RF

ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. XLV NO. 9 P.O. BOX 3454, TUSTIN, CA 92781-3454 SEPTEMBER 2004

THE PREZ SEZ:

We will shortly be entering the last quarter of the year, and this means that we will be looking for volunteers to step up and participate in your club's activities. I believe that W6HHC will be running for the office of OCARC President next year, but what about the other offices? Think about your own participation, consider volunteering, it's only for a period of a year, and literally, only for a few hours a month.

I admit that I wasn't sure I could be a passable OCARC President this past year, but I am not kidding when I say it was a BALL. I really enjoyed doing it. But it could not have been done without everyone who gave of their time and effort, this is a tired and wornout platitude, but I have learned just how true it is.

Thank you all for the opportunity to participate, and thanks to all who participated. To all those whom I may have prodded too hard, or embarrassed in some way, please forgive and excuse me.

73,
Steve, ~~KG1BZ~~

now...
N1AB

CLUB REUNION & PARTY

Club members have been on the phone and sending emails trying to contact former members to invite them to the Club Reunion being held at the September meeting.

Many members have moved from the area and those that can't attend have been asked to send a short email comment, if they'd like, to be read or posted at the reunion.

Contacting everyone is almost impossible so if you know of a former member who we missed, please invite them yourself. So we'll have an idea of how many are attending, please also ask them to RSVP to:

bobaf6c01@w6ze.org

Members should be sure to attend and to greet our guests openly. We plan to have plenty of pizza and sodas for members and guests to enjoy.

ALEX, W6RE: SILENT KEY

Longtime member and past President Ralph Alexander, W6RE, passed away some months ago. The club only heard about it recently. Alex had moved to a retirement home in Tustin.

NEXT MONTH IS THE YEARLY

OCARC AUCTION

See Page 7 for rules and details.

SEPTEMBER PROGRAM:

At the September meeting we're trying something new. We're having a **REUNION** for our past members. Be sure to come and meet some of our former members and see what they're up to today. Pizza will be served and we'll also read some emails from former members who have moved out of the area. Be sure to attend; and please make our guests feel right at home. The meeting will be at the usual place and time. See you all there! **Wear your badge!!!!**

The next regular meeting will be:

Friday, Sept. 17th 2004 @ 7:00 PM

We will be meeting on the 2nd floor in the east bldg.

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Next Club Breakfast & Open Board Meeting Sat. Oct. 2nd 2004

THE ORANGE COUNTY AMATEUR RADIO CLUB, INC.
P.O. Box 3454, Tustin, CA 92781

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Bob Buss, KD6BWH
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kd6bwh@aol.com

Monthly Events:

General Meeting:
Third Friday of the Month
At 7:00 PM
American Red Cross
601 N. Golden Circle Dr.
(near Tustin Ave & 4th St)
Santa Ana, CA

Club Breakfast:
First Saturday of the month at 8:00 AM
CowGirl's Cafe, Too
2601S. Harbor Blvd.
(just south of Warner)
Santa Ana, CA

Club Nets (Listen for **W6ZE):**

7.086 MHz CW **OCWN**
Sun - 9:00 AM - 10:00 AM
Rick KF6UEB, Net Cntl.

28.375± MHz SSB
Wed - 7:30 PM - 8:30 PM
Bob AF6C, Net Control

146.55 MHz Simplex FM
Wed - 8:30 PM - 9:30 PM
Bob, WB6IXN, Net Control

VISIT OUR WEB SITE
http://www.w6ze.org
for up-to-the-minute club information, the latest membership rosters, special activities, back issues of ***RF***, links to ham-related sites, vendors and manufacturers, pictures of club events and much much more.

Club Dues:
Regular Members $20
Family Members* $10
Teenage Members $10
Club Badge** $3

Dues run from January thru December & are prorated for new members.

*Additional members in the family of a regular member pay the family rate up to $30 per family.

