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Darrell Davis KT4WX – Newsletter Editor

FROM THE WORKBENCH

By Darrell Davis KT4WX
Editor – THE EXPERIMENTER and ARRL Assistant Section Manager

Welcome to the next issue of the THE EXPERIMENTER. I have wanted for over the past year take THE EXPERIMENTER over to Scribus but have not had the time that I would like to have to take it over completely. Since that time a lot of things have happened. I was appointed as an Assistant Section Manager and decided to run for Section Manager earlier this year and was declared elected on September 8, 2014. I asked Geoff if he was willing to continue as the WCF Section Technical Coordinator for my term as WCF Section Manager (2015-2016) and he agreed. At the same time, Geoff offered to resume his position as the editor for THE EXPERIMENTER and I have accepted. Therefore this will be my last issue as your editor. Welcome back Geoff. Also THE EXPERIMENTER will be published on a quarterly basis. This issue will be the 4th quarter issue and will close out 2014.

I want to take this opportunity to wish all of you a Happy Thanksgiving, a Merry Christmas, and Happy Hanukkah to my Jewish friends, and a Happy New Year. I will continue to serve you as your Section Manager. But do not worry, I will continue to write articles for THE EXPERIMENTER and doing projects on my workbench.

CALL FOR ARTICLES

Calling now for articles for the next issue of THE EXPERIMENTER. Please have those articles to Geoff Haines N1GY by February 1. You may contact Geoff by the following:

Email: n1gy@arrl.net **Phone:** *(941)*
US Mail: **Website:** http://www.n1gy.com

BITS AND BYTES

By Darrell Davis KT4WX
Editor – THE EXPERIMENTER and ARRL Technical Specialist

Welcome to the next installment of Bits and Bytes. I hope you enjoyed reading the initial installment of this column. Like I stated previously, I will use this column to try to give you a practical education in the area of microcontrollers and how you can use them.

Last time we talked about the difference between a Microprocessor and a Microcontroller. To summarize, A Microcontroller contains the ROM (Program Space) and RAM (Data Space) that are normally external to a Microprocessor. On the other hand a Microprocessor is just execution engine normally with interfaces to ROM and RAM which are external.

I wish to introduce you to another two terms: CISC and RISC. You say what are these?
CISC stands for Complex Instruction Set Computer and is pronounced “sisk”. A good definition is the one I found at Wikipedia, *“C**omplex Instruction Set Computer** is a computer where single instructions can execute several low-level operations (such as a load from memory, an arithmetic operation, and a memory store) and/or are capable of multi-step operations or addressing modes within single instructions.”* The CISC style processor was more popular in the 1970's and 1980's when memory was at a premium and more complex instructions that combined simpler instructions saved program memory. However this comes s at a price. A microprocessor that typically is high in power consumption due to a more complex instruction set. Typical microprocessor that is an example of a CISC is the Intel x86 processor that is used in the desktop computer that runs the Windows Operation System.

RISC, stands for Reduced Instruction Set Computer and is pronounced “risk”. A RISC processor has a much smaller instruction set and therefore the design of the RISC microcontroller or microprocessor consumes much less power than a CISC style processor. RISC style of microcontrollers, specifically the ARM architecture, are used everyday in smart-phones and Tablets. If you smart-phone used a CISC processor, it would need roughly the equivalent of a 12 Volt automotive style battery to power the thing and the heat it would give off would be quite significant.

CISC Processors have their place and so do RISC processors. When it comes to raw, uncompromisable horsepower, a CISC processor is the way to go, if the source of supply is readily obtainable. But when it comes to battery powered applications, a RISC processor is the only way to go. And in recent years, RISC processors are getting to be a significant percentage in horsepower of their “big brother” CISC processor. The RISC processor is what made the smart-phone and the tablet possible. The average CISC processor consumes a minimum of 50W of power or much more. A RISC processor consumes 5W of power or less. You use the processor which is appropriate to your design. In this case in an embedded design, the RISC processor is the only way to go: keeping power consumption low and very little generation of heat as a result. Next time we will go into the basic families and platforms of microcontollers that are popular out there and define some more basic terms for you. Until then, keep your soldering iron hot.

ANNOUCEMENT: FIRST ANNUAL ARRL WEST CENTRAL FLORIDA SECTION TECHNICAL CONFERENCE

Below is a copy of the PDF flyer concerning details about the first WCF Section Technical Conference. Starting on January 1, 2015 you will be to register at http://www.arrlwcf.org. Make plans to attend this Technical Conference.

