



P.O. Box 6421 Auburn, CA 95604

January 2013

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At The Key of SFARC:

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Dave Albright, NO6NO

REPORTERS

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

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 Riverside, Roseville – 8:00 AM

NET CONTROL OPS

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

NEWSLETTER EDITOR

Barbara Anderson, W6EVA
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WEBMASTER:

Carl A Schultz, WF6J



Calendar:

Fri 11 January: Club Meeting

Sat 26 January: Club Breakfast



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- *Miscellaneous Radio*
- *Christmas Party Minutes*

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

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President's Message

As predicted by many, a new year is now upon us. Two years ago, I walked out of Raley's with my new ticket in hand. I distinctly remember my first meeting at the library. I walked in still waiting to see my name listed on the ULS website. Like several folks we've met this last year, I introduced myself simply as a new ham without a call sign. Jim - KJ6AZH told me to check a website called QRZ.com. I did as instructed and was surprised to see my first call, KJ6MOS listed right there during the meeting. I was always taken by the amount of elmering that goes on within SFARC and I thank all of you for providing me and those like me with your wisdom & guidance.

As I look back at 2012, SFARC has really done an amazing job bringing new hams into the hobby and expanding the membership rolls of the club. I'm pleased to see the next generation of Hams (notably Justin - K6UVK and Amaryllis - KJ6TFT) joining our ranks. I'm hoping the two of them will become leaders within the organization. Justin and Amaryllis - Let us know what attracts the iPad generation to ham radio & how can we bring more young hams into the hobby, ok?

Evolution or Revolution

Something I've noticed in my short time as a Ham; there doesn't seem to be much experimenting or radio building going on with the next generation. Maybe because everything comes in a box, ready to use these days. Back in the day, ham radio was really a tinker's hobby. Guys were designing their own sets using left over parts from who knows where, and hams really acquired a firsthand knowledge of electronic principles, propagation and antenna theory by doing. In contrast, new hams today study for the test on the internet or Smartphone; they memorize questions & answers, some of which relate to equipment like crystal controlled radios and tube amps we have never seen or in many cases will never be exposed to in real life. Then they go out and buy the latest Baofeng \$50.00 wonder or possibly a mobile rig and call it good. I'm wondering, as the hobby evolves and more & more new digital modes and computer controlled microchip radios are introduced, if there is room for any tinkering anymore? Is it time for the question pool to be scrapped and brought into the 21st century or should we as Hams re-evolve ourselves into tinkerers and experimenters again?

Looking ahead into 2013, I see continued growth of SFARC; however, we are quickly approaching a crossroads. How much do we want to grow? Have we outgrown the Auburn Library? Are there any areas of the hobby our membership would like to explore this coming year? Are there any changes to our programs that would be beneficial? Would we like to put together any workshop type programs for either meetings or additional get-togethers? Personally, I'd like to see us do a basic CW clinic, an antenna building workshop, digital mode or satellite classes. Maybe even a mobile installation class. The board looks to you for direction and input. Step right up and don't be shy. Call, email, or let a board member know your ideas for the continued success of the club in 2013. Let's make 2013 a banner year for SFARC, and see Auburn become the area leader in participation, learning, and growth.

73,
Bob - K6UDA

The future of Amateur Radio...
Myla, my granddaughter, 10 months old



Miscellaneous Radio

WWV, WWVH, WWVB, WWVL, JJJ, CHU, and others

One of the earliest uses for “wireless” was to solve the “longitude” problem at sea. Finding your latitude is very straightforward. You just measure the elevation of the sun above the horizon at noon with a sextant. You can substitute bright stars if you have a book of star tables, and those tables have been around for hundreds of years. Longitude is equally straightforward, with one wrinkle. The Earth rotates 15 degrees per hour. So, if local noon for you occurs 2 hours after it occurred at some place, your longitude is 30 degrees west of that place [we rotate west → east]. The wrinkle is knowing the time at two places on the Earth at the same moment.

