Dixie Amateur Radio Club

June 2010 Volume 34, Issue 6

W7DRC Operations

Field Day 2010
June 26-27, Highland Park

What is Field Day?

ARRL Field Day is the largest on-the-air operating event in Amateur Radio. It draws tens of thousands to the airwaves each year, bringing new and experienced hams together for a weekend of fun!

Overview

ARRL Field Day is the single most popular on-the-air event held annually in the US and Canada. Each year over 35,000 amateurs gather with their clubs, friends or simply by themselves to operate.

ARRL Field Day is not a fully adjudicated contest, which explains much of its popularity. It is a time where many aspects of Amateur Radio come together to highlight our many roles. While some will treat it as a contest, most groups use the opportunity to practice their emergency response capabilities. It is an excellent opportunity to demonstrate Amateur Radio to local elected community leaders, key individuals with the organizations that Amateur Radio might serve in an emergency, as well as the general public. For many clubs, ARRL Field Day is one of the highlights of their annual calendar.

Budding amateur radio operator 11-year-old Breanna Talbot made over 80 contacts with other HAM radio stations across the country from the temporary station set up by the Dixie Amateur Radio Club for Field Day, June 23-24

Objective

To work as many stations as possible on any and all amateur bands (excluding the 60, 30, 17, and 12-meter bands) and to learn to operate in abnormal situations in less than optimal conditions. Field Day is open to all amateurs in the areas covered by the ARRL/RAC Field Organizations and countries within IARU Region 2. DX stations residing in other regions may be contacted for credit, but are not eligible to submit entries.

Date

Field Day is always the fourth full weekend of June, beginning at 1800 UTC Saturday (12:00 Noon local time) and running through 1159 UTC Sunday (11:59AM local time). Field Day 2010 will be held June 26-27, 2010.

Join your club at Highland Park in Washington City. Map and directions in this issue. Talk in on the club link system, either 145.490 or 146.640. Come to the June meeting to reserve your time to operate! And make sure you come out to help with setup and teardown. These can be the most educational and fun things you do! Operating is fun, but learning how to mount a tri-band beam or a dipole can be beneficial to your future hamming! Save the date. See you there!

Who Are We?

The Dixie Amateur Radio Club, Inc. is a non-profit IRS 501(c)(3) association of federally licensed Amateur Radio operators (also known as "ham radio" operators) who primarily reside in southwestern Utah, mostly in the greater St. George City metropolitan area. We also have members who live in rural areas of Washington County and in areas outside of the county. The Dixie Amateur Radio Club, Inc. is a formally "Affiliated Club" with the American Radio Relay League (ARRL) "The National Association for Amateur Radio".

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Affiliated Club

2010 Board Members

President...C. R. "Nick" Nickle W7CRN

Vice-President....Kory Talbot KE7MMH

Secretary..... Kevin Merrill KE7TLW

Treasurer.....Harold Wells KE7OZG

Board Member.....Scott Taylor KE7YIQ

Board Member..Bruce Bissell KE7LGD

Board Member....Ken Forshee KE7DZI

Past Presidents of DARC

2009.....Ken Forshee KE7DZI
2008.....Ric Wayman K7DLX
2007.....Hal Whiting KI2U
2006.....Hal Whiting KI2U
2005.....Gary Zabriskie N7ARE
2004.....Dan Farwell W8EQA
2003.....Dan Farwell W8EQA
2002.....Ron Sappington WI7Z
2001.....Travis Lofthouse KD7FRN
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Can anyone help me complete this list? Please contact Ric Wayman at k7dlxham@gmail.com

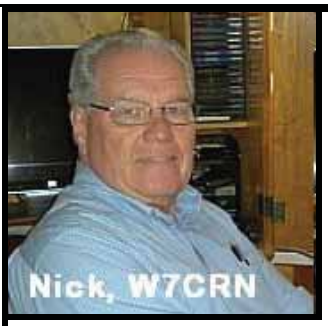
SUBMISSIONS WANTED!

Send your ideas, bios, articles, cartoons, etc. to Ric Wayman at k7dlxham@gmail.com.

ALL HELP WILL BE APPRECIATED!

Nick Nickle, W7CRN

President's Corner



Board of Directors Meeting

The June Board of Directors meeting will be held on Thursday, June 3rd at 7:00 PM in room E of the Community Arts Building, 86 South Main Street in St George, members are welcome to attend.

