



P.O. Box 6421 Auburn, CA 95604

June 2015

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At The Key of SFARC:

PRESIDENT

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Jim Jupin, WA8MPA

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Mark Graybill, W8BIT

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Satellites: Greg, KO6TH
History: Gary, KQ6RT
Misc Radio: Fred, K6DGW
Sunshine: Richard, WA6RWS

WEBMASTER:

Birton Gilbert, N6UG

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 7:30AM

NET CONTROL OPS

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

NEWSLETTER EDITOR

Barbara Anderson, W6EVA
anderson51@wavecable.com

ARRL PIO:

Carl A Schultz, WF6J

VOLUNTEER EXAMINER

Dave Albright, NO6NO

Calendar of Events

**June 6th:
Northern Nevada Swap Meet
in Minden, NV**

**June 12th:
Club Meeting**

**June 27-28th:
Field Day
Nyack, CA**

Inside this issue:

- *From the Mic*
- *Tour de Cure*
- *Miscellaneous Radio – Radiotelephone Part 1*
- *Some words from Fred*
- *2015 SFARC Field Day T-shirt*
- *Dayton*
- *Board & General Minutes*

**COUNTDOWN
TO
FIELD DAY
2015**

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



Summer, ham radio, and traveling

As we start traveling this summer it is important to be ready for the trip. For me that includes reprogramming my car radio with the repeaters in the area I am headed to. Have you ever traveled into a new area and ID'd on the local machine with nothing heard? I have, then the thoughts start flowing...did I program it correctly? Is my radio working? Can I get into the machine from here? Does this local machine suck? Are there just no hams on the air?? Then I usually try another machine. I am sure someone heard me and just did not say "hi."

As we are a large group let's all make it a point to say "hi" to the new person that is visiting the area this summer. I know that I like to talk to the local radio person when traveling. They have all kinds of useful information and suggestions about the area like where to eat, where to stay, what to do in the area, and the list goes on. I think that this is an important part of the radio community. Let's make some new friends and share our local treasures with the traveling hams.

Field day ready or not here it comes!!

Are you ready for the best weekend of the year? Field day is coming at the end of the month! This is the only ham radio holiday! This month's meeting will be dedicated to field day. So be ready to ask your question, sign up for operation times, camping or not, and any other items. If you have questions about the weekend get in touch with Mark W8BIT.

See you at Field Day; it's going to be a fun!!

73's for now!



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Tour de Cure in Rocklin – Saturday May 30, 2015



Sierra Foothills Amateur Radio Club again provided communications and field support to the American Diabetes Association’s annual Tour de Cure in Rocklin. Participating club members were responsible for locating and transporting several tour participants who were injured or suffering from exhaustion.

Another successful charity event. Thank you to all club members who were there to help!



At Net Control – Johnson Springview Park
Scott K6SVW, Laura K6LVW, George KG6LSB, Bruce K6BAA and son Alex

MISCELLANEOUS RADIO

Radiotelephone

PART 1

Early radio was Morse code, turning the signal on and off for the dots and dashes. We all know that. As a means for “record communications” [“messages,” generally delivered in writing on paper], it was a superb medium, and it took the landline telegraph to sea, air, and intercontinental. While maritime CW tends to be thought of more often as “All the ships at sea” ... like Titanic ... there was a thriving and vast point-to-point international network that few knew about. A company's transmitter sites might have a dozen or more multi-KW transmitters, one for each circuit, with large directional antennas aimed at far off countries and, there were multiple such companies, all CW

But, few people, and certainly not the average Joe or Jane, knew Morse code, and as a result, “wireless” was the playground of a special few, some of whom were Amateurs. But capitalism being what it is, entrepreneurs sought a way to use “radio” to make money from all the Joe's and Jane's out there, and this required that they transmit using something understood by everyone. Music, drama, sports events, and news, all in a language everyone understood.

