

August Meeting

Date: July 25, 2003 - 7 PM socializing, meeting starts at 7:30 PM.

Date: Friday, August 22, 2003

Time: Socializing at 7 pm, meeting at 7:30 pm

Place: Oak Elementary School, 1501 Oak Avenue, Los Altos (three blocks east of Grant Road)

Speaker: Stefan Goette, KG6MAO

Topic: Radio Propagation

Summary: Learn the secrets of how radio waves travel through space, the unique characteristics of each band, why one polarization is preferred over another, how signals bend and bounce, refract and diffract, what communication distances are possible and under what conditions. Stefan KG6MAO will cover these exciting aspects of amateur radio.

Also, there will be a show and tell. Bring your new equipment, gadgets, or flea-market treasures to show to the club. And be sure to bring your hardest questions to submit to Dr. Know-It-All !!!

- Steve, K6OIK

July Meeting Report

At the July meeting, we had a wonderful presentation from Mikel, KN6QI, FARS club president. He presented the theory and operation of PSK-31 and did a demonstration. With just a vertical antenna in the school parking lot, Mikel made a contact to a HAM in Lethbridge, Alberta, Canada. Mark, KG6RQL, took away the ICOM T2H prize.



Mikel, KN6QI



Mark, KG6RQL



Club Meeting

Presidents Column

Flea Market. The next Foothill Electronics flea market is Saturday September 13. This one is sponsored by WVARA (West Valley Amateur Radio Association). You can find the schedule on the FARS web site www.fars.k6ya.org. Spread the word about this year's flea markets.

New Hams. I would like to extend a personal welcome to the new members of the club who took our recent Technician License Class in June and July. We had thirteen participants in the class and nine who passed their license test on the last day of the class. Everyone who participated in the class has been granted an Associate Membership in the club and is invited to participate in all our activities. I'm sure they will have many questions about equipment and operating, so I ask the membership to make them feel welcome and help them get going in our new hobby. Especially give a hand those who need a little more help to pass their license exam.

Programs. This month we take advantage of one of our talented members as Stefan talks about the mysteries of radio propagation. Next month we have our annual homebrew contest, so get those projects ready for presentation and prizes. Don't forget to bring your Amateur Radio questions for "Doctor Know-it-all".

- deMikel, kn6qi

Secretary's Report

The FARS Board held its monthly meeting the night of August 5, 2003. Attendees were Mikel, KN6QI; Frank, K6FCW; Steve, K6OIK; Mike, KG6GUE; Omri, AA6TA; Stefan, KG6MAO; Howard, KG6GRO; and Mark, KG6GRR. The board discussed the club account, which needs to be moved or will incur charges. The location for the club meeting was also discussed and Omri (AA6TA), who has done an excellent job coordinating the meeting place, is following up. Mikel, KN6QI, will speak with the Police Chief about a location for the club station at or near the Los Altos Police station. The recent training class was reviewed, the good things and suggestions for the next class. Thank you to Mike, KG6GUE, for coordinating the class and to all that helped with the instruction and demonstrations. Club expenses were approved (field day, relay, club meeting). Due to the frequent need at meetings, a club projector was discussed. The terms of the board members were reviewed.

- Martin, KD6WJW (de Mark, KG6GRR)

Upcoming Events

Aug 22 7:00 PM Club meeting, Oak School
 Sep 2 7:30 PM Board Meeting, Los Altos Town Crier
 Sep 13 Dawn to Noon, Foothill Flea Market
 Sep 26 7:00 PM Club meeting, Oak School
 Thursdays 8:00 PM, FARS net, 145.230(-), 100 Hz PL
 See more events, [FARS Calendar](http://www.fars.k6ya.org/events/calendar.shtml)
[<http://www.fars.k6ya.org/events/calendar.shtml>](http://www.fars.k6ya.org/events/calendar.shtml)

Our information is that the ELECTRONICS Flea Market will CONTINUE and is not affected by the recent decision by Foothill College to cease the general Flea market.

CLUB INFORMATION

President: Mikel Lechner, KN6QI
Vice President: Steve Stearns, K6OIK
Treasurer: Frank Weiss, K6FCW
Secretary: Martin Liberman, KD6WJW
Radio Officer: Omri Serlin, AA6TA
Training Officer: Mike Zensius, KG6GUE
Relay Editor: Mark Hardy KG6GRR

FARS Board: Dick Baldwinson N6ATD, Herb Davidson
KF6BKL, David Cooper KE6PFF, Howard Califf KE6PWH,
Howard Takaoka KG6GRO, Stefan Goette KG6MAO.

