Welcome to SFARC, Auburn, CA

Sierra Signals

P.O. Box 6421   Auburn, CA 95604   **July 2013**   http://w6ek.org   info@w6ek.org

At The Key of SFARC:

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DIRECTORS
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Mark Graybill, W8BIT
Donna Naylor, W6CQX

FIELD DAY CHAIRMAN
Dave Albright, NO6NO

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 162.2)

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 CA - 8AM

NET CONTROL OPS
Dave Jenkins, WB6RBE
Gary Cunningham, KQ6RT
Norm Medland, W6AFR
Casey McPartland, W7IB

NEWSLETTER EDITOR
Barbara Anderson, W6EVA
916.624.1343
anderson51@starstream.net

WEBMASTER & ARRL PIO:
Carl A Schultz, WF6J

Happy 4th of July

Calendar:

Fri 12 July: Club Meeting

Sat 27 July: Club Breakfast

Sat 19 October: Cystic Fibrosis bike ride in the Newcastle area

Inside this issue:

- *The Loading Coil*
- *Field Day Photos*
- *LDGYT-100 Brand Specific Autotuner*
- *Miscellaneous Radio*
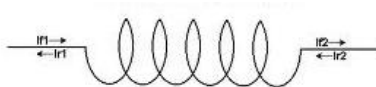- *Board & General Minutes*
- *Field Day Stats*

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

The Loading Coil

By Bob -K6UDA, President

Wow, another Field Day is in the books. This year, it was done in spectacular fashion. The weather was about as picture perfect as you could have asked for. There were tons of visitors, lots of new ham faces, 24 hrs of intense radio play and a meal fit for a king. Here's the rundown from a sophomore point of view.

Last year was my first field day. I was a new ham and inexperienced in the ways of the Jedi antenna slinger. I was enthralled with the sheer amount of hams on the air and worked as many as I could while trying to maintain body heat. This year, I ended up on the FD committee. Actually having a task to complete, I loaded up the Motor home early and headed out at high noon on Friday for setup day. I figured everyone would meet up between noon and 1300 hrs. As soon as I got under way, the chatter on the club repeater started. I was about a mile behind **Dennis WU6X**. **Richard WA6RWS, Bob WE6C, Robert W6RBL** and several others had already arrived and were busy erecting the portable tower.

Upon arrival, we got parked and immediately got busy hanging wires from tree tops, staking tents and vertical antennas, putting up tables, unpacking radios, and building an infrastructure small governments would be proud of. My proudest moment came with the inaugural shot of the pneumatic antenna launcher. I pumped up the can to 80lbs of air pressure, tied the fishing line to a weighted tennis ball, and packed it into the firing tube. A crowd gathered to watch the launch. I took aim over the treetops, pulled the trigger, and it sailed well over 150 ft vertical and several hundred feet down range. The ball stuck in a very tall pine about a hundred yards past the power lines outside of camp. It was a very impressive sight. I used about 25 lbs of air pressure for the remainder of the launches. Later that evening, we tested radios and antennas along with dinner and some BYOB beverages. It was a lot of fun just hanging out with the guys. Dennis spent the day and most of the evening setting up computers.

Saturday morning arrived early and at the crack of dawn guys started gathering at Dennis's camp for coffee and muffins. **Mike N6BRP** managed the survival food tent. Even with the no-show of disasterstuff.com, we had plenty of survival foods to sample. **Justin KJ6UVK** provided a bucket of muddy pond water which we filtered into crystal clear drinkable water. Many folks came by the prepper tents and sampled the goodies we put out. GOTA was a huge success. The perfect weather allowed travelers to stretch their legs and come see what all the hoopla was about. (Six meter) **Bob W6YVH** coached many new hams and non hams as they discovered the world of HF amateur radio. **Carl WF6J** manned the satellite station, plotting orbital passes of anything flying with a radio on board and **Dave NO6NO**, organized our first ever Field Day VE session where we gained a new ham.

Then, there was the main circus tent... **Bob WE6C, Dave NO6NO, Bob (2) N6EMS** and **Bruce K6BAA** provided the various radio gear to work 80,20,15 in all their different modes along with 2meter simplex operations. The tent was always filled and many different operators got a crack at the mic or keyer. I didn't get as much of a chance to operate as I would have liked to because I was running from station to station taking a few pictures, videos, and trying to keep things flowing. Dinner was absolutely wonderful. There was a huge variety of dishes, everything from Tri-Tip to ravioli, turkey & even solar stew.