Pendulum-regulated clocks don't work well ... or at all ... on ships, and even chronometers with rotating balance wheels performed poorly due to manufacturing crudeness, changes in bearing friction with ship movements, and temperature variations. When wireless came along, it was possible to send “INT QTR” meaning “What is the correct time?” and get “QTR 2135” from a coast station with a good stable chronometer in a moderately well controlled environment. In 1884, it was internationally agreed [except by France – surprise!] that zero longitude went through the Royal Observatory in Greenwich England, would be called the “Prime Meridian,” and that the time kept by that observatory would be known as Greenwich Mean Time or GMT, after all, Britannia ruled the waves. GMT was the time kept by Naval and marine chronometers, and all radio stations that communicated with ships [and later, aircraft]. For a few more years, France put the Prime Meridian through Paris, so no one sent INT QTR to a French station and so far as I know, there has never been a Paris Mean Time. ☺

WWV began transmitting on MF in 1920¹ from Washington DC on 600 Kcs, and oddly, transmitted entertainment programming. It shortly moved to 750 Kcs with farm news in Morse [farmers spoke Morse?] from the Dept. of Agriculture. This all lasted about a year when its mission shifted to transmitting precise [for the day] frequencies to assist broadcasters in calibration of their wavemeters to stay on their assigned frequency. At that time, a few tenths of one percent was pretty good accuracy ... that would be around +/- 50 Khz or so on 20m! Quartz crystal oscillators came along in the mid-20's and WWV became a much better frequency standard.

Up until the mid-30's, WWV's signal was usable on the east coast only, within 400-500 km of the transmitter. It was moved to College Park MD, upgraded several times, and new frequencies were added, the first being 5 MHz. Moved again to Beltsville MD, by now crystal controlled. Note however ... no time signals. They came along in the latter 30's, when the 10 MHz and 15 MHz transmitters were added. Morse code time announcements were broadcast every 5 minutes, and voice was added in the early 50's, about the time I became KN6DGW. When I was first licensed, WWV transmitted on 2.5, 5, 10, 15, 20, 25, 30, and 35 MHz although the only frequencies I had a receiver for and could hear it in So. Cal. were 10 and 15 MHz. WWVH on the island of Kauai came along right after WW2 to provide coverage in the Pacific.²

WWV moved to its present QTH at Ft. Collins CO in 1966. It joined WWVB on 60 Khz and subsequently WWVL on 20 Khz. WWVB remains to sync Gary's “atomic clocks” in the raffles [at night, WWVB isn't readable on the west coast in daylight]. WWVL operated for a few years and was finally discontinued. Today, WWV and WWVH transmit on 2.5, 5, 10, 15, and 20 MHz and their carrier frequencies are locked to a cesium beam frequency standard which is a bit better than +/-0.3 percent. ☺ As transmitted, the carrier frequencies are within one part in 10¹² [10¹² is 1 followed by 12 zeros] although propagation effects can reduce that to one part in 10¹¹ or so depending on where you're located.

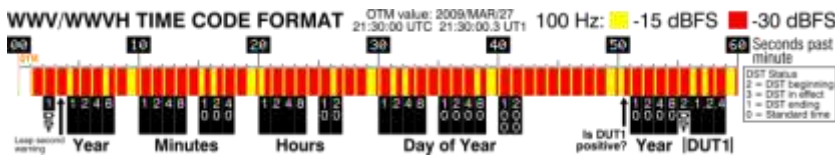
And, their content is vastly more complex. On most alternate minutes, they transmit either a 500 or 600 Hz tone at 50% modulation. They mark each second [well nearly all, some are eliminated] with 5 cycles of a 1KHz tone that sounds like a “tick”, and there are periodic voice announcements of Pacific and Atlantic weather, geomagnetic readings, health of the GPS satellites, and Notices to Mariners. When I was a teen, the voice and Morse time announcements were in Eastern Standard Time. They switched to UTC in the latter part of the 60's. WWVH

¹ WWV is the oldest continuously operational radio station, predating KDKA by about 6 months.

