

# SCOPE

A newsletter by and for the Palomar Amateur Radio Club of San Diego, California.

The slate of candidates for the Palomar Amateur Radio Club Board of Directors for the year 2010 will be elected at the December meeting. Bring food to share at this annual social event. There will be games, ice cream, and cake.



Ron Pollack K2RP writes about the milestone transmitter, the Heathkit DX-100, starting on page 3.

An article on PARC and Amateur Television begins on page 4.

The October board of directors meeting minutes can be found on page 5.

An article about the ATV Newsletter by Bryon Foster N6IFU can be found beginning on page 8.

A summary of Loren AD6ZJ's November program about phased vertical arrays can be found on page 10. This article is adapted from the text on



*Loren AD6ZJ gave a presentation about Four Square Antennas at the November 2009 meeting. Photo by KB5MU*

## PARC Board Of Directors Slate for 2010

President Dennis Baca KD6TUJ  
Vice President Ron Pollack K2RP  
Secretary Gary Kent W6GDK  
Treasurer Georgia Smith KI6LAV  
Director Conrad Lara KG6JEI  
Director Paul Williamson KB5MU

*Below, Fred May N2HLG wins the November PARC drawing! Congratulations N2HLG on your new HT. Photo by KB5MU.*



Loren's slides. He shares some useful resources and a good book recommendation in the article that will get your vertical antenna project up and on the air in short order.

The call for a Field Day Chairman goes out on page 11 courtesy of a writeup by Paul KB5MU.

A very brief set of Field Day results can also be found on page 11. See the full results in this month's QST.

See you at the meeting and on the air! -W5NYV

## Save the Date

### Club Meeting

**2 December 2009**

Social and Elections  
Bring food to share!  
There will be games, ice cream, and cake.

### Board Meeting

**9 December 2009**

Palomar Amateur Radio Club board meeting at 7:00pm at W6GNI QTH

### Notable Fact

**December 2009**

December is the Universal Human Rights Month.

# Classified Ads are Free for Members!

## For Sale

Astron RS35A 35 amp power supply \$80  
Kenwood TM-221A 2M Transceiver \$90  
Mirage 220 amp. 2 W in 20 W out (New from Mirage \$170) \$70  
Lunar 40W 2 meter amp \$40  
Kenwood TS-621A Dual band (2M/220) transceiver, nice, with manual, mike power cord \$275  
Yaesu FL2100B Linear 80-10 M \$325  
All working and looking good!  
Ron K2RP (760) 436-8109 K2RP@ARRL.NET



## HAM RADIO OUTLET

Jose XE2SJB  
Jerry N5MCJ

H  
R  
O

**KENWOOD**  
*rf* **CONCEPTS**  
**DIAMOND**  
**US TOWERS**  
**KANTRONICS**  
**YAESU, MFJ, ICOM**  
**BENCHER, Inc.**  
**HUSTLER**  
**COMET**  
**AMERITRON**

*Astron,*  
**AEA,**  
**OUTBACKER**  
*Larsen Antennas*  
**TEN-TEC**  
*Hy-gain, Tri-EX,*  
*Cushcraft And Others*  
*too*  
*Numerous to*  
*Mention!*

Drop in to see our display of working equipment. Find out about Pkt location determining equipment (APRS). Check our complete line of magazines, ARRL books, license manuals, and Bulletin Board with all sorts of Goodies listed.

Open: 10a.m. – 5:30p.m. *Ask about our great prices*  
Monday thru Saturday  
858 560-4900  
or toll free 1-800-854-6046

**Directions:** On 163, take **Clairemont Mesa Blvd.** off ramp to East. Stay in right-hand lane. Turn right at stoplight. As you are turning right you can see our beams in this shopping center. Travel 100 yds. On Kearny Villa Rd. and U-turn back to shopping area and HRO sign. Be sure to see our equipment in action on **real** antennas!

## Club Reports Membership

New Members Joining PARC:  
KJ6BWX (family), KJ6BTJ,  
and KJ6BTK.  
And two reinstatements.

A number of members have elected to receive the SCOPE on the web. This saves the club the cost of printing and mailing, which is good. The 'not so good' is that they do not get the monthly reminder that their membership is up for renewal - which is printed on the mailing label for those that receive the SCOPE by mail. As a service, we are printing the call's of the web SCOPE members that have let their membership expire, hopefully by oversight. The following memberships have expired in the last couple of months: KD6FKN, KG6UTS, N6KTC, KI6IID, K6PD, and KC6VXY. PLEASE RENEW!!

AI  
W6GNI

## Fold and Staple

KB6NMK Jo  
KB6YHZ Art  
W6GNI AI @ Kathy  
WA5ACE Sonny  
KI6LLC Roni

## PALOMAR ENGINEERS Box 462222, Escondido, CA 92046 TOROID CORES

Palomar stocks a wide variety of cores and beads. Our RFI Tip Sheet is free on request.

Our RFI kit keeps RF out of your telephones, TVs, stereo, etc. **Model RFI-4**  
**\$35 +tax+\$8 to ship.**

## BALUN KITS

Ferrites slip over coax. Shrink tubing holds them in place. Works from 3.5-60 MHz (Use two kits for 160m).