After dinner I was able to work some QRP on my KX3. It wasn't easy busting all the 100 watt wonders throughout the country but I managed a 5/7 out of a New Jersey station and made a few other contacts before realizing size does matter and went back to the main tent to play until the almost wee hours working 20 & 40 meters.

A long list of thank you's

As fun as field day was, it wouldn't be an event at all if it were not for the hard work and planning of many club members. I have to say a very special thank you to **Dennis WU6X** for the incredible job he did with the computer system. To **Bob WE6C**, for supplying most of the main equipment used, and about 75% of the setup knowledge needed to pull this thing off. **Mike N6BRP**, I saddled you with something we've never tried before and you turned it from a bust to a fun little venue despite our main sponsor flaking and a general lack proper planning on my part. And one big "thank you" to the entire field day committee - **Dave NO6NO, Richard WA6RWS, George KG6LSB, Carl WF6J**, and everyone else who showed up on Friday to get dirty and make this day happen.

Next year, we host a hundred!

Mike Perry N9NMA has uploaded a video to YouTube:
http://youtu.be/c3NStufIHoE

See the website for
more photos!

LDGYT-100 Brand Specific Autotuner

By Dennis Gregory, WU6X

I've been borrowing an MFJ manual tuner (read knobs) from Chuck-AE6LR for Field Day for the past several years, and decided to buy one of my own this year, as it worked perfectly. So, I started poking around on the usual swap sites and this particular model must be in high demand, because after weeks of looking, those I found "previously owned" were only $25 less than a brand new one … no warranty either, and typically banged up a bit.

So, I was almost ready to buy a new one when I came across the subject of this article. Notice that I've added the wording "brand specific" to the title. That's because this tuner is specifically built to run only with my transceiver family, the Yaesu FT-857/897 and 100 radios. The reason being is that the tuner is powered off the +13V available at the CAT port of the radio.

Well, you guessed it … I bought one at a great price ($190), brand new, with a warranty for just a few dollars more than the MFJ manual unit I had been shopping for. Hooray! Christmas in April again! Don't you just love to see those boxes arrive on your porch with ham radio origins, like AES, Universal, HRO? Hmmmm?

So, as soon as I could get it un-wrapped, read the quick reference start-up instruction, fill it with gasoline, and connect the coax (did he say gasoline? Just checking if you are still with me …), I connected my 40m inverted V and tuned the FT-857D to 15m and pressed the ONLY control on the front panel … the TUNE button. The only other indicator, a RED LED, came on to let me know it was working and, in about 4 seconds, I had a 1:1 SWR on the inline SWR test meter. Awesome!

Here are the specs:
- RF Power: 1 to 100 watts SSB and CW, 30W on PSK.
- Latching relays for ultra-low power consumption
- Built-in CAT interface for Yaesu 857/897/100 radios Powered from Yaesu radio over CAT port.
- CAT thru port for computer radio control. 4800 baud
- 2000 memories sorted by frequency.
- 1.8 to 54 MHz coverage (coverage for MARS)
- Tunes 4 to 800 ohms. (16 to 150 on 6M)
- SO-239 in and out connections for dipoles, verticals, beams, G5RV, OCF, Cobra, etc.
- Size: 7.0"L, 7.0"W, 2.0"H; Weight: 20 ounces
- Includes CAT interface cable

Yes, it's small enough to go mobile and easily fits under the seat next to the radio … it's about the same size as the 857D. The single front panel button is used to select a stored previously tuned memory, a bypass mode, or completely re-tune and store a new frequency map. I haven't taken the cover off yet, so not sure how these guys are getting all that required tuner stuff into such a small box. This is hard to believe, as that is typically what I do with new electronics is look inside before I even plug them in … you won't believe what I've found that has saved me grief a few times (bits of loose solder, cold solder joints, small animals, etc.).

Anyway, this little tuner is highly recommended if you own one of the above transceivers. If not, LDG makes several brand-specific tuners for different radio brands/models, and may have one waiting on the factory shelf just for you!