**There is a $1 charge if you'd like to have your badge mailed to you.

Meteor Showers

by: Bob Evans, WB6IXN

Whether you like meteor skip, or, just watching a meteor shower, check out the list below for your next heavenly event! Remember, meteors radiate out in all directions from a point within the constellation mentioned below:

NAME	BEGINS	ENDS	CONSTELLATION
Quadrantids	Jan 3	Jan 4	Big Dipper,Bootes
Lyrids	Apr 19	Apr 22	Lyra,the Harp
Aquarids	May 1	May 13	Aquarius, water bearer
Perseids	Jul 27	Aug 17	Perseus, son of Zeus
Orionids	Oct 15	Oct 25	Orion, the Hunter
Taurids	Oct 26	Nov 16	Taurus, the Bull
Leonids	Nov 15	Nov 17	Leo, the Lion
Geminids	Dec 9	Dec 13	Gemini, the Twins

Best times to observe:		Maximum
Quadrantids	2 am, northeastern sky, Jan 3 & 4.	Jan. 3
Lyrids	1 to 2 am, slightly east of overhead.	Apr. 21
Aquarids	2 to 3 am, eastern sky.	May 4
Perseids	2 am, northeastern sky.	Aug. 11
Orionids	1 am, east-southeastern sky.	Oct. 20
Taurids	1 am, overhead.	Oct. 31
Leonids	2 am, eastern sky.	Nov. 16
Geminids	1 am, overhead.	Dec. 13

At present, the Perseids and the Geminids are among our richest meteor showers!

2005 RF EDITOR WANTED:

The Orange County Amateur Radio Club is looking for an Editor for next year's RF. Please consider taking on this interesting and rewarding job.

Here are some tips I've learned (sometimes by the hard way!) to make the paper look professional:

1. Limit your use of fonts. This paper normally uses only two fonts, Helvetica and Century Schoolbook, except for special circumstances.

2. Use only one space between sentences. Modern word processors recognize the space between sentences and adjust internally.

3. Choose a good layout program. I use AppleWorks® (it is available for Windows® too). I have tried Word®, but was always fighting the auto-formatting. Adobe® and Macromedia® make excellent layout programs. Choose one you'll feel comfortable with and learn it!

4. Be consistent! Choose a format, font size, continuation style, etc. and stick with it. Don't change font size for fit; change the spacing between paragraphs instead.

5. There are a lot more, tips and the former editors will be glad to assist you in keeping RF a paper the club can be proud of!

The Editor

PHOTOS FROM THE AUGUST MEETING

Left: Dino Darling, K6RIX, answers questions after his video presentation on the guy-wire change-out at KFI.
Right: Carl, WA6BSV, kneels by his new possession, an actual guy-wire insulator from the KFI tower. Dino donated the over 100 lb. door prize to our monthly raffle. (Photos by AF6C)

Bob's TechTalk #32
by Bob Eckweiler, AF6C

Oscillators

If we're going to build a code practice oscillator (CPO), perhaps we should first discuss oscillators. An oscillator is a device that puts out a periodic wave. This periodic wave can take the form of a sine wave, a square wave or something in between. The main requirement is that the wave repeats continuously. Normally oscillators only have an output and no input. Some oscillators have controlling or syncing inputs, but we'll not concern ourselves with these in this discussion.

What makes an oscillator work? Let's look at Figure 1A. It consists of an amplifier with a gain of 10 and is powered by a +15 volt power supply. The voltage output of this amplifier will be 10 times the input voltage. Because of the size of the power source, the output cannot exceed 15 volts nor be negative (less than zero volts). If the input is increased beyond 1.5 volts then the output will reach 15 volts and stay there; this condition is called *cutoff*. Also, if the input is decreased below zero volts (to a negative voltage) the output will stop at zero; this condition is called *saturation*. See Figure 1B.

