

## April Meeting

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

**Place:** Loyola Elementary School, 770 Berry Avenue, Los Altos. Directions to the meeting are later in the newsletter.

**Speaker:** Jim Peterson, K6EI

**Subject:** "Zen and the Art of Top Band Operating"

**Summary:** Top Band is the lowest in frequency of all amateur bands, ranging from 1800 to 2000 kHz. This talk will cover unique aspects of Top Band operating, including how propagation and noise characteristics differ from the HF bands, DX possibilities, and how to install an efficient antenna when you don't have a lot of real estate.

We will have "Show and Tell" before the presentation. Additionally, during the break, you can submit written questions to Dr. Know-it-all on amateur radio related topics and see your questions answered in the Relay.

- Steve, K6OIK

## March Meeting Report

Peter Griffith, WA6VAQ, presented his "Go Kit." Peter presented a large assortment of items in his Go Kit. There was everything from radios and cables to food and clothing. Look for the list of items later in the newsletter.

Harry Reinstein, AE6LD (see photo below), carried away the Handheld Transceiver. Apparently, Harry is a new member to the club. What an initiation!



The number for Michael Horner, KG6LBE, was chosen for the "Wish You Were Here" prize. Unfortunately, Michael was not present.

## Presidents Column

**Incorporation.** The FARS Board has completed work on the Bylaws for incorporation. A copy is available at <http://www.fars.k6ya.org/docs/FARS-Bylaws.html> for members to review. Also the Articles of Incorporation are available online at <http://www.fars.k6ya.org/docs/FARS-Articles.html>. Members should have received notice of the upcoming vote on the new Bylaws and Articles of Incorporation at this month's membership meeting. We will vote at this meeting to approve these Bylaws, Articles of Incorporation and authorize the president to file papers for incorporation. These new Articles and Bylaws will replace the current FARS Bylaws and Constitution upon the first Board of Directors meeting after completing the incorporation.

The Board of Directors of FARS has spent several hours developing these new Bylaws to allow incorporation of the club and we recommend a **Yes vote** on all measures.

**Flea Market.** The next Foothill Electronics flea market is Saturday May 10. This one is sponsored by SCCARA (Santa Clara County Amateur Radio Association). You can find the full schedule on the FARS web site [www.fars.k6ya.org](http://www.fars.k6ya.org) or at the official flea market web site at [www.electronicfleamarket.com](http://www.electronicfleamarket.com). Spread the word about this year's flea markets.

- de mikel, kn6qi

## Secretary's Report

The FARS board held its monthly meeting on the evening of April 1, 2003. Members present were Mikel, KN6QI, Howard, KG6GRO, Steve, K6OIK, Stefan, KG6MAO, Omri, AA6TA, Dick, N6ATD, Dave, KE6PFF, Mike, KG6GUE, and Martin, KD6WJW. A proposal to change the club's fiscal year to March 1 through the last day of February was voted on and approved. The new by-laws and other items associated with incorporation will be voted on at the April club meeting. Formal notification of this will be mailed to the membership. The license class sponsored by the club has been rescheduled to start in June. Other items discussed included speakers and topics for the monthly meetings, raffle prizes, and Field Day issues.

- Martin, KD6WJW

## Upcoming Events

- Apr. 25 7:00 PM Club meeting, Loyola School
- May 6 7:30 PM Board Meeting, Los Altos Town Crier
- May 10 Dawn to Noon, Foothill Flea Market
- May 23 7:00 PM Club meeting, Loyola School
- Thursdays 8:00 PM, FARS net, 145.230(-), 100 Hz PL
- Wednesdays 9:00 PM, New HAM net, 147.39 (+), 151.4 PL

See more events, [FARS Calendar](http://www.fars.k6ya.org/events/calendar.shtml)  
<<http://www.fars.k6ya.org/events/calendar.shtml>>

## 9-Volt Regulator By Dave Platt, AE6EO

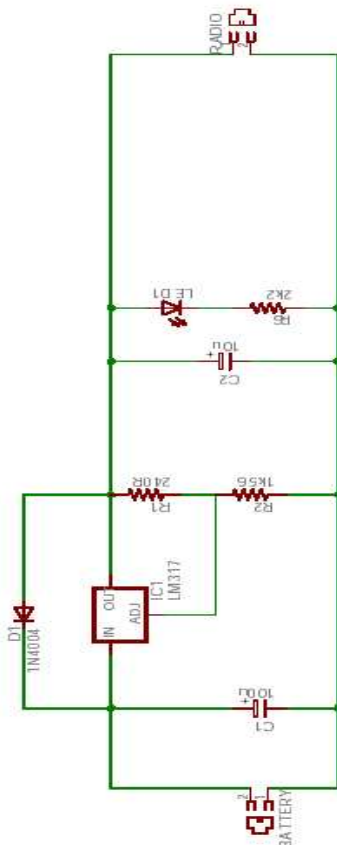
The schematic for the little 9-volt show & tell regulator is on my web site (<http://www.radagast.org/~dplatt/hamradio/>).

