



Welcome to SFARC, Auburn, CA

# Sierra Signals



P.O. Box 6421 Auburn, CA 95604

December 2014

<http://w6ek.org> [info@w6ek.org](mailto:info@w6ek.org)

## At The Key of SFARC:

### **PRESIDENT**

Tyghe Richardson, KD6MLH  
tyghe@tjrauctions.com

### **VICE PRESIDENT**

Dave Albright, NO6NO  
no6no@pacbell.net

### **SECRETARY**

Dennis Gregory, WU6X  
wu6x@hotmail.com

### **TREASURER**

Richard Kuepper, WA6RWS  
rkuepper@surewest.net

### **DIRECTORS**

Mark Graybill, W8BIT  
Robert Bell, W6RBL  
Jim Jupin, WA8MPA

### **FIELD DAY CHAIRMAN**

Mark Graybill, W8BIT

### **REPORTERS**

Satellites: Greg, KO6TH  
History: Gary, KQ6RT  
Misc Radio: Fred, K6DGW  
Sunshine: Richard, WA6RWS  
rkuepper@surewest.net

### **REPEATERS**

145.430 (-0.6 MHz/PL 162.2)  
440.575 (+5.0 MHz/PL 162.2)  
223.860 (-1.6 MHz/PL 110.9)

### **CLUB NET**

Thursdays, 7:30PM, W6EK/R  
145.430

### **CLUB MEETINGS**

Second Friday of the month,  
7:30PM at the Auburn City Hall,  
1215 Lincoln Way, Auburn CA

### **CLUB BREAKFAST**

Last Sat of the month at Mel's Diner  
1730 Grass Valley Hwy, Auburn 7:30AM

### **NET CONTROL OPS**

Dave Jenkins, WB6RBE  
Norm Medland, W6AFR  
Bob Brodovsky, K6UDA  
Al Martin, NI2U

### **NEWSLETTER EDITOR**

Barbara Anderson, W6EVA  
916.624.1343  
anderson51@wavecable.com

### **WEBMASTER & ARRL PIO:**

Carl A Schultz, WF6J

## Calendar of Events

December 7<sup>th</sup>:  
Enduro

December 13<sup>th</sup>:  
Club Christmas Party

December 25<sup>th</sup>:  
Christmas



December 27<sup>th</sup>:  
Club Breakfast

## Inside this issue:

- *From the Mic*
- *Christmas Party Announcement*
- *Enduro rescheduled*
- *Miscellaneous Radio – Voltage Multipliers*
- *Board & General Minutes*



**We encourage members to receive Sierra Signals via email to save the Club the cost of reproduction and mailing**

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## From the Mic

*By Tyghe Richardson – KD6MLH, President*

### Christmas Party!

I would like to see everyone at the Christmas party on the 13th. If you missed the November meeting please visit the web site and sign up for what you would like to bring to the party.

### The election!

I would like to thank everyone that voted for me as president for the 2015 year. I think we are going to have a fun filled year! I hope that everyone will take advantage of the fun and excitement the club has to offer.



# Christmas Party

**SFARC Member's Christmas Dinner**  
**Saturday December 13<sup>th</sup>, 2014 at 6 pm**  
**Auburn Veteran's Memorial Hall - 100 East St**

The **Enduro** has been rescheduled for Sunday December 7<sup>th</sup>, 2014

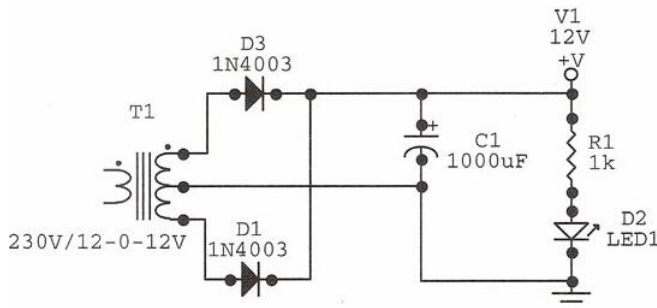
Anyone interested in volunteering??