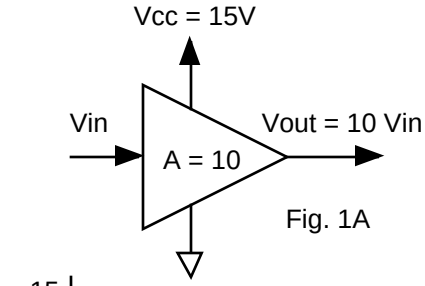


Fig. 1A

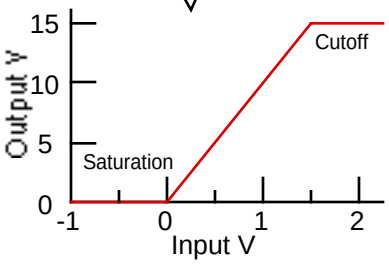


Fig. 1B

(The terms cutoff and saturation refer to the state of the output transistor in the amplifier)

Now, let's connect the output to the input through a resistive attenuator that has an adjustable loss of between nine and eleven. This attenuator provides a *feedback* path from the output to the input. See Figure 2A. Assume for each of the following examples that the initial input to the amplifier is one volt (resulting in ten volts output).

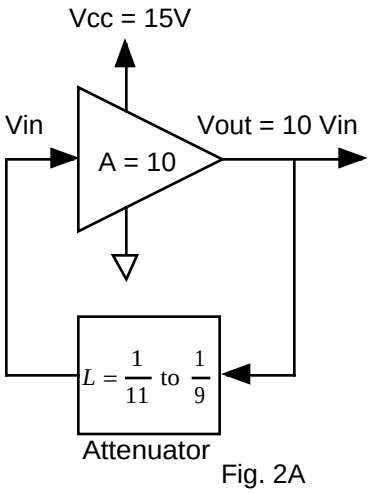


Fig. 2A

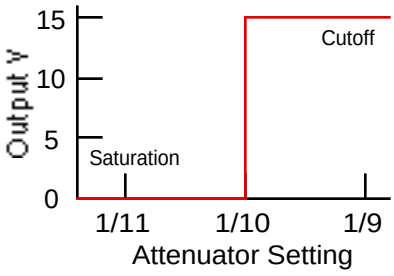


Fig. 2B

If the attenuator is set to a loss greater than ten, then the output voltage will drop to zero (saturation) since the amplifier gain is not enough to make up for the loss in the attenuator.

Likewise, if the attenuator is set to a loss less than ten, then the output voltage will increase to 15 volts (cutoff) since the amplifier gain is greater than the loss in the attenuator.

Should the attenuator be set to ten, then the gain and attenuation will be equal and the output voltage will remain at 10 volts. In the real world this is a very unstable situation since any slight change in gain or attenuation will result in the output moving to one of the two stable states. These are called *latched states*, The steep slope shown in Figure 2B represents the unstable point at an attenuation of 1/10

Let's replace the attenuator with a phase-shift network. We've discussed phase shift networks in a prior ***Techtalk*** column. Our network is designed to have a phase shift of 360° at the design frequency; this is equal to a phase shift of 0°. At the design frequency this network also has a known loss. If the amplifier gain is set near the network loss and some sort of a starting pulse is input to the amplifier, one of three things will occur:

If the gain is less than the network loss, then the output will briefly oscillate at the design frequency with decreasing amplitude until it dies out.

If the gain is higher than the network loss, then the output will oscillate at the design frequency with increasing amplitude until the peaks cause cutoff and saturation resulting is a distorted (almost square) waveform.

However, if the gain is the same as the network loss then the output will oscillate at the design frequency and produce a near sinusoidal waveform. The amplitude will depend on the initial starting signal. Once again, this is a very unstable condition and any small change in conditions will result in one of the preceding conditions.

In order to make real world oscillators stable in amplitude, the gain is usually set near what is required for continuous oscillation, and some special circuit or condition is designed into the oscillator to constantly correct the gain. A good example is a Wein-bridge oscillator[1] that uses the changing resistance of a small lamp to keep the gain (and thus the amplitude) stable.

A real-world way to start an oscil-

lator is also required. Sometimes a special starting circuit is used, but commonly the circuit relies on noise from our imperfect world to start the oscillations. The higher the initial amplifier gain the faster the oscillator will start.