Station Trustee: Stan Kuhl, K6MA
FARS Web Page: <http://www.fars.k6ya.org>
Download Relay: <http://www.fars.k6ya.org/relay>

Club members and non-members are encouraged to subscribe to the FARS Announcement list by browsing www.fars.k6ya.org/mail, clicking on Subscribe/Unsubscribe and following the instructions under "Subscribing to fars-announce."

You may also submit an announcement to the FARS Announcement at fars-announce@svpal.org. The list is moderated and messages will be posted as approved by the list moderator.

The FARS board of directors may be reached at fars-board@svpal.org

Club meetings are held at 7 PM on the fourth Friday of each month except January (Winter Banquet); and sometimes there are changes for June (for field day) and Nov. & Dec (for holidays).

Annual club membership \$20. Club badges are \$6. Visitors are always welcome! Directions on the back page. Talk-in: N6NFI (145.23-, 100 Hz) or W6ASH repeater (145.27 or 224.36).

The FARS *Relay* is the official monthly newsletter of the Foothills Amateur Radio Society. Contributions to the newsletter from members, family, and guests are earnestly solicited! Contributions subject to editing and/or compression. ASCII files via Internet or diskettes preferred; but all readable forms welcome.

Here is how to reach the editor:

Mark Hardy, KG6GRR
Mail: 2998 Jerald Avenue
Santa Clara, CA 95051
Voice: 408-243-0701 (Before 9 PM, preferred)
Fax: 408-243-0701
Email: kg6grr@arrl.net, At FARS meetings.

DXpedition

Please share the following with friends and your club. I will be leading a new kind of expedition next summer to Svalbard, "Land of the Ice Bears" and there is space available for HAMs, Families and Friends.

Go To www.casualdx.com to find out more!!!

Also see my ads in World Radio and DX Magazine.

QSL 73, Regards, Marc K9PET

Dr. Know-It-All

August 2003

Summer doldrums are here. When the weather gets nice, the mind gets lazy. Knowing this several club members thought the time was ripe to try and stump Dr. Know-it-All with summer questions.

Question #1: How is the audio tone generated in CW? From Frank Weiss, K6FCW.

Answer: To answer this we must first make a distinction between CW and Morse code, two terms whose meanings are occasionally blurred. Morse code is a way of encoding information for transmission. The term does not specify a method of transmission. Several different modulations or emissions can be used to send Morse code. On-off keying (OOK), amplitude-shift keying (ASK), frequency-shift keying (FSK), and phase-shift keying (PSK) are possible methods. A primitive but simple method with FM transmitters is to modulate a keyed audio tone obtained by putting a transmitter's microphone near a code practice oscillator's speaker. This FM method uses more bandwidth than necessary, and the pitch of the Morse tone is set by the sending station rather than the receiving station. For these reasons, FM Morse is not used below 50 MHz.

In the HF bands, continuous wave or CW is used exclusively for the transmission of Morse code. The term "continuous wave" is a misnomer because the carrier is not continuous. It is keyed on and off in accordance with the Morse characters. Therefore, the Morse information is conveyed in the amplitude of the carrier and not its frequency or phase.

The transmitted signal contains no audio. The audio tone that a receiving operator hears is generated inside the receiver. We will describe how this is done in a conventional analog receiver. It is noted, however, that some modern receivers that employ IF DSP, such as Icom's IC-756ProII, use a different method than that described here. These IF DSP radios are today's forerunners of tomorrow's software defined radios.

In a conventional analog receiver, both CW and single-sideband signals are received by using a beat frequency oscillator (BFO) to inject a pure sinusoidal signal into the IF passband. The BFO signal is generated by a separate, stable oscillator that is usually tunable. Several steps are required to set up a receiver to get the best reception of a CW signal. First, the operator tunes the signal for maximum S-meter deflection, although the tuning may be offset somewhat to place any offending interference out of band. Tuning for maximum S-meter deflection assures that both sidebands of the CW signal are completely inside the IF filter's passband. Second, it's best to turn the RF gain control down and the audio gain up, to reduce intermodulation distortion from strong local signals. Third, the BFO is tuned to a frequency within a kilohertz or so of the CW signal's frequency in the receiver's IF. The BFO signal has no sidebands and can be set above or below the CW signal in frequency.