Club Meeting

The June 16th club meeting will focus on Field Day plans with a presentation on using the Field Day contact logging software, and if time permits we will review the Ham Radio Deluxe presentation that we did not have time for at our April meeting.

May Social and Hamfest

The May social and hamfest in Rockville was a very enjoyable afternoon for all that attended. I would like to publicly thank Harold (KE7OZG) and Jackie Wells for hosting this event at their family property on the banks of the Virgin River. The chefs, Harold, Jackie and Kory (KE7MMH) prepared an outstanding dutch oven meal that included salad, chicken, potatoes, corn on the cob, raspberry cobbler with ice cream, and homemade cream soda. Those that participated in the fox hunts had a great time, especially the young people that got an introduction to direction finding. Rick Christensen, NV7D, from Hurricane was there for the swap meet with his extensive supply of good parts at good prices – anyone needing electronic components for a project should contact Rick.

With over 40 people in attendance, beautiful cool weather and

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President's Message (continued)

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plenty of sunshine, this event must be considered a success with about $250 being generated to support the clubs social activities for the year. Thank You! - to everyone that participated in this hamfest and making it a success.

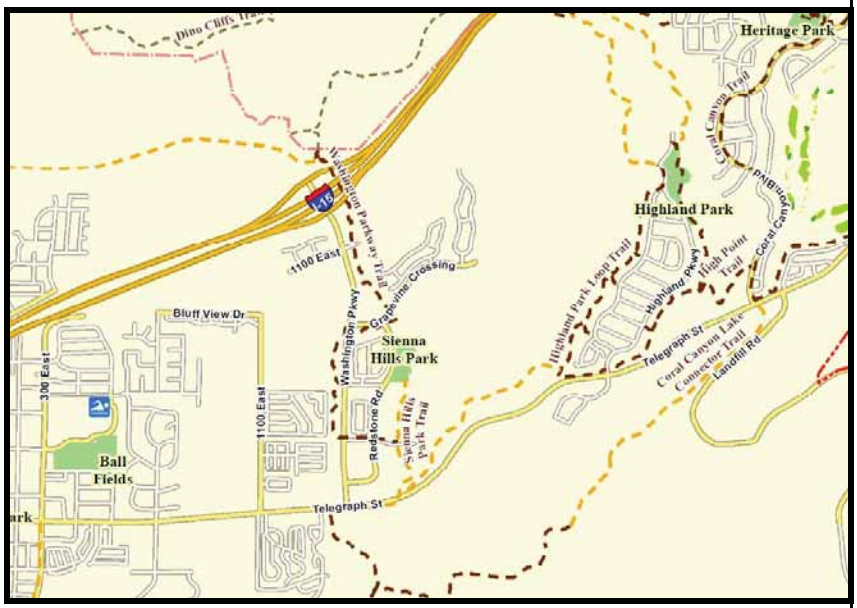
Field Day

ARRL Field Day, always the fourth full weekend in June, is one of the most popular events in amateur radio. Each year tens of thousands of participants bring an element of fun with them as they combine the public service aspects of Amateur Service with the experimental nature of our hobby. Field Day gives us an opportunity to develop our skills to meet the challenges of emergency preparedness as well as acquaint the general public with the capabilities of Amateur Radio.

We have many members in our club that have not had the opportunity to experience the fun of this event. Each of you, and your friends and neighbors that may know nothing about ham radio, are invited to attend and participate – come and operate on bands and modes that you rarely or never use, make contacts across the US and in Canada – and beyond – learn new skills and make new friends both on the air and off. This is a prime opportunity for Technician class operators and those that may be interested in becoming a ham to operate an HF radio and make contacts around the country. Come join us on Field Day to develop your operating skills and experience the excitement of ham radio.

Again this year, our Field Day site will be located in the large pavilion at Highland Park in Washington City, Utah. Drive northeast on Telegraph road toward Coral Canyon, at the traffic light at the top of the hill turn left onto Highland Parkway, continue on Highland Parkway to Highland Park. (see map)

Setup for Field Day will begin at about 9 AM on Saturday morning, June 26th. Operations will start at 12 noon (1800 UTC) on Saturday, June 26th and will continue until 12 noon on Sunday, June 27th. There will be multiple stations setup for operation on multiple bands and modes (CW, SSB, Digital).



