

W6OTX**W6ARA**PAARA NEWSLETTER
VOLUME 67, NUMBER 5, May 2016**K6OTA****K6YQT**

PAARAgraphs



The Official Newsletter of the

Palo Alto Amateur Radio Association, Inc.Celebrating 79 years as an *active* amateur radio club—Since 1937

Bob Vallio, W6RGG

Topic

Bob will talk about his 2014 trip to 9K2HN in Kuwait for the CQ WW CW DX contest, where they set a new Multi-Multi CW record score for Asia. He will also take questions about the Pacific Division and ARRL.

Bio

Bob earned his Novice license in 1952 as WN6RGG. In 1953 he upgraded to General and dropped the N, now W6RGG then upgraded again to Extra in 1968. Bob is an accomplished DXer and contester. He has also participated in several DXpeditions including FO0XX (Clipperton Island), XF4L (Revillagigedo), 6Y5BF (Jamaica), 5W1AZ (Western Samoa), KP2A (Virgin Islands), 4U0ITU (ITU HQ in Geneva), VP5VW (Turks & Caicos Islands), 5V7A (Togo), HC8N (Galapagos Islands), OJ0/W6RGG (Market Reef), OH0/W6RGG (Aland Islands), and BS7H (Scarborough Reef). Bob is a long time member and past president of NCDXC and NCCC and was elected to the CQ DX Hall of Fame in May of 1997. He has also been active in Emergency Communications with Alameda County RACES since 1975.

Bob was elected Section Communications Manager, and Section Manager of the ARRL East Bay Section from 1978 to 2000, and Vice Director of the ARRL Pacific Division from 2000 to 2003, and Director of ARRL Pacific Division from 2003 to present. He has served on every committee of the ARRL Board of Directors, most recently being elected by his fellow Directors to the Executive Committee.

Upcoming Events

- May 6 PAARA General Meeting, 7:00 PM
- June 3 Cubberly Community Center, Room
- July 8 H-6, 400 Middlefield Rd, Palo Alto
- May 18 Board Meeting, 7:00 PM
- June 15 Everyone welcome!
- July 20 Location TBD



President's Corner

May 2016

It seems like summer is just around the corner, and with that comes Field Day. This year the PAARA Sponsored ASVARO Flea Market directly follows FD in early July, so I'll be starting to twist arms earlier than usual. We have our USS Hornet tour, which will be done by the time you receive this. The Maker Faire Bay Area is coming up soon, and I hope to see you there. I also went to the NCCC Awards Luncheon to pick up some lumber, but saw a lot of PAARA members too.



Field Day 2016 is rapidly approaching. PAARA is finalizing preparations for another blow-out event in Bedwell Bayfront Park in Menlo Park. We've had a few planning meetings already and the aluminum polishing is about to

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Touch Screen Calibration

Bob Van Tuyl, K6RWY

Introduction

The Bay Area Radio Builder Club (BARC) takes on various projects to get experience constructing and debugging various circuits. Bob bought a Banggood 2.4 inch TFT LCD Shield Touch Screen Display Module for an amazing price of US\$ 6.49. After getting the basic input and output libraries connected to a program Bob wrote he discovered that there was a slight problem with respect to the input from the touch screen and the output to the display. They were using different coordinate systems!

It became clear early on that I needed to find a transform from the touch screen coordinate system to the display output coordinate system. But first I had to develop a system for inputting coordinates from the touch screen. An interrupt service routine seemed in order but the touch screen doesn't issue an interrupt. So a polling real time system is required.

My first attempt to characterize the transform was to use two points on the display, capturing both the display coordinates and the touch screen coordinates. A big assumption here is that both coordinate systems are linear. Thus the transform is implemented by simple straight line equations: $X_d = m_x * X_t + b_x$ and $Y_d = m_y * Y_t + b_y$. X_d and Y_d are the display coordinates of (x,y). X_t and Y_t are in touch screen coordinates that correspond to X_d and Y_d . The slope of each line is given by m_x and m_y . The display coordinates for touch screen input of (0, 0) are b_x and b_y . All the inputs and outputs are integers so I attempted to create transform equations with integers using the two points.