**Model BA-58** (for RG58, RG8X & similar cables up to ¼" dia.) \$8.50+tax+\$8 S&H/order

**Model BA-8** (for RG-8, RG-213, 9913 and similar cables up to ½" dia.) \$16.50+tax+\$8 S&H/order.

See catalog at [www.Palomar-Engineers.com](http://www.Palomar-Engineers.com)

Please check our complete ads in **QST**, **CQ**, and **WorldRadio** magazines.

# Heathkit DX-100

by Ron K2RP

Anyone who was an active ham from the mid 50s through the mid 60s is almost certainly familiar with the Heathkit DX-100.

Heathkit was responsible for many milestones in our hobby, starting with the original amateur kit, the low power AT-1 introduced about 1952.

Encouraged by the huge market for reasonably priced amateur kits, and the continued availability of war surplus parts, Heath debuted the DX-100 in 1955. Even though it was only the company's second transmitter kit, it was an instant success and was considered a serious transmitter for serious hams!

The family resemblance between the two early Heathkits is tenuous at best, being primarily the color! While the AT-1 was a 25 watt input, CW only, crystal controlled unit, the DX-100 offered 120 watts output (almost 200 input) on CW and 100 watts out on AM phone, with a built in VFO. The 15 tubes included 2 6146 finals and 2 1625 modulators. The VFO is a clone of the popular VF-1 external VFO. The modulator tubes were probably WW II surplus as they were used in the ARC-5 series of Command transmitters, and were a 12 volt version of the popular 807. This is a massive transmitter, weighing well over 100 lbs!

After building thousands of these kits, a 100B version was introduced in 1958. Several improvements were made in the B version (there was no "A" version): The original version switched 4 crystals or VFO control from the front panel. The design flaw was that the 4 crystals were located inside the cabinet, which had no access, so changing the crystals involved removing a couple of dozen screws and wrestling 100 lbs. of transmitter out of the case! The B version only had one crystal position, switched from VFO inside the cabinet, but an access door was provided. This made tube changing much easier as well. The original model had a stepped loading switch and a variable cap for fine loading, a common system at the time. The B version employed a larger variable cap for loading, which reduced arcing.

The biggest historical significance in the B version, I believe, was

the inclusion of a provision for the use of the SB10 SSB adapter, although it was not introduced for another year. When the unit was designed in the early 50s, SSB was mostly experimental and AM was the predominant phone method. By the time the B came around, it was clear that SSB was the way of the future, and any successful transmitter would have to include provision to avoid certain obsolescence.

The marketing team at Heath had a knack for finding a need and filling it. The Novice license had been introduced in mid-1951, and ham radio experienced unprecedented growth. Novices were limited, initially, on the HF bands, to small portions of the 80 and 11 meter bands, soon changed to 80, 40, and 15. Privileges in these bands were severely restricted, limiting Novices to crystal control, CW, and 75 watts input. As thousands of these Novices upgraded, they were instantly in the market for a higher powered, VFO controlled transmitter with a modulator for AM. The DX-100 filled the bill perfectly, with a price tag under \$200.

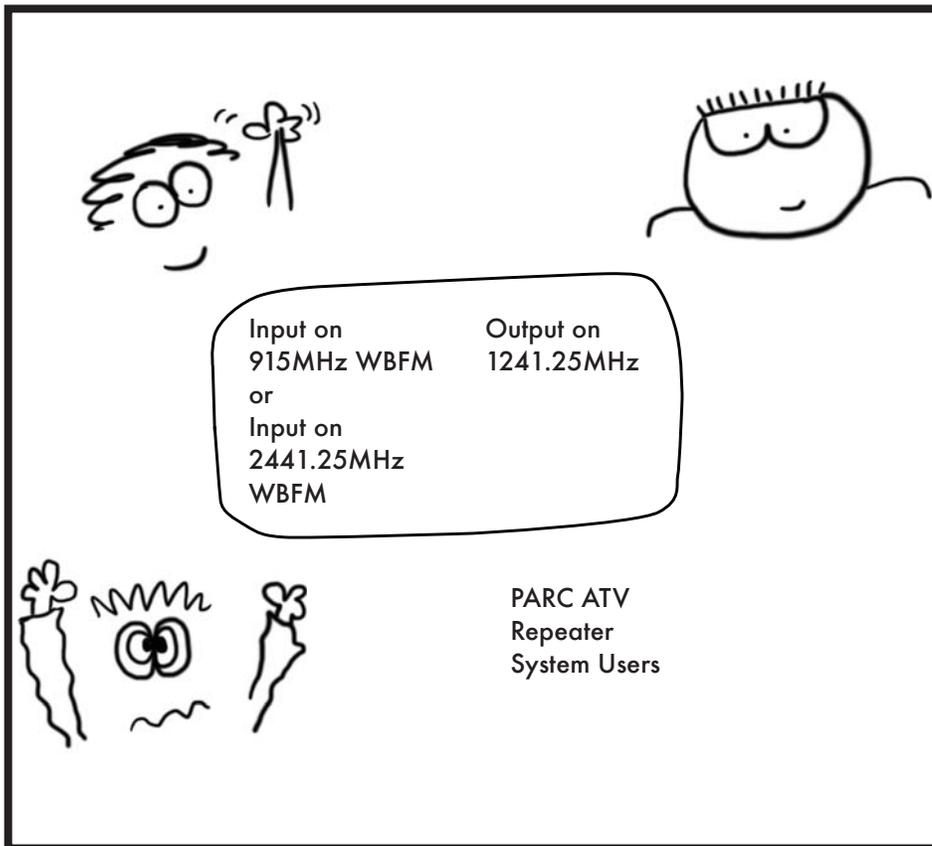
Of course, it's impossible to know exactly what equipment was used by individual hams over 50 years ago, but some statistics in QSTs of the era give us some indication. In those days, the reports of the Phone and CW Sweepstakes contests included the equipment lineups of the winners of the (then) 73 ARRL sections. An analysis of these reports shows dramatically the sudden change from home brew to manufactured and tube type transmitters, especially for CW.