MISCELLANEOUS RADIO

Coding and Ham Radio

Well, here we are again. By the time you read this, Field Day 2013 will be a memory [as will the Western States Run]. Last month, we sort of wandered through some of the preliminaries and looked at some pieces of data coding, much like wandering through a swap meet and picking up a few things at random. This month, we'll focus on one of the many aspects of information theory … Error Detection … what a receiver can do to validate that a data block was received without errors along the way.

Errors can arise in several places in the transmission path and from several causes. Noise, such as QRN in a radio channel is possibly the most obvious, but there are others too. Distortion in the channel, caused perhaps by overdriving an amplifier stage into compression or clipping, or a filter in the channel that is not wide enough to transmit the entire signal spectrum are two other common causes. Fading in a radio channel reduces the signal to noise ratio, effectively raising the level of random noise.

When transmitting binary data, the receiver receives the signal and has to make an either-or decision … the signal either represents a "1", or it represents a "0". There is nothing in-between, and because there are only two states and nothing in-between, it's called a "hard" decision[1]. The receiver decides that it has received a "0" and it is stuck with that decision for that bit. If that decision was wrong, that bit will be an error. Because of this hard decision making on the part of the receiver, we can employ a little Boolean algebra to build a model of a noisy channel and the errors it produces.


The Boolean operation is called "Exclusive-OR", and the figure to the left depicts it. It takes two bits as input, and produces an output of "1" only if the input bits are different. If the two input bits are the same [either 0 or 1], the output is a zero. The symbol on a logic diagram or schematic is the symbol here, and in a Boolean algebra equation, the "+" sign inside a circle is the notation. Indeed, XOR is sometimes referred to as "Boolean Addition."
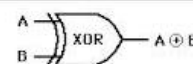
So, we have a stream of bits in the channel, represented by the string of 1's and 0's labeled "DATA" in the diagram to the left. We'll represent the noise in the channel by another stream of bits [ERRV], and the signal seen by the receiver is simply the Boolean sum [XOR] of the two streams of bits, bit-by-bit. This noise representation is usually called the "error vector," and wherever it contains a "0", nothing happens to the associated data bit. Where the error vector is a "1", it inverts the associated data bit creating an error … I made them red in the example and there are two error bits. If I want to simulate a noisier channel, I just add 1's to the error vector.

Some radio channels exhibit essentially random noise. These are often termed gaussian channels [for obscure reasons] and microwave, satellite, and ham – non-mobile - VHF/UHF channels are approximate examples. These correspond to randomly placed "1's" in ERRV. In other channels, the noise isn't randomly distributed but comes in bursts … sequences of 1's in the error vector. Mobile ham VHF/UHF and HF channels are examples of "bursty channels."

So, the problem for the system is to find some way that the receiver can use to determine if the data bits were received without errors. Now, there is no absolutely positive way to know that. That is, there exists no mechanism to know for certain, probability of exactly 1.00, that there are no errors in the received data.[2] But, we can make the probability as close to 1.00 as we choose, however the penalty we pay is adding more and more bits to the data block, reducing the effective data rate in the channel. How we make that decision in designing a data communications system is complex

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1   "Hard" as in "irrevocable" not "hard" as in hard to do.

2   You'll have to trust me on this one, but believe me, it is true

and depends, in part, on what the effect of a mistake would be.

If the stream of data is a digitized voice or video signal, it's not such a big deal. The mistaken bits will corrupt the sound or picture for a moment, but may not even be noticed. We're all used to occasional burps and hiccups on a cell phone call or an occasional pixel-freeze on a digital satellite TV signal. On the other hand, if the stream of data are commands to an unattended electrical sub-station, or even worse, commands to a roving vehicle on Mars or a satellite around Saturn, a mistaken bit could have dire consequences [e.g. a TURN LEFT command gets corrupted into a STOP AND CATCH FIRE command ☺].