Initially, this was an almost impossible task given that early radio consisted of high power spark transmitters making as much racket in the neighborhood as they did on the air, huge antennas, and complicated [and insensitive] receiving apparatus. Then came the vacuum tube which could be configured as an amplifier, an oscillator, or a detector, and it generated continuous [i.e. steady] RF energy on a single frequency. All that was required was to somehow get the radio frequency signal to carry the audio sound, which came to be called “modulation.”

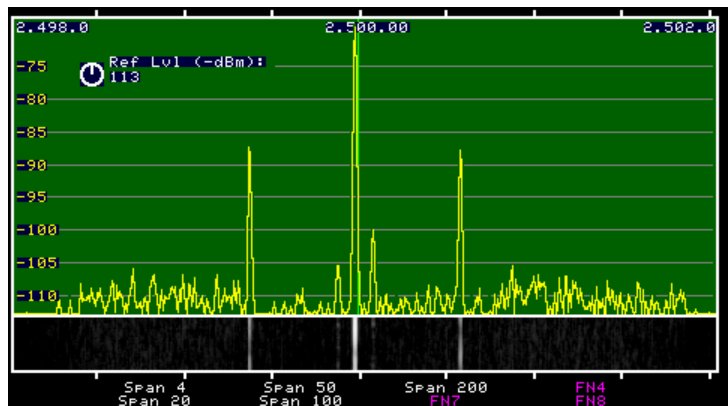
Small Theoretical Digression: Consider a transmitter, let's say on 14050 KHz, with no modulation. It's producing a signal that carries no information other than the fact that it is there. We conveyed that information when we turned it on [i.e. changed it's amplitude from zero to some non-zero value]. To convey any additional information, we have to change something about it. That steady signal has exactly three properties we can change – amplitude, frequency, and phase. There's nothing else. **End Digression.**

Amplitude Modulation: The first attempts at radiotelephone aimed at modulating the amplitude, which became known as “Amplitude Modulation,” and I hope you're not surprised at that. This is pretty easy and straight forward. All you really need to do is apply the modulating signal [e.g. the audio from a Brooklyn Dodgers broadcast] to some part of the transmitter that can control the amplitude of the resultant signal.

Early attempts were moderately primitive by today's standards. One test consisted of putting a carbon microphone in series with the wire leading to the antenna, routing the RF through it. I imagine one did not want to “close-talk” that microphone. 😊

Hams generally did this through plate modulation ... the high voltage feeding the final class C amplifier stage went through the secondary of a “modulation transformer.” The primary was fed with the amplified audio signal, and voila! ... amplitude modulation. The final amplifier stage ran class C because it could be 70-75% efficient, and you got more output power for the cost of your power supply and electricity. A disadvantage was that, to fully modulate a 500 watt carrier, it took a 250 watt audio amplifier feeding the very large and costly modulation transformer but that was the amateur radio strategy for several decades. Some broadcast stations, in search of less distortion and higher fidelity, modulated a low level stage in the transmitter and then followed it by class A amplifiers. Class A amplifiers are about 25% efficient so a 50KW clear channel station needed a 200KW PA.

Amplitude modulating an RF carrier with a 600 Hz tone creates two “sidebands” 600Hz above and below the “carrier.” The sidebands contain the information being transmitted and, except for being inverted copies of each other, they are identical. The carrier “carries” no information. An alternative perspective of AM is that you are mixing [heterodyning] the audio and RF signals and as with all mixing, you get the original signals plus their sum and difference. The carrier is the original RF signal, the original AF signal dies in the RF stages of the transmitter, and the sidebands are the



sum and difference signals. The spectrum above is 2.5 MHz WWV from my P3 panadapter. You can see the carrier, the two sidebands 600 Hz above and below it. WWV is also modulated at a very low level with a 100 Hz sub-carrier carrying an IRIG-H time code and you can see the sidebands for the sub-carrier as well, very close in to the carrier.