In the 1954 contest, of the 73 CW winners, only 15 used manufactured (including kit built) transmitters. Of these, 9 were expensive Collins units, whose cost made them unavailable to the average amateur of the day. The remainder, of course, used homebrew rigs.

The very next year, 1955, 27 winners chose commercial gear over homebrew. The Collins crowd was down slightly to 8 winners, but the new DX100 was used by 4 section winners. This is noteworthy since the transmitter was introduced only a few months before the contest, and time had to be allowed to construct and test it. By 1956, 33 winners were no longer using homebrew transmitters, and 6 of them chose the DX100.

*continued on page 6*

<i>NiCd Lady Company</i>	
<b>Grace Lloyd</b> N6WPA <a href="mailto:grace@nicdlady.com">grace@nicdlady.com</a>	
<a href="http://www.nicdlady.com">www.nicdlady.com</a>	
<b>Custom Assembly • Rebuilds • Batteries</b> • Lead Acids • Replacement Packs	
20585 Camino Del Sol • Unit B Riverside, CA 92508 800/906-6423 951/653-8868 Fax 951/653-5189	
<b>Your Complete Battery Source</b>	



“It should also be pointed out that 439.250 MHz has been a well established ATV video carrier frequency for many years. Amateur Television enthusiasts were in fact the first users of the 70-cm Amateur band. Unfortunately, self-serving interests and poor spectrum management decisions made by frequency coordinating councils in the past have allowed FM voice repeaters and packet radio stations to infiltrate the 438 MHz to 444 MHz subband over the past several years. This has occurred despite the long established recognition of 439.250 MHz as an Amateur Television frequency by the US ATV Society and the American Radio Relay League.

## Amateur Television

by Mike K6MRP and Michelle W5NYV

Amateur Television (ATV) is television done according to FCC part 97 rules. It's noncommercial television transmitted by licensed amateur radio operators.

If you look at the ARRL Repeater Directory under Amateur Television, you can see what are considered to be the standard ATV frequencies. Our club's ATV plan is inputs on 915 MHz wide-band FM (WBFM) and 2441.25 MHz WBFM. The frequency used to coordinate activity on PARC's ATV system is 146.415 MHz NBFM simplex (tone 79.7). The ATV output frequency is 1241.25 MHz AM.

PARC's ATV equipment is presently off the air for a major rebuild. The part of the system that provided the necessary station identification stopped working.

The selection of input and output frequencies can be a very complicated process that balances many concerns and interests. A good example of the various considerations in selecting 70cm ATV input/output pairs can be found here:  
<http://www.qsl.net/kd2bd/tsarc.html>

About two-thirds of the way through the article, the following passage can be found.

The 420MHz to 450MHz 70-cm frequency allocation is a spectrum resource that is shared with government fixed, mobile, and radiolocation services who are primary users of the band. Considering that Amateurs are secondary users, the FCC requires that adequate measures be taken by Amateurs to avoid interference to government services. High power pulsed radiolocation transmissions are easily detected on an ATV receiver, and considerate ATV operators cease operations when radar signals are seen to avoid interference with radiolocation services sharing the 70-cm band. It would be an interesting exercise to determine what mechanisms, if any, FM repeater and packet radio users, who employ hard limiting receivers designed for immunity against pulsed interference, use to identify the presence of radiolocation transmissions, and what measures these users take to avoid interference to primary government radiolocation services on the band.”

One can see several issues raised in these two paragraphs. The entire article is well worth reading, but the points emphasized here are that we're secondary users on the band, frequency coordination is often difficult and sometimes

*continued on page 7*

# October Board of Directors Meeting Minutes

The meeting was called to order at 7:00 PM by President Dennis Baca KD6TUJ. The meeting was held at the home of Al Donlevy W6GNI.

## Treasurer's Report

Georgia, KI6LAV presented the August Treasurers' report. Total assets are \$12,398.38 and prepaid dues are \$5,838.00. The auction profit to the club was \$355.00. A motion was made to accept the treasurers' report by Loren AD6ZJ and seconded by Mike K6MRP Mike. Motion Carried.

## Secretary's Report

Minutes approved.

## General Meeting: 4-Square and Other Phased Arrays

Loren AD6ZJ to present.

**Membership Report:** Presented by Al W6GNI Current club membership is 300.

## Repeater Site/Technical Report:

Mike, K6MRP gave the repeater site report. The fuse panels are in for the 48VDC system. Wiring still needs to be completed at the far end. We still need to get 48VDC to 13.8V power supplies for all the units. We have a few choices to consider. The 6m repeater could use a new antenna. The ATV repeater is still in repair at the home of Art KC6UQH.