Historically, error detection began on wire-line telegraph circuits by simply counting the words in a message and including the count in the header or preamble to the message text. We still do that today on the National Traffic System[3] where it is called the "check." Fairly crude, but, the messages are plain text and the receiving ham can do a great deal of error detection just by asking if this makes sense in English. During the Vietnam War, a huge number of messages were sent home by troops. They were aggregated from local in-country SSB and CW nets at Bien Hoa AB [AI8AB] where they were cut on punched tape and transmitted on RTTY via Elmendorf AFB in Anchorage AK [AK1AIR] to the CONUS. The MARS standard was to include the word count "check" in the header, and at the bottom of the message, insert a line or two that had just each of the number groups and any strange names, in the order in which they occurred in the message. This was based on the premise that if "1234 MAIN ST" got corrupted to "1234 PAIN ST," the delivering station could likely figure it out, whereas if "1234" became "6234," he probably couldn't. It was very effective, but of course these messages were not commands to a spacecraft. ☺

As computers arrived on the scene, the first error-detection scheme was fairly simple. It was called a "checksum" and it worked as follows:

	Data Bytes
	082
	149
	185
	157
	215
	215
	114
	147
	101
	231
	104
	080
	086
	092
	216
	158
	236
	218
	177
	091
Sum	3054
Checksum	238

Let's say you are going to write the string of 8-bit data bytes at the left in a block onto a magnetic tape. I created these in Excel, they are random, and none exceed 255 so they can each be represented in 8-bits. To form the checksum, I just add them all up which comes to 3054. That is way too big to be represented in an 8-bit byte. Two schemes were used to get around this problem and for both, the checksum was written to the tape at the end of the data block. The process was repeated when the data were being read back from the tape, and if the sums agreed, the block was declared error-free.

The simplest was to just let the addition overflow the 8-bit byte which discarded all of the overflow bits. What was left was an 8-bit checksum[4] which was written to the tape at the end of the block. In the more complex method, the full sum was separated into 8-bit bytes and written sequentially after the data block.[5]

In either case, the checksum is not foolproof. The full sum will detect all 1-digit errors in my little list because if you change any one digit in the block the sum will be different. It will not detect all 2-digit errors however. If the "231" got corrupted to "230", and the "185" became "186", the sum would be the same.

The checksum is even worse. Because I've thrown away all those overflow bits when I added everything up, there are potential 1-digit errors that will yield the same checksum, and the probability of that being true increases as the block of bytes gets longer.

Nevertheless, a checksum is a form of error-detection, and like all such schemes, it involves adding additional information to the basic data stream. That information is derived from the data stream, it adds overhead to the communications channel, but it may increase throughput since the receiver can ask for a repeat right away if it detects an error.

CRC-16: Many of the disadvantages of the checksum can easily be overcome if we turn to a bit of mathematics. We'll

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3   Yes, NTS is still alive … if not totally "well." Try 3533KHz at 1900 local for NCN1. I'm NCS on Wednesdays. ☺
4   What's left after all the adding is the total sum divided by 256, discarding the quotient and keeping the remainder
5   This was not prevalent because it placed constraints on how long a data block could be, and it didn't buy much more in the way of effectiveness.

do the math in words, it's called a Cyclic Redundancy Check. It's a Redundancy Check because, like a checksum, it creates bits from the data stream which are added to the stream but do not add any new information. It's Cyclic because it is derived from a class of codes in which you can circularly shift any code word any number of bits in either direction [i.e. an end-around shift], and you'll always get another code word. The end result of all this coding drivel is that a true CRC with n bits is guaranteed to detect <u>all</u> errors up to n bits in the block. Substantially more useful than a checksum.

A CRC is quite simple to generate in binary hardware using the Linear Feedback Shift Register we used quite awhile back to build a digital FIR filter. The concept is pretty simple and amounts to treating the block of data bits as if they were a polynomial [the polynomial form for 1011 is x^3+x+1, the x^2 term is missing because of the "0"] and "dividing" it by a specific polynomial. You ignore the quotient, and the remainder is the CRC which is appended to the data block. The receiver does exactly the same thing only it includes the CRC at the end of the block in the division. If the answer is zero, you are guaranteed that, if there are errors in the block, there are n or more of them where "n" is the length of the CRC. You can think of the CRC as the binary value appended to the data block that will make the answer "zero" when the CRC is calculated by the receiver.

There are a large number of CRC's differing in length and divisor polynomial. A very common one is called CRC16-ANSI. Its divisor, in binary, is 1010000000000001. It was adopted by IBM fairly early and used for error-detection on disk drives, magnetic tape drives, and their Bi-Sync communications protocol, and became an ANSI standard. Another is CRC15-CCITT with a divisor of 0001000000100001 which is the CRC that is part of Amateur AX.25 packets.

