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Keeping Accurate Time for UTC-Synchronous Modes

Run *WSJT-X* in "Realtime" Priority

I run *WSJT-X* on a very small laptop computer under *Windows* 8.1, often on internal batteries and from remote locations.[1] I noticed that there were momentary hesitations in the clock display of *WSJT-X*, then the clock would jump several seconds to "catch up." Obviously *WSJT-X* was not getting the required attention from the *Windows* operating system. Here is a way to force "realtime" priority so that a UTC-synchronous program like *WSJT-X* will run properly on a small or tired old machine. I assume that wsjtx.exe is installed at the default location, C:\WSJT\wsjtx\bin\wsjtx.exe.

1) Create a ".bat" file using a simple text editor such as notepad.exe — I named mine "WSJT-X-PRIORITY.bat" — then right-click on "WSJT-X-PRIORITY.bat" and choose EDIT.

2) Type the following line, including all spaces and quotation marks:

cmd.exe /c start "runhigh" /realtime "C:\WSJT\wsjtx\bin\wsjtx.exe"

Close and save the .bat file.

3) Create a Shortcut to "WSJT-X-PRIORITY.bat" — I named mine "JT-WSJT-X-PRIORITY.bat - Shortcut." Right-click on the shortcut and choose PROPERTIES, then on the SHORTCUT tab, choose ADVANCED. Check the box RUN AS ADMINISTRATOR, otherwise the /REALTIME switch in step 2 will not take effect. While on the ADVANCED tab, you can choose an icon for the shortcut by clicking CHANGE ICON. I found the WSJT icon at C:\WSJT\wsjtx\bin\wsjtx.exe.

4) Run *WSJT-X* by clicking on the new shortcut icon.

You can place the .bat file, as well as its shortcut, in any convenient directory. Test to see the priority status of WSJTX.EXE (while it is running) as follows. Start "Task Manager," navigate to the DETAILS tab, then right-click on WSJTX.EXE in the list of running applications, and mouse-over the "set priority" menu item. You should see "realtime" as the selected mode. I've tested this under *Windows* 7, 8, and 8.1. Obviously this will work with other applications as well.

While operating portable and on batteries (my computer reverts to half speed on batteries) I additionally prevent other resources from stealing computer focus. At remote mountaintop locations or campsites, the Internet is often not available, so I temporarily turn off the browser, Wi-Fi, and disable the virus software. — *73, Kai Siwiak, KE4PT, 10988 NW 14th St, Coral Springs, FL 33071*; **k.siwiak@ieee.org**

"Power to the Public Service Operator," March 2015 *QST*

I read Rick Palm's, K1CE, article about battery technology in the March 2015 "Public Service" column.[2] I would like to point out that the summary of the lithium iron phosphate ($LiFePO_4$) battery technology is somewhat misleading.

The article begins by reviewing the benefits of $LiFePO_4$ batteries, then has a "but wait" moment when it points out that the maximum discharge current of a $LiFePO_4$ battery has a "critical difference" and is lower than a gel cell. While that *may* be true of the specific brand and model of battery Rick was referring to, please be aware that the discharge current that can be delivered by a $LiFePO_4$ is actually *vastly* higher than sealed lead-acid batteries of similar capacity. This is because of the almost non-existent internal resistance and superior coulombic efficiency of $LiFePO_4$ batteries.

Specific manufacturers choose to artificially limit the maximum output current, perhaps to protect internal wiring, or in recognition of the type of connectors being used, or maybe out of concern for the dangerous amount of power that can be delivered to a short circuit (1000 W is not out of the question). This limitation is usually put in place by a current sensing circuit controlling output FETs — disconnecting the battery in the presence of a short, for example. It is part of the battery protection circuitry built into the $LiFePO_4$ battery.

If you examine several vendor websites, you will probably notice that they offer several different $LiFePO_4$ batteries of similar capacity. You might wonder why they have two or three almost identical batteries. The reason is that they have different output current limits. Some are ideal for VHF/UHF FM rigs (maybe a 10 A maximum current draw) and others are ideal for full 100 W output rigs with a 20 A current requirement.

I own and have used and tested many different $LiFePO_4$ batteries, and, in general, am very happy with them. The batteries I have used have a variety of capacities: 2.5 Ah, 9 Ah, 30 Ah, and 60 Ah. Each of these batteries was chosen to have a 25 A maximum continuous current. Note that this is continuous. Peak current is several times this amount, and the 9 Ah battery, for example, was used to start a car in winter when it had a dead battery!

Sadly, this false negative comparison of a $LiFePO_4$ battery to a sealed lead-acid (gel-cell) battery seems to put a stamp of approval on the continued use of sealed lead-acid batteries. This glosses over the absolute worst performance issue of sealed lead acid batteries: to maintain specifications, sealed lead-acid batteries require either a constant float charge using an expensive/complicated multi-stage charger, or monthly charging. A $LiFePO_4$ battery can be fully charged and left on a shelf for 12 months or longer, and will still have the vast majority of its capacity left (think 75% to 90%). If you attempt to do that with a sealed lead-acid battery, you will have a dead battery on your hands, and also a battery that has been damaged (reduced capacity, increased internal resistance, and increased self-discharge). This is a major problem for EmComm people, who might only deploy once a year, if that.