See SCOPE in **color**  
on our website at  
[www.palomararc.org](http://www.palomararc.org)!

## Upcoming General Meeting Topics

December – Elections and Christmas social  
January 2010 Monica Zech  
Month TBD - Lin Robertson KJ6EF – Vintage broadcast radios  
Month TBD - KC6YSO – AM and other boat anchors  
Month TBD - AK6QJ – Subject TBD  
Month TBD – Ed Zeranski KG6UTS – Military radios

The inverters are still giving us fits. The new power system should eliminate the inverters.

## Discussion items:

John, WB6IQS purchased some lengths of coax for field day use and other use. He requires reimbursement of \$30.00.

We need input from members on what topics would interest them for future presentations. We will look for input from members at the December meeting.

Nominating committee members consisted of Jo KB6NMK, Jim W6SST, and Ron K2RP. Floor nominations can be made during the November meetings. We need a volunteer for Field Day chair for 2010. Should PARC use LOTW? Yes.

## OLD Business:

PARC Camper Trailer – The old trailer has been transferred to the tow yard is ready for termination. Look for something in the Scope. 75<sup>th</sup> anniversary logo contest. Should we do one? Will discuss further

Generator – Is now operating and Dennis is looking into propane conversion kit and will see about getting a used tank from a local supplier.

There were updates on the Palomar Mountain Volunteer Fire Department.

## Repeater Down?

### Hanging?

Let us know!

Send an email to:

[board@palomararc.org](mailto:board@palomararc.org)  
with your observation, the date, and time (approximation OK). Many ears make light work.

## Board Members Attending November Meeting

President Dennis Baca KD6TUJ  
Secretary Loren Hunt AD6ZJ  
Director #2 Conrad Lara KG6JEI  
Membership Al Donlevy W6GNI  
Director #1 Paul Williamson KB5MU  
Scope Editor Michelle Thompson W5NYV  
Treasurer Georgia Smith KI6LAV  
Repeater Chair Mike Pennington K6MRP

# Heathkit DX-100

*continued from page 3*

In addition to the obvious benefit of kit and manufactured units being much easier to assemble and get on the air, an often overlooked factor was resale value. Kit built transmitters commanded much higher values at resale and trade in time compared to homebrew.

It is interesting to see that even in 1954, only a handful of winners constructed their own receivers. State of the art receivers had become complex enough, and manufactured receivers were inexpensive enough, to signal the end of the era of widespread receiver construction.

One reason for the enormous popularity of the DX100, of course, was the price. The two major competitors in kit form in 1955 were the Viking II and Viking Ranger. The Viking II was closest in specifications, using the same final tubes, but required an external VFO. The basic kit was \$280, and the VFO about \$45, making the pair cost almost double the DX100 price. The Ranger was more modern than the Viking II

design, and featured a built in VFO, but offered only 75 watts of input on CW, and 65 on phone, with a single 6146 for a final amplifier. Even so, it cost a bit more at \$219.

If a manufactured unit was preferred over a kit, a typical transmitter of the same basic power level and features was the B&W 5100 which would set you back \$475.



All these were popular and successful in the marketplace. Johnson Viking had marketed the Viking I and II models since 1950, and were alone in the kit market for this type of transmitter until Heath introduced the DX100. Shortly afterward, the Viking II was discontinued, and the Valiant became available with 3 6146s in the final and commensurately more power. But, the DX100 maintained its market share.

As soon as a new receiver or transmitter was released, modification articles began to appear in the enthusiast magazines, and the DX-100 was certainly no exception. Dozens of articles were written, describing modifications mostly in the keying and audio circuits.

Once again, Heathkit produced a classic milestone in the development of amateur equipment.

**RF PARTS COMPANY**  
From Milliwatts to Kilowatts™

Complete inventory for servicing amateur and commercial communications equipment

RF POWER TRANSISTORS — TUBES — POWER MODULES

Diodes • Relays • Trimmers • Capacitors • Heatsinks  
Transformers • Chokes • Combiners • Wattmeters • Books

3-500ZG • 811a • 572B • 4-400a • 6146B • 8072 • 8560AS  
3CX400A7 • 3CX1200A7/D7/Z7 • 3CX1500A7 • 3CX3000A7  
4CX250B • 4CX250R • 4CX400A • 4CX800A • 4CX1500B

Merit W6NQ • Gary K6CAQ • Steve K6NDG • Rob WA6GYG • Doug K6DRA

**760-744-0700**

www.rfparts.com • orders@rfparts.com

Since 1967

The one you see here followed me home this summer, having been in storage for many years. The panel was original, with no extra holes, and the common timed sequence keying modification had been made. After a physical and electrical restoration, I performed a popular audio stage mod for greater low frequency response. The reports have been gratifying on both CW and on the AM nets.