Why are there so many CRC's I hear you ask? [if you didn't ask, pretend you did]. The answer is partly mathematical and partly human nature. Different communications channels and their applications are optimized with different length CRC's. CRC1 is just a parity bit, commonly used in random access memories. CRC5 is used in the ubiquitous USB interface, it's a trade off between detection capability vs. added length of the data blocks. Ethernet, ZIP files, one of the MPEG's, and a host of others use one of a number of CRC32's. That's the mathematical reason.

The human reason is that some companies wanted to keep theirs proprietary, and even resorted to reversing bit order, inverting the CRC [all 1's become 0's and vice versa], and other feeble attempts to conceal their CRC's as trade secrets. Alas, CRC's are derived from cyclic codes, you can reverse-engineer <u>**any**</u> cyclic code from its set of code words, you can see all of them just by feeding the company's device different data words and looking at the output, and none of this is at all hard. ☺ They probably should have hired a mathematician. ☺

73,

Fred K6DGW

BOARD OF DIRECTORS MEETING MINUTES
June 14, 2013

The SFARC Board meeting for June commenced at 1800 hours at Round Table Pizza in Auburn.

Roll Call: President Bob Brodovsky-K6UDA and all officers and Directors were present except for Vice President-NO6NO and Board member Donna-W6CQX. Also present were PIO Carl-WF6J, Jim-WA8NPA, and guests Bob-WB6VYH, Al-NI2U and Dave-N6SHD. A quorum was not present so no official business was presented or voted on.

REPORTS and DISCUSSIONS

President's Report: Bob-K6UDA discussed an invitation to participate in Patriot's Day at William Jessup University, Aug 3 @ 10a to 5p; the Board agreed to bring it to the Membership for interest/discussion.

VP's Report: no report.

Secretary's Report: Dennis-WU6X reviewed the Field Day slide presentation planned for the General meeting with FD Chairs who will be presenting.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at beginning of May as $6,656.95; expenses of $87.58; income of $469.14 and balance of $7,038.51.

Repeater Report: 2m repeater working well with a few anomalies in the 220 box. Richard to investigate.

VE Report: no report due to absence.

Web/PIO Report: Carl-WF6J covered publicity for FD and handouts to be available at Field Day.

Refreshments: Jim-WA8NPA reported that income for refreshments at the meeting has been minimal, not really meeting expenses. The Board instructed Jim to simply remind people that a donation is appreciated (but not mandatory) to help cover the cost of refreshments at the General meeting.

Meeting adjourned at 1830 hours. Submitted by *Dennis Gregory-WU6X, SFARC Club Secretary*

GENERAL MEETING MINUTES
June 14, 2013

The SFARC General meeting for June commenced at 1930 hours at the Auburn City Hall Rose Room, President Bob Brodovsky-K6UDA presiding. All Officers and Directors were present except for Vice President-NO6NO and Board member Donna-W6CQX; also present were PIO Carl-WF6J and Field Day Committee Chairs. Bob led approximately 49 members and guests, along with distinguished ARRL Section Manager Ron Murdock-W6KJ, in a Pledge of Allegiance to the flag followed by an introduction of Officers, members and guests.

REPORTS:

Past minutes: The minutes of the past meeting as posted in the Newsletter were approved as submitted on motion by Jim-WA8NPA and 2nd by Al-NI2U.

President's Report: Bob-K6UDA reported on an opportunity we received via email to participate in Patriot's Day at William Jessup University on August 3rd, 10am to 5pm. Dick-WB6EDR volunteered to lead the group interested in participation.

VP's Report: No report due to Dave-NO6NO's absence.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at beginning of May as $6,656.95; expenses of $87.58; income of $469.14 and balance at the end of May of $7,038.51. Richard also spoke about how the Newsletter is distributed and asked members not getting a copy to contact him.

Secretary's Report: Dennis-WU6X reminded guests and new members to pick up a "Welcome Letter" during the break.

VE's Report: No report.