A COAX TESTER FOR SHORT CIRCUITS

By Geoff Haines N1GY
ARRL WCF Section Technical Coordinator

As I was browsing around the web this morning I saw a video by another ham in which he used what he called his coax tester. He did not explain the circuit for his tester but it gave me an idea. Obviously what he had was a form of continuity tester with specific design elements for attaching it to a newly installed coax connector. It took only a moment to come up with a workable circuit. The functionality of the tester is obvious. I have installed many PL-259s over the years and testing for a short with a regular digital meter sometimes seems to require three hands. This tester allows one to simply screw the PL-259 onto the tester to get an immediate "GO/NO GO" indication. If the LED lights up- you have a short circuit either in the coax or the connector. Start over. If the LED does not light up, the installation of the connector has no short circuit.

I mounted the components in a small plastic box left over from a previous project and labeled the box with instructions on its use. I included a test button in the circuit so that the user could make sure that the unit would give a proper indication when used. The button momentarily short circuits the tester so the LED will light up. If it does not then it is probably time to replace the two 1.5 Volt AAA batteries that power the LED. The actual size of the batteries is not critical, AA or AAA will work just fine. The important thing is to power the unit with 3 volts DC. That way, no dropping resistor is required. If you want to use a 9 volt battery just add the appropriate dropping resistor to the circuit (*Editors Note: Otherwise you will burn out the LED*). A 330 Ohm 1/8 watt resistor will do the trick just fine for 9 volt power. I suggest the use of a battery holder to make exchanging the batteries as easy as possible.

A protective ring wall was installed around the test push button to prevent inadvertent short circuits while it is stored in a tool box, pocket, or go-kit. The ring wall is nothing more than a section of a PVC tubing connector, hot glued around the push button. It has to be higher than the button, but only by a fraction since you want to be easily able to operate the button when using the tester.

Here is a photo of the completed coax tester.

Figure 1:

Photo of Completed Coax Tester in an Enclosure

As you can see, the circuit is very simple. If there is a short circuit in the cable under test then voltage will be passed to the LED and it will light up. If the push button is activated then the circuit is also completed and the LED will light up.

Figure 2:

Schematic of Coax Tester

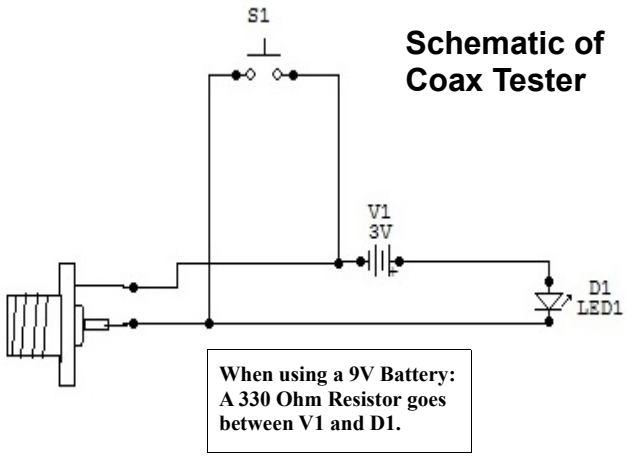

Figure 3
Parts List

1	**SO-239 connector**
1	**Red LED**
1	**Momentary Push Button (Normally Open)**
1	**Battery Holder for battery(ies) of choice**
1	**330 Ohm resistor (only needed if using a 9 volt battery for power)**
1	**Suitable enclosure**
1	**protective ring to go around push button (section of PVC connector)**
	Assorted hookup wire, hot glue, etc.

The battery life for a device like this is about the same as the battery shelf life. The first set of batteries will probably outlast the operator unless the operator builds 50 or 60 coax assemblies per day.

DECIBELS

by Joel Bryant WM4P
ARRL Technical Specialist

All of us hams have used the term decibel or db. It sounds impressive, but what exactly does it mean?

According to the ARRL Handbook decibel's a way of expressing a ratio logarithmically. Now that helps a lot doesn't it? It does it you know what a ratio and logarithm is.

Ratios are just one number divided by another number. Now a logarithm is a bit more complicated. The logarithm of a number is the exponent to which another fixed value, the base, must be raised to produce that number. So, if we use base 10, the logarithm of 10 is 1, the logarithm of 100 is 2 and the logarithm of 1000 is 3 and so forth. (10^1 = 10, 10^2=100, and 10^3=1000). We will use base 10 logarithms for dB calculations, on your calculator it may say log10 or something similar, to convert from a logarithm to a number use the anti-log it may be 10^x or log^-1. I have used log^-1 in this article.
If the upper number is greater than the lower number so that the ratio is greater than 1 that indicates a gain or increase in power (positive sign). If the upper number is less than the

lower number so that the ratio is less than 1 that indicates a loss or decrease in power (negative sign).

