RF

ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. LII NO. 3 **P.O. BOX 3454, TUSTIN, CA 92781-3454** **March 2011**

The Prez Sez.....

By Paul W6GMU

Ahhh, March already….could Spring please arrive already? With luck, we've seen the last hard frost of the season.
Next month I look forward to having another fun experience with our "Portables in the Park" activity (it WILL NOT rain on that day!).

Meanwhile, during this month I look forward to firming up our plans for our main annual Club activity: Field Day 2011! Preparation time is growing short and we still urgently need a Field Day Czar plus a few more Band Captains, so please consider serving in one of those capacities.

A good time WILL be had by all, I assure you!

Our March speaker, Santa Ana Fire Dept.'s Capt. Steve Snyder (KI6EYQ), is from the Santa Ana Response Team which provides auxiliary communications in the event of disaster or public service event. Our VP, George N6VNI will run the March meeting as I will be out of town.

Be well! Paul - W6GMU

OCARC 2011 Dues

"Dues are Due!!"

It is 2011, and that means that it's time to renew your club dues.

You have through the end of March 2011 to pay your dues without falling in arrears. Don't miss out on the events

March Program

Our guest speaker for the March meeting is Capt. Steve Snyder - KI6EYQ of the Santa Ana Fire Department.

SANTA ANA RESPONSE TEAM

S.A.R.T. is a newly formed ARES group of amateur radio operators who get called out to assist with emergencies within the City of Santa Ana.

The next general meeting will be on:

Friday, March. 18th @ 7:00 PM

As usual, we will be meeting in the east Red Cross Building, Room 208.

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Monthly Events:

General Meeting:
Third Friday of the month
at 7:00 PM
American Red Cross
601 N. Golden Circle Dr.
(Near Tustin Ave. & 4th St.)
Santa Ana, CA

Club Breakfast:
Second Saturday of every
month at 8:00 AM
Jagerhaus Restaurant
2525 E. Ball Road
(Ball exit off 57-Freeway)
Anaheim, CA

Club Nets (Listen for **W6ZE**):

28.375 ± MHz SSB
Wed- 7:30 PM - 8:30 PM
Bob AF6C, Net Control

146.55 MHz Simplex FM
Wed- 8:30 PM - 9:30 PM
Bob, WB6IXN, Net Control

7.086 ± MHz CW **OCWN**
Sun- 9:00 AM – 10 AM
John WA6RND, Net Control

VISIT OUR WEB SITE

http://www.w6ze.org

for up-to-the-minute club information, the latest membership rosters, special activities, back issues of RF, links to ham-related sites, vendors and manufacturers, pictures of club events and much much more.

Club Dues:

Regular Members	...$20
Family Members*	...$10
Teenage Members	..$10
Club Badge**	…….$3

Dues run from Jan thru Dec and are prorated for new members.

*Additional members in the family of a regular member pay the family rate up to $30 per family.

**There is a $1.50 charge if you'd like to have your badge mailed to you.

Don't Miss it!!!

Visalia

International DX Conference

April 15-17

The 62nd Annual International DX Convention sponsored by the Northern California DX Club will be held at The Holiday Inn Hotel & Conference Center in Visalia, California from April 15 - 17, 2011.

If you're a DXer or interested in any aspect of Ham radio, then IDXC is the place to be. Top DX operators from around the world will be there. You'll match those familiar callsigns with new faces, and shake hands with the person you have had a sched with for the past 10 years but never met.

Learn the secrets for big signals on top band. How to have fun adventures chasing IOTA, attend the contest forum, antenna forum, DX forum, or Contest Academy. There are seminars for everyone from the seasoned pro to the beginning DXer. Visit the Exhibit Hall, where you can talk to the people who design and use the best DX equipment. We have some great raffle Prizes the likes of which top even the famed Dayton Hamvention. And don't forget the YL's — we have a Special Tour for them as well. Enjoy DXpedition presentations - Technical sessions - Vendor exhibits - Contest Academy - Ladies Tour - Golf Tournament - Saturday Banquet - Over $25,000 in raffle prizes - and meet DXers who travel from around the world to this premier DX event. Early registration closes on March 19th, so register today at http://www.dxconvention.org/ .

HR 607 Bill
is
Threat to 440 MHz Band

by Carl WU6D

If you have not already heard, a bill has been introduced into congress as the First Responder Act of 2011" HR607. On the face, it sounds like a great bill, but there is a portion of the bill that is asking for 440 amateur band to be put up for sale.