The scheme worked well enough that I was able to draw a keypad and get digits and other characters from the keypad by simple comparisons. Using a finite state machine I was able to collect frequency digits, execute various commands (which take two input characters from the keypad) and use one of the key pad buttons to execute some radio function (i.e. unknown function). This all worked but the edges of the key-

pad were a little indistinct. Touching near a line sometimes caused an incorrect input.

One problem with the two point system is that I chose the points that are at the corners of the display. They turn out to be hard to access. With two points a simple solution exists by solving two simultaneous equations. If more than two points are used some other scheme needs to be used to find the slopes and offsets (i.e. m and b). Around midnight one evening I dragged out Sokolnikoff & Redheffer, "Mathematics of Physics and Modern Engineering" published in 1958. On page 702 I found the development of the "Method of Least Squares." I have used this method before but had forgotten the details. Now, I could use a number of points to find m and b for both x and y transforms. Oh, and I finally broke down and used double precision numbers.

Program Architecture

Fancy title for the main parts of the program with an explanation for their existence. The Arduino may be programmed using C++ or C using an IDE from the Arduino.cc web site. When a new program is created there are two functions installed in the main file (e.g. Program-Name.ino). They are `setup()` and `loop()`. `Setup` is called once when the program is starts or is reset. `Loop` is called repeatedly. No infinite loop in the loop function is required as the infrastructure calls `loop` when `loop` returns.

`Loop` then has all the responsibility to perform reading all the inputs and processing the data read. This suggests two functions: `Sense()` and `Process()`. The `Sense` function might be first followed by `Process`. The biggest concern with `Process` is how long it might take. Some processing may take a long time when measured against the inputs. If the processing takes too long, some inputs may be lost. So an analysis of the maximum time for processing before the `Sense` function must be called may be necessary. Now in this case everything is focused on the touch screen so timing is not a big issue, but if we marry the Arduino and touch screen display to a radio we may need to allow `Sense`

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to be callable from Process. There are two critical issues, how to make Process independent of Sense and the second is how does Process see the inputs in the same order that they are received.

The first issue is resolved by requiring the Sense function not modify any variables used by the Process function. Then we can call Sense anywhere. The second issue is the transfer of data from the Sense function to the Process function in a way that will not change any variable that the processing function uses and preserves the order of the input.

Ring Buffer

The ring buffer is one data structure that satisfies both constraints. It is a simple structure and can be implemented with an array and indexes or pointers. The primary attributes are:

- There are two indexes (pointers), a read index and a write index
- The buffer is empty when the two indexes are equal
- The indexes are incremented modulo the number of entries in the array
- The buffer is full when the incremented (note previous rule) value of the write index equals the read index

An array entry could be a structure of two or more primary types (e.g. (Xt, Yt)). Adding something to the ring buffer first checks that it is not full, adds the new data to the array entry indicated by the write index and then increments (see increment rule) the write index. The Sense function then writes data it receives into the ring buffer. It will read the read index but does not change it.

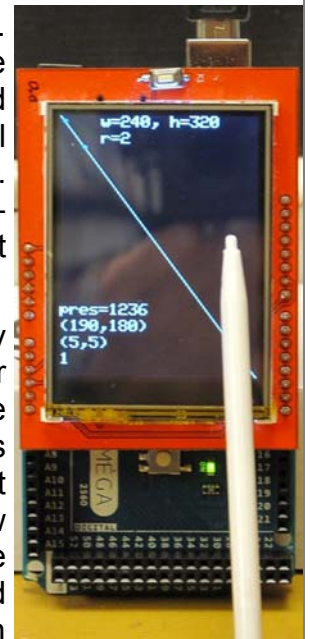
The Process function then compares the read index and the write index. If they are unequal then there is something in the buffer. Then each data item is removed by copying the data indicated by the read index and then incrementing (see increment rule) the read index. Each data item is processed right after it is removed from the buffer. The Process function looks at the write index but does not change it.

So, what are the downsides of this simple data structure? Well if there is more input than can be processed in a specific amount of time then some input data may be lost. That is Sense will try to add some data to the buffer but it will be full. Sense has nowhere to put the data so the data item must be abandoned. Think hard about the average input from all sources that use a ring buffer for transmission of data.