There is a large variety of oscillator circuits that have been designed. Each consists of at least one amplifier and feedback network.

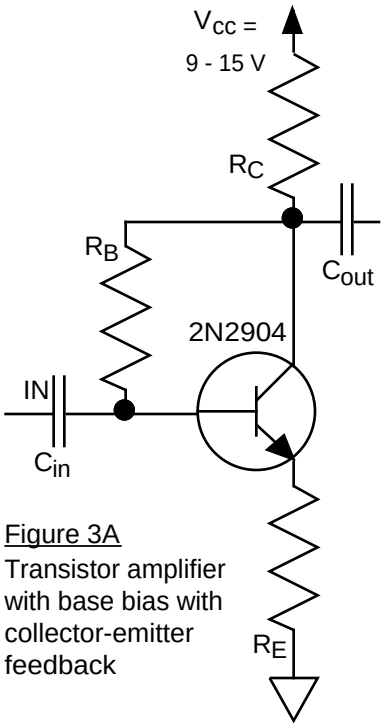


Figure 3A
Transistor amplifier with base bias with collector-emitter feedback

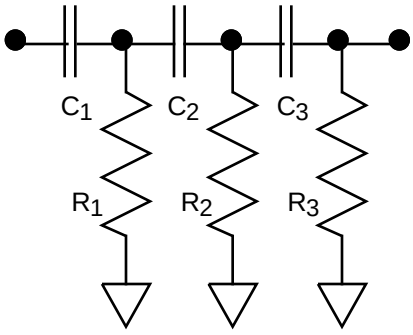


Figure 3B
Three stage high-pass phase-shift network

I've chosen to use a phase-shift oscillator as the oscillator for our CPO. It consists of a single transistor amplifier and a three stage phase shift network. Let's look at the amplifier first. It's schematic is shown in Figure 3A. The circuit uses an easily obtained 2N3904 NPN transistor in a common emitter configuration with base bias.[2] The resistors are selected so that the amplifier, with no input, has a collector voltage Vc of about 1/2 of the supply voltage Vcc. The 2N3904 commonly has a beta of more than 100 and the gain of the stage is set by the emitter resistor which is chosen to provide enough gain to cover the loss in the phase shift network and then some. Our amplifier has one other important trait. A positive signal at the input will result in more current flowing in the transistor and in R_C. This will result in the output voltage decreasing. Our amplifier thus provides a phase shift of 180° and our phase shift network must only provide an additional 180° of phase shift at the desired frequency of oscillation.

The network used in phase shift oscillators is commonly made up of either three or four high (or low) pass RC networks (Figure 3B). For our design, high pass filters will be easier to integrate with the amplifier circuit as we'll see. If each RC network contains components of equal values then each RC network will provide 60° of phase shift (or 45° if four networks are used) at the frequency of oscillation. Unfortunately, since the RC networks interact with each other you cannot just use the single network values to get the proper R and C, nor can you add the individual RC network losses together to get the total network loss. That requires some complicated matrix mathematics to solve.[3] However, the answers are simple and we'll keep it simple. For a three stage phase shift network the equations for frequency (f) and loss (A) are:

$$f = \frac{1}{2\pi RC\sqrt{6}}$$

$$A = \frac{1}{29}$$

Now let's connect the two devices together; See Figure 4. Notice that the input capacitor of the amplifier is replaced by one of the capacitors in the network. Also notice that the third resistor (R3) in the network has been removed. We will rely on the input resistance of the amplifier for that resistance. This needs to be taken into account in the design of the amplifier and in selecting R. Since the three RC networks need not be identical, R1 and R2 can be adjusted by trial and error to compensate for the input impedance.

Once the circuit is built, the gain is adjusted by varying R_E until the circuit just oscillates. This corresponds to an amplifier gain of 29. The output should be sinusoidal and have a peak-to-peak voltage almost as large as Vcc. If the gain is reduced the oscillations will stop and if it is increased the waveform will distort. The gain should be increased from the initial point until distortion is noted on the waveform and then backed off slightly till the distortion vanishes.