² WWVH is on the Barking Sands Test Range, classified of course. We couldn't get on the range to see it but I do have a photo of me standing next to the WWVH highway sign. I'd have included it here if I knew where it was.

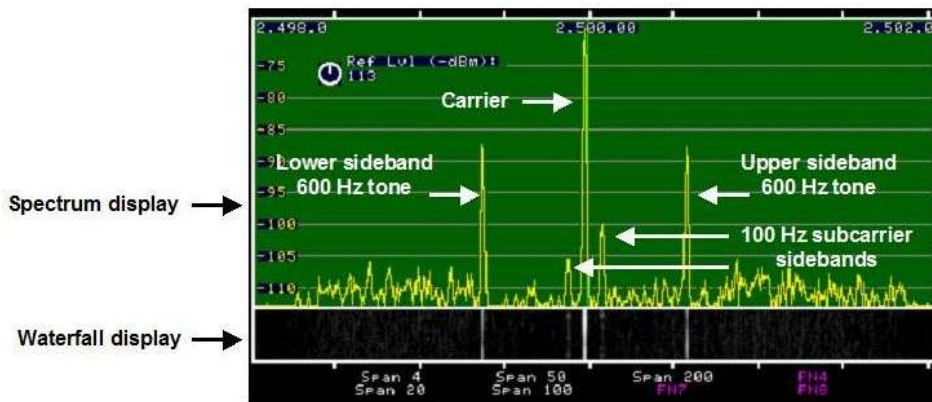
identifies first with a female voice at 15 seconds before the hour, followed by WWV at 7.5 seconds before the hour with a male voice, purported to be that of Lee Rodgers, a host on San Francisco's KSFO.

There's also some stuff you can't hear. It's a modified IRIG-H³ time code modulated onto a 100 Hz subcarrier. There are currently 7 IRIG time codes [A, B, D, E, F, G, and H], and they differ primarily in their data rate. "What happened to 'C'?", I hear you ask ... it did exist but was dropped by the IRIG some time ago. IRIG-H takes a minute to get through the entire sequence year month day hour minute second data plus information on daylight saving time, whether there's about to be a leap second inserted, and some other items. The bits are encoded in a fairly complex manner on the 100 Hz subcarrier by switching the amplitude of the subcarrier, and by when that switching takes place. For those who are interested, here's a diagram of a 1 minute IRIG-H frame as transmitted by WWV and WWVH. You can find it and the full explanation on Wikipedia.



2.5 MHz WWV signal at night. The span of the panadppter is 4 KHz, and the green area is the bandwidth I had the K3 DSP

set to 4KHz. Since the span on the horizontal axis is also 4 KHz, the green bandwidth area exactly fills the screen.



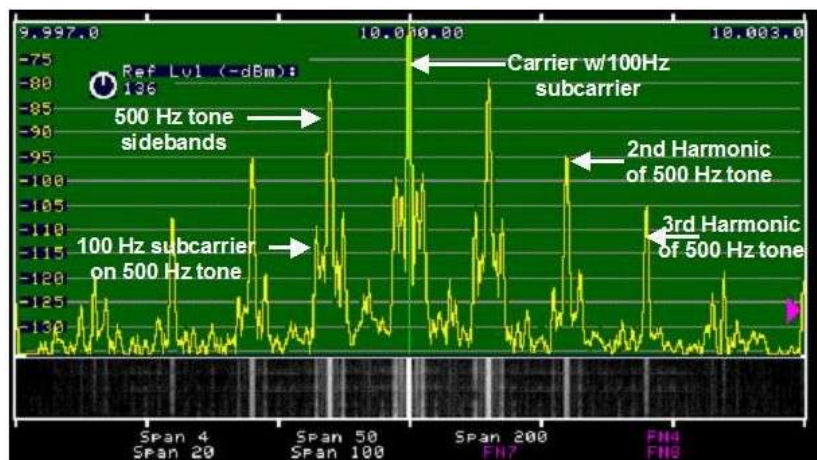
This is exactly what we would expect WWV to look like. It's a double-sideband AM signal modulated by a 600 Hz audio tone, and a 100 Hz subcarrier for the time code. The subcarrier modulates the main carrier at 18% [that's why its two sidebands are much lower than the tone's sidebands