Calibration Strategy

The first scheme using two points was not accurate. The least squares method offers some accommodation to errors. In order to create a transform from one coordinate system to another the program must know the coordinates from both systems at the same point. Since the touch screen provides an input only when the screen is pressed (pretty hard too) the program needs to output a target and the person must attempt to touch that point. Human error comes into play at this point. The touch screen is a laminate on top of a display screen. They are separated by a small distance and while the eye sees a dot on the screen at one point if the user is not looking at precisely 90 degrees to the screen there will be some small amount of parallax. Furthermore, the tip of the stylus is a dull point and probably covers several pixels on the touch screen. The hardware picks a coordinate that it likes but is it really right above the dot?

The program begins by drawing a line from corner to corner and places a blue dot on the line. The user is then to press the blue dot with the stylus. We know where the blue dot is in the display coordinates and Sense puts the touch screen coordinates in the ring buffer. Whoops! What if during the touch Sense



**Banggood.com
Touch Screen
Display & Arduino
Mega Board**

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sees two touches? To avoid this timers were introduced into the program to not allow a second touch within a 1/3 of a second (or so). Once Sense has found a touch and stored it, the processing function reads the value and uses the know location of the blue dot and the touch screen coordinates to add to the least squares computation. After that, the Process function produces another blue dot on the line and waits for another input. This goes on until dots traverse the diagonal of the screen (about 10 points). At that point using the least squares algorithm the values of the slopes and offsets are computed and output.

The program then computes the display coordinates of each dot from the touch screen inputs. The display coordinates are used to display a red dot for each input. By comparing the overlap of the blue and red dots one can surmise the effectiveness of the algorithm.

The programmer can then copy down the values and insert them into a module designed to marry the two devices. The module (an object of a class for c++ people) then translates touch screen coordinates into display screen coordinates so that Sense and Process only use one coordinates system.

Complications

There are complications. The display can be oriented in one of four rotations. Each side may be considered to be top of the screen. Furthermore, the display coordinates have (0, 0) in the upper left hand corner of the display (which changes with orientation). The touch screen has a fixed coordinate system which corresponds to the display in only one orientation. It turns out that one transform can be found for each coordinate (x and y) for one of the orientations and then a simple subtractions of an appropriate equation will yield transforms for the other orientations.

Method of Least Squares

The method of least squares minimizes the vertical distance between several points and a straight line. The assumption is that due to unavoidable noise, the points while being derived

from a linear equation do not all lie on the line. Therefore, the goal is to find that line. The math is cumbersome but the result is easy to apply.

Given a straight line equation: $y = m \cdot x + b$, n points where x and y are known then

$$m = (n \sum xy - (\sum x)(\sum y)) / (n \sum x^2 - (\sum x)^2)$$

$$b = (\sum y - m \sum x) / n$$

To compute m and b requires adding all the x 's, y 's, $x \cdot y$'s and x^2 's together and keeping track of the number of points (i.e. n) and then applying the above equations.

The Transforms

Running the calibration program several times results in slightly different results. Here are the transforms from one of the calibration runs:

$$X_d = 0.327 \cdot X_t - 56.911$$

$$Y_d = 0.432 \cdot Y_t - 71.785$$

The positive slope indicates that the origins are in the same place. Using these transforms one can compute the value of the touch screen input at 0 and the maximum width (height) of the screen. When one does that the touchscreen input at the display origin is (174, 166). The touch screen coordinate at the maximum display coordinate (i.e. 240, 320) is (908, 906).

Conclusion

The display is not expensive and we now have the tools to make it useful for inputting frequency, band, executing functions in a radio and a host of other possibilities. Was it worth the two weeks of tinkering? Another display from Australia costs around US\$ 85. If we were making a 1000 of these then maybe it would have been worth the effort. One, not so much. But I had fun putting the program together and maybe that is all that is necessary.

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start. We are actively seeking operators for SSB and CW, and need setup and teardown volunteers as well. You can talk to any PAARA board member or any of the Station Captains (KG6O, K6WX, W6NEV, N6DB) to join the team. If you do join, don't forget to get an exclusive 2016 PAARA Field Day Team tee

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shirt. It's best to order right away, because once they're gone, they're gone. The last day you can order is May 13th. Last year, nearly everyone on the team had a shirt, so don't miss out. We also would love to have the GOTA (Get On The Air) station filled with potential hams, particularly young ones, who are ready to make their first HF contact. If you can bring someone by, or even better bring a whole group by, contact our GOTA Captain, Justin, N6ETC. It's going to be a really fun time, so please mark your calendar for June 25-26, and check out the shirts at <http://paara.org/pages/fieldday.html>.