It's a very "vanilla" LM317 regulator circuit with no fancy additions. R2 sets the output voltage - about 1560 ohms for 9 volts, about 960 ohms for 6 volts. For other voltages, set  $R2 = 200V - 240$ , where V is the desired output voltage. For flexibility, replace R2 with a 2500-ohm trimpot, and you can dial the voltage to anywhere from 1.2 at the low end, up to more than 12 volts if your incoming supply voltage is high enough (the LM317 needs a couple of volts of headroom to regulate well). This circuit can be powered from an ordinary 12-volt-DC "wall wart", or from a car battery or gel cell.

An even simpler circuit, for a single fixed voltage, can be made with a 78xx-series regulator - 7805 for 5 volts, 7809 for 9 volts, etc. I like the LM317 because it's flexible, has good self-protection, and regulates a bit better than the fixed-voltage parts. Also, I have a bunch of them in my junk drawer :-)

There's another PDF in that directory, "charger.pdf", which shows a slightly more complex LM317 circuit. This one is an adjustable "float" charger for sealed lead-acid "gel cells". It adds a bunch of additional protective circuitry against accidental short-circuiting of the output, reversed battery hookup, or excessively-rapid charging of a fully drained gel cell. Using a DC "wall wart" of around 18-20 volts, you can float-charge gel cells indefinitely at about 13.7 volts without damaging them.

There's nothing particularly original about either of these circuits - I cribbed the techniques from the LM317 data sheets, available for download from <http://www.national.com/ds/cgi/LM/LM117.pdf> - 73, Dave AE6EO



## 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>

FARS announcement mailing list is moderated, so you cannot reply directly to the list: [fars-announce@svpal.org](mailto:fars-announce@svpal.org)

Also, note you can contact the FARS board of directors at [fars-board@svpal.org](mailto:fars-board@svpal.org)

To subscribe/unsubscribe, send a message to: [majordomo@svpal.org](mailto:majordomo@svpal.org)

In the e-mail message (in plain text) put one of:  
unsubscribe fars-announce YOUR-EMAIL-ADDRESS  
subscribe fars-announce YOUR-EMAIL-ADDRESS  
(e.g. Subscribe fars-announce dwilkes@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, Nov. & Dec. Annual membership \$20, family \$25. Club badges are \$5.75. 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:  
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Mail: 2998 Jerald Avenue  
Santa Clara, CA 95051  
Voice: 408-243-0701 (Before 9 PM, preferred)  
Fax: 408-243-0701  
Email: [kg6grr@arrl.net](mailto:kg6grr@arrl.net), At FARS meetings.

**Dr. Know-it-all, April 2003  
(by Steve Stearns, K6OIK)**

Questions received last month were on twinlead J-pole antennas, solar-powered battery chargers, and how to "read" equipment specs. Because the amateur literature on J-pole antennas belies many misconceptions about this antenna, the J-pole question merits a lengthy answer. This month's column is devoted to the J-pole. The answers to the other questions will appear next month.

**Question:** What are the dimensions for a 10-meter J-pole made from twinlead? W6APZ

**Answer:** The question is harder than it appears. The J-pole antenna is one of the least understood antennas judging by the scarcity of good articles on J-poles in the ARRL's antenna publications. A number of 2-meter twinlead J-poles can be found on the World Wide Web, but all have different dimensions. Without a proper theory of operation, the various authors tune their versions of the antenna differently, thereby arriving at different dimensions, and sometimes failing even to achieve unity VSWR.

Let's start with a definition of what a J-pole is and then consider how to tune it. The business part of a J-pole, the part that radiates, is a half-wavelength radiator just like a dipole. Consequently the radiation behavior, directivity pattern, radiation resistance, and gain are the same as for a half-wavelength dipole. The antenna can be mounted vertically or horizontally. No ground plane is required if mounted vertically.