If you've been following along, you must be asking yourself how the gain is controlled to prevent the instability mentioned previously. The beauty of this circuit is that gain control is built right into the circuit. If you breadboard the circuit you'll notice that the amplitude peaks are near Vcc and zero. As the output of the amplifier approaches saturation and cutoff, the gain decreases. If the gain isn't set too high, this decrease is enough to stabilize the oscillator. This does add some distortion to the sine wave, but if the bias point is set close to midway so that both cutoff and saturation influence the gain, the distortion is minimal.

One other thing needs to be taken into account. The circuit, as shown, is operating without a load. If you want to do something useful with the signal you must couple the output to another circuit. This load will affect the AC gain of the amplifier. The gain should be readjusted with the load connected.

[1] footnotes appear on page 6

Table 1 gives component values for a phase shift oscillator that operates at about 1 KHz. It will run off of a 12V supply or a nine volt battery, and it draws only a couple of milliamps. Breadboard one up and play with it.

Next month let's look at an audio amplifier that will allow us to drive a small speaker with our oscillator.

Table 1.
Component values:

R_1, R_2	13KΩ 5%
R_B	510KΩ 5%
R_C	4.7KΩ 5%
R_E	250Ω trim pot
C_1, C_2, C_3	0.005 µf
C_{out}	0.022 µf
Q_1	2N3904 NPN

All resistors are 1/4 watt or larger (carbon film preferred)

All capacitors are disk ceramic type, though mylar, polyethylene or paper should work as well.

Experiment with what's in your junk box.

Notes:

1 **See any recent ARRL handbook for information on the Wien-Bridge Oscillator.**

2 **A good reference on transistor biasing is: *Transistor Circuit Approximations* by A.P. Malvino, McGraw-Hill, 1968.**