The bel (named in honor of Alexander Graham Bell) would be log(number 1/number 2), this was determined early in communications history to be too large of a unit to be useful, so the decibel was adopted for use in communications work. The decibel is 1/10 of a bel. So a decibel is 10 log(number 1/number 2) for power (20 log (number 1/ number 2) for voltages and currents)).

There are many different decibel references, that is the bottom number of the ratio. So a dbW is referenced to one watt. So, a the 10 watt transmitter would have an output of 10 log(10/1) = 10 dBW. The dBm uses a 1mW reference so a 10 watt transmitter would have an output of 10 log(10/.001)= 40 dBm.

Decibels are very useful for defining very small signals and very large signals. Lets take the instance of a complete transmitter that has an output of 1000W and the oscillator produces 1mW. The overall gain of the system is 1000/0.001 = 1,000,000. That is a messy number to work with. Now let convert that to decibels 10 log(1000/.001) = 60dBW. I don't know about you but 60 is a lot easier to work with that 1,000,000 for me.

Okay we've got the history and definitions out of the way, lets think about the practical use of the decibel.

Almost every commercial antenna that has a specification sheet has a gain figure published in dBd or dBi. That is gain over a dipole (dBd) or an isotropic radiator(dBi). Isotropic radiator? That is a theoretical perfect antenna that emits the same power in all directions, its radiation pattern would be a sphere, you know a ball. Through some highly complex calculations that are beyond the scope of this article and my comprehension, it has been determined that a dipole (a practical reference antenna) has a gain of 2.15 dB greater that an isotropic radiator. That is dBi = dBd +2.15. Alright, what does that mean? Now if I am Acme Antenna Sales I am gonna list my antennas as having a certain dBi gain, why? Because it is 2.15 dB better than a dipole. Now back to the math. Lets us say I have an antenna with with 3 dBi of gain. Sounds good so far. Lets see what that means if I feed the antenna with one watt what is the effective radiated power? A little algebra and we come up with:

3=10 log (x/1)
0.3= log (x/1)
log^-1 0.3 = 2 Watts

Not bad but something to think about when shopping for an antenna.

The real usefulness of the dB comes in when doing an analysis of a transmitter, feed line and antenna system.

Lets take a scenario that could be close to a real life situation and calculate the effective radiated power (erp) for an installation (All other losses will be disregarded for simplicity, but remember that connectors and couplings have losses).

First the specifications of the installation:

Transmitter Power: 10 W
Feed line loss -3dB
Antenna gain 6dBi

Next lets convert the transmitter power to dBW. This would be:

10 log(10/1)=10 dBW

Now here comes the good part, to find out what the erp from the antenna all we have to do is some addition: 10 dBW +(-3 dB) + 6 dB= 13 dBW or back to watts we have an effective radiated power of 20 Watts. So a 3 dB increase in power doubles the power. Conversely a -3dB loss halves the power.

Now if your employer offers you a 3dB raise or 3% raise I hope you know which one to take now.

73 and enjoy as many aspects of our hobby as you can.

CALL FOR SPEAKERS
FIRST ANNUAL WCF SECTION TECHNICAL CONFERENCE
by Darrell Davis KT4WX

Calling all Technical Specialist and other hams with technical expertise. We are looking for speakers for the First Annual ARRL West Central Florida Section Technical Conference. Starting January 1, you will be able to register online to attend and even more importantly register to be a speaker. Registration will take place at http://www.arrlwcf.org. We have several speakers that have already tentatively committed to be speakers but we need many more. We have ½ or 1 hour slots available and your presentation may be for beginners, intermediate, or advanced users. If we have enough speakers we will run three simultaneous program tracks or if we do not have as many as we would like we will run two. This will allow us to draw as wide an audience as possible. Also we will have a guest from the ARRL Lab who will no doubt be one of the speakers.

You may contact me at kt4wx@arrl.net or call me (or text) at 863-245-9923 for more information about being a speaker. You do not need a PowerPoint presentation or handouts if you wish to be a speaker, although having either or both of these will help you connect with the audience even more. If you need help getting a PowerPoint together please let me know as well as I am willing to help you.

We would like to have all our speakers registered by March 15 so we can print up an agenda (list of presentations) for the conference. We are also taking suggestion as to where to hold the Second Annual WCF Technical Conference in 2016.