The difference between a J-pole and dipole is how the radiator is fed. A dipole is center fed at a current maximum. A J-pole is fed at the end at a voltage maximum. The feed is accomplished by a section of parallel conductor transmission line. A common misconception is that the transmission line should be a quarter wavelength long, grounded at the far end, and fed at an intermediate point along the quarter wave section. This misunderstanding accounts for why so many published J-poles miss the 1:1 VSWR mark.

The proper way to design a J-pole feed network is to forget the quarter-wave idea, and instead think about the feedpoint. The feedpoint drives two transmission lines that are connected in parallel. One transmission line is a shorted shunt stub, and the other goes to the end of the radiating element. The second line is nothing more than a transmission line segment terminated in the impedance presented by the radiating element at its end.

If the radiating element is resonant, then its impedance is real everywhere along its length. So, our resonant half-wavelength radiator presents a pure resistance to the transmission line at the design frequency. In the vicinity of the design frequency, the radiator acts like a parallel RLC circuit at anti-resonance. The hardest part of designing a J-pole is figuring out the values of  $R$ ,  $L$ , and  $C$  that make up this equivalent circuit.

The twinlead radiator uses the two wires together in the common mode rather than in the differential, or transmission line, mode. Both wires radiate together. Let's assume that Radio Shack #15-1174 twinlead is used. The specs for this line are 300 ohms, velocity factor 0.82, and AWG #20 wires.

We outline the design steps, assuming a design frequency of 28.8375 MHz:

1. Lookup AWG #20 in a wire table to find its diameter is 0.8118 mm.
2. Solve the open-wire impedance equation to find the spacing-to-diameter ratio  $s/d$  is 10.59.
3. Compute the equivalent diameter of parallel AWG #20 conductors obtaining 3.736 mm.

4. Compute the free space half wavelength to get 5.198 m.
5. Compute the ratio of half wavelength to equivalent diameter as 1,391.
6. Look up the  $K$  factor in *ARRL Antenna Book*, 19<sup>th</sup> ed., p. 2-5, Fig. 8, to get 0.963.
7. Compute the radiator's length as  $K$  times the free space half wavelength, 5.006 m.
8. Run an EZNEC model of a dipole of twice this length to get the impedance around the first anti-resonance.
9. Determine a parallel RLC circuit that fits the impedance data found in Step 8, and scale the  $L$  and  $C$  values to resonate at the design frequency.

Step 9 may be done by mathematical analysis or by trial and error using winSMITH. At this point we have an equivalent circuit of the end fed radiator. The main thing was to get the radiation resistance  $R$ , but it is handy to get the  $L$  and  $C$  needed for a complete narrowband model because this permits the determination of the VSWR bandwidth of the antenna. The values are:

$$R = 3,470 \text{ ohms}$$

$$L = 3370 \text{ nH}$$

$$C = 9.05 \text{ pF}$$

Now consider the matching network. Remember that the feedpoint sees the parallel connection of two 300-ohm transmission lines, one terminated with the parallel RLC anti-resonant circuit that represents the end-fed radiator, and the other terminated with a short circuit. We want to set the lengths of both lines to achieve the desired impedance at the feedpoint. We can design for any impedance, but 50 and 300 are standard. Since twinlead is cheap, let's stick to 300 ohms. Later I'll show a simple network (also made from twinlead) to transform 300 ohms to 50 ohms.

**Figure 1** gives the optimum lengths for both transmission line sections in electrical degrees. Dimension  $A$  designates the length of the shorted shunt stub, and  $B$  designates the length of the line feeding the radiator. Notice that the sum of lengths  $A + B$  is not always 90 degrees, thus disproving a myth about tuning J-poles. For our radiator's resistance of 3,470 ohms, the optimum lengths are

$$A = 17.8 \text{ degrees} = 0.422 \text{ m}$$

$$B = 73.6 \text{ degrees} = 1.742 \text{ m}$$

When building the J-pole, it does not matter if the two wires comprising the radiator wires are shorted to one another at one or both ends. I would leave both ends open because shorts are a nuisance when making adjustments. This completes the design of the J-pole except for a small matter. The feedpoint is 300 ohms. It can be transformed to 50 ohms by the method shown in the *ARRL Antenna Book*, page 15-1. Using two more segments of 300-ohm twinlead, we add a segment of length  $C$  from the 50-ohm source to the 300-ohm feedpoint, and lastly, we add a shunt open-circuited stub of length  $D$  across the 300-ohm feedpoint. The optimum lengths are

$$C = 22.2 \text{ degrees} = 0.526 \text{ m}$$

$$D = 63.9 \text{ degrees} = 1.513 \text{ m}$$

The 50-ohm feedpoint is balanced, so a 1:1 current balun is recommended if connecting to unbalanced coax. **Figure 2** shows a circuit diagram for analyzing the J-pole in Ansoft *Serenade SV*. The radiator is represented by its RLC equivalent circuit.