Come early and stay for the hamburger cookout at 5 PM on Saturday, the Club will provide hotdogs, hamburgers, and soft drinks; bring potluck salads and sides to share. See ya'all there.

Thanks & 73,

Nick Nickle – W7CRN

QRZ.com to offer a new electronic logbook

A message from Fred Lloyd, AA7BQ
Founder and publisher, QRZ.com

QRZ is pleased to announce two major developments in its evolution. After many months of program and systems development, QRZ will shortly make available an online Logbook that will be accessible by all of its Ham users. In addition, we are announcing that QRZ will begin issuing operating awards and certificates for all classes of on-air activities with direct coupling to our online Logbook and Callsign Database.

These new features will become available to the general public in just a few weeks after the completion of a test and evaluation period. We are looking for volunteers to assist with the initial trials.

Our logbook is fully integrated into the QRZ system. Every callsign in our database has its own log and all QRZ members may make log entries as well as approve incoming reports. When an incoming contact report is confirmed, it becomes eligible for operating awards credit. The Logbook system will be available to all Ham members, with or without a subscription. Subscribers, however, will receive additional capabilities including extended details, wildcard searches, uploads and downloads, enhanced editing, and awards eligibility tracking.

All current XML Logbook Data subscribers will receive access to the online Logbook. The XML Logbook Data subscription will include the online Logbook as a standard part of its features. All existing QRZ subscribers in the Premium, Platinum and Data Only categories are also included in this upgrade. Current subscription prices will remain the same, with the basic XML Logbook Data package still at just $29.95 per year.

It should again be noted that no subscription is required to get started with the QRZ Logbook. Users can start building their list of contacts from day one by simply entering them into the system. A subscription can be purchased at any time and all previously entered information is retained, regardless of the users prior subscription status.

Complimenting our Logbook will be a full array of operating awards based on confirmed contacts between QRZ members. In addition to contacts confirmed directly on QRZ, our awards program will recognize and credit contacts confirmed by other organizations including eQSL, ARRL, and more. A data upload capability will make it easy for you to upload your existing logs into the QRZ system.

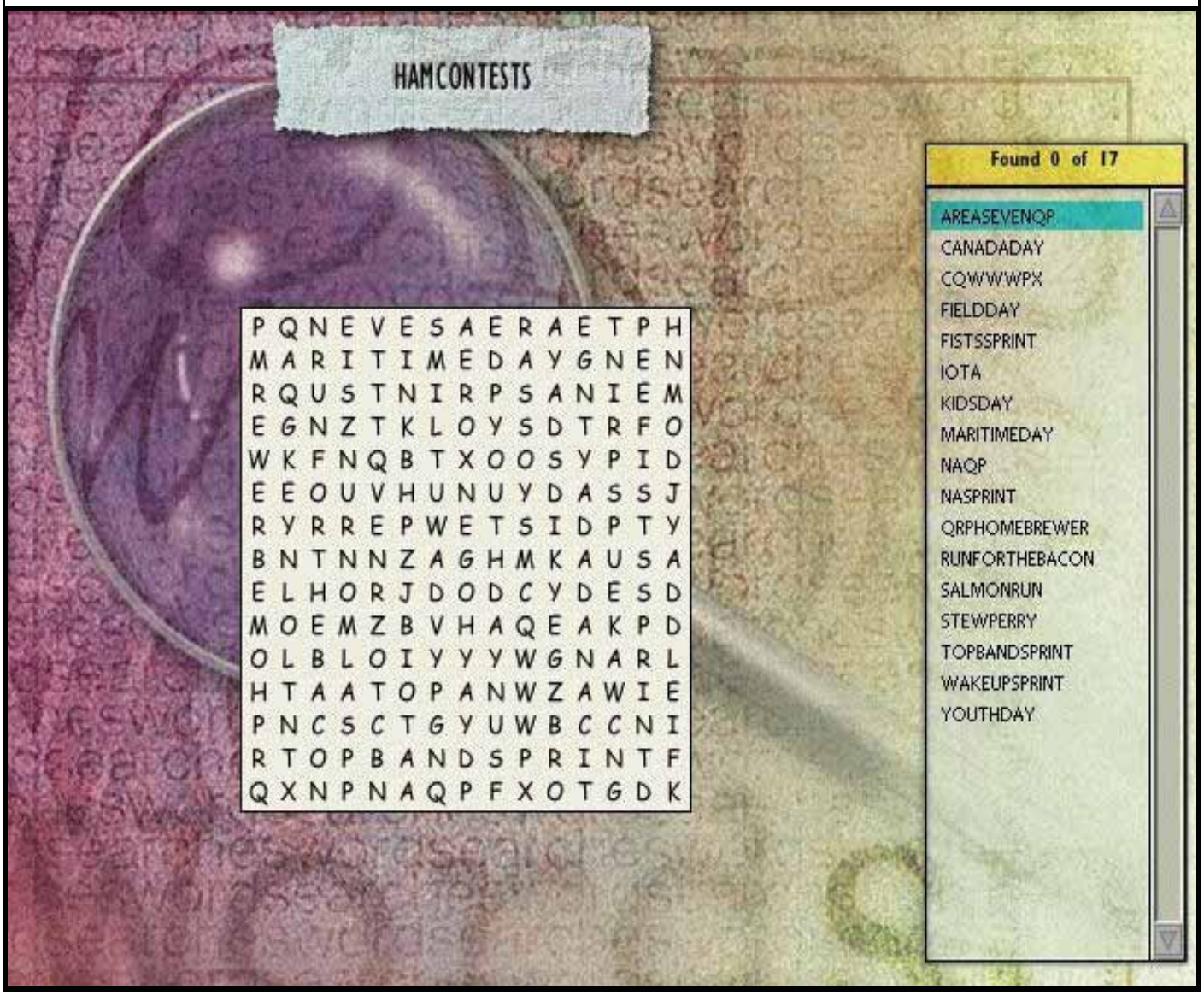
To inaugurate our awards program, we'll be hosting a QRZ-100 contest which will recognize the first person to use our Logbook to make and confirm 100 on-air contacts with other QRZ users.