George Simmons [grsim@mindspring.com](mailto:grsim@mindspring.com)

## MISCELLANEOUS RADIO

### Voltage Multipliers

Voltage multipliers have been around a long time. Their original use was to create very high voltages [500 megavolts or more] to power particle accelerators and lightning research. But, they also have had a fairly rich history in ham radio as well. In the early days of the Novice license, when many new hams were teenagers and universally broke, voltage doubling power supplies offered a way to get 800 or so volts DC with with a much cheaper 400 VRMS power transformer that you might salvage from a console radio or TV.



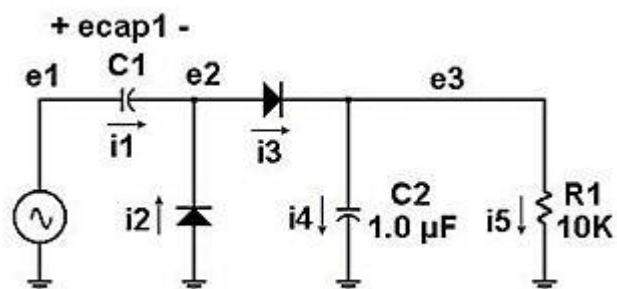
Most everyone is familiar with the full-wave rectifier circuit. A center-tapped transformer feeds two diodes which conduct alternately on opposite half-cycles of the AC input, charging capacitor  $C_1$ . If  $C_1$  is large enough, it supplies current to the load between the AC peaks, and the output is essentially DC with some 120 Hz ripple riding on it.

The upside of the full-wave circuit is that the output ripple is twice the frequency of the input AC, making filtering easier. The down-side is that we get only one-half the voltage across the transformer secondary. One can ignore the center-tap and  $D_1$ , connecting the bottom of the secondary to the chassis connection and get the full voltage across the secondary, but it's then a half-wave rectifier,  $D_3$  conducts only on positive half cycles, and the 60 Hz ripple on the output is much higher, requiring more filtering. Incidentally, today's 12 VDC power supplies use capacitor values that were unavailable in the 50's, and are regulated. Most HV supplies in those days included a couple of capacitors, maybe in the 20  $\mu\text{F}$  range arranged in a pi-configuration with a couple henry choke between them.

In the early days of the Novice license [50's/early 60's], many new hams were teenagers, none of us had any money, and the cost of power transformers went up something more than proportionally to the output voltage. To power a 75 watt transmitter with a pair of 807's<sup>1</sup> you needed about 800 VDC for the plate circuit. For a full-wave rectifier, you needed a 1,600 VRMS transformer which was very costly and generally out of reach for nearly all of us. Most of us used half-wave rectifiers, meaning a 120 to 800 VRMS transformer would work at about a quarter the cost. We also put a couple of cheaper [or free] transformers in series to get the required voltage. There being no free lunch in the Universe, the increased output ripple meant larger capacitors and perhaps a 2 or 3 henry filter choke, reducing the savings by quite a bit, and some just tolerated some 60 Hz hum on their signal.<sup>2</sup> I did discover that the primary of a TV power transformer would act as a choke – sort of – and it was free.

If you were really broke, you could salvage a 250 VRMS transformer from a junk TV set and use a voltage doubler. Here's the conceptual circuit.

On the positive half-cycle,  $C_1$  charges to the peak input voltage through the first diode, and  $C_2$



<sup>1</sup> The ubiquitous, at the time, beam-power tetrode, not a pair of beer cans

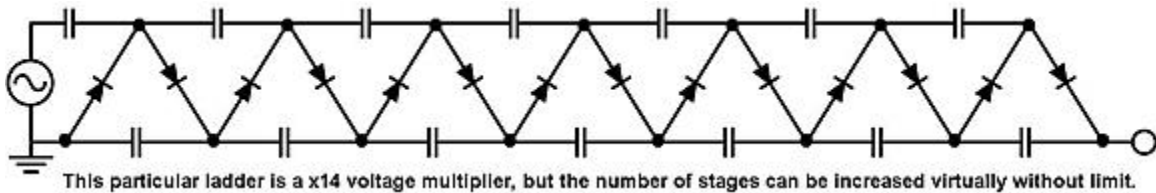
<sup>2</sup> I never did that, of course

charges to the peak input voltage plus the voltage on  $C_1$  through the second diode, or roughly 2X the input voltage. On the negative half-cycle,  $C_1$  and  $C_2$  discharge through the load in series.