Finally, sealed lead-acid batteries contain environmentally hazardous lead. $LiFePO_4$ batteries could probably be disposed of in a landfill because they contain no hazardous materials. [It seems to make a lot more sense to take them to a scrap metal dealer, because of the copper inside the battery. — *Ed*.] I can't dispose of a sealed lead-acid battery in my state without paying a $5 hazmat fee.

$LiFePO_4$ batteries are *not* perfect. They have higher up-front costs (but lower total life cycle costs when compared to sealed lead acid batteries by about a factor of 2). The Public Service column seemed to apply attributes to them that are not limitations at all, but simply a battery designer decision, and the decisions the users made when they purchased that brand/model. — *73, Bob Beatty, WB4SON, 32 Carrie Ln, North Kingstown, RI 02852*; **wb4son@gmail.com**

Putting Up 75/80 Meter Dipoles

Joel Hallas, W1ZR, had an interesting item in the October 2015 "The Doctor is In" column in *QST*. Joel provided sketches and a discussion of suggested ways to erect 75/80 meter dipoles for hams with small yards. Of particular interest to me was the discussion about ambient winds that preclude putting an antenna very much higher than 22 feet above ground.

Normally, a good impedance match on 75 meters requires the antenna feed point to be something like 40 feet above ground. At a height of only 22 feet, the feed point impedance is much lower than 50 Ω.

In Figure 3 of that article, showing loading coils halfway out each side of the center fed dipole, Joel states that if the antenna is constructed as suggested, the impedance will be on the order of 31 Ω, which will give an SWR of 1.6:1 or a bit higher. He goes on to say that if matched to 50 Ω, the 2:1 bandwidth will be about 65 kHz. What Joel did not discuss, and is important to "layman technicians" such as myself, is how to construct the matching circuit that will provide this 50 Ω impedance match.

Two options come to mind. One would involve use of a ferrite toroid transformer, which converts 50 Ω down to 31 Ω, and is usually installed directly at the antenna feed point.

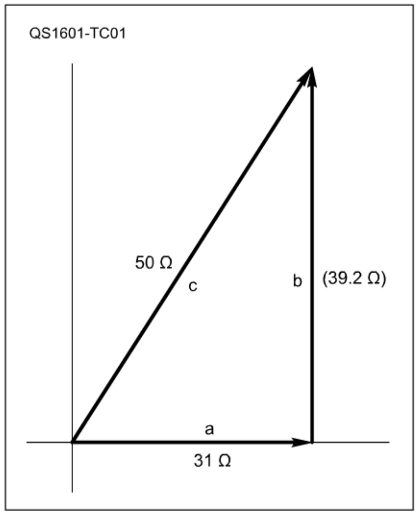

Figure 1 — Using a right triangle with the Pythagorean Theorem, we can calculate the value of an inductor to be connected across the feed point of our low 75/80 meter dipole antenna to match the 31 Ω input impedance to 50 Ω.

The other option, and the one that I have used in the past, is to simulate a shorted ¼ λ stub across the feed point, which implies that a small inductor is wound and connected across the feed point. This places the inductance in parallel with the antenna load, and by electrical phenomena, puts capacitance in series with the load.

Using the Pythagorean Theorem from geometry, we can draw a simple right triangle, and label the shortest leg as "a," the longest leg as "b," and the hypotenuse as "c." The short leg, "a" will be valued as 31 Ω. The hypotenuse will be valued at the maximum impedance, and our desired final impedance, which is 50 Ω. Side "b" is the unknown impedance that we need to create our matched condition. See Figure 1.

Now, by subtracting a^2 from c^2, we have the square of the unknown side, "b."

$$b^2 = c^2 - a^2 = 50^2 - 31^2$$

$$b^2 = 2500 - 961 = 1539$$

$$b = \sqrt{1539} = 39.2$$

So we will need an impedance of 39.2 Ω to create our impedance match.

Next, we must equate that reactance value with an inductance in microhenrys. For that calculation, we will use the formula:

$$L = X_L / 2 \pi f$$

Since we are building an antenna for the 75 meter band, let's choose a frequency of 3.8 MHz.

$$L = 39.2 / (2 \pi \, 3.8 \times 10^6)$$

$$L = 39.2 / 23.9 \times 10^6 = 1.64 \times 10^{-6}$$

$$L = 1.64 \ \mu H$$

Connected across the feed point, such a coil is sometimes called a helical hairpin.

I don't have a complete understanding of all the math involved (my college degree is in business administration), so I can't explain how the shunt-inductor-become-series-capacitor affects the antenna load, except to say, from practical experience, that if the value of the coil is greater than perhaps 1.8 μH, there will be a transformation in the antenna resonance greater than 75 kHz; conversely, if the coil value is somewhat less than 1.8 μH, the transformation will be somewhat less than 70 kHz. Generally, I just subtract 70 kHz from my antenna design frequency, and build the antenna using that lower resonant frequency. At any rate, the new antenna autotuners will take up the slack nicely, so we don't have to worry too much about it.

If you want the antenna to be resonant at around 3800 kHz, try building it for 3730 kHz. I usually try for a final resonant frequency of around 3850 kHz, so I would start with a "build frequency" of 3780 kHz in that case. — *73, Mike McAlister, KD6SF, 7570 Dartmouth Ave, Rancho Cucamonga, CA 91730*.

Notes

[1]Kazimierz Siwiak, KE4PT, "A New Zealand Portable Adventure," *QST*, May 2015, pp 69 – 70.

[2]Rick Palm, K1CE, "Power to the Public Service Operator," Public Service column, *QST*, March 2015, pp 87 – 88.

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