The VSWR of the antenna at the 50-ohm feedpoint is shown in **Figure 3**. The 2:1 VSWR bandwidth is 1.13 MHz or about 4%. In a future article, I'll show how to broadband this antenna by using a different feed and match network.

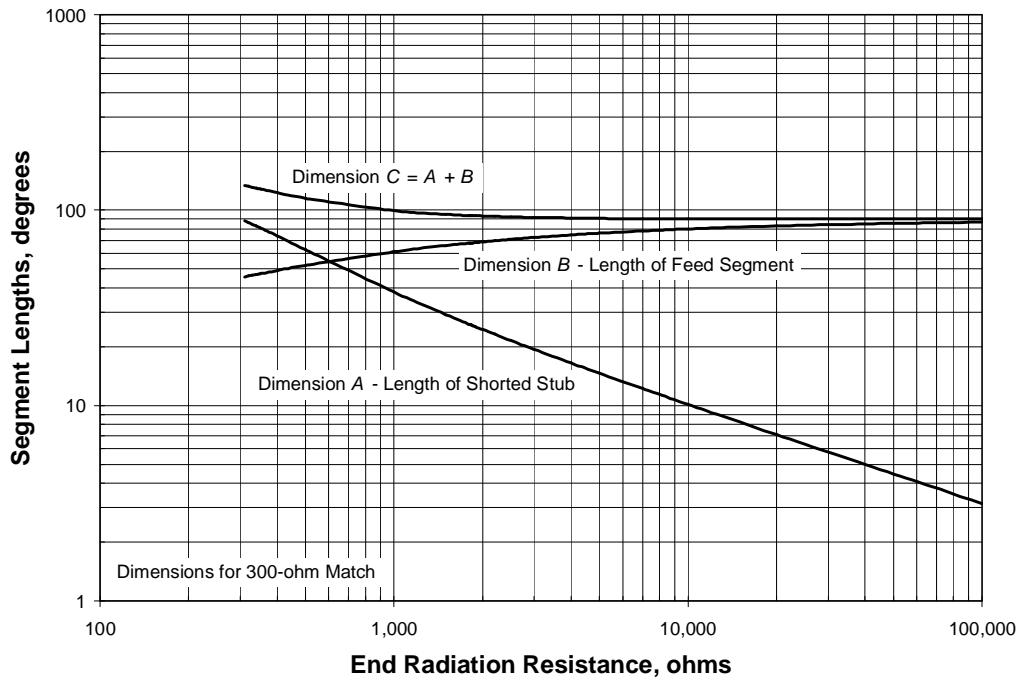


Figure 1. Optimum J-pole matching section for match to 300 Ω.