3 **I'd be glad to email the derivation to anyone interested.**

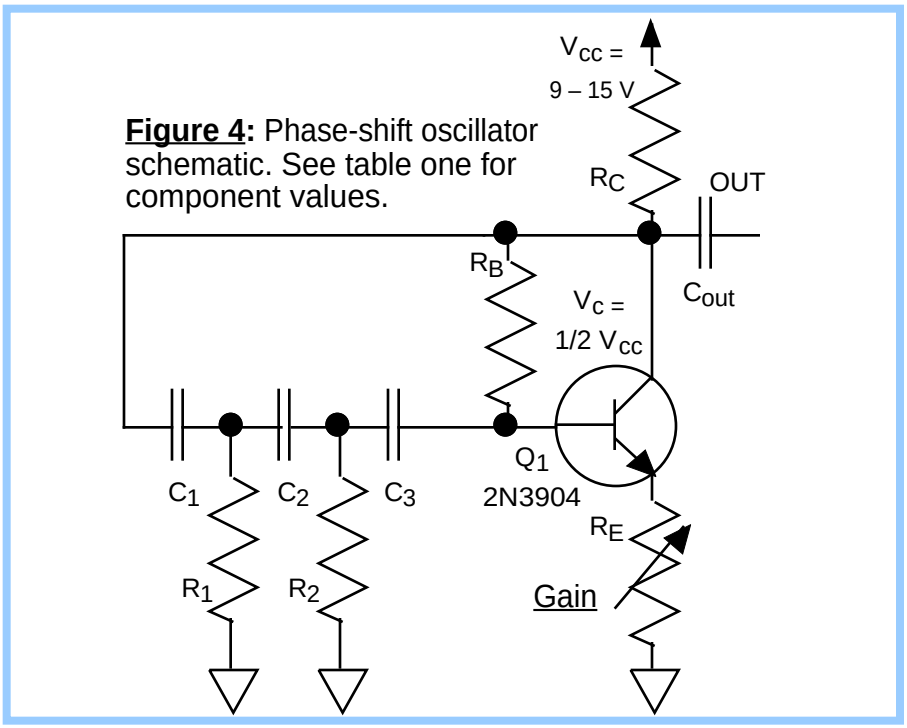
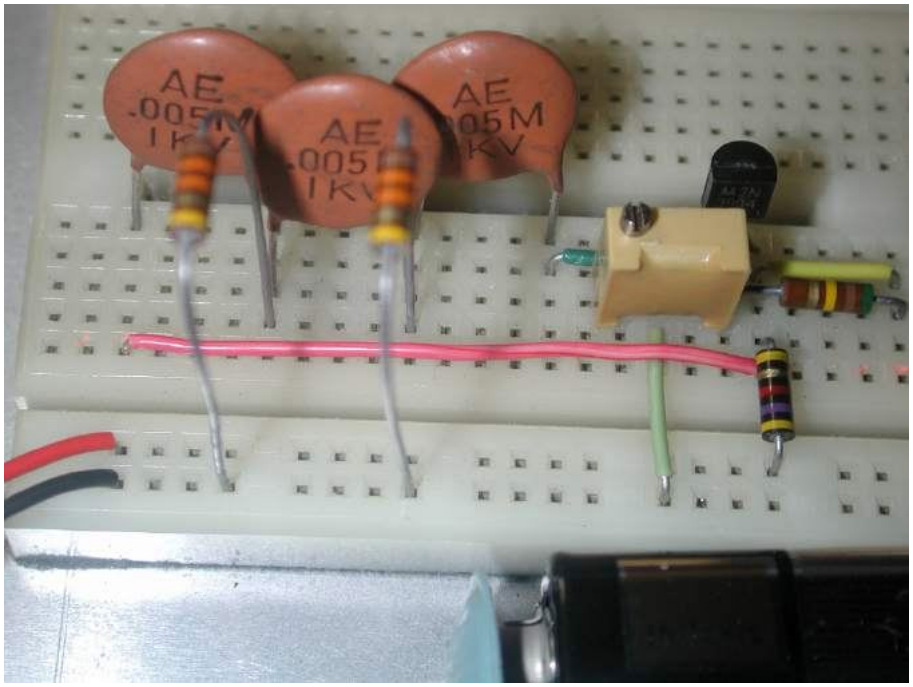


Figure 4: Phase-shift oscillator schematic. See table one for component values.



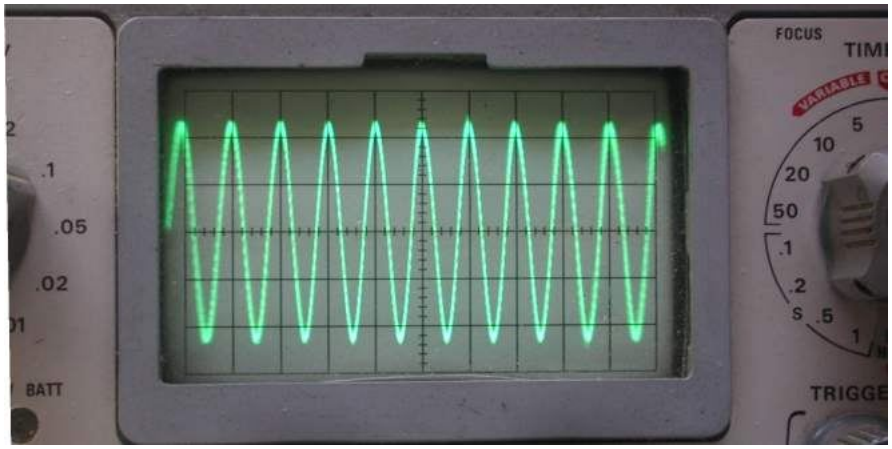


Figure 5: (Top) Is a photo of the breadboarded phase-shift oscillator. Q_1 is at the right immediately above the caramel colored trim pot (R_E). The Dark object to the lower right is a nine-volt battery.

