



Sierra Foothills Amateur Radio Club

<http://www.sf-arc.org/>

JUNE 2010

PO BOX 1005. NEWCASTLE. CA



At the key of SFARC

OFFICERS

PRESIDENT

Al Martin, NI2U
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VICE PRESIDENT

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n6gp4900@sbcglobal.net

REPORTERS

Satellites: Greg, KO6TH
History: Gary, KQ6RT
Misc Radio: Fred, K6DGW
Sunshine: Richard WA6RWS
rkuepper@ymail.com
916-482-5027

RESOURCES

REPEATERS

145.430 (-0.6 MHz/PL 162.2)
440.575 (+5.0 MHz/PL 94.8)
223.860 (-1.6 MHz/PL 100.0)

CLUB NET

Thursdays, 7:30PM, W6EK/R
145.430

CLUB MEETINGS

Second Friday of the month,
7:30PM at the Library, 350
Nevada St, Auburn CA

CLUB BREAKFAST

Last Sat of the month at
Susie's Café, Cirby at Riversic
Roseville - 8:00 AM

NET CONTROL OPS

Dave Jenkins, WB6RBE
Gary Cunningham, KQ6RT
Norm Medland, W6AFR

NEWSLETTER EDITOR

Matthew Diridoni, KC6RUO
916-749-3032
mattteod@comcast.net

S

F

A

R

C

SPECIAL SERVICE CLUB

Calendar of Events



June 26 & 27 **ARRL Field Day**

September 11 **Third Annual Sacramento Valley Hamfest**
Lincoln High School
790 J St., Lincoln, CA
<http://svhamfest.org/>

For more information and rules on the ARRL activities listed above, go to:
<http://www.arrl.org/contests/calendar.html?year=2010>

SFARC CLUB MEETING Presentation

"Field Day 2010", Chuck Baker, AE6LR

"Tech Ten" Presentation
Making a two meter beam using
common materials.

Presented by Alan Bohnet, KI6WDV.

Don't miss this interesting presentation!
Bring a friend See you there!

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From the Presidents Shack

Al Martin, NI2U

President's Thoughts

By-Laws

At the April meeting, we began a discussion about whether or not the club is categorized as a 503(c) by the IRS. The 503 (c) status means that the club can hold raffles. Some other issues about the status were brought up that deal with the state.

Bob KD6WTY) is working on the questions. The progress to date includes correction all issues with the State. Also, the Club has both a State Corporation Number and a Federal EIN. Bob located the EIN and Leslie provided us with the State Corporation Number.

The Club status if it is 503 (c) allow us to have raffles. Bob is using his resource (Mary Anne) as she has updated the Federal Paperwork for another organization. Bob and I will draw on other Club resources as necessary to resolve any issues at the Federal level. Who knows, we may go back to raffles in the By-laws when this work is complete. The club may need to provide income information on the past activities.

Field Day

Com on out and drag new hams or inactive hams to Field Day. Everyone will have a good time. Please let Chuck, AE6LR, know what you can bring both equipment and people.

Let's get a list of names together for mementos. The club will provide pins for the GOTA operators. The experienced hams will buy the mementos for themselves.

Club Picnic

The Club picnic location looks like the same as last year, Ashford Park off of Auburn Ravine Road.



SFARC SUNSHINE REPORT

Richard Kuepper

Mary Anne, KE6EST was in the hospital for several days this week, but she is now home and on the mend.

Richard WA6RWS

MISCELLANEOUS RADIO

Software Defined Radios – Sampling

So last month, we started in on Software Defined Radios [SDR's] of which we have several examples available to us on the market. Flex Radio is one, the Soft Rock kits are another, and the Elecraft K3 is yet another. That's the one we're focused on, only because I have one and understand it best.

Recall that ahead of the Analog-Digital Converter [ADC], an SDR is pretty much like any other analog radio. There's an RF stage [usually], a mixer converting things to a 1st IF [8 MHz in the K3], and a second mixer converting things to the 2nd IF [15 KHz in the K3]. That's a low frequency as 2nd IF's have usually run, but there's a reason, and most SDR's are in that general range.