Thanks and 73,

_____

Fred Lloyd, AA7BQ
Publisher, QRZ.COM
aa7bq@qrz.com

K7DLX's Word Search "Ham Contests"



May Meeting Presentation

At the May meeting, Ric Wayman K7DLX gave a presentation on PSK-31 transmissions. The basic theory behind PSK-31 was discussed, and a demonstration of the mode was given.

Farwell and Good

The Incurable Itches: DX And Contests

By Dan Farwell, W8EQA

Man has always been competitive. Bigger, better, faster- that's what we want! Why should ham radio be any different? We try to talk farther, longer and make more contacts than the next guy.

Amateur radio has made a sort of science out of this concept.

Here's an idea! Let's send grade "A" operators all over the known world. So that everybody has a chance to contact every last extreme piece of real estate on the planet. Then we'll schedule a contest (or two) every weekend from now on so there will be absolutely no rest for the wicked.

Tens of thousands of amateurs could really care less about talking to all those foreign operators. Or getting worked up about a contest that plugs up perfectly good frequencies with people that seem to be on some kind of self-inflicted pain program.

On the other hand, there are countless others that live for this type of abuse. Neglecting family and friends to compete in some primal ritual that seems to never end.

Maybe that's what makes this hobby so much fun. Polarizing the members into groups that are so dedicated to their individual desires that they can derive pleasure from physical pain and satisfaction from just trying harder.

The beauty is that it really works. The fellow that just wants to pass the time with his friends or neighbor can do so with everyone's blessing. And the guy who just wants to beat his own brains out in a contest or pileup can remain in his blissful world too!

Don't knock any of these ideologies unless you've tried them.

The rag chewers are happy and so are the hordes of bleary-eyed Field Day operators. The same goes for the satellite enthusiasts and the two meter repeater devotees.

It's just great to be a small part of such a great hobby. Enjoy your niche but, don't be upset if I scratch my itch really hard.

Dan Farwell, W8EQA, is a past president of the DARC, and an honorary life member. His contributions to the club are numerous. He lives in St. George with his wife Melody, W7RRR, and when not working for the Wal-Mart Distribution Center can be found on the HF bands running the rare DX stations. This is part of a series Dan has written about his life as a ham operator and knowledge he has gained through the years he would like to share.

SWR Meters Make You Stupid! (part 2)

by Eric P. Nichols (KL7AJ)

One of the best habits you can get into as a new radio amateur is the habit of MEASURING everything. You NEVER want to take anyone's word for anything when it comes to amateur radio electronics, (or any other subject, for that matter), even from an infallible reliable source (or even me!) The fact of the matter is that actually doing experiments takes a bit of work...repeating ignorance takes none whatsoever. Well, maybe flapping your gums uses a calorie or two, but that's about it.