which are at 50%]. During each second, it is reduced to 3%, and the time of that reduction determines if it is encoding a 0, 1, or marker. Since it is amplitude modulated, it too generates sidebands on each side of the subcarrier which you can see looking directly at the screen [they're hard to see on the bitmap screen capture image]. This image came from the 2.5 MHz transmission; the 20 MHz transmission looks identical.

No one would think that the National Institute of Standards and Technology would be the "gold standard" for standard radio transmissions, and when it comes to the standard frequencies and time signals, it definitely is. I believe the baseband is assembled as a single audio signal which then modulates all the transmitters. Oddly, many of the voice transmissions are very poor quality, often unreadable [excluding the ID and time announcement which are generated locally at the station]. I am fairly sure the other announcements originate at other agencies and are transmitted to WWV in some manner, possibly VoIP which might account for the poor quality.

There is another problem for which I do know the source on the 5, 10 and 15 MHz transmissions. Here's a screen capture of the 10MHz signal on 20 Dec at 0013Z. I've widened the span and bandwidth to 6 KHz to show the entire signal.

Note that we have the 10 MHz carrier with



3 "Inter-Range Instrumentation Group."

the 100 Hz subcarrier as before, and here, you can see the sidebands from the time code modulation, especially in the waterfall display. The tone was 500 Hz for this minute, and you can see the two sidebands as before. The vertical scale is calibrated in dBm [decibels below 1 milliwatt] at the K3 antenna input connector.

However, now, there are another pair of sidebands at 1 KHz, the 2nd harmonic of the 500 Hz tone. The carrier was at -73 dBm [S-9] when I snapped this screen shot, the two fundamental sidebands are at -80 dBm where they should be. The 2nd harmonic, which shouldn't be there at all, is at -95 dBm, 15 dB below the fundamental and 22 dB below the carrier. And you can clearly see the 3rd harmonic as well, about another 10 dB down. While it's not marked, you can see the 4th harmonic too. It's down a good 47 dB from the carrier, but clearly discernible. Note that the fundamental 500 Hz tone, and its harmonics are also modulated by the 100 Hz time code subcarrier, and that harmonics of the 100 Hz subcarrier show up between the main signals ... it's not real apparent in the spectral display but obvious in the waterfall.

All of this is a sign of non-linearity in the transmit chain and since none of these artifacts appear on the 2.5 and 20 MHz transmissions, and we're pretty sure there is a single baseband modulating signal, it would appear that the WWV transmitters are not all identical. It turns out that the 2.5 and 20 MHz transmitters use the AM Broadcast scheme where a low level RF stage is modulated and all the following amplifier stages are linear. The 5, 10, and 15 MHz transmitters are very similar to ham transmitters in the pre-SSB days ... a Class-C power amplifier, plate modulated. Remarkable difference in the resulting signal spectrum.

WWVB transmits on 60 KHz, does not ID, and transmits only the time code on its main carrier. It's inaudible here in the daytime, and it is hard to hear at night on an E-field antenna. Most devices that use it as a standard sync do so at night using H-field [magnetic] antennas which are somewhat immune to noise. WWVL was transmitting on 20 KHz from 1963 to 1972.

The US is not the only country with the correct time. In the mid-60's, we couldn't hear WWV in SE Asia, so we used JJY, in Japan as you might suspect. At that time they had an HF service similar to WWV and it was very strong in SE Asia. We needed very good time hacks to time star transits to determine our positions since for an aircraft navigation system like TACAN, the pilot needs to know where it is to figure out where he is. Nowadays, I think JJY is on VLF only. CHU is a Canadian service that for many years was just above 40m [7335 KHz] which was within tuning range of many hams' 40m-only receivers and got a lot of use in the late 50's and early 60's when getting to WWV might not have been possible [I know, today it's hard to think that would have been the case, but it was for many then]. CHU is currently on 7850 KHz and has at least one other frequency fairly close to 80m. There are a lot of time and frequency stations on the air, see <http://ac6v.com/standard.htm> for a list. I'm not sure how current it is, it still shows JJY on HF and I think they retreated to 60 KHz quite awhile ago.