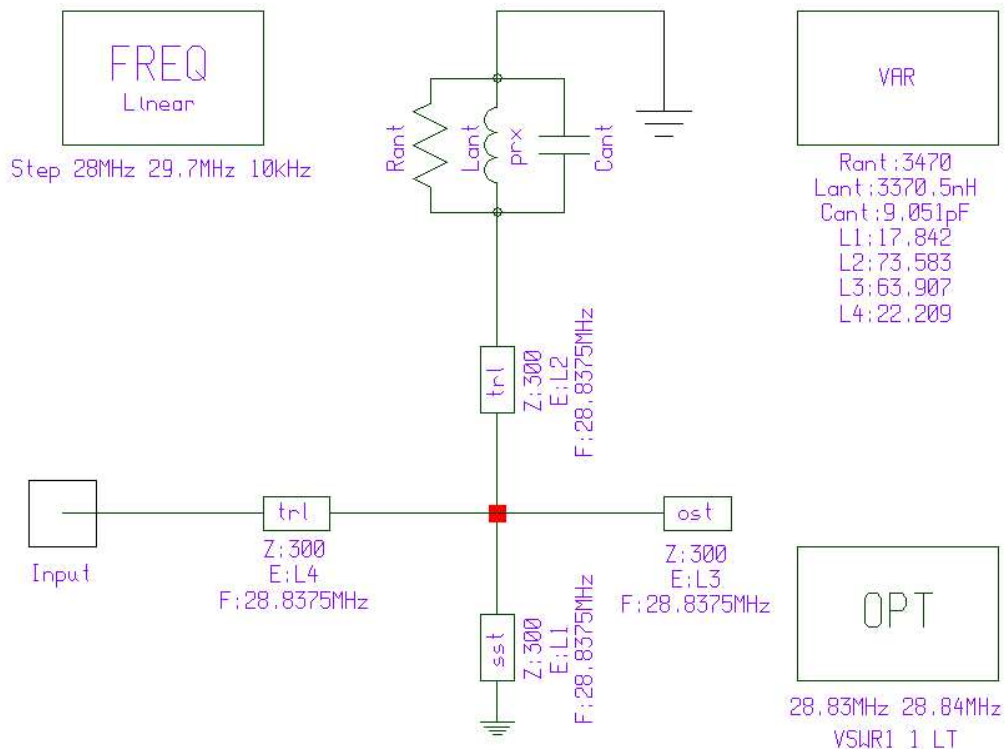


Figure 2. Schematic of 10-meter twin-lead J-pole showing optimum lengths in degrees.

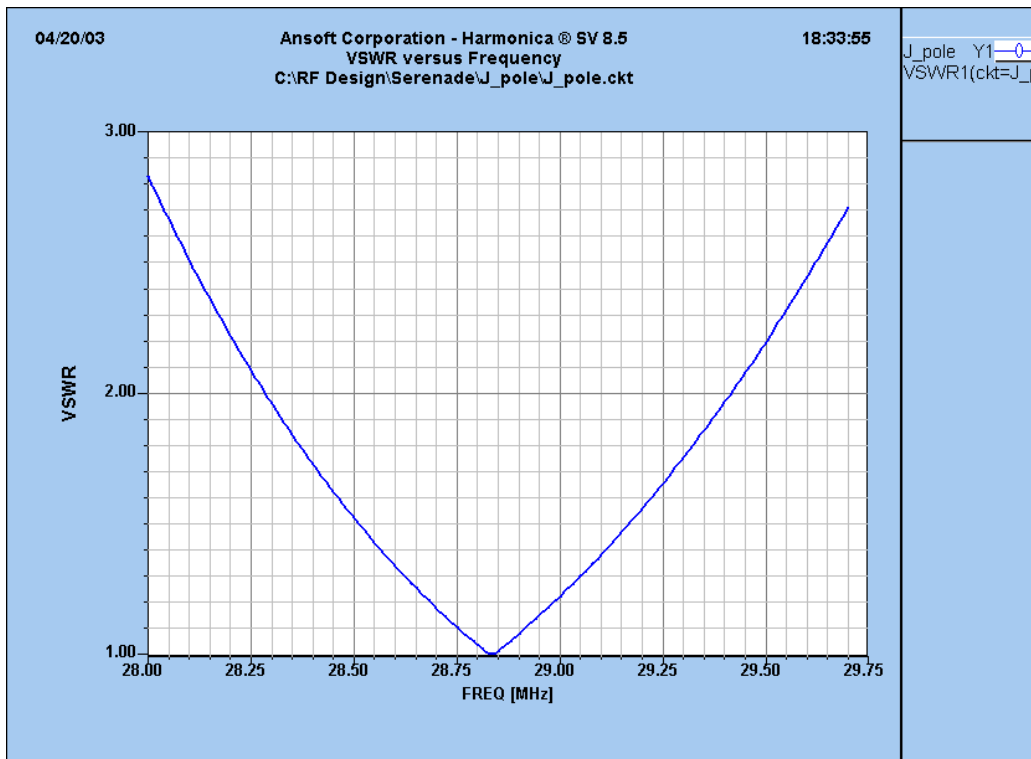


Figure 3. VSWR of 10-meter J-pole with 300-to-50  $\Omega$  matching section.

### Go Kit Contents (from Peter, WA6VAQ)



Take care of family and home first  
 Gas stove (from Asian market)  
 Portable picnic table (for station)  
 Pop-up shelter, chair  
 Go bag, suitcase, back-pack, tool box  
 Waist (fanny) pack for day trips  
 Personal items: coat, hat, gloves,  
 eyeglasses, sunglasses, dust mask,  
 change of clothes, lip balm, sun  
 screen, lotion, insect repellent, tooth  
 brush and paste, medications, first-  
 aid kit, poncho, umbrella, soap,  
 towel, watch  
 Trousers – zip-off bottoms to shorts  
 Food, snacks  
 Water