Here's another great principle, right from the physics lab: If you want to know what's happening, follow the heat. What's this mean? Quite simple, actually, but it does have some subtle implications. When you generate a certain amount of radio frequency energy, it can only go to two places. It can be radiated into space. Or it can make something hot. There are no other options. We'll see why this is crucially important as we move along.

No End in Sight

Let's take a look at a transmission line that's infinitely long...our Ladder Line to Eternity. At the far end of the ladder line, let's put a 100 watt light bulb. (Granted, it may take you a while to stroll out there and attach the light bulb, and then stroll back to complete the experiment, but bear with us for a moment). Now, let's connect a 100 watt radio transmitter to the input end of our infinite transmission line. Let's turn on the radio transmitter for precisely one second, and then turn it off. Now, let's go make some coffee, and while it's perking away, or dripping away, or reheating in the microwave, we'll rummage around in our closet and find an old pair of binoculars. We grab our coffee and sit down on the lawn and train our binoculars toward the end or our infinite length transmission line. (It might be advantageous to do this experiment at night, as you can imagine). Actually, it will take an infinite amount of time for the one-second R.F. burst to get to the light bulb, and ANOTHER infinite period of time to see the results of the light bulb.

Most likely, this experiment will fail, unless you live to a REALLY REALLY REALLY ripe old age. But that's okay; even failed experiments are educational. So let's modify our experiment a little, so as to be a bit more likely to succeed. Let's use a transmission line that's only one light minute long. That will be a mere 11.16 million miles long, plus some spare change, a MUCH more manageable figure. Again, let's turn our transmitter on for one second, and then turn it off. We'll now train our binoculars on the light bulb a mere 11.16 million miles away. After TWO minutes, we'll see the light bulb turn on, for exactly one second. (Again, keeping in mind it takes a minute for the light from the bulb to get back to your eyeball).

Now, isn't that amazing?

At the risk of unduly complicating matters, we'll add a few minor details. One should know that a conventional incandescent light bulb is horribly inefficient. If you're lucky, about 2-1/2% of the energy is actually converted into light; the remaining 97.5% is, you guessed it, HEAT. It also has a resistance that changes dramatically with the power applied, which becomes more relevant when we use light bulbs for actual R.F. indicators. But we have a long ways to go in our lesson before those factors become significant.

The important point to glean from this is that ALL the energy we sent down the transmission line, (100 watt-seconds in this case, to be precise) is dissipated, that is, never to be heard from again. It is LOST energy. Radio energy radiated from an antenna is also LOST energy. Of course, it might be a little philosophically weird to call the energy radiated from an antenna “lost” because that is the whole purpose of the thing in the first place. But we can never call that energy back, which is the important point.

Now, if you've been really paying attention, you may have thought to yourself, “What about that 59 second interval before the energy reaches the light bulb? How can we even define POWER or ENERGY? Don't you need some sort of LOAD? Until the burst gets to the light bulb, there IS no load! Aren't we violating Ohm's Law...or something?”

All excellent questions. And they are central to the discussion.

This is where we encounter a mysterious entity known as “Characteristic Impedance.” Characteristic impedance can be thought of as an EQUIVALENT RESISTANCE at the input end of an infinitely long transmission line. Its value is independent of the length of the line. It is a function of the spacing between the conductors, and the diameter of the conductors. There's a formula that's not too

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SWR Meters Make You Stupid! (continued)

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complicated, but you don't need to memorize it. You just need to know that the characteristic impedance is LOW for closely spaced, fat conductors, and HIGH for widely spaced, thin conductors. For typical commercial-grade ladder line, it's about 450 ohms. In days of yore, homebrew ladder line generally ran at around 600 ohms.

Now, this is where we get to the good stuff. As far as your transmitter is concerned, characteristic impedance of an infinite line appears as a REAL resistance. You can calculate power generated just as if the input terminals of the transmission line were a REAL flesh-and-blood (or at least, CARBON) resistor. And furthermore... until the transmitted signal REACHES the far end of the transmission line AND back (we'll talk about reflected waves shortly) the input impedance is also equal to the characteristic impedance of the transmission line. In other words, the impedance a transmitter sees for a BURST is always equal to the Characteristic Impedance, no matter WHAT happens to be dangling at the far end of the line. (We will see that for STEADY STATE radio signals the situation can be very different). We could also say that AT THE INSTANT of launch, we can use the characteristic impedance to calculate power and energy of any transmitted signal, using voltage and current, just as if it were an actual physical resistance.