It all turns on sampling ... periodically checking the amplitude of the incoming analog waveform and reporting it as a number. What the software part of the radio gets is a series of numbers ... often called "number soup" by the DSP guys ... that represent the time-varying amplitude of the input signal. We math guys call this a "time-series" and there is a wealth of mathematics that we can do with a time-series. But, this isn't a math club, so let's start with the easy parts.

Here are two sine waves. Let's say the lower frequency one is 500 Hz, the higher frequency one is 1,050 Hz. I sampled both 13 times in one cycle for the lower frequency signal [It's really 12 times, but this is the first sample interval, the 13th sample is really the first of the next interval]. I chose the frequencies arbitrarily.

The markers on the curves represent the samples taken by the ADC, and the lower frequency curve looks pretty much like a sine wave. The higher frequency curve looks a little rough, and it should, ... whereas the lower frequency signal got 12 samples per one cycle, the higher frequency one got only 6.

When the signal composed of these two sine waves [500 Hz and 1,050 Hz] is presented at the analog input of the ADC, it looks like their sum at each instant of time. The figure on the right is that sum, which I normalized so that it ranges between +1.0 and -1.0 as seen by the ADC. The sample points are the same as in the first figure, and the actual two sine waves are "buried" in that sum.

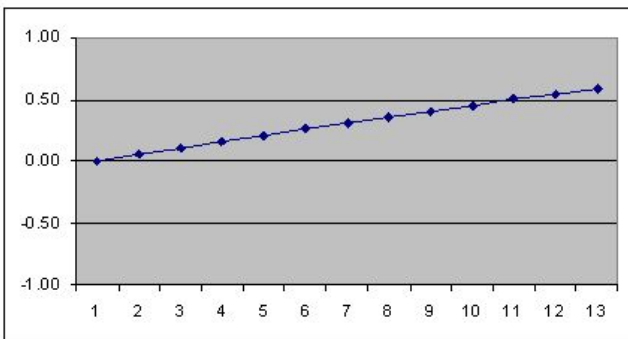
I set this up for 12 samples for one cycle of the lower frequency signal specifically to show what happens with higher frequency signals and a constant sampling rate. The table shows the process [and gives away how I did this too – Excel spreadsheet ©

SAMPLE NR	SIN F1	SIN F2	NORM SIGNAL
0	0.00	0.00	0.00
1	0.50	0.89	0.75
2	0.87	0.81	0.90
3	1.00	-0.16	0.45
4	0.87	-0.95	-0.05
5	0.50	-0.71	-0.11
6	0.00	0.31	0.17
7	-0.50	0.99	0.26
8	-0.87	0.69	-0.15
9	-1.00	-0.45	-0.78
10	-0.87	-1.00	-1.00
11	-0.50	-0.45	-0.51
12	0.00	0.69	0.31

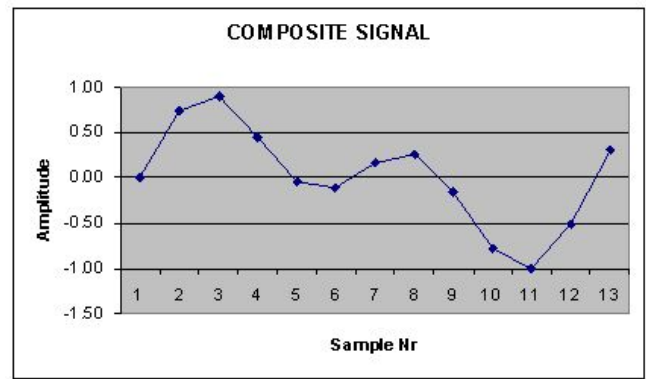
Since I wanted the 12 samples to span exactly one cycle of the lower frequency [F1], each sample represented 30 more degrees into the sine wave, and sample 12 in the table represents 360 degrees or one complete cycle [the plots label the samples starting at 1 for some

reason, and I don't know how to change that in Excel] The "SIN F1" column is just the trigonometric sine function of that increasing angle, and at sample #1, it is one-half, which we know is the sine of 30 degrees. Frequency 2 is just over twice frequency 1 and so at sample 1, the signal is already at 0.89 which means the angle for that signal was 62.87 degrees rather than 30. The column "NORM SIGNAL" is the normalized sum of the F1 and F2 columns, the string of numbers the ADC reports into the digital signal processing unit – the "number soup."