Since the circuit uses the charge stored in two capacitors in series, a HV supply would require fairly hefty capacitors, way more than 1  $\mu\text{F}$  cheaper ones, and the ripple would be much higher, but the power transformer was free. 😊

Voltage doublers were about as far as I remember anyone going to power a ham transmitter, but there is no technical reason why you can't multiply the voltage by any factor you choose. As the multiplication factor goes up, more and more of the load current is being supplied by capacitors in series, we all know that capacitors charge and discharge into a resistive load exponentially, so higher multiplication factors lead to higher ripple on the output. This ripple can be mitigated by larger capacitors or by using the circuit on high impedance loads that don't draw much current, or both. Really high multiplication factors are almost universally used on extremely high impedance loads that draw very little current, such as electrostatic particle accelerators.

Such high-factor multipliers are called Cockcroft-Walton ladders because the circuit, when drawn symmetrically, resembles a ladder. Here's the generalized version:



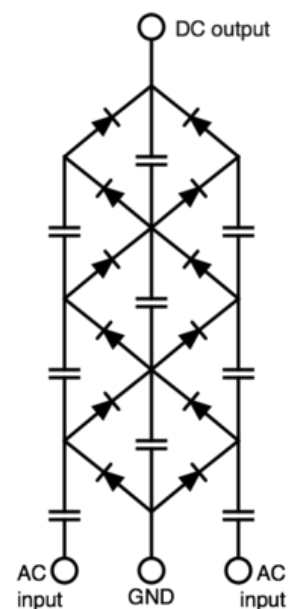
Each diode charges the next stage capacitor to the peak input voltage plus the sum of the voltage on all preceding capacitors. Obtaining 5-10 KV peak was fairly easy, neon signs used transformers that produced those kind of voltages. Feeding this 14-stage C-W ladder with one would result in 70-140 KV at the output, and there is no practical limit to the multiplication factors. Applications for these ladders draw essentially no current.

The C-W ladder shown above is a half-wave multiplier. Ripple on the output can be lowered by going to a full-wave ladder, shown at the right. Obviously, it involves twice as many diodes and capacitors but if the input AC is at 60 Hz, the output ripple will be at 120 Hz.

Voltage multipliers have just about disappeared from ham shacks. Nearly all of our equipment today is low impedance, operating on low voltages [12 VDC] and at currents measured in amperes rather than milliamperes. High power linear vacuum tube amplifiers still operate at high DC voltages, but they almost always have an integrated power supply, full-wave rectifiers, and 120 or 240 VAC input.

This is true of solid state high power linear amplifiers as well. My KPA500 operates at about 70 VDC on the power amplifier transistors, but the power supply is inside the amplifier, and all I do is plug it into the wall.

There are other EHV<sup>3</sup> generators, but they all tend to function on the same principal as the C-W ladder ... charge capacitors in parallel, discharge them in series.



The Marx generator does that, however it produces short pulses of extremely high voltages using spark gaps. It charges the capacitors in parallel and when fully charged, the first of a series of spark gaps is triggered. This acts like a switch, connecting to the next capacitor and spark gap. That gap's breakdown voltage is now exceeded, it fires, and connects three capacitors in series. This progresses down the ladder almost instantly, delivering a multi-megavolt pulse at the output, the spark gaps become open circuits again, and the process repeats.

C-W and Marx generators have never had a place in ham shacks, but the principle of voltage multiplication has in the past. Who knows, the concept of a spark gap transmitter faded with vacuum tubes and then reappeared in the Accufix LORAN-C transmitter a few years ago. Maybe we'll see voltage doublers make a reappearance too.

73,

Fred K6DGW



## BOARD OF DIRECTORS MEETING MINUTES

### November 14, 2014

The SFARC Board meeting for November commenced at 1805 hours at the Sizzler restaurant back room in Auburn.