And, that's "How to make AM radiotelephone" There were/are several different ways to change the amplitude of the transmitted signal using different approaches such as applying the modulating signal to the control grid, or the screen grid of the PA instead of the plate, but in the end, it all came out AM. SSB is just AM with the carrier and one of the sidebands removed. We'll take a look at one of the more weird AM methods next month.

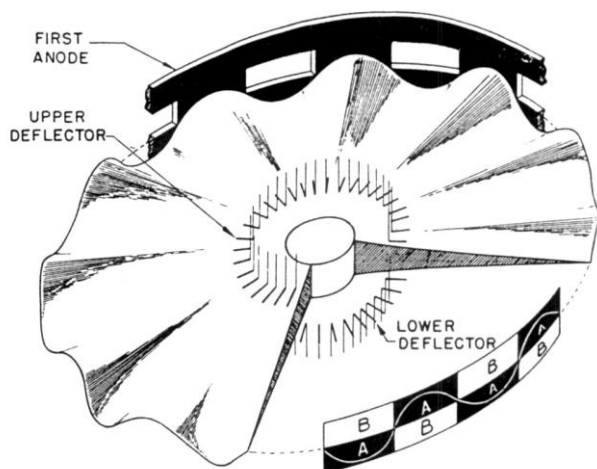
Frequency Modulation: FM came along later. It is somewhat more complex on the transmit side, quite a bit more complex on the receive side and it really couldn't blossom until Edwin Armstrong's superhetrodyne receiver architecture made it into real time. For FM, we hold the amplitude of the entire transmitted signal constant and we arrange for the modulating signal [the audio] to change the frequency of the RF signal. The louder the audio, the bigger the frequency excursion. The higher the audio modulating frequency, the faster the RF frequency changes back and forth. That's pretty much the 1955 ARRL Handbook explanation of FM.

FM, however, is a bit more complex. Our 600 Hz audio signal again generates sidebands, but now, there are an infinite number of them instead of just two, spaced at increasing distance from the carrier, 600 Hz apart. This is a radio club, not a math club, so we'll skip over the mathematics behind this, except to note that the sidebands decline in amplitude as you get farther from the carrier, and at some point, become inconsequential. This point is effectively the "deviation," and defines the bandwidth occupied by the FM signal. Those with sharp and lasting memories may remember how this ultimately got me a raise at the TV station. 😊

FM broadcast in the 60's used ± 75 KHz deviation [150 KHz total] in 200 KHz assigned channels. I don't know what they use now because there's additional modulation to get stereo and they have other subcarriers too. The aural side of NTSC TV was FM, ± 25 KHz, but NTSC TV is dying fast, now only on low power stations and translators. Current ham practice on VHF/UHF is 4 - 5 KHz deviation.

How to generate FM? Well there are a variety of ways, and some really quaint and interesting techniques for implementing those ways. **Direct FM:** For direct-FM, you simply cause the resonant frequency of the transmitter oscillator to change linearly with the modulation signal. This was common in the 50's, called reactance modulation, and used a vacuum tube to adjust the amount of reactance in the oscillator's circuit. It's almost never found today.

I started college at UC Berkeley at 16 – way too young for Cal and Berzerkeley. I had a job at KPFA and we had a small transmitter at the studios in downtown Berkeley to fill in coverage in Albany and El Cerrito where the main transmitter was shadowed. It was KPFB, an RCA 250 watt direct-FM transmitter on 89.3 MHz with a yagi pointed north-ish. Now, you couldn't use a VFO on a commercial transmitter, so the VFO was slaved to a temperature-controlled crystal oscillator by a servo motor mechanically connected to the "VFO Knob" [I'm not making this up, open the front door and there was the servo motor with a knob on it. You could turn the knob, shift us off frequency, release it, and the servo would QSY KPFB back to 89.3 MHz]. The servo loop had a low pass filter that made it immune to the frequency variations created by the modulation, but it would adjust the VFO slowly as the overall temperature changed, keeping KPFB within 2 KHz of 89,3 MHz, the required tolerance then.