The audio tone is created by the process of "detection." Detection can be done by either a nonlinearity, such as a diode rectifier, or a frequency mixer which combines two signals. In receivers built before around 1960, it was common practice to inject the BFO signal directly into the IF signal, which

effectively adds the IF and BFO signals. The resulting sum signal was then passed through a diode rectifier, which performed AM detection. By 1970, however, nearly all receivers were using balanced mixer circuits called product detectors. A product detector has two inputs. Rather than being added, the IF and BFO signals are applied independently to these inputs. Both detectors, the diode rectifier and the product detector, generate signals at frequencies that are the sum and difference of the input signal frequencies. If, for example, the CW signal in the IF is at 455 kHz and the BFO is at 456 kHz, the detector output will have signals at 1 kHz, 455 kHz, 456 kHz, and 911 kHz. A low-pass filter after the detector allows only audio frequencies to pass. So the 1 kHz signal gets through, and the other three frequencies are discarded. After low-pass filtering, the 1 kHz audio signal goes to an audio amplifier and speaker or headphones.

Now here's the important idea: The 1 kHz signal is created from the CW and BFO signals only when the CW and BFO signals are both present. However the BFO signal is steady, always on. So the 1 kHz audio signal goes on and off in synchronously with the CW signal. Consequently, the audio signal has the same on-off keying information as the original CW signal.

Question #2: Are there differences in the electrical properties of various solders?

Indeed there are. Solder is an alloy made of two or more metals. The proportions of the constituent metals are chosen so that the alloy changes phase from solid to liquid abruptly, without an intermediate mushy phase. Alloys with this property are called eutectic. Most electrical solders are made from tin and lead. The eutectic proportions, by weight, are 63% tin and 37% lead. Solder with these proportions is eutectic and melts at 361 degrees Fahrenheit. However, because tin is expensive and lead is cheap, the ratio 60% tin and 40% lead is commonly sold. 60-40 solder is less expensive, but it does go through a very slight mushy phase when cooling. Tin has higher conductivity than lead, so that is another reason to prefer the eutectic blend over the cheaper stuff.

Solder is not a glue. Rather it forms an alloy with the base metals that it joins. Atoms of the base metal migrate into the solder and vice-versa. Excessive migration weakens the solder and results in brittle joints prone to breaking. Gold dissolves readily into solder when soldering gold surfaces and creates brittle joints. Aluminum, cadmium, and zinc are also detrimental to solder. Additives to tin-lead solder may include small amounts of silver, which minimizes scavenging of silver when soldering thin silver films, and antimony, which increases the strength of the solder. Tin-lead solder doesn't react with certain metals such as aluminum, high-alloy steel, cast iron, and titanium. So these metals can't be soldered with tin-lead solder. However, aluminum can be soldered by using aluminum-zinc solder. In response to public concern over environmental hazards of electronic waste, new electronic solder blends that are lead free have appeared on the market.

A key element in electrical soldering is flux. Electrical solder is a hollow tube, and the hole in the middle contains a core of "rosin" flux. When metals are heated, they form a surface oxide layer which the solder won't react with. The effect is much like trying to solder to aluminum. The liquid solder balls up and refuses to flow or "wet" the surface. Flux does two things. First it melts and coats the base metal preventing contact with the air,

and thereby preventing new oxide from forming. Second, flux's acidity removes any oxide that is already present. However, the flux that remains on a joint after soldering continues to be acidic and can cause corrosion over time. For this reason, it's best to remove residual flux with a solvent after soldering.

Different solders have different core sizes. When doing new assembly on clean parts, a low flux solder is fine. Such solder has a smaller core and less flux, making cleanup easier. Conversely when working on old electronics that has had time to develop a thicker oxide layer on metal leads and wires, a high flux solder with a larger core is indicated.

Here are a few simple rules to soldering success. These are:

- Wash your hands before starting. Oils from your hands can spoil the work.
- Protect small parts, particularly semiconductor devices, from static discharge. Work on an anti-static mat, use a grounded wrist strap and a grounded soldering iron.
- The surfaces to be soldered should be clean and shiny. Scrape wires and leads with a dull knife.
- All joints should be mechanically tight before soldering. Nothing loose or floppy.
- Solder quickly at a low temperature. Too high temperatures encourage oxide formation, and too long heating encourages base metal migration and leads to brittle joints.
- Don't move the joint until it's cooled. Good joints look shiny; "cold" joints are dull and grainy.
- Remove excess flux with an appropriate solvent. Especially important for gear that you want to keep for many years.
- Wash your hands when finished. You've been handling lead!