So now, if we were to REMOVE the light bulb from the far end of the transmission line, and repeat the experiment, it wouldn't make a hill of beans worth of difference as far as our transmitter is concerned...at least for two minutes...after which time it wouldn't matter anyway, since by that time our transmitter has been long shut down! Our transmitter has no way of knowing (or caring) what's at the far end of the transmission line, under instantaneous (short burst) conditions.

I think you'll agree that the description of a burst's behavior in a transmission line is pretty trivial...hardly worth elaborating. Where things get interesting (and more complicated) though, is when we have FORWARD and REFLECTED waves occurring simultaneously. But take heart...we don't have to deal with that quite yet.

Let's return to our missing light bulb configuration. What DOES happen to that 100 watt-second burst when it encounters a “bridge out” condition? Interestingly enough, the R.F. energy doesn't just blorp out of the end of the transmission line into space. If it COULD do this, there wouldn't be much point in an antenna in the first place. In fact, if you could invent a transmission line that could efficiently blorp R.F. off into space, you'd be a very rich person. Instead, what happens is that the R.F. burst gets TOTALLY REFLECTED back toward the source. That energy has to go somewhere, and if it's not converted into heat or radiated into space as a radio signal, it has to find someplace where it CAN do either one or the other. Well, to be perfectly honest, it DOES have one other option. It can keep bouncing around forever. We'll talk about that option a bit later.

But first, let's modify our test setup once more. Let's leave the far end of the transmission line flapping in the breeze. (Hmmm...I guess at 11.16 million miles out in space, there probably isn't much of a breeze). Anyway...we have an UNTERMINATED transmission line out yonder. At the NEAR end we'll connect a double throw switch, so we can conveniently connect either a transmitter or a light bulb to the transmission line. Now, we'll throw the switch to the transmitter side and send a one second burst. Next, we'll shut off the transmitter and throw the switch to the light bulb side, and wait a couple of minutes. (Actually one minute and 59 seconds).

Voila! At the appointed time, the light bulb shines for one second. Aren't we amazed? What have we learned? Well, a couple of things, at least. Number one is that REFLECTED energy is REAL energy. We were able to light our light bulb with the energy that was reflected from the far end of the un-terminated transmission line. The second thing we learned is that that transmission line is 11.16 million miles long. Well, we already knew then when we strung the thing out there, didn't we? But, in case we didn't, we could have determined its length by carefully measuring the round trip time, knowing that electrical currents travel through a transmission line at about 186,000 miles a second, plus some loose change.

In fact, telecommunications people actually use this method in the real world for locating discontinuities in otherwise inaccessible transmission lines. This method is called TDR for “Time Domain Reflectivity” measurement. As you might suspect, in the real world, we don't usually have 11.16 million-mile-long transmission lines. Actual TDR tests use much shorter bursts...generally in the order of nanoseconds...which will allow you to measure transmission lines that are mere hundreds of feet long. As long as your outgoing burst quits before your reflected burst comes back, you can do TDR tests. (You also don't generally use light bulbs for TDR detectors, but rather oscilloscopes).

Now, let's talk a bit about the discontinuities mentioned in the

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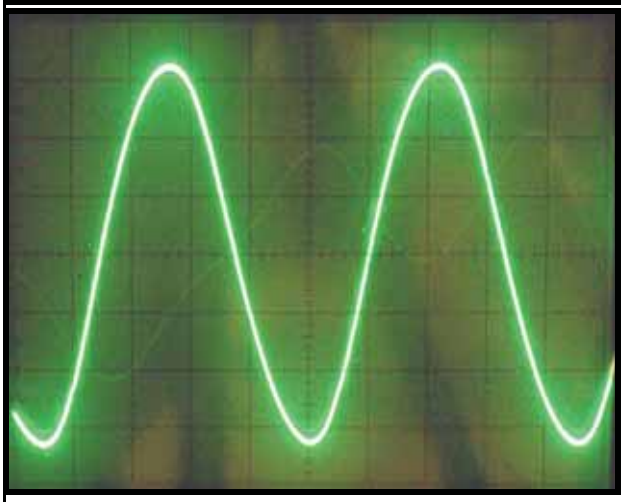
SWR Meters Make You Stupid! (continued)



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previous paragraph. You don't need totally open (or shorted) transmission line to give you a reflected energy burst. It's just that under these two conditions you get TOTAL reflected energy. (You also get total reflected energy if the termination is a pure reactance...either a perfect capacitor or inductor...but we'll address that later).