Repeater Report: Richard-WA6RWS reported on some intermittent issues between 2m and the 220 box linking. He plans to investigate this week, but due to the intermittent nature of the problem it has been hard to track down. Also, Richard reminded people trying to talk through the repeater with a hand-held to setup an outside antenna, as there has been many very weak signals coming through lately. Also, "kerchunking" of the repeater is discouraged, and is actually illegal by FCC rules; people keying the repeater to check signal strength are reminded to identify when doing so, or simply ask for a signal report.

Satellite Report: Greg-KO6TH reported on operations planned by the International Space Station for Field Day-2013. Frequencies are 145.800 down and 144.490 up.

Sunshine Report: Nothing to report

Refreshments and Drawing: Refreshments Chair, Jim-WA8NPA reviewed the "eats and drinks", and Drawing Chair, George-KG6LSB reported on items available for the drawing.

ARES Updates: Chuck-KG6FFK reported on the success of the June 11th exercise and the mutual aid experience that helped make the exercise a success and an excellent learning experience. Chuck presented Al-NI2U with a certificate of appreciation for his support to EOC.

OLD BUSINESS:

Field Day Pins: Dick-WB6EDR reminded members that Field Day pins will be presented to members who ordered them at the FD site ONLY. There are a few extra pins that will be made available on a first-come/first-served basis.

FD T-Shirts: T-shirts were distributed to those in attendance who ordered them. Others available will be handed out at the Field Day site. A few extras were made available at the meeting for sale to the Membership.

Upcoming Support Opportunities: George-KG6LSB reminded the Club of the upcoming Cystic Fibrosis support opportunity on 19 October. Contact George to volunteer or for more information on the event. Patriot's Day at William Jessup University on August 3rd, 10a-5pm; interested persons should see Dick-WB6EDR who is coordinating SFARC

(Continued from page 11)

participation in the event.

NEW BUSINESS:

Section Manager: Ron Murdock-W6KJ acknowledged ARRL life members in the Club and annual renewal members. Ron reported on ARRL mail being temporarily discontinued due to spam problems. Ron reminded the membership that we have a "card checker" in attendance, Bob-WB6VYH and encouraged members to use this service to confirm contacts for awards.

General Announcements: The Club Net meets every Thursday's at 7:30; Board and General meetings occur on the 2nd Friday; Board is held at Round Table Pizza at 6pm, and General meetings at 7:30. Club breakfast (last Saturday), the "Prepper Net" and the Elmer Net are held on opposite Wednesday nights at 7:30pm. See W6EK.org for more information or date changes.

Tech-Ten: no Tech-Ten due to Field Day presentation planned, but "show-n-tell" items included Bob's Elecraft KX-3 and portable HF antenna, and Jim's (WA8NPA) RigExpert HF antenna analyzer.

Presentation: Field Day committee Chairs conducted a PowerPoint presentation of Field Day areas of interest, with site logistics getting the most feedback from the Membership this year due to the large attendance expected and concern for available space. Each chair discussed their respective area of responsibility (equipment, site, publicity and food).

The meeting adjourned at 2130 – Submitted by, Dennis – WU6X, Club Secretary

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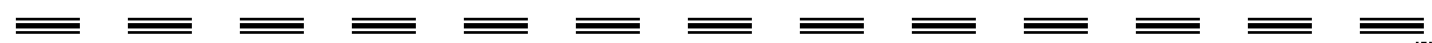
These are the final stats from the logging software with all individual logs entered. This does <u>not</u> include ANY bonus points

Total Contacts = 585
Total Points = 809 (bonus not yet calculated)

Operating Period: 2013/06/20 16:01 - 2013/06/22 22:57

Total Contacts by Band and Mode:

Band	CW	Phone	Dig	Total	%
80	0	28	0	28	5
40	49	164	6	219	37
20	141	130	2	273	47
15	26	31	0	57	10
6	0	8	0	8	1
Total:	216	361	8	585	100

SIERRA FOOTHILLS AMATEUR RADIO CLUB
P.O. Box 6421, Auburn, CA 95604

SIERRA FOOTHILLS AMATEUR RADIO CLUB   **2013 MEMBERSHIP APPLICATION**
P.O. Box 6421, Auburn, CA 95604

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:	$_____	ARRL member? (circle) Yes No
		TOTAL:	**$_____**	**Please add $1 if paying via PayPal**

*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

Rev. Nov 2012