Most of us solder by hand, one joint at a time. However, assembly lines require automated methods. Through-the-board type circuit boards are soldered on their undersides. The underside of the board is passed over a stream of molten solder. This method is like drinking from a drinking fountain, except the width of the liquid solder stream must equal the width of the circuit board. This method is called "wave" soldering. Conversely, surface-mount boards must be soldered on their top sides. A solder paste containing solder and flux is first applied to the board, and the components are held in place with cement. The board is heated until the solder paste melts and flows. This method is called "reflow" soldering.

That's it for this month. You can send your comments or questions about any aspect of Amateur Radio to Dr. Know-It-All. Comments and questions are accepted in writing at the monthly meetings of the Foothills Amateur Radio Society or you can email or contact the Relay editor or any of the club officers (see <http://www.fars.k6ya.org/officers.shtml>).

Reference:

1. M. J. Hoban and B. M. Lunt, *Soldering*, 1997, from <http://et.nmsu.edu/~etti/spring97/electronics/solder/solder.html>

Field Day Report, "When All Else Fails"

The FARS club participated in the 2003 Field Day the weekend of June 28-29, 2003. There were many participants from the club and from the local communities and many contacts all over the world. The club participated as class 2A-SCV using the club callsign, K6YA. The club scored 2524 points with 236 CW (x2), 31 Digital (x2), and 728 Phone QSOs (x1) and a power multiplier of 2. We added 1500 bonus points for a total of 4024 points.

Below are a few pictures of the FARS field day. More pictures may be found in the July 2003 Relay, which may be found at <http://www.fars.k6ya.org/relay/>. Also check http://home.comcast.net/~stefan349/FARS_pics/thumbnails.html



The CW Master



Barbecue



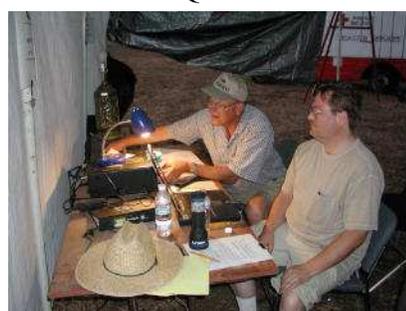
Antenna Setup



BBQ Master



Club Stations



Sideband Station



Sideband Station



Antenna at Night

FARS Membership Form

PLEASE fill out the membership form for all new/renewal members.

FARS 2003 MEMBERSHIP RENEWAL FORM Date: _____

Name(s) & Callsign(s) & Class (E-A-G-T-N-None): _____

Mailing Address: _____

Home phone: _____ Work phone: _____

Fax (H or W?) _____ Packet BBS Address: _____

E-mail: _____ ARRL Member(s)? _____

Preferred modes: (e.g. HF-SSB/VHF/QRP/Other): _____

I'm willing to Elmer new hams with: _____

Special topics of interest / suggestions for club meeting speakers: _____

Dues: \$20 per year, new members add \$6 for badge fee

Please note: Membership runs from January 1 to December 31.

Send your check payable to FARS, to:

FARS, c/o Frank Weiss K6FCW, 109 Stratford Court, Mountain View, CA 94040



How to get to meetings:

(Visitors always welcome)

For the next few months, our meetings will be held at the Oak Elementary School gym room (directions below) on the fourth Friday at 7 PM for the code practice/socializing and 7:30 PM for the regular meeting. There may be changes in the meeting dates for January, June, November, and December.

DIRECTIONS:

Oak Ave. is off Grant Road, between Fremont and Covington.

From El Camino Real, take Grant Road south (towards Foothill Expwy). At the Oak stop light, turn left (only possible turn). Go 0.3 miles on Oak. Watch for the parking lots and the gym on your left.

From Foothill Expwy. take Grant Road north (towards El Camino). At the Oak stop light turn right (only possible turn). Go 0.3 miles on Oak. Watch for the parking lots and the gym on your left.

TALK-IN via the [N6NFI](#) (145.230-; 100Hz PL) repeater or the [W6ASH](#) 145.27- (100Hz PL) repeater