Eating utensils, napkins  
 Hand sanitizer, sanitary wipes  
 Toilet paper  
 Dental floss (*in case you meet a  
 dentist-HI HI*)  
 Hard hat  
 Knife  
 Push up mast, w/under wheel wedge,  
 Uncommon USA Inc, flag poles,  
 800-419-5880  
 Pool skimmer (as mast)  
 Flashlight, light sticks, "head" light  
 Magnetic mount antenna(s)  
 HF antenna  
 Antenna tuner  
 Counterpoise  
 HT(s), 2M/440  
 Mobile/Desktop radios (HF/2M/440)  
 Manuals for radios  
 Head phones and extension cables  
 Mic's and ear phones  
 Multi-meter  
 Speakers and extension cables  
 Power cords (Anderson power poles,  
 alligator clips)  
 Batteries for HTs, AA battery holder  
 Chargers and car adapters  
 Solar panels - flexible (West Marine,  
 Eco Systems)  
 AM/FM radio (crank, solar, battery)  
 Mini television  
 FRS radio (walkie-talkie)  
 CB radio (*please forgive Peter-HI HI*)  
 Cell phone  
 Digital recorder  
 Manuals for electronics

12V DC light (Lantern)  
 12V Battery (gel cell)  
 Batteries for electronics  
 Cables (coax) for radios  
 Connectors, adapters, splitters  
 12V soldering iron  
 Ropes and twine  
 Sling-shot and weights  
 Velcro fasteners  
 Cable ties  
 Clamps  
 Tools (screwdrivers, pliers, hammer, etc.)  
 Markers  
 Duct tape (name tags front and back,  
 whatever needs fixing)  
 Jumper cables  
 GPS, compass  
 Notebook w/paper, pen, pencil  
 Club lists  
 Repeater directory  
 Repeater lists  
 Repeater codes/commands  
 Band plan  
 Copy of HAM license  
 Badges  
 Badge cords  
 Emergency responder card  
 Emergency numbers  
 Maps

(For information only. No product  
 endorsements implied.)

Links to find information on go-kits:  
<http://www.specsnet.org/go-pak.htm>  
<http://scc-ares-races.org/go-pak.htm>

# 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: \_\_\_\_\_

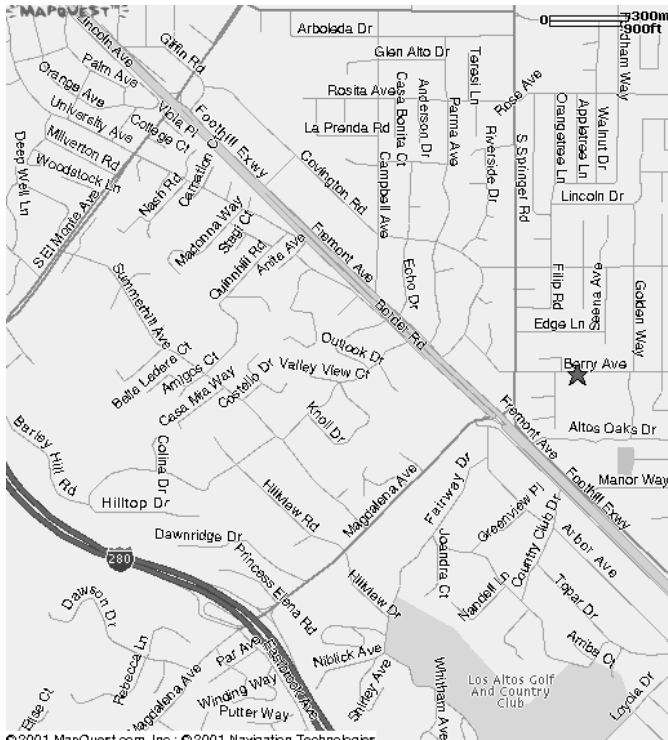
Special topics of interest / suggestions for club meeting speakers: \_\_\_\_\_

Dues: personal: \$20; family: \$25.

**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)

Our meetings usually will be held at the Loyola 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:

Loyola School is at 770 Berry Avenue in Los Altos, between Springer Rd. and Miramonte Ave.

FROM FOOTHILL EXPWY take the Rancho shopping center exit and go east (toward El Camino Real) on Springer one short block; turn right onto Berry; watch for the school parking lot on your right. Walk past the office and turn right. The gym is the first building on your right.

FROM I-280 take the Magdalena Av. exit and go east (towards Foothill Expwy). Cross Foothill Expwy onto Springer; then follow directions as above.