At any rate, a discontinuity is any sudden change in the characteristic impedance of the transmission line, such as a point where the lines are squished closer together or stretched apart. (A sudden right-angle bend will also cause a small discontinuity). A burst of R.F. will be partially reflected from any discontinuity in a transmission line. Part of it will be returned to sender; part of it will be passed along to the termination. Very gradual changes in characteristic impedance will NOT cause a discontinuity. In fact, “tapered” transmission lines can be used as smooth impedance matching devices. Such things as the slant wire feed and the delta match, both variations of the tapered transmission line, were universally used in the broadcast industry and amateur radio for much of their early history. (There's an ancient local A.M. broadcast station in Fairbanks that until just a couple of years ago used a slant-wire-fed grounded tower! I had the dubious honor of working on the thing at one time.)

Anyway...where were we? Oh yes...discontinuities and partial reflections. We need to set the record straight right here and say that these are NOT inherently bad things! We can USE reflections on a transmission line to do all kinds of useful and wonderful things. We can't just IGNORE them, but we don't need to wring our hands over them, either! Things are generally SIMPLER when there no reflections to contend with; but this by no means suggests that a MATCHED transmission line system is necessarily any better than an unmatched one. We'll talk a bit about the CONJUGATE MATCH before too long. As a prelude to this, however, let's modify our experiment one more time.

Let's remove the light bulb from the double-throw switch, and connect a shorting bar to those terminals, instead. Switch the switch to the transmit side. Send a one-second burst, turn off the transmitter, and then throw the switch to the other side. What happens when the pulse returns from the distant land and encounters the shorting bar? Why, it gets TOTALLY REFLECTED back out to the far end again! In fact, it will keep bouncing back and forth between the two ends of the transmission line forever. Actually, we could REMOVE the shorting bar and get the same result...an OPEN transmission line is just as reflective as a SHORTED one. As long as there is NO RESISTANCE in the termination, the reflection is total.

Now, we hope you have understood that all the previous discussion assumes an IDEAL transmission line. We always have to study IDEAL components in order understand the real-world editions thereof. Actual, practical transmission lines have resistive losses in them, which complicates the matter a little bit. In reality, an R.F. burst would never even make it to the far end of an 11.16 million mile transmission line. (Well, actually, it WOULD, but it would be less than the cosmic noise in the wire by the time it got there!) In reality, H.F. radio signals start running into trouble after a couple of miles, even in the best transmission lines humanly makeable. (I understand someone was able to make Ethernet work over a mile of rusty barbed wire, but this is NOT recommended practice!)

Now for the FUN Part! Hopefully you've been able to follow, and actually ENJOY some of this transmission line stuff, because we're just about ready to get to the real meat.

We've intentionally separated our FORWARD and REFLECTED signals for all the previous discussion. This is easy to do with short bursts, for (hopefully) quite obvious reasons.

However, amateur radio transmissions do NOT consist of such short bursts of R.F. (relative to the length of the transmission line, that is. A CW “dit” is MUCH less than a second long...but typical ham radio transmission lines are MUCH less than 11.16 million miles long, as well!) In typical communications service (as opposed to RADAR), any reflected signal on a transmission line is almost assuredly going to coincide with, or overlap, the outgoing signal. This opens up ENTIRELY new phenomena...as well as potential for confusion.

Whenever two electrical signals overlap each other in a conductor, you have the potential for interference to occur. If you remember from our chapter on antenna fundamentals, interference can be either constructive or destructive. Interference can occur in wires, just as it can in free space, with much the same results.