The rotation rate of the Earth is not constant, generally it is slowing down. It doesn't change by much but every so often [like every 2 or 3 years], the difference will add up and UT1 [astronomical time] will fall behind UTC [atomic time] and they'll insert a leap-second in UTC between 23:59:59 and 00:00:00 to keep them relatively close. This nearly always happens either in June or December. I have a dive watch that is remarkably accurate [2-3 seconds/month] and several years ago, I set it to WWV before going to bed on "leap-second day," and when I got up, it was exactly 1 second fast. From that, I concluded that leap-seconds are real.

I hope everyone had a good holiday season,

73,

Fred K6DGW

CHRISTMAS PARTY MINUTES

December 14th, 2012

The SFARC Christmas Party (no Board or General Meeting) for December commenced at 1930 hours at the Methodist church in Newcastle. All Officers, Board members and other SFARC staff were present, as well as newly elected officers for 2013.

After an amazing feast of turkey, ham, and many, many side dishes, President Bob-K6UDA welcomed the group of approximately 57 members and family followed by an introduction of Officers. A moment of silence was observed in memory of Jim Carman, K6ARR, who passed earlier this year. Jim was a founding member of our Club and was always present at meetings, Club events and the annual Christmas Party ... he will be missed.

FESTIVITY REPORT:

Awards:

- Bob, K6UDA presented silent key, K6ARR's badge lanyard to **Justin, K6UVK** in memory of Jim's life-long participation in the Club and in his memory.
- Richard, WA6RWS presented **Donna, W6CQX** with the Field Day Cook's Hat for her excellent service to the Field Day crew. Donna runs a mean bar-b-q and the In-n-Out Burger official hat will only help her in that work. ☺
- Richard also presented **Debbie, KF6LXN** with an official In-n-Out Burger hat as well, for her huge contribution for organizing and cooking for the Christmas Party.
- Al, N12U presented **Gene, KG6NYH** with a certificate for "Sustained Performance" for his many years as raffle Chair.
- Al presented **Richard, WA6RWS** and **Carl, WF6J** with certificates for "Sustained Performance". Richard for his many years holding several positions in the club (currently Treasurer, repeater guy, Sunshine, official Greeter, and I'm sure a few I probably missed). And, Carl for his efforts as PIO officer and webmaster ... two very important functions in a healthy club.
- Al presented **George, KG6LSB** and President **Bob, K6UDA** with "Recognition" awards for their contributions; George as refreshments Chair and Bob for stepping up to be President when no one else volunteered.
- Bob, K6UDA presented **Al, N12U** with the "Big Dog on the Porch" award for his organizational skills and efforts to keep our Club programs fresh and interesting.
- Raffle awards were many, with just about every woman in attendance getting something nice from the "Ladies raffle". The top prize of a hand-made quilt was one by **Jean, AE6LR's XYL**.
- Top prize of \$150 cash was one by **Al, N12U**
- The much sought-after raffle prize, the ubiquitous atomic clock, was finally one by **Bob, K6UDA**

Treasurer's Report: Richard provided a Treasurer's report for these Minutes as follows: a beginning balance as of November 1st is reported as \$3,684.88. Expenses in November totaled \$378.98. Deposits included membership renewals to total \$118.19. leaving a net cash on hand after transfers and office supplies debts, at end of November as \$3,424.09.

The Christmas Party ended somewhere around 2050 with a great time had by all; plenty of laughs, great visiting and, of course, many good eats including plenty of home-made desserts. Until next year then ...

Submitted by, Dennis-WU6X, Club Secretary



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P.O. Box 6421, Auburn, CA 95604

2013 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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