Ω

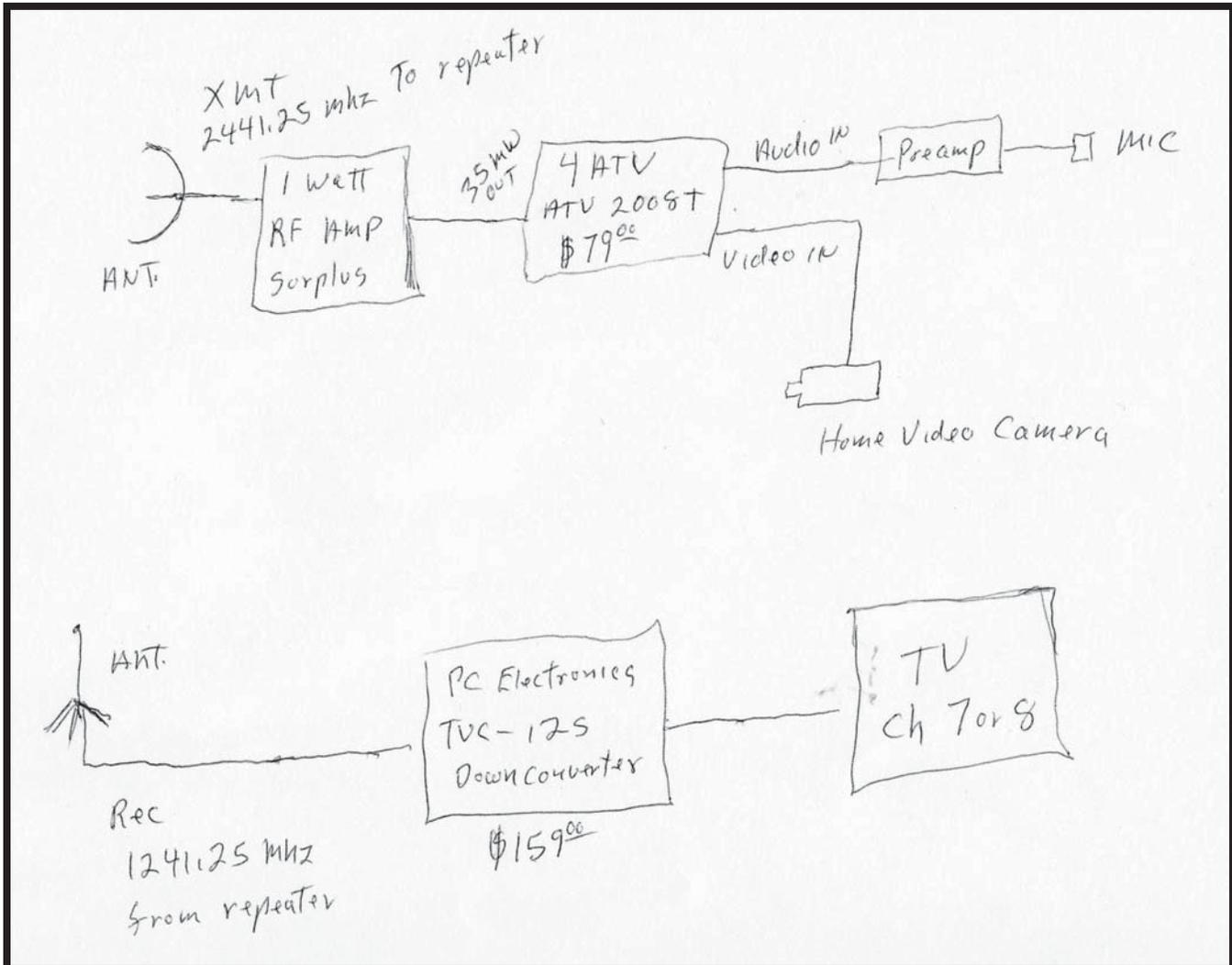
# Amateur Television

*continued from page 4*

fractious, that there is significant interference from government radiolocation, and that the very nature of the transmissions that we use may make it difficult to monitor our effect on the band.

As noted above, PARC does not have an ATV input in the 70cm band. Bill KB6MCU, who was in charge of the ATV at the time our frequencies were coordinated, believed that the Metro Link packet node would interfere. Mt. Miguel and Point Loma repeaters also used that input.

Mike K6MRP describes his home station, "For my receive I use a Yaesu TV-736 mod/demod that works with my Yaesu 736R all mode transceiver. In the beginning because I had the Yaesu I would receive the picture and talk to them on 146.430 simplex link. I could see and talk to them and they could talk to me through the regular ATV repeater." Below is a sketch of Mike's ATV setup.



The downconverter Mike uses in his ATV setup is suitable for use with PARC's ATV frequency plan. It's called the TVC-12S, and you can see the pdf describing it at <http://www.hamtv.com/pdf/TVc-12SM.pdf>.

An ATV system is not overly complicated nor is it especially expensive. While one can spend a lot more, a PARC ATV system can be built for less than the cost of many HTs.

The greatest limiting factor for ATV is whether or not you can get a good view of the repeater and how far away you are from the repeater. The repeater site on Palomar Mountain affords a pretty good view of most of San Diego, but if you live in, for example, South County, you will need to make up for the increased range with increased gain.

# The ATV Newsletter

by Michelle W5NYV

Bryon Foster N6IFU, editor and publisher of the *ATV Newsletter*, was kind enough to speak with me about the origins and development of the newsletter on the phone on the 20th of November 2009.

With over 1500 subscribers, this internationally-distributed newsletter is a hub of information. Recent topics in the November 17th issue ranged from ATV DXing, digital ATV, a classified advertisement section to an ATV programming guide and status and updates on various repeaters and stations.