"**HR 607 lists the paired bands of 420-440 MHz and 450-470 MHz among the bands to be reallocated for commercial auction within 10 years of its passage. Of serious concern to the ARRL is the inclusion of the 420-440 MHz amateur allocation in the list of frequencies to be cleared for auction," said ARRL Regulatory Information Manager Dan Henderson, N1ND. The ARRL and the Amateur Radio community certainly support the work of public safety agencies and understand their desire for an interoperable network; however, the inclusion of most of the amateur 70 cm spectrum as one of the replacement bands is illogical and unacceptable. The 420-440 MHz band is not Public Safety spectrum and should never have been included in any spectrum swap of Public Safety allocations."**

We need for all of you to contact your US Congressperson to not vote on this bill.

Please read the article that the ARRL has put out.
http://www.arrl.org/news/spectrum-management-bill-threatens-amateur-frequencies

Our portion of the 70 cm band is not the only one being attacked.

TechTalk92

DATV – Looking at DVB-S2 Modulation

by Ken Konechy W6HHC

Most of the earlier OCARC TechTalk articles about Digital-ATV have provided details about how DVB-S modulation works. DVB-S is currently the most popular modulation standard being used by hams for DATV. This month I will look at some of the technical details of DVB-S2 modulation technology.

While the majority of DATV hams use DVB-S modulation and some hams use DVB-T modulation (see TechTalk86), I have had some conversations with hams who propose that ham radio should move on to DVB-S2 modulation for Digital-ATV. I am a big advocate of understanding all the competing DATV technologies and protocols, since each technology has its own set of strengths and weaknesses (aka: PROs and CONs). So let us see, if DVB-S2 can improve ham radio Digital-ATV?

Commercial World of Television

The Digital Video Broadcasting organization (DVB) approved DVB-S2 to be the modulation technology for commercial High Definition TV (HDTV) broadcast satellite transmissions (uplinks and downlinks). The DVB organization succeeded in getting DVB-S2 approved as a ETSI standard in March 2005. The DVB organization states that "DVB-S2 will not replace DVB-S in the short or even the medium term, but makes possible the delivery of services that could never have been delivered using DVB-S".

Some of the commercial TV design goals for DVB-S2 are:

- Quasi-Error-Free operation at about 0.7dB to 1 dB from the Shannon limit
- Optimized for multi-stream HDTV
- Interactive Services (IS) Interactive data services including Internet access
- Digital TV Contribution and Satellite News Gathering (DTVC/DSNG)
- Data content distribution/trunking and other professional applications (PS)

I find it interesting to note that other than the first bullet above, none of the services and features in the other bullets are not of much interest to hams.

Typical Transmitter Block Diagram

DATV pioneer and enthusiast Stefan Reimann DG8FAC of SR-Systems in Germany has shown that DVB-S2 digital technology is possible for hams (see the SR-Sys model 2TS-MidiMOD2). **Fig 1** is a block diagram of a basic DVB-S2 ham station for DATV. The analog camera and video is compressed by a MPEG-2 encoder board. The TransportStream (TS) digital data is fed to the DVB-S2 exciter board that does a lot of complicated data processing and then converts the digital data directly into modulated RF at a desired frequency. The small RF output signal of the exciter board is typically amplified by two stages of very linear RF amplifiers.

Video Data-Rate and Compression

For DATV, the analog camera output is first digitized by the MPEG-2 Encoder board shown in **Fig 1**, and then compressed by the MPEG-2 algorithm. The reason the compressed video data rate varies in **Table 1** is that the small value means little motion in the video scene and the larger value means a lot of motion.