Sponsoring the ASVARO Electronics Flea Market shifts one month each year, and for 2016 our month is July. That's one of the hardest months to do the Flea Market (we're usually a bit worn out from FD), but our crack PAARA team of volunteers will be able to execute this mission with aplomb. Because of the overlap in activities, I will start organizing our team a little earlier than usual, starting in late May. If you are interested in helping out at the Flea Market in any capacity, including food sales, moving things to or from De Anza, setting up, selling tickets, or helping to get the supplies, please let me know by the usual means. We'd be glad to have your help.

The Maker Faire is May 20-22 at the San Mateo County Event Center. This year, we are having an expanded ARRL Volunteer Examiner sponsored testing booth. We will be administering tests all throughout the Faire. If you know of anyone who would like to get their Amateur Radio license or who wants to upgrade, please direct them to Mike, NE6RD, or send me a note and I can fill in the details. It's always better if we know in advance that you are coming so that there is enough material on hand.

I was honored to attend the Northern California Contest Club Awards Luncheon and see all of the dedicated contest participants and winners receive their awards. It was a real inspiration. I also was able to pick up my two awards from CQP 2015. It was a great reminder of the friendly competition and camaraderie that

makes our hobby special. I had a opportunity to meet Sandy, DL1QQ, who was visiting from Germany to promote and solicit donations for WRTC 2018. Check out wrtc2018.de for more information. PAARA was well represented at NCCC too, and I saw our May speaker: Pacific Division Director Bob Vallio, W6RGG.

Lastly, I received a letter this week from Palestine. I was quite surprised because I don't have that one in the log. Inside I found two QSL cards and a hand written note from Mai, E41MT, whom I had met almost 2 years ago at Pacificon. I was reminded of how special it is to have friends around the world because of ham radio. Amateur Radio, while a technical hobby on the surface, is truly based on friendship.

I hope that I can report all of the fun everyone had on the USS Hornet next month. I unfortunately will not be there because I will be in Las Vegas for the Nevada State Amateur Radio Convention. When I return, though, I'll have some stories of my own to tell at our next meeting.

CU AT PAARA IN MAY DE K6WX

From the PAARAvault

This month Gerry will be bringing a Kenwood TS-820S to the meeting for sale. This tube hybrid radio from the mid '70's was the pinnacle of the Kenwood hybrid line.

It operates at 10-160 m + WWV in 10 bands (no WARC bands) 1.8-2.0 MHz, 3.5-4.0 MHz, 7.0-7.3 MHz, 14.0-14.35 MHz, 21.0-21.45 MHz, 28.0-28.5 MHz, 28.5-29.0 MHz, 29.0-29.5 MHz, 29.5-29.7 MHz, WWV 15 MHz (RX only) in SSB/CW/FSK modes at ~100W in SSB & CW and ~60W in FSK.. There are lots of reviews of this radio on eHam.net and receiver test results can be found at <http://www.sherweng.com/table.html>.



Gerry will entertain offers from the start of the meeting and conclude at the end of the meeting.

April Board Meeting Minutes

The April Board Meeting was postponed 1 week due to scheduling issues. The meeting was held at the home of Marty Wayne, W6NEV, commencing at 7:26 PM on April 27th, 2016. In attendance were Kristen McIntyre, K6WX (President), Marty Wayne, W6NEV (VP), Jim Thielemann, K6SV (Secretary/Membership), Ron Chester, W6AZ (Treasurer) [via videoconference], and non-Board Members, Doug Teter, KG6LWE (Field Day Coordinator), Chris Hoffman, KG6O. A quorum was not present.

NOTE: at this moment the next board meeting location is TBD. If you're interested in attending the next meeting, contact a board member a few days before May 18th to confirm the location.

President's Report: Kristen, K6WX, commented on how ham radio generates friends around the world. She was surprised to receive a letter from Palestine. "Who sent me this envelope" she thought, "I haven't made contact with anyone from Palestine". Turns out roughly two years ago at Pacificon she did meet and have a conversation with someone who is in Palestine now. They were reaching out to see if they could meet again as they are traveling back to the area shortly. "You never know who in the world you'll make friends with either over the air or at an event", she said.