So, the fundamental process is to sample the analog signal coming out of the 2nd IF multiple times, and then use mathematics on the string of numbers to change levels, build filters, identify noise pulses and delete them, demodulate the signal to audio, and all the other things that need to be done. Each of these math processes takes the string of numbers from the previous process, modifies it, and passes it on to the next process. Eventually, we have a string of number which represents the sampled values of the resultant audio output – we send it through a digital-to-analog converter [DAC], and the audio signal we expected shows up in our headphones. There are some constraints however in this sampling process.



The first, and probably the biggest is sampling rate. In my example, I sampled at a rate such that I got exactly 12 samples in one complete cycle of the lower frequency signal which turns out to be 6 KHz. And, connecting those samples with straight line segments



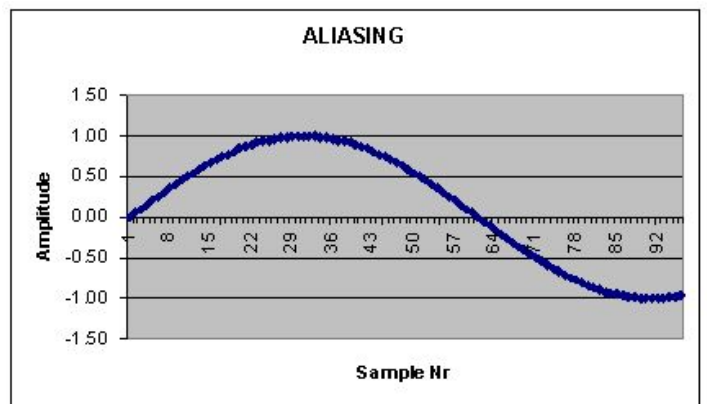
[that's what Excel did when it drew the plot for me], I get a respectable looking sine wave. Had I sampled at a higher rate, it would have looked even better. The higher frequency signal got fewer samples in one cycle, and it looks a little ragged. What happens if we feed a really high frequency to the ADC but don't change the sample rate?

SAMPLE NR	UNDER SAMPLE
0	0.00
1	0.05
2	0.10
3	0.16
4	0.21
5	0.26
6	0.31
7	0.36
8	0.41
9	0.45
10	0.50
11	0.54
12	0.59

Well, here's an example. For this example, I multiplied the F2 frequency by 10 making it 10.5 KHz. Again we have the 12 samples, and the "UNDER SAMPLE" column has the value at each sample point. However those values don't look much like the sine wave of the previous plots. In fact, it looks like they just keep getting bigger and bigger.

That's what it looks like on the plot too. What you can't really see is that this is not quite a straight line, it is very slightly curving downward. It is, in fact, the beginning of a very low frequency sine wave. In the last plot below, I increased the number of samples [but

not the rate] such that many cycles of the 1,050 Hz signal would have been sampled. The result is exactly what will happen in a real ADC – the much longer sequence of numbers describes a very low frequency sine wave. So, what happened to our 10.5 KHz signal? Well, it got "aliased" to a much lower frequency because the sampling rate was too low. The 10.5 KHz



not the rate] such that many cycles of the 1,050 Hz signal would have been sampled. The result is exactly what will happen in a real ADC – the much longer sequence of numbers describes a very low frequency sine wave. So, what happened to our 10.5 KHz signal? Well, it got "aliased" to a much lower frequency because the sampling rate was too low. The 10.5 KHz

sine wave went through just over two full cycles before the first sample after zero happened. It then went through just over two more cycles at the second sample, and so on. This yields the slowly rising curve. If I had continued the sequence out to about 120 samples or so, we'd see a full cycle of this low frequency artifact. There is a theorem in math and EE called the Nyquist Theorem. It assures us that, if we sample at a rate greater than at least two times the highest frequency being sampled, we can reconstruct the original analog signal exactly.

Conversely, sampling at two or less times the highest frequency will result in aliasing which, when the analog signal is reconstructed from the time series, signals that weren't present at the input will appear. So, designers will pass the analog signal through a low pass filter prior to the ADC to assure that high frequency components greater than 2 times the sample rate will be blocked.