**Roll Call:** All officers and Directors were present except for Jim-WA8MPA. Guests included Amaryllis-KJ6TFT, Toni-KK6JPJ, Al-NI2U, Jeff-N5JEF, Bruce-K6BAA, Fred-KF7QVB, and Bob-K6UDA.

#### REPORTS and DISCUSSIONS

**President's Report:** Tyghe-KD6MLH had no report or business for the Board.

**VP Report:** Dave-NO6NO had no report or business for the Board.

**Secretary's Report:** Dennis-WU6X discussed a possible sequence of events for the General Election planned for the general meeting.

**Treasurer's Report:** Richard-WA6RWS reported finances for October are on budget, and updated the board on cash prizes and expenditures planned for the Christmas Party.

**VE Report:** Dave-NO6NO reported (14) examiners in attendance for (2) candidates to pass (2) Tech exams.

**Directors:** Mark-W8BIT gave a short Field Day 2015 Committee meeting update and reported a few band captain assignments are still needed, and a GOTA Coach. Mark also suggested we should plan more help at the GOTA table. The FD committee has suggested on-site testing early next spring.

**Other Business:** Richard suggested a "grand prize" special drawing for the Christmas Party of a mobile dual-band radio. Motion by Robert-W6RBL, 2<sup>nd</sup> by Mark-W8BIT to spend up the \$400; passed unanimously and will be brought to the General membership for final approval.

Mark reported he and Carl had been discussing changes to the W6EK website that would allow Officers and Board to update information on the website without the need for any programming knowledge.



Richard suggested it would be nice to solicit some type of “entertainment” for the Christmas Party, such as skits, or other entertainment.

Meeting adjourned at 1840 hours. Submitted by *Dennis Gregory - WU6X, SFARC Secretary*



## GENERAL MEETING MINUTES

### November 14, 2014



The SFARC General meeting for November commenced at 1930 hours at the Auburn City Hall Rose Room, President Tyghe-KD6MLH presiding. All Officers and Directors were present except for Jim-WA8MPA. Tyghe led approximately 45 members and guests in a Pledge of Allegiance to the flag followed by an introduction of Officers, Directors, members and guests present.

#### **REPORTS:**

**President’s Report:** Tyghe called for approval of the minutes from last meeting as posted in the newsletter. A motion by Dave-NO6NO, 2<sup>nd</sup> by Mike-N6BRP to approve as posted passed unanimously with no corrections. No other report.

**VP Report:** Dave thanked the membership for their support this past year on “presentations” and other activities during the year.

**Secretary’s Report:** Dennis-WU6X reminded guests of a Welcome letter they can pick up at break, and an overview of the Club’s Yahoo! Group and events calendar.

**Treasurer’s Report:** Richard-WA6RWS reported bank account and budget in good standing, inviting members to view details if needed, and deposits including the White Elephant Auction proceeds.

**Elections Committee:** Dennis-WU6X gave an overview of elections rules and completing ballots with write-in. Tyghe called for nominations; Wendy-KK6HSK was nominated for VP and other candidates gave a brief campaign speech.

**Christmas Party Committee:** Gene-KG6NYH asked for volunteers for setup and clean-up. Two sign-up sheets were passed around to allow members to sign-up for a side dish and also the setup/teardown. A sign-up sheet is also planned for the website. The date is set to Saturday, December 13<sup>th</sup>, setup at 4:30, dinner at 6pm. The Club supplies the turkey, ham, plates, drinks and tableware.

**Other Business:** Tyghe reported the Board had voted to purchase a “grand prize” dual-band VHF/UHF mobile radio for the Christmas Party and asked for a motion from the floor. Motion made by Dave-NO6NO, 2<sup>nd</sup> by AI-NI2U to spend up to \$400 for the radio; the motion passed unanimously, and the Treasurer was directed to make the purchase.

**Field Day 2014 Update:** Mark-W8BIT reported the Club came in 1<sup>st</sup> place in Sacramento Valley Section with just over 1,000 QSO’s, and 49<sup>th</sup> place out of 150 in class 4A Nationwide. Mark also asked for band captains and for the members to think about volunteering for FD 2015.