Bryon got involved in ATV about five years ago. From his location in Simi Valley, he began to compile a list of people active on ATV from Santa Barbara to San Diego, and he started to keep track of the status of the ATV repeaters. Getting the knowledge out about whether or not the repeaters were up or down was useful, and this sharing of information was the original impetus behind the newsletter. As it arose from the Amateur Television Network (ATN), which is a network of ATV repeaters doing "fast scan amateur television in Alabama, Arizona, Northern California, Southern California, Georgia, Illinois, Indiana, Kentucky, New Mexico, Nevada, Texas, Washington, Delaware, Maryland, New Jersey, and Pennsylvania"<sup>1</sup>, the newsletter started out as the *ATN Newsletter*.

Frequencies used by the Amateur Television Network<sup>2</sup> are, most commonly, either 434MHz AM or 2441.5MHz FM for the input, with 1253.25MHz FM appearing in the list as well. Output frequencies are 1253.25, 1277.25, 421.25, 919.25, 912, or 2417.5 MHz. The modulation is VSB, which is Vestigial Side Band. This is the modulation used in NTSC analog broadcast television.

With a background in marketing, Bryon began making personal contacts with anyone that had dropped out of ATV. He invited them back into the hobby, and kept track of who would check into the ATV chatroom on George Migliarini AC6RB's Camstream.

A Camstream is a video link over the internet. Registration is required, but the service is considered to be easy to use and is free. There are many ATV operators that link over the internet with Camstream. However, it does have limitations in terms of the number of simultaneous viewers.

1 <http://atn-tv.org/ATN.htm>

2 <http://atn-tv.org/freqsummary.htm>

In practice, Camstream was generally limited to six or seven people. Any more than that and the video would freeze, there would be a loss of audio, and people would be bumped off.

The British Amateur Television Club<sup>3</sup> (BATC) invested a lot of money in a nice system that accomplished the same functions - linking video streams over the internet - but with a substantially increased capacity.

From the *ATV Newsletter* of 9 September 2008, Bryon reported,

For about \$8.00 U.S. [at current exchange rates it is \$6.60] you can become a member of BATC and stream video from your ATV repeater or QTH. And the BATC streaming video doesn't have the problems that Camstream does with having too many viewers and having the stream slow down and lose audio and eventually dropping viewers when you reach about 8. The BATC.TV streaming video had 400 viewers at its peak when they broadcast the AMSAT-UK Meeting.

Being a member of the BATC, besides offering the streaming video you also will receive a cyber subscription to their club magazine. Which includes many articles on Digital ATV as well as AM and FM ATV modes. You can subscribe using a credit card or use Pay Pal.

The newsletter continued to track status, but started adding net reminders, articles, and notices of gear for buying, selling, and trading. Bryon became net control for the club ATV net. As the newsletter grew, it naturally evolved into a newsletter of general ATV interest, and was therefore renamed *ATV Newsletter*.

Bryon is in a particularly good position to ascertain the health and future of ATV in the region. As an active member of the amateur television community and having experience in marketing and communications, his observations about ATV are something that PARC can do something about.

Bryon believes that ATV should be a whole lot more popular than it is. The reason it hasn't broken through to more people is due to several factors. One, there is a lack of direction from clubs. Simply placing a repeater on the air is not the finish line. Activities are key, and activities don't just happen by themselves. They take some planning and some enthusiasm and some people

3 <http://www.batc.tv/>

with the gear to participate.

A common complaint is that there isn't anything to do once you get it on the air. Bryon quoted a fellow from Simi Valley who said, "You build your station, you get it on the air, and check into the net, and there is nothing else."

Without a critical mass of people, there aren't activities. However, without any activities, there won't be a critical mass of people drawn in the first place. This is not a problem peculiar to ham radio. This is a problem of any and all associations and groups. Fortunately, it's a solvable problem.

Another issue that Bryon raised is that there is very little standardization in ATV. Each repeater may be unique. There are, like in PARC, systems that are insufficiently documented or depend on surplus gear that may or may not be available. Failures, therefore, can be more challenging to overcome.

A final point that Bryon made is that with local ATV networks, if you don't like the programming or the content, then there may be little other choice except to dig in and create your own. ATV is, in general, very different from HF or 2m, where you can more easily tune to another frequency and find people that you might better fit in with. With ATV, the "pond" is small. ATV should bring out the best in us, in terms of manners and considerate operation, but there are cases where the opposite has been true.

## So what can we (PARC) do with ATV?

The San Bernardino Microwave Society transmits their meetings via Camstream, and takes check-ins over ATV. This provides the meeting content over a much wider area. PARC could transmit member (and board!) meetings over ATV.

P.C. Electronics<sup>4</sup> has a document on their website called "ATV in Public Service", which describes a portable ATV station for field deployment. The intended uses are public service events and communicating with emergency operations centers. Providing a video stream at a public event or emergency can be very useful. If a picture is worth a thousand words, how many words is a live video stream worth?

A membership program about video, covering the basics of analog and digital transmissions, would provide the foundation and opportunity to talk about a club-organized home station effort. If you'd like to talk more about the future of ATV in PARC, please find me at any of the upcoming meetings. There will be a series of articles about PARC's ATV efforts in future Scope newsletters.