The KPFA transmitter was on Grizzly Peak in the Oakland-Berkeley Hills. It was a GE 5 KW transmitter on 94.1, we had a 10 dB antenna for 50 KW EIRP. KPFA was a low budget show then, the first listener sponsored radio station in the nation, and is still low budget. The modulator was a Phasitron. Raise your hand if you've seen one of these.

The Phasitron was a vacuum tube manufactured by GE. It had a central hot cathode emitting electrons¹ and some plates that formed them into a disk. There were some fine radial wires, fed with 3-phase RF from the exciter, that put "wrinkles" into the electron disk and made it rotate at the exciter's RF frequency [less than 1 MHz if I remember correctly]. Near the outside of the tube, there were two concentric cylindrical anodes. The inner one had slots in it and the outer one collected the electrons that came through the slots. The

¹ As did all vacuum tubes of the day

diagram shows the wrinkled electron “sheet” and the first [slotted] anode. The 2nd anode surrounded the first.

Since the disk was rotating at the RF frequency and the outer edge was wrinkled, the current that got to the outside cylinder was RF at the exciter frequency. The Phasitron is surrounded by an axial electromagnet that has the program audio connected to it. Its effect is to slightly retard or advance the “wrinkled disk of electrons” based on the modulating signal, thus retarding or advancing the phase of the RF signal on the outer cylinder. The signal was multiplied up to 94.1 MHz, amplified to 5 KW and sent to the antenna. That's a long explanation to get to ...

Phase Modulation: Phase modulation is “almost” FM. For those inclined to differential calculus, frequency is just the first derivative of phase in an RF signal and changing the phase changes the instantaneous frequency. As in the above Phasitron illustration, phase modulation can become frequency modulation. All it takes is a filter that rolls off the higher audio frequencies at 6 dB per octave. Strangely, it turns out that PM is far easier to generate with a stable carrier than direct FM and practically all today's FM ham radios generate FM from some form of PM with a filter.

The Phasitron was weird for sure. It was also noisy, not hugely but we could detect it fizzing and popping on our transmitted signal, hence we called it the Fizzitron.” It was also microphonic. If you leaned close to it in the rack and yelled at it, you could hear it weakly on the air. While we all had 1st Phone licenses, we were still teenagers and the KPFA engineering crew had minimal adult supervision. 😊

Summer came and they sent us down to LA to build KPFA with a 10 KW transmitter on Mt. Wilson, TV/FM Central for all of So. Cal. It was a real home-brew transmitter² [again, not kidding], but the exciter wasn't. It was an REL Serrasoid FM exciter, in the 100 KHz range. It too generated PM and turned it into FM with an audio filter.

A crystal oscillator drove a linear saw-tooth generator that triggered a one-shot multivibrator [a circuit that put out a pulse when triggered]. Things were arranged so that the one-shot would trigger half way up the sawtooth signal in the absence of any audio. The modulating signal changed that trigger point either earlier or later, thus changing the phase of the output pulses. The pulse train was then filtered back to a sine wave, multiplied to 90.7 Mhz, amplified to 10 KW, and sent up the hardline to the antenna. Serrasoid exciters were manufactured by Gates and REL and competed with GE [phasitron] and RCA [direct FM with PLL stabilization].

Nowadays, we have Varicaps which are solid state diodes. When they are reversed biased, the charges in the semiconductor separate into two layers, just like the plates of a capacitor. More reverse bias, the layers move farther apart with lower capacity. Less reverse bias, they get closer, more capacity. Thus it's a solid state variable capacitor and if the audio is impressed on the reverse bias voltage and the diode is part of a synthesizer or crystal-locked PLL, it will generate PM. Add the audio filter [in DSP these days] and you get FM.

And, just as you can generate AM/SSB totally with arithmetic, you can also generate FM [and PM] in DSP as well. We'll look at a non-traditional method for AM next month.