Allow me to introduce one more term that will help tie all this together: the Superposition Theorem. It is one of those physical

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SWR Meters Make You Stupid! (continued)

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truisms that seem so obvious it shouldn't even need mentioning, but it has profound implications. Stated simply, it's this: ***At any point in time, any given location on a wire must have one and only one voltage.***

Seems pretty obvious, doesn't it? Or to state it even more stupidly: You can't have two voltages in one place at the same time. How does this truth affect life on Earth as we know it? If we have two waves traveling on a wire...one going East and one going West...at ANY point on the wire, the waves MUST add or MUST subtract. There are no other options. Now, whether they ADD or SUBTRACT depends on their relative phasing. For the case of total reflection, we have a few options. An OPEN transmission line termination (no termination) will return a reflected radio signal IN PHASE with the forward signal. The two signals will SUPERIMPOSE, or ADD at the point of reflection. Since the forward and reflected signal amplitudes are equal, the VOLTAGE at the termination point will be twice what it would be if no reflection existed. You can actually see this with a Lecher Wire. Remember the Lecher Wire at the start of the chapter? You just KNEW we'd come back to that sooner or later, didn't you? Well, here we are!

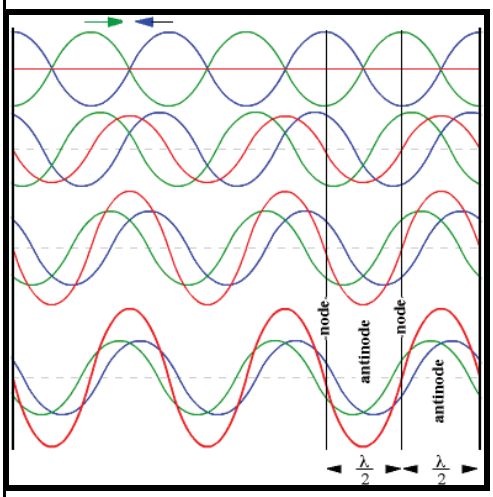
What about the case of a dead short at the termination? Again, we have total reflection, but the reflected wave is 180 degrees OUT OF PHASE with the forward wave. So the SUPERIMPOSED voltage will be the DIFFERENCE between the forward and reflected signals, which are, as mentioned above, EXACTLY equal (but opposite). The resulting voltage at that point will be zero, as the Superposition Theorem tells us it must be. But we already know that, because we ALWAYS have zero volts across a dead short! So, whether we're treating our transmission line as a "lumped constant" (Ohm's Law) device or as a "distributed" (wave) device, we come up with the same answer!

Which brings us to another DEEP truth about physics. Our Universe is staggeringly consistent. If we can't arrive at PRECISELY the same answer to a problem by approaching it from two different angles, we're doing something WRONG! You can ALWAYS double-check this stuff. Don't take my word for it. MEASURE it yourself!

This process of superimposing an East traveling wave and a West traveling wave on a single pair or wires generates what is known as a STANDING WAVE. It's fairly obvious why it's called this; the relative values of voltage (SUPERPOSED VOLTAGE, that is, remain stationary relative to position along the line. You can see mechanical standing waves on any vibrating object, a plucked guitar string, for example. Or you can wobble a curly telephone cord back and forth and generate nice standing waves (if you can still find a phone with an actual cord!) You can easily measure electrical standing waves with a Lecher Wire...in fact, that is its main function.

Here's something very interesting and important. Remember how we demonstrated that a FORWARD moving wave (traveling wave) has real energy? We lit up a light bulb with it. Remember how we demonstrated that a REFLECTED traveling wave has real energy? We lit a bulb with that too. But guess what? A Standing Wave has no energy! It is a pure mathematical construct! It is analogous to isobar lines on a weather map. They INDICATE where pressure air pressure variances occur but they are NOT air pressure in themselves.

Now a system that SUPPORTS standing waves does indeed store energy. But this energy is in the form of forward and reflected REAL energy waves. The STANDING wave is just the visible, but powerless ("Wattless") MANIFESTATION of the two traveling wave components. And this one point is where most of the Amateur Radio Stupidity Exchange concerning transmission lines comes from. A standing wave in itself can do NOTHING good or bad to any piece of amateur radio equipment. Blaming "standing waves" for transmitter damage or other ills is like blaming the number Pi for the truck tire that ran over your foot. Yes, Pi describes the diameter and circumference of the truck tire that ran over your foot, but Pi is NOT a truck tire!



Does this mean that we ignore standing waves? Not at all! But we need to know that Standing Waves are an INDICATION...not the THING ITSELF. With the PROPER INTERPRETATION, they can tell us a few things. Unfortunately, most hams have no clue how to properly interpret standing waves.

Conclusion Next Month!