**Sunshine Report:** Richard-WA6RWS reported that Craig-N6YUV broke his ankle.

**Repeater Report:** Richard-WA6RWS reported that the 220 repeater is still configured as a standalone box. When connected to the other repeaters it causes noise interference. He and Birton plan to chase the issue

soon. Richard also told membership about the ability to check audio levels into the receiver with the command #825. Richard also reminded the Membership that the **PL for 2m is now 162.2**.

**VE Report:** Dave-NO6NO reported (14) candidates took 22 elements with (9) techs, (4) generals and (1) extra passing.

**Drawing and Refreshments:** Jim-KD4BKZ and Tyghe (for absent WA8MPA) gave a report on drawing prizes and refreshments, respectively.

**OLD BUSINESS:**

**Bob-K6UDA** is still looking for volunteers for the SFARC Swap meet set for March 14, 2015. Please contact Bob if you are interested in serving your Club at this event.

**Richard-WA6RWS** reported receiving a donation from Western States of \$400 to SFARC for use of the 2m repeater and Club volunteers for the Tevis Cup event. A motion by Bob-N6EMS, 2<sup>nd</sup> by Jim-KD4BKZ to deposit the full amount to the repeater fund; the motion passed unanimously.

**General Elections:** Ballots were cast, collected, and counted by the Elections Committee. Results of the election were as follows:

- President: Tyghe-KD6MLH (2<sup>nd</sup> term)
- Vice President: Bob-K6UDA (1<sup>st</sup> term)
- Secretary: Bruce-K6BAA (1<sup>st</sup> term)
- Treasurer: Richard-WA6RWS
- Director #3: Birton-N6UG (1<sup>st</sup> term)

**General Announcements:** The Club Net meets every Thursday's at 7:30pm; Board and General meetings occur on the 2nd Friday, Board is held at **Round Table Pizza** in on Elm Avenue at 6pm (location subject to change – see the Yahoo! Groups event calendar), and General meetings at 7:30pm at **Auburn City Hall**. The Club breakfast is held on the last Saturday at **Mel's Diner** in Auburn; an Elmer Net is held every 1<sup>st</sup> and 3rd Wednesday night at 7:30pm on the 2m repeater. See **www.w6ek.org** for more information.

**Tech-10:** No presentation was scheduled, however Richard-AA6RS displayed a transistor tester he bought and assembled that provides a 1-button test for any transistor, capacitor, and other electronic components. The tester runs from a 9v battery and allows insertion of the device under test in any orientation. Search for item **#171305716456**.

The meeting adjourned at 2104. Submitted by Dennis–WU6X, Club Secretary



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**2015 MEMBERSHIP APPLICATION**

Name: \_\_\_\_\_ Call: \_\_\_\_\_ Class: \_\_\_\_\_ e-mail: \_\_\_\_\_  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Associate Name: \_\_\_\_\_ Call: \_\_\_\_\_ Class: \_\_\_\_\_ email: \_\_\_\_\_  
Phone: \_\_\_\_\_ Cellphone: \_\_\_\_\_ Application is: (Circle) New Renewal

**Dues / Donations:**

Membership: yearly*	\$ 22.00	Name Badge:	\$ 7.00	Yes (special name)_____
Associate: yearly*	\$ 7.00	Repeater Donation:	\$ _____	
Auto Patch Donation:	\$ _____	Newsletter Booster:	\$ _____	
Misc. Donation:	\$ _____	Christmas Donation:	\$ _____	ARRL member? (circle) Yes No
<b>TOTAL:</b>		<b>\$ _____</b>	<b>Please add \$1 if paying via PayPal</b>	

\*Prorated dues for NEW Members/Associates Only

July	\$ 20/6	October	\$ 14/3 + following year
August	\$ 18/5	November	\$ 12/2+ following year
September	\$ 16/4	December	\$ 10/1 + following year

OFFICE USE ONLY:

DO NOT WRITE BELOW THIS LINE

Date: \_\_\_\_\_ Treasurer: \_\_\_\_\_ Secretary: \_\_\_\_\_ Roster: \_\_\_\_\_

Payment: \_\_\_\_\_ Check Number: \_\_\_\_\_ Cash: \_\_\_\_\_ PayPal: \_\_\_\_\_