73,

Fred K6DGW

² 4 Eimac 4-1000A's in parallel in the power amplifier, 5.4 KV @ 3.6 A

Fred, K6DGW, frequent, articulate, and generous contributor to newsletters in our Section, has this:

"With the arrival of the new synthesizer for my K3 and thus the ability to receive down to 100 Kcs, I've learned about WSPR and been exploring the MF region below the AM broadcast band. Using my flagpole with a single wire feed into the shack, there are a myriad of NDB's, the Differential GPS transmissions from Lincoln and Chico on 314 and 318 Kcs [really strong here in Auburn] and a number of as yet unidentified signals. WSPR on 474.200 Kcs all night has yielded decodes of signals at 3,400 km with 5-10 W EIRP. Haven't heard anything on 137 Kcs yet. Always something new in ham radio."

73,

Fred K6DGW

- Northern California Contest Club
- CU in the 50th Running of the Cal QSO Party 3-4 Oct 2015
- www.cqp.org
- Auburn CA CM98lw"

2015 SFARC Field Day T-shirt

I present the 2015 SFARC Field Day T-shirt. **Contact Bob K6UDA to order**. The Cost will be \$15.00 each sizes S thru XL. Add a buck for bigger. BTW, for those wondering what that means at the bottom, it's the Grid coordinates at Nyack.

73,

Bob K6UDA

(916)871-0726

K6UDA@att.net

**FINAL
REMINDER**



DAYTON

BY DAN KB6NU

Dayton was a Blast this Year.

A couple of weeks ago, I made my annual pilgrimage to Dayton for the 2015 Hamvention. This year, I had even more fun than in the past, and that's saying a lot.

I started Dayton 2015 on Thursday by attending the QRP-ARCI's Four Days in May seminar (<http://www.qrparci.org/fdim/>). George Dobbs, G3RJV, gave a very nice talk that not only talked about circuits, but also the people he's met over the years and the places he's been. Paul, MOXPD, gave an interesting talk on crystal filters and using an Arduino to control a QRP rig. The final talk, by Glen, KW5GP, was also about using an Arduino to control a QRP rig. Other talks covered transmission lines and SWR and adventures in PCB making. I learned something in every single one.

That evening, I participated in Vendor's Night. I sold quite a few copies of my CW Geek's Guide to Having Fun with Morse Code and gave out quite a few "I'm a CW Geek" buttons and "Hams Obey Ohm's Law" stickers.

Friday and Saturday were all about the Hamvention. As far as new products go, there were a couple of interesting announcements. Elecraft introduced the K3S, an updated and upgraded K3 HF Transceiver, and FlexRadio introduced the Maestro, a "front end" with knobs, dials, and LCD screen for their software-driven radios. Apparently, hams like knobs and dials after all.

It seemed to me that there were more people at this year's Hamvention. There were certainly more sellers out in the flea market. And deals were to be had. I picked up a Bencher BY-1 for only \$50. I also found a Hallicrafters HA-1 T.O. Keyer which I believe to be the first commercially-available electronic keyer (http://www.ai4fr.com/main/page_ham_radio_hallicrafters_ha1.html). Produced in the 1960s, it uses tubes to generate dots and dashes.

Dayton usually has a great lineup of forums, but aside from perhaps the TAPR forum, the Antennas forum, and maybe the ATV forum, none of them really called to me. Also, I was really busy talking to people I know, meeting readers, and trying to get the dealers to carry my books, so I didn't get to a single one.

Being the CW geek that I am, I'm hoping to hold a CW forum at next year's Hamvention. I've already contacted the forum people, and while they haven't committed to giving me time, I did get a very positive response. C U THX?

=====

When he's not attending the Dayton Hamvention, Dan, KB6NU enjoys working CW on the HF bands and teaching ham radio classes. For more information about his operating activities and his "No-Nonsense" series of amateur radio license study guides, go to KB6NU.Com or e-mail cwgeek@kb6nu.com.



BOARD OF DIRECTORS MEETING MINUTES May 8, 2015

The SFARC Board meeting for May commenced at 1800 hours at the Sizzler restaurant in Auburn.