Kristen indicated her reserve of stories is doing OK but as always on the lookout for more stories. If you have committed to a story but not submitted it (there are several people out there fitting this category) please put pen to paper or fingers on the keyboard and let your creative juices flow! Do you have any projects, Field Day experiences, technical articles, hints n kinks, DX contacts, or experiences setting up your station or antenna, on the air experiences that might be of interest? If you have and have not previously drafted that story, now is the time to get a byline of your own in PAARAgaphs and get that story submitted to Kristen for publication." Remember it is 'home grown' stories that make PAARAgaphs great", she said.

Vice President's Report: Marty, W6NEV, announced that Bob Vallio, W6RGG will be giving a talk about his 2014 trip to Kuwait. He also provid-

ed information on the speakers he's lined up through September. He still needs to find speakers for two meetings this year. If you know of someone who would be of interest to the group, let Marty know.

Marty reminded the board that purchasing tickets for the next field trip, to the USS Hornet on April 30th at 11AM, is closed. There will be 34 members and friends on the field trip. Two people who purchased tickets have advised him they now can't attend. If you had wanted to go but didn't purchase a ticket, contact Marty as these places may still be available. He's sent emails to all attendees with information on where to meet and the schedule. Contact Marty if you didn't receive his email.

Secretary's report: Jim, K6SV, reported that there are currently 170 PAARA members and that only 22 previous members have been dropped due to non renewal. This is the smallest number of people who didn't renew since he's been secretary. He also reported that there were 3 new members joining in April.

Treasurer's Report: Ron, W6AZ, advised the board that the finances are in fine shape. Though there aren't any proceeds from the Flea Market yet, there have been enough other sources of income to balance out the books. He reported that Garry, N6NV, sold two radios, one each at the last two meetings, from the Club's huge collection, which takes up most of Garry's basement. Another discussion ensued about how to best reduce the inventory of radios in Gerry's custody or at a minimum find another storage location. Doug, KG6LWE, indicated there may be a possibility at his QTH once his construction is finished.

Under Old Business, Marty, W6NEV, reminded everyone of the special order 2016 Field Day shirt that is still available for PRE-ORDER ONLY in sizes medium through 3XL. You can order either through the PAARA web site using PayPal or directly from Marty. Remember, you must pre-order this shirt in order to receive one. The last day to order is May 13, 2016. Here is the link to order: <http://paara.org/pages/fieldday.html>

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Jim, K6SV, reported that between schedule conflicts and the weather not much had been accomplished at the repeater site this past month. The heliax feed lines have been installed from the base of the antennas to the ground. They now need to be routed over to the shack and cut to length and terminated.

The board discussed the merits of purchasing fully rebuilt computers for Field Day, versus rebuilding some newer laptops ourselves that are newer than the ones currently used for field day. As there wasn't a quorum, no decision was reached but it was agreed that an email vote would be conducted shortly amongst the board members.

Marty, W6NEV reported that plans for Field Day are progressing, with volunteers lined up to cover most of the tasks. He's still looking for volunteers for setup, operation, and teardown. Hopefully by the next meeting, dates of the antenna work parties will be announced so that work can begin. See Marty if you can help in any way.

Under new business, Jim K6SV, mentioned his concern regarding the "club" electronic files and their vulnerability or, heaven forbid, something happening to the member who oversees them. A temporary plan was agreed upon.

Kristen, K6WX, reminded the board that July is PAARA's month for hosting the Flea Market. As it's directly after Field Day, it will be more challenging than usual. See or contact Kristen to volunteer your services for this important fundraiser.

The Board meeting was adjourned at 9:02 PM.

Jim Thielemann
Secretary/membership
K6SV

**Please welcome to PAARA
New members:**

Ronald Seefred	WA6JVL,
Karl Dresden	KJ6GUK
Rich Hulett	N6AJS

May Raffle Prizes

1st TM281A / 2m Mobile Transceiver

- High Power 65W Output
- Large Front Speaker
- Vivid Amber LCD Display with 32-step brightness control



- 200 Memory Channels, plus one call channel



2nd Two Com Speakers

- RF Proof Amplified Stereo Computer Speaker System
- Stereo High Fidelity Response for Use with Voice or Music
- Optimized for Operation in Close Range of any Radio Transmitter

3rd Battery Tender Junior Charger

- Complete 4-step charging program (Initialization, Bulk Charge, Absorption Mode, Float Mode).
- Automatically switches to float / maintenance voltage after fully charging the battery.
- Solid state two color LED indicates stage of charger.
- Reverse polarity protected.