The second constraint concerns the resolution inherent in the sampling process. This isn't an issue in my little Excel spreadsheet simulation since the numbers can get as big as they want to in both the positive and negative direction with essentially as many decimal places I choose. But a real ADC outputs a computer word of a fixed length. Consider an 8-bit ADC for simplicity [typical ADC's in radios will be at least 24-bit and often higher]. An 8-bit word can represent up to 256 values from zero to 255. Since we have both positive and negative values, half of those are for positive values and half for negative values. One 128th of 1 volt is 7.8125 millivolts which becomes the smallest change in the analog signal that can be detected in the number soup.

The third constraint is dynamic range. Using our 8-bit example, we would like for the highest positive amplitude analog signal to produce a 127 output [all 8 bits set to one's]. Unfortunately, knowing what the highest amplitude signal will ever be is hard, especially when KF6T, who lives 2.7 km from me and runs 1,500 watts, taps his key. All amplitudes over what we have established as the "127 level" will continue to report 127. In essence, the ADC has clipped the strong signal just like overdriving your linear will cause it to flat-top or clip the peaks, to the annoyance of your comrades on the band. On the other hand, if the largest amplitude is such that it does not drive the ADC to report 127, then we're not using the full range of our ADC. If that amplitude corresponded to 100, our resolution is now 10 mv. Designers solve this problem by using ADC's with word lengths much longer than 8 bits, and by controlling the gain of the stages feeding the ADC with an AGC loop.

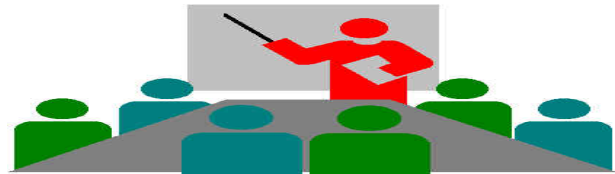
Next month we'll take a look at some of the mathematical magic we can work on the number soup, and we may even get a peak at where that waterfall display when you're operating PSK31 comes from.

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**SFARC BOARD MEETING MINUTES FOR
MAY 14, 2010**

Meeting started at 1730 hours at the Round Table Pizza in the Elm Ave. shopping center.

Present were President Al Martin NI6U, Vice President Chuck Baker AE6LR, Secretary Bill Mahl W6WEM, Director Frank Sharit W6DHN and Director Gary Cunningham KQ6RT. Absent were Treasurer Bob Balthrope KD6WTY and George Simmons KG6LSB.

Continued lifetime membership qualifications and guidelines were discussed.

Field Day plans were discussed and suggested equipment needed. The purchase of a proper First-Aid kit was recommended.

Also discussed was the non-profit federal tax-exempt status.

Meeting ended @1830 hours.



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**Fifty Years Ago at SFARC
By Gary Cunningham, KQ6RT**

June 1, 1960

The regular meeting of June 1, 1960 -was called to order at 2025 by. President Jim Carman outside the Home Ec. Bldg. as the weather was quite warm. There were 9 members and one guest, Zona Randall who later took out membership in the club.

After a session outside, the group moved inside as it got dark. Field Day: discussion was held, after which Bob Davis moved that we plan to participate in the Field Day, Linn Hunter seconded the motion and it was passed unanimously. It will be held the weekend of the 25th, with the site tentatively the Bob Davis hilltop.

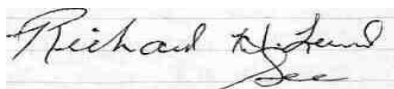
It was called to the attention of the club that Mars is now meeting on the first Wednesday of the month, so it was proposed that we hold ours on the second Wed. of the month. Notation to our intentions will be made on next month's meeting cards.

Bills were presented for the Potluck meeting; Howard Davis was presented with six months' dues for his help in the kitchen.

Dues Paid were Frank Carman \$2, Howard Davis \$.50, Walt Randall \$5, Bob Davis \$1, Linn Hunter \$2, Zona Randall \$1, and Dick Lund \$1.

The meeting Adjourned at 2140 followed by a Coffee and Do-Nut session.

Respectfully Submitted



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Auburn, CA 95603
(right next door to Midas)
530.888.8483
dave@radiosupplyco.com**

SFARC CLUB MEETING MINUTES

MAY 14, 2010

Meeting started at 1900 hours with the Pledge of Allegiance and Officer, Director, and club member introductions.

Secretary Report – Bill Mahl W6WEM reported Officer meeting minutes.

