text boxes to the right of TX FREQUENCY and RX FREQUENCY. Save the values and close the dialog box. This is the most important step.

4. Click OPTIONS on the program's menu bar

5. In the resulting dialog box, enter 4038.5 in the box next to TRANSMITTER FREQUENCY. Save the values and close the dialog box. You can also enter 4038.5 in the "CAT BAR" if you use it. Also set the transmitter mode to USB there.

6. Make sure your radio's dial frequency is set to 4038.5 Khz and USB, especially if you are not using CAT control from the program.

7. Choose "TRCVR CAT/PTT" under the Configure menu. Make sure "Display zero beat frequency" is selected. Also check "AFSK in place of FSK"

You should now be pleasantly surprised to discover that the AMTOR tuning indicator on the Waterfall display will now be centered on 4040.0 KHz, just as predicted.

The only problem with sound card programs is that there are not, to my knowledge, any programs which have the capability to send AMTOR ARQ. Because of that, you can't use a sound card to pick up traffic.

However, we are currently working on macro set-ups to be used with MixW to permit using your existing TNC for the modes for which the sound card won't work. That's really useful because you can do the ARQ modes, but you still get the advantages of the sound card software such as the waterfall display.

Conclusion

I hope this will clear up some of the confusion about Assigned Frequencies, dial frequencies, modems, and digital systems we use in MARS.

If you have any questions about this or find I've said something with which you disagree, please contact me at nnn0sys@navymars.org.

I've posted a dial calculator on my personal web page at http://kn4gc.us/dialcalculator.html. W4PNX also has a dial calculator on his web site at http://home.sprynet.com/~w4npx/centrfrq.htm This one calculates dial frequencies to access his multi-frequency HF station. He sums the entire process up by saying "THE FREQUENCY WHERE YOU LOOK FOR ME DEPENDS ON YOUR SHIFT AND/OR TONE CENTER FREQUENCY, NOT MINE."

This information was originally presented at the 2005 Central Area Conference. This version does not have the graphics that were shown during that presentation as they could not be reproduced by the publishing program used to create this article.

Lee, NNN0SYS, is currently the State Director for Navy Marine Corps MARS in North Carolina. He retired from the Naval Reserve as a Captain in the Engineering Duty Corps. He graduated from the United States Naval Academy and has a Master's Degree in Electrical Engineering from the Naval Postgraduate School. He retired from the Department of Defense where he worked as an Electronics Engineer for the National Security Agency. He's been an Amateur Radio operator since first licensed as WV2RPF in 1961. He first joined Navy MARS in 1967 as NNN0QTF, and rejoined in 1995 after an overseas tour of duty. He is married and lives in Flat Rock, NC. When he's not "doing" MARS, he's the local Community Emergency Response Team program coordinator.

Sayings Of Old

CUT THROUGH THE RED TAPE: In old England. lawyers kept their clients' papers in a file folder tied with red ribbon to prevent the papers from falling out. Of course, when they wanted to get at the papers, they would have to cut through the red tape.

MINDING YOUR Ps & Qs: Ale was served at local taverns out of a tankard, and you were charged by the angle of your elbow: half way up, you drank a pint; all the way up, you drank a quart. Since the quart cost so much more than the pint, you were warned to "Mind your Ps & Qs." Also, minding your p's and q's is an admonition given to typesetters who, in days of yore when type was set by hand, had to be careful in picking up and returning letters to their particular slots because these two letters look so much alike.

GETTING TANKED: You got tanked when you drank too much out of a tankard, as mentioned above. In those days of yore, if you got so "tanked" that you passed out, there was a chance that somebody might think you had died and send for the undertaker.

GETTING THE SHORT END OF THE STICK: Again, in days of yore, candles were expensive to make, so, quite often reeds were dipped in tallow and burned instead. When visitors came, it was the custom for guests to leave by the time the lights went out. Therefore, if your host didn't want you to stay very long, he would burn a "short stick."

BURNING THE CANDLE AT BOTH ENDS: When a clerk worked at night, it was hard to see by candlelight, so he might take his candle and turn it on its side and light both ends. It would give twice as much light, but would burn out in half the time. The phrase, therefore, came to mean someone who worked very had, but would wear themselves out---what today we call "burn-out."

GETTING THE BUM'S RUSH: A rush in this use, is a plant, such as a bulrush, and rushes were used to burn in fireplaces. When you had company who would come late, and you didn't want them to stay long, you would encourage your guests to leave when the rushes burned out.

GIVING SOMEONE THE COLD SHOULDER: When guests would overstay their welcome as house guests, the host would, instead of feeding them good, warm meals, give them the worst part of the animal, not warmed, but the **cold shoulder.**

GETTING A SQUARE MEAL: In olden days your dinner plate was often a square piece of wood with a "bowl" carved out to hold your serving. Generally speaking, this wooden plate was larger than the typical small plate and would hold a larger meal. Thus when you ate from your wooden plate, you would have dined well and you would not go away hungry!

RULE OF THUMB: An old English law declared that a man could not beat his wife with a stick any larger than the diameter of his thumb. A more humane explanation of this phrase is that from the knuckle of your thumb to the end of your thumb is roughly an inch.

GETTING YOUR GOAT: This may refer to an old English belief that keeping a goat in the milk barn would have a calming effect on the cows, enabling them to give more milk. When a person wanted to antagonize one's enemy, he would steal the goat with the expectation that the cows would give less milk. A more plausible explanation in modern times is, "Don't tell any one where your goat is tied up---then they can never get your goat," meaning if people don't know your weakness, that person can't use your weakness to get at you.

THINGS TO THINK ABOUT: Be thankful, Be kind, Be patient, Be on time, "Be still, and know that I am God," Be honest, Be a model of restraint, Be merciful, Be cheerful, Be there for those in need, Be a tower of moral strength, Be unafraid to stand for what you know to be morally right, Be a good listener, Be nice to everyone for thereby have some entertained angels unawares, Be all that you can be as a child of God, Be a loving, yielded, servant of Christ, Be clean in thought, word and deed, Be there for your church, Be there for your family members, supportive, caring and loving, Be thrifty with your time and your money. To sum up, Be as outstanding as you can be in all the above.