4th MAHA PL to BNC Cable

5th World Atlas Book

6th Repeater Directory

7th Electric Radio Book

8th Bongo Ties



April Raffle Winners

Left to Right

- 4th Cliff Lloyd / KN6DH / MFJ Dual Clock
 1st Steve Wilson / KG6HJU / Kenwood TM-281A / 2m Mobile Transceiver
 7th Steve Wilson / KG6HJU / Bongo Ties
 3rd David Heine / KK6TOZ / ARRL 2015 Handbook
 5th Walt Gyger / K6WGY / MFJ 335 BS Mag Mount
 2nd Gerry Tucker / N6NV / Battery Tender Junior Charger

Not Pictured

- 6th Marty Wayne / W6NEV / ARRL Pocket Repeater Directory

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Station Trustee K6OTA...	Ron Chester, W6AZ	
Property Manager	Gerry Tucker, N6NV	
Fund Raising Coordinator.	Bob Korte, KD6KYT	408 396 4745
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	dteter@wawi.com	
Historian Position	<i>Position Vacant</i>	
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Field Day Coordinator ...	Doug Teter, KG6LWE	650-367-6200
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	ab6so@smrn.com	
Photographer.....	<i>Position Vacant</i>	

VE Exams

Redwood City Main Library, Community Conference Room, 4th Saturday 10:30 am each month and De Anza Park, Sunnyvale, 2nd Saturday 10:30 am each month except November and December. See website for details and exceptions: <http://amateur-radio.org> or Contact Al, WB6IMX@att.net

Electronics Flea Market

Sponsorship by A.S.V.A.R.O. — Association of Silicon Valley Amateur Radio Organizations
 Second Saturday of month, March-October, 6am–2pm
 Howard M. Krawetz, N6HM 650-856-9761
 Contact: <http://www.electronicfleamarket.com/>

PAARA — Palo Alto Amateur Radio Association

Meets 1st Friday 7:00pm each month at Room H-6, Cubberley Community Center; Net 145.230 - PL 100Hz Mondays at 8:30. See our website at <http://www.paara.org> for more information or contact: Joel Wilhite KD6W, KD6W@ARRL.NET, 650-325-8239

FARS — Foothills Amateur Radio Society

Meets 4th Friday each month at 7:30pm
 Contact: <http://www.fars.k6va.org>

NCDXC — Northern California DX Club

Meets 3rd Thursday 7:30pm each month,
 Repeater for member info 147.360, Thursday 8:00PM
 Contact: <http://ncdxc.org> or Mike Gavin W6WZ, (650) 851 8699

QCWA Chapter 11

Northern California Quarter Century Wireless Association

Meets third Wednesday monthly at Harry's Hofbrau in Redwood City @ 11:30 AM.
 Guests are welcome. Saturday morning net on 146.850 MHz, PL 114.8

50 MHz & Up Group

Meets 1st Thursday each month at 7pm in the Texas Instruments Building E conference room in Santa Clara.
 Contact: <http://50MhzandUp.org>

SPECS

Southern Peninsula Emergency Communication System

Meets each Monday 8:00pm on Net 145.27, 440.80 MHz
 Contact: <http://specsnet.org> or Tom Cascone, KF6LWZ, 650-688-0441

SCARES

South County Amateur Radio Emergency Service

Meets 3rd Thursday 7:30pm each month, Belmont EOC, Belmont City Hall, One Twin Pines Lane, Belmont CA 94002. Net is on 146.445 [PL 114.8] & 444.50 (PL-100) 7:30 Monday evenings. Contact: President Gary D. Aden, K6GDA 650-743-1265 (D), 650- 595-5590 (N)
 Web: <http://k6mpn.org> E-mail: pres@k6mpn.org