In closing, a large collection of amateur television information can be found here:  
<http://hamradio.arc.nasa.gov/amateurstv.html>

***IMPULSE Electronics***  
(760) 747-5277 – (866) 747-5277  
[www.impulseelectronics.com](http://www.impulseelectronics.com)

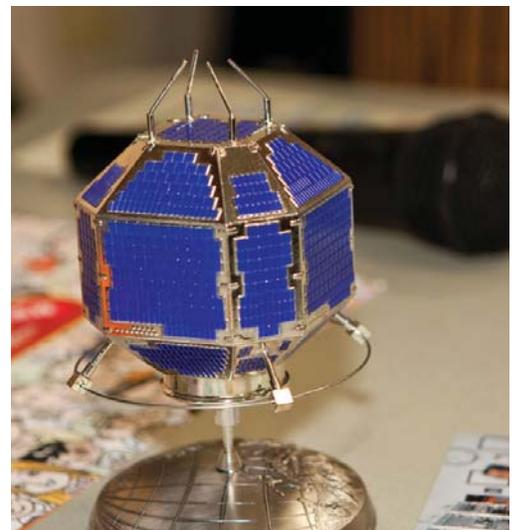
**Your Connection for  
Emergency Power Solutions**

**Power Products**  
Power Pole Connectors – Power Cables – Tools  
AGM Batteries – Red/Black Zip Cord 14 – 8 GA

**West Mountain Products**  
RIGrunner – RIGblaster – Accessories  
PWRgates – Computerized Battery Analyzer  
**Coax Cable – Coax Assemblies – Adapters**  
**Terminals – Coax Connectors – Battery**  
**Chargers – Battery Accessories**  
Email [sales@impulseelectronics.com](mailto:sales@impulseelectronics.com)



*Above, Loren AD6ZJ shows off a model satellite (below) from JARL, obtained during his recent Japan trip. Photos by KB5MU.*



4 <http://www.hamtv.com>

# Vertical Array Systems

by Loren AD6ZJ

*Article adapted from the November 2009 Palomar Amateur Radio Club membership meeting program, which was given by Loren AD6ZJ*

## Why do we Need a Vertical Array?

Gain is a good thing. Every 3 dB of gain has the same effect as doubling your power output. While you can use a linear amp to double your power, no linear that I'm aware of will help the received signal and you need to hear them to work them. In addition an array antenna also has directivity that can be used not only to enhance the wanted signal but also reduce an unwanted signal.

OK. So we need gain, but why a vertical array and not just a horizontal beam? On the low bands (30m – 160m) most of us don't have the real estate or the pocket book to put up an effective beam. For example, for a 2-element full-sized 40m beam to be setup for optimal performance we would like it to be  $\frac{1}{2}$  wavelength above ground. So our beam would be 65' high, 65' long and 22' wide! Most of us just can't do that. On the other hand, a 40m vertical array can be ground mounted with the elements spaced 33' apart with the tops at about 33'. The vertical array is easier to deploy and doesn't require a big tower. Of course if I had the land and the funds (and the patience to go through the permit process) I would put up the beam.

## Basics of a Driven Array

There is a finite amount of RF available at the antenna for a given wattage output of the transmitter. An isotropic radiator (a sphere-shaped theoretical antenna) is said to have a gain of 0 dBi. A dipole antenna in free space is said to have a gain of 2.16 dBi but a dipole antenna  $\frac{1}{8}$  wavelength above ground has a loss of -1.4 dBi (at 15 degree takeoff). A single ground mounted vertical with average ground has a gain of -0.3 dBi. If we add a second vertical and couple it properly to the first vertical we will produce gain (more on this later). We don't actually produce anything (watts is watts) but we focus the available energy into a particular direction or directions. The array has loss in some directions and that energy is focused to produce gain in the desired direction.

There are many choices for gain and directivity. We can get gain and directivity in many forms just by adjusting the distance between elements and the phase relationship between them. Some combinations that are desirable are also complicated

while others are much simpler to deploy. Take a look at the  $\frac{1}{4}$  and  $\frac{1}{2}$  spaced arrays and you can see there are a few arrangements that don't take much effort. In particular if we can feed our antennas with 0, 90 or 180 degree phase shift we don't require any sophisticated equipment to create phase shift networks. For instance, if we take our 2 elements on 40m and space them  $\frac{1}{2}$  wavelength apart and feed them with a simple T splitter and equal lengths of coax we end up with a broadside array (the gain is perpendicular to the pair of verticals). Or we feed the same pair but add an additional  $\frac{1}{2}$  wavelength of coax (180 degree shift) we have an end fire array in line with the pair and in the direction of the lagging vertical. I don't want to oversimplify the setup as feeding two antennas with our 50 ohm coax will be approximately half the feed impedance seen by the transmitter so some form of matching should be used to get back to the 50 ohms.

Once we have our array built we can change directions by adding or subtracting coax feeder length to one or more of the elements. If your mostly interested in pointing to the North East with the occasional need to work Asia you could just run outside and swap coax around. Of course the low bands are active after dark so you would be running around your backyard with a flashlight. By adding some complexity to the building process you can simplify the use of your array. A double pole double throw relay (DPDT) can be effective at quickly switching 2 element 180 degrees. Add another relay to feed the elements in phase (the same phase shift) to produce broadside gain. By adding more elements and more relays you can build elaborate array systems including the popular four-square array. We will now look at some ways to do this in my favorite antenna book.