Treasurers Report – Bob Balthrope KD6WTY was absent, however, we have \$1794.41 in the bank.

CE Report – Casey McPartland W7IB reported 4 Tech and # general tests were given.

Satellite Report – Greg Dolkas KO6TH reported that Voyager 2 has a software problem. Also the moon bounce occurred using the Arecibo receiver in Puerto Rico.

Sunshine Report – Bob Boeckman WA6ULL is at home and doing better.

Tech Ten – Chuck AE6LR gave a presentation on understanding ARRL propagation reports.

Unfinished and Old Business – Life membership was discussed. Recommended was at least 10 years active club member, one life membership per year, and have a sponsorship.

Federal non-profit status was discussed. Leslie Nye N7NYE is familiar with all the particulars and will relay all the information to Al Martin NI2U.

New Business – Al Martin AI2U visited the Lincoln Hills Radio Club and proposed that the club look into purchasing bumper stickers for our club.

Dan Quillin KQ6DQ reported that anyone willing to volunteer as a fire lookout for the coming fire season to let him know. Wolf Mountain and maybe other lookouts are available.

Chuck AE6LR asked that the club buy a first-aid kit for club activities. Leslie N7NYE made a motion to buy a first-aid kit, Motion was 2nd for Jim KI6AZH. Motion passed. Al NI2U also suggested that the club buy ARRL pens for the Get On The Air people with a limit of 6 pens. A motion was made by Casey W7IB and 2nd by Jim KI6AZH. Motion passed.

Chuck AE6LR made a presentation on solar storms and solar flares.

Meeting ended @2115 hours

Respectfully submitted,

Secretary

Bill Mahl W6WEM



[Local ARRL Exam Sessions](#)
Courtesy of the ARRL

06/03/2010 | Granite Bay CA 95746-6258

Sponsor: Un-sponsored
Location: Raley's Community Event Center
Time: 8:00 AM (Walk-ins allowed)

06/05/2010 | Granite Bay CA 95746-6258

Sponsor: Un-sponsored
Location: Raley's Community Event Center
Time: 8:00 AM (Walk-ins allowed)

06/12/2010 | El Dorado Hills CA 95762-4324

- **Sponsor:** Rubicon Trail Foundation
Location: Oak Ridge High School
Time: 9:00 AM (Walk-ins allowed)

06/19/2010 | Carmichael CA 95608-6613

Sponsor: River City ARCS
Location: Carmichael Elks Lodge-Use East Entrance
Time: 7:00 AM (Walk-ins allowed)

07/10/2010 | Yuba City CA 95991-2810

Sponsor: Yuba Sutter ARC
Location: Cornerstone Evangelical Church
Time: 9:00 AM (Walk-ins allowed)



SATTELITE REPORT

Greg Dolkas, KO6TH

Ham Radio Heads to Venus

Yes, Venus. The planet. Second rock from the Sun. There's a satellite on it's way there, and it's carrying a Ham Radio.

Launched May 20th at 2158 UTC, the satellite is already well on its way. Ten hours later, signals were received from a distance of 300,000 km. If you're heading for Venus, you can't just mosey on out there. Even so, it will take the rest of this calendar year to get to Venus. This is serious interplanetary travel.

The overall mission was constructed by JAXA (roughly the Japanese equivalent of our NASA), and a consortium of 22 universities. There are two satellites involved. One, the "Akatsuki" (Planet-C) Venus Climate Orbiter was built by JAXA, is a 1.6 m x 1.6 m x 1.25 m "bus" with two solar arrays, each with an area of 1.4 square meters. The spacecraft weighs in at about 1,400 lb. It is designed to spend at least 2 Earth years orbiting Venus, studying the atmosphere, clouds, and weather patterns, including signs of lightning and even possible volcanic eruptions.

The other satellite, UNITEC-1, is a relatively small cube, measuring about 14 inches on a side and weighing only 33 lb. Built by UNISEC (The University Space Engineering Consortium), it will be the first university-built satellite to fly beyond the orbit of the Moon, and into interplanetary space. It's mission is to experiment with the on-board computers, and to test long-range, inter-planetary communication using amateur radio frequencies. The Amateur Radio transmitter puts out 4.8 watts into each of two microstrip patch antennas. The first milestone in that communications test was achieved with the 300,000km reception of the satellite's 5.84 ghz signal.