Roll Call: All officers and Directors were present with the exception of VP Bob-K6UDA. Also present were guests AI-NI2U and Orion-KK6RGT.

REPORTS and DISCUSSIONS

President's Report: Tyghe-KD6MLH began discussion on the club renewal form update reflecting the multi-year discount option. Treasurer Richard-WA6RWS advised he will update and implement the changes.

Secretary's Report: Bruce-K6BAA presented to the board life membership draft proposals for review. Each board member will review the proposals for a later decision on which one to be implemented.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at beginning of May of \$9186.16; deposits of \$105.04, expenditures of \$117.88 with an ending balance of \$9173.32. Richard added Club memberships now stand at 120.

OTHER DISCUSSIONS

Director Birton-N6UG reviewed web updates to the club web site to include linking the calendar to the Yahoo group, efforts to reduce spam and prevent email scammers.

Meeting adjourned at 1830. Submitted by Bruce-K6BAA, Club Secretary

GENERAL MEETING MINUTES May 8, 2015



The SFARC General meeting for May commenced at 1930 hours at the Auburn City Hall Rose Room, President Tyghe-KD6MLH presiding. All Officers and Directors were present with the exception of VP Bob-K6UDA. Tyghe led approximately 33 members and guests in a Pledge of Allegiance to the flag followed by an introduction of Officers, members and guests.

REPORTS:

Past minutes: Minutes were approved as posted in the Newsletter on motion.

President's Report: Tyghe briefly discussed the agenda. Tyghe reviewed this evening's board meeting to include a motivational discussion for members to run for office. He then called for Officers' reports.

Secretary's Report: Bruce-K6BAA reviewed the events at the Public Safety Fair April 25 and thanked Jim-WA8MPA and Scott-K6SVW for their assistance at the event. Requested input for the club newsletter; a Welcome letter available for new members and guests, and a reminder to the membership to sign the attendance sheet.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at the beginning of May of \$9186.16; \$105.04

Continued from page 9

in deposits, expenditures of \$117.88 and a balance of \$9173.32. Richard added Club memberships now stand at 120.

VE's Report: Al-NI2U, VE reported 14 elements were given to 9 candidates resulting in 6 new techs and 2 new extras who included club member Toby-KD6MLU.

Repeater Report: Richard-WA6RWS advised the 220 repeater is currently down.

Sunshine Report: Richard-WA6RWS told the membership Dave-NO6NO is now out of a medically induced coma. Jim-KQ6VP also detailed Dave's condition.

Refreshments/Drawing: George-KG6LSB reviewed items planned for the drawing and reviewed the Enduro and MS Walk events. George also briefed the membership on the upcoming Tour de Cure event in Rocklin, May 30th. Scott-K6SVW reported on refreshments for the break.

Web Master: Director Birton-N6UG discussed the club web site and asked members for suggestions for improvements/additions.

Field Day 2015: Mark-W8BIT reviewed the antenna test exercise at Bob-K6UDA's QTH on April 12th. Mark also discussed the results of the digital noise problems that were addressed at the exercise.

OLD BUSINESS:

None

NEW BUSINESS:

George-KG6LSB advised there is a need for a drawing replacement member and asked for a volunteer.

General Announcements: The Club Net meets every Thursday at 7:30pm; Board and General Meetings occur on the 2nd Friday, Board meeting is held at **Sizzler Restaurant** in Auburn, 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 the first and third Wednesday night at 7:30pm on the 2m repeater. See www.w6ek.org for more information.

Tech-10 & Presentation: Al-NI2U, Burton-N6UG and Richard-WA6RWS delivered an informative presentation on repeaters which was well received by the membership in attendance.


The meeting adjourned at 2100. Submitted by Bruce-K6BAA, Club Secretary



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P.O. Box 6421, Auburn, CA 95604

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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
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

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Payment: _____ Check Number: _____ Cash: _____ PayPal: _____