See "ARRL ON4UN's Low Band Dxing by John Devoldere" 11-8, 11-37, 11-38, 11-39, 11-61

To have an effective vertical array usually requires a good radial system. If it's a ground mounted vertical you can never have too many radials. A DC ground path is also a good addition. It will bleed off static accumulation keeping it out of the rig. I notice less static when I have a DC ground path. Depending on the feed system you choose you might already have the DC path accounted for.

Where do I get more information?

- ON4UN's Low-Band DXing – HRO
- ARRL Antenna Compendium – HRO
- The ARRL Antenna Book – HRO
- ARRL's Wire Antenna Classics – HRO
- EZNEC V5.0 – [www.eznec.com](http://www.eznec.com)

# CQ CQ Field Day Chair

by Paul KB5MU

ARRL says Field Day is "not a contest" – but they list it under Contests on their web site and it has Rules like any other contest.

Like this one:

Object: To work as many stations as possible on any and all amateur bands (excluding the 60, 30, 17, and 12-meter bands) and in doing so to learn to operate in abnormal situations in less than optimal conditions. A premium is placed on developing skills to meet the challenges of emergency preparedness as well as to acquaint the general public with the capabilities of Amateur Radio.

PARC has participated in Field Day each year (on the fourth full weekend of June) for decades. Some years the emphasis has been on "any and all", some years it has been on "as many stations as possible"; occasionally the most applicable clause has been "less than optimal conditions". It's nearly impossible to avoid developing some skills and learning some lessons at Field Day. The lessons are not always the ones we expected.

It's early December, and Field Day is half a year off. Much of the detailed work to prepare for Field Day won't really get started until the last few weeks before the event. If you're just going to drop by and enjoy the event or even operate a shift at one of the stations, you probably don't need to start worrying about it yet. But somebody does.

That somebody is the club's Field Day Chairman, and we need a volunteer to step forward. The Field Day Chairman sets the tone for the whole event. He or she influences how ambitious the club's participation will be, from a very casual fun outing to a hard-core competitive effort. Perhaps most importantly, the Chairman is responsible for obtaining a great site that facilitates the kind of Field Day event planned. It's much nicer when the site is decided on and confirmed well in advance.

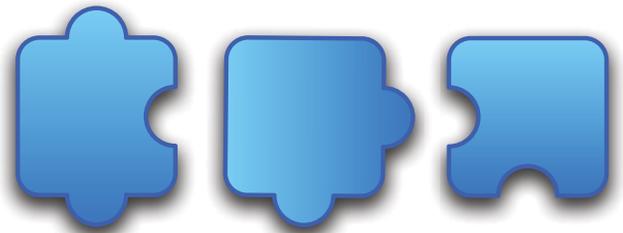
If you've attended a number of PARC Field Day events, you'll have an idea about how we've habitually done them. You may have ideas about how we could do them better. As Field Day Chairman, you would have an opportunity to try. The Club owns lots of equipment to make Field Day easier – you will decide how best to make use of it (or not). The Club has many members with all kinds of experience – you will recruit the talent to make Field Day work out best. You might (or might not) delegate most of the detailed work of Field Day to a cadre of experienced Band Captains, leaving your own time free for overall coordination. If you love the way PARC Field Day has always been done, you can choose to follow in those footsteps. If you think we've had it all wrong, the Board is ready to listen to you and (I predict) will endorse your plan, if you can make it work.

Please consider volunteering to serve as 2010 Field Day Chairman.

Email [board@palomararc.org](mailto:board@palomararc.org) to volunteer or if you have questions.



Field Day 2010 - Where do you fit in?



## San Diego Section Field Day Results - Partial

Compiled by Pat Bunsold WA6MHZ  
Per December QST

Class	Club or Entity	Callsign Used	Points	Participants
3A	Palomar ARC	W6NWG(+WD6FWE)	2686	45
3A	Convair/220 Club	W6UUS	2474	14
3A	Fallbrook ARC	N6FQ	1616	59

SCOPE  
P.O. Box 73  
Vista, CA 92085-0073

Return service requested

PERIODICALS  
POSTAGE PAID  
AT VISTA CA  
92085-9998

Scope (USPS #076530) is published monthly by the Palomar Amateur Radio Club 1651 Mesa Verde Drive, Vista, CA 92084. POSTMASTER: Send address changes to SCOPE, P.O. Box 73, Vista, CA 92085. Periodicals postage paid at Vista, CA 92084. Dues are \$20 per year or \$35 per year for a family. Dues include a subscription to Scope.

Editor: Michelle Thompson W5NYV

Submissions: [scope@palomararc.org](mailto:scope@palomararc.org)

Questions? Ideas? Comments? [W6NWG@amsat.org](mailto:W6NWG@amsat.org)

## Featured Program:

Please come to our annual holiday social at our general club meeting at 7:30pm on 2 December 2009 at the Carlsbad Safety Center, 2560 Orion Way, Carlsbad, CA, USA. Bring a dish to share. The club will provide ice cream, cake, and coffee. There will be games to play, and we'll have a great time. We look forward to seeing you!