The farther out the satellite gets, the harder it will be to hear. As with any form of communication, there is a relationship between the rate data can be sent and the breadth and strength of the signal itself. The weaker the signal, the slower it must be sent, and the narrower the bandwidth needs to be. We do this instinctively when we talk, slowing down and speaking more plainly when it is hard to be heard. In radio, we switch from SSB to CW, narrowing the bandwidth to bring up the signal to noise ratio. Ultimately, we slow the CW down, making each of the "Dit" and "Dah" symbols easier to detect. So, as UNITEC-1 heads out into space, the communication with Earth will change from 1200 bits per second AFSK (Packet radio) when close by, to CW at a mere 1 bit per second.

Making things even more difficult, the satellite does not have any on-board attitude control system. This was due to a lack of time and funds to develop, as the simple systems used in Earth orbit don't work in interplanetary space. Out there, you need small rocket jets (thrusters) to control the spacecraft's orientation. That's a system that is vastly more complicated than the technique of using a simple electromagnet to align a spacecraft with the Earth's magnetic field. As a result, UNITEC-1 is expected to tumble randomly, making it a matter of luck and patience for when the two antennas will be aimed at Earth.

It is the goal of the University Consortium to encourage the development of a global network of interplanetary-capable Ham participants for monitoring the satellite and collecting information on its progress. All it takes is a little luck, a little patience, and a really good 5.8 ghz receiver and dish, and you too can receive Ham Radio signals from Venus.

73s, Greg KO6TH



Attention Sierra Foothills Amateur Radio Club
Members: Field Day - June 26th and 27th

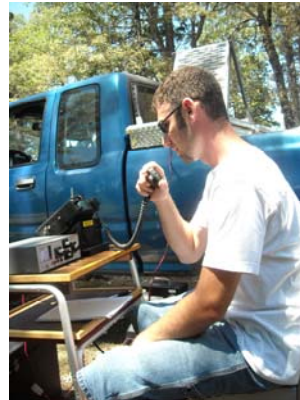
Field Day - June 26th and 27th - is coming upon us fast. I'm encouraging all members to plan on participating. There are many reasons, **some very lofty**, but one of the best reasons is the **fun**. Come out for the full time or for just a portion of the time, but don't miss out.

If you are new to amateur radio it's a great opportunity to get involved and learn from the more seasoned hams. If you have been in amateur radio for awhile it's a great opportunity to help others get involved and pass on operating



skills and knowledge to the less experienced.

There should be something for everyone. We can use all HF bands (except the WARC Bands) plus the VHF and UHF bands. We can use several different modes such as phone (SSB/FM), CW, and Digital. We will set up radio operations in the field which is a great experience that will help during real emergencies or temporary operations.



We will need radio equipment, antennas, tuners, feed lines, tables, chairs, computers, and other miscellaneous items. At the next club meeting we will discuss Field Day. Think about participating.

You can e-mail me with questions or to indicate if you plan to attend and equipment you might be able to bring.



Chuck Baker,
ae6lr@yahoo.com
(530) 745-9664

SIERRA FOOTHILLS AMATEUR
 RADIO CLUB
 P.O. Box 1005
 Newcastle, CA 95658

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SIERRA FOOTHILLS AMATEUR RADIO CLUB
2010 Membership Application

Please Print

Name: _____ Call: _____ Class: _____ e-mail: _____

Address: _____ City: _____ State: _____ Zip: _____

Associate Name: _____ Call: _____ Class: _____

Phone Number: _____ Application: (Circle One) New Renewal

Member Dues: Circle Amounts That Apply. Applications (for new members only) received in the middle of the year will be pro rated. Contact the President or Treasurer for exact rate.

Membership: (P)	\$22.00	Name Badge: (R)	\$7.00
Associate: (Q)	\$ 7.00	Repeater Donation: (S)	\$ _____
Auto Patch Donation: (T)	\$ _____	Newsletter Booster: (V)	\$ _____
Misc. Donation: (X)	\$ _____	Christmas Donation: (W)	\$ _____
TOTAL: (Y)		\$ _____	

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Date: _____	Treasurer: _____	Secretary: _____	Roster: _____
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