SCCARA

Santa Clara County Amateur Radio Association

Operates W6UU & W6UU/R, repeater 146.985-pl
 Nets: 2m, 7:30pm Mon; 70cm, 442.425+ (pl 107.2) Thur.
 Meets 2nd Mon each month @ 7:30 PM.
 Contact: <http://www.qsl.net/sccara> or Clark Murphy KE6KXO 408-262-9334
 ARRL/VEC license testing contact 408-507-4698

SVECS — Silicon Valley Emergency Communications

Operates AA6BT repeater (146.115 MHz+)
 contact: <http://www.svecs.net> or Lou Stierer WA6QYS 408 241 7999

TEARS — The Elmer Amateur Radio Society

Dedicated to operational training, knowledge building & FCC exam testing.
 KV6R repeater under construction.
 Contact: AA6T@ARRL.NET
 Most members are Extra Class or VE's. See QRZ dot com/kv6r for class info

WVARA — West Valley Amateur Radio Association

W6PIY six-meter repeater on 52.58MHz. Normally, six-meters is linked with 147 and 223, while 441 and 1286 repeaters are linked.
 VHF: 52.58 (-500) 151.4 ctcss UHF:
 147.39 (+600) 151.4 ctcss 441.35 (+5.0) 88.5 ctcss
 223.96 (+1.6) 156.7 ctcss 1286.20 (-12m) 100.0 ctcss
 Meetings are 3rd Wednesday of every month.
 Contact: <http://wvara.org>, Bill Ashby N6FFC, 408-267-3118, N6FFC@Juno.com, or N6FFC@ARRL.NET

American Red Cross, Santa Clara Valley Chapter

Contact: <http://santaclaravalley.redcross.org> or Scott Hensley KB6UOO, (408) 967 7924
shensley@Novell.com

(Please send changes to PAARAgaphs editor)



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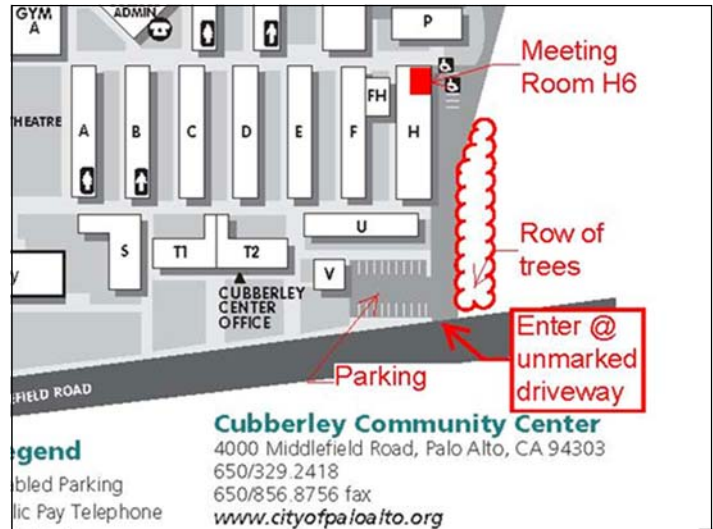
If you would like to
 order a badge, see
Doug Teter, KG6LWE.

PAARA Weekly Radio Net

Info and Swap Session
 every Monday evening at 8:30pm
 on the N6NFI 145.230 MHz repeater

<u>Week</u>	<u>Control Operator</u>
1 st	Joel KD6W
2 nd	Doug - KG6LWE
3 rd	Jack - N1VSL
4 th	Marty - W6NEV
5 th	Rob KC6TYD

If you're interested in trying out at Net Control,
 Contact Doug, KG6LWE. It's good practice,
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**Meeting Location — Middlefield Road
 between San Antonio and Charleston in Palo
 Alto. 4000 Middlefield Road**

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**Palo Alto Amateur Radio Association
 P.O. Box 911, Menlo Park
 California 94026-0911**

Club meetings are on the first Friday of each month,
 7:00pm at the Room H-6, Cubberley Community Center.

Radio NET & Swap Session every Monday evening, at
 8:30pm, on the 145.230 –600 MHz repeater, PL 100Hz.

Membership in PAARA is \$20.00 per calendar year,
 which includes one subscription to PAARAgaphs
 \$6 for each additional family member (no newsletter).

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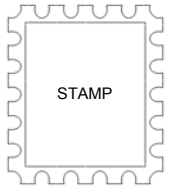
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PAARAgaphs Newsletter
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