Figure 6: (Right) is a scope picture of the oscillator's waveform. Vertical gain is 1V/div and the timebase is set at 1mS/div.

the Annual W6ZE Ham Radio Auction

Presented by the Orange County Amateur Radio Club, W6ZE

Friday Eve. October 15, 2004

The auction will be held at the American Red Cross Building, 601 N. Golden Circle Drive in Santa Ana. A map is posted at http://www.w6ze.org/MtgSiteMap.gif

For complete details & some of what will be auctioned, or to list what you will bring to sell, see our website at www.w6ze.org

or phone Ken (714) 744-0217 or Bob (714) 639-5074

You need not be a member to buy or sell.

Let's make it a good one. Turn your junk into someone else's treasure and into your cash.

Let your cash turn someone's junk into your treasure.

Auction Rules

The OCARC Annual Auction will take place on Friday evening, October 15th, 2004, at 7:00 PM at the American Red Cross facility located at 601 N. Golden Circle Drive, Santa Ana. The room will open at 6:00 PM to allow registration, set-up and viewing. All buyers and sellers are welcome. The following rules for the auction will be in effect:

1) Only Ham Radio or electronic equipment/items will be auctioned (that is: no fishing equipment, etc.)

2) Buyers and Sellers must register at the door with the OCARC treasurer. There is NO registration fee.

3) Only 3 items from a Sellers lot will be auctioned during each turn. After auctioning 3 items, the auctioneer will move on to the next lot. After the first 3 items from every lot have been offered for bidding, the auctioneer will start the second round of auctioning with the next 3 items in Lot #1.

4) Sellers should number each item in their lot. A tag should indicate the minimum bid they expect.

5) Auction bidding will take place at the following minimum increments:

A. $0.00-to-$5.00: increments of $0.50.
B. Over-$5.00-to-$50.00: increments of $1.00.
C. Over-$50.00-to-$100.00: increments of $5.00.
D. Over-$100.00: increments of $10.00.

6) Payments for purchased items are due at the end of the auction and shall be by cash or check with the appropriate ID. No two-party checks or credit cards are allowed. Disbursements to the Sellers will be by OCARC check only. Sellers will be charged 10% of the selling price for items sold by OCARC.

7) A special table will be set up for donated items. The proceeds of donated items will go to the OCARC.

General Meeting Minutes:

August 21, 2004

President Steve, KB1GZ, called the meeting to order at 7:18 PM. President Steve introduced the guest speaker, Dino Darling, K6RIX, who gave a very interesting presentation about the changing of the guy wires on the KFI radio station tower. His video, verbal description and the items he brought were more than enough to describe how dangerous (and exciting according to Dino, if you call being 750 feet in the air in a basket exciting) this job was. He brought an insulator to be included in the Good of the Club raffle and Carl, WA6BSV, was the lucky winner.

Roll Call: Ken, W6HHC; Matt, K6LNX; Elmer, WA6PFA; Lowell, KQ6JD and Larry K6LDC were board members not in attendance.

Treasurer's Report: Treasurer Bob Buss, KD6BWH reported there was $2,360.72 in the club bank accounts.

Communications: There was no new communication to be read and there was no Old Business.

New Business: Bob A6FC reported a concern that those signing up as interested in the club on the web site are not getting follow up contacts. It was decided this subject would be discussed at the next board meeting.

The September meeting will be a reunion and is being headed up by Bob, A6FC.

Meeting adjourned at 8:32 PM.

Respectfully submitted
Rich Helmick
KE6WWK
Secretary

Board Meeting Minutes:

September 4, 2004

Due to The Labor Day holiday and the large board participation at the Orange Street Faire no Board meeting was held.

KD6XO, K6LNX, KD6BWH, AF6C WA6BSV and W6KFW met at Cowgirls Two for a pleasant breakfast. Informal discussion of the planned September reunion was discussed.

de Bob, AF6C

Next RF Deadline: Oct. 4th

ORANGE COUNTY AMATEUR RADIO CLUB, INC
P.O. BOX 3454
TUSTIN, CA 92781-3454

First Class Mail

Time Dated Material.
Please Expedite!!