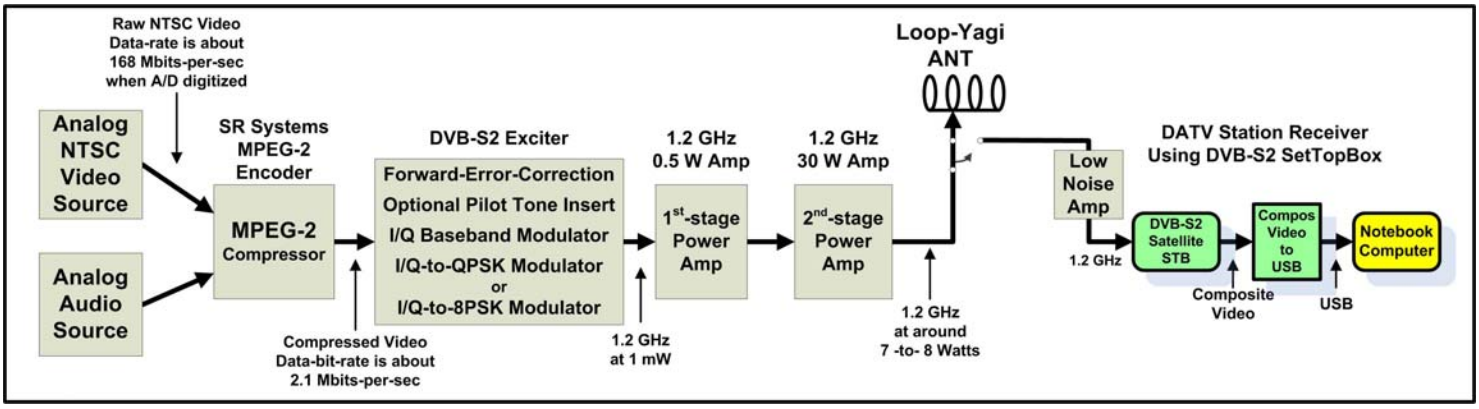


Figure 1 – Block Diagram of Basic DVB-S2 Station for DATV

Table 1 – Camera Video Data Streams and MPEG-2 Data Streams

Video Data Stream	Data-Rate	Notes
Analog NTSC camera	168 Mbits/sec	A/D digitized, uncompressed
NTSC MPEG-2	2-3 Mbits/sec	compressed
NTSC H.264/MPEG-4	~1.5 Mbits/sec	compressed
VHS MPEG-2	1-2 Mbits/sec	compressed
Analog PAL camera	216 Mbits/sec	A/D digitized, uncompressed
PAL MPEG-2	2.5-6 Mbits/sec	compressed
HDTV camera	1-1.5 Gbits/sec	uncompressed
HDTV MPEG-2	15-60 Mbits/sec	compressed
HDTV H.264/MPEG-4	12-20 Mbits/sec	compressed

Notice in **Table 1** that the digitized NTSC camera video stream data-bit-rate is 168 Mbits/sec before compression, and MPEG-2 will reduce this to a Net-Bit-Data-Rate between 1 and 3 Mbps, which is quite a reduction in the data rate,

The newer video CODEC, H.264, can be also used with DVB-S2. This CODEC is sometime called H.264, sometimes called MPEG-4-Part-10, and sometimes called Advanced Video Coding (AVC). But, all of these terms mean the same standard, technically. H.264/MPEG-4 can reduce the bit-rate by a factor of 50% over MPEG-2. However, the MPEG-4 encoding adds considerably to the latency of the transmitted signal, compared to MPEG-2.

FEC Inflation of Payload Data Stream Data-Rate

Forward Error Correction (FEC) is a technology that not only can detect errors on the received signal, but adds enough redundancy of the data so that it can correct several wrong bits. But, there is a trade-off when choosing the amount of redundancy. Since redundancy inflates the data-rate of the output stream, the trade-off is between more redundancy or keeping the inflated data-rate smaller. As we will see a little later in this article, the larger the inflated output data-rate, the higher the required RF bandwidth. So at some point the FEC algorithm will not have enough redundancy to correct too many errors, and the DATV receiver screen will go blank or freeze.

The FEC algorithms used in the DVB-S2 protocol are different that those used in the older DVB-S and DVB-T protocols. The DVB-S commercial television standard uses a first FEC algorithm called the inner-Punctured-Convolutional-Code encoding specification and then decoded by Viterbi. The second FEC algorithm is called Reed-Solomon. Combining the Convolutional encoding with Viterbi decoding is an FEC technique that is well suited to a channel in which the transmitted signal has been corrupted by Gaussian noise.

The DVB-S2 FEC specification originated with the desire for improved efficiency. In DVB-S2, the DVB-S inner convolutional coding has been replaced with Low Density Parity Check (LDPC) coding and the DVB-S Reed-Solomon encoding is replaced with the Bose-Chaudhuri-Hocquenghem (BCH) algorithm for outer encoding.

The inner LDPC FEC algorithm can be configured for different levels of error correction. These different redundancy settings are usually called: 1/2, 3/5, 2/3, 3/4, 5/6, 8/9 and 9/10. (See **Table 2**) Where the first number ("1" in the case of configuration 1/2) is the number of input bits. The second number ("2" in the case of configuration 1/2) is the number of output bits from this FEC algorithm. In the case of "1/2", the data "inflation rate" is 100%

The second algorithm that is used is the BCH FEC algorithm produces a variable length overhead. It adds an overhead of typically 192 bits to a long data body frame for the FECFRAME length of 64,000 bits. Its data stream "inflation rate" is very small, typically around 0.5% or less depending on the FEC Rate (see **Table 3** for exact values).

Table 2 – FEC rates for DVB-S2 Broadcasts

FEC	QPSK	8PSK	16APSK	32APSK
1/4	Optional	No	No	No
1/3	Optional	No	No	No
2/5	Optional	No	No	No
1/2	Yes	No	No	No
3/5	Yes	Yes	No	No
2/3	Yes	Yes	Optional	No
3/4	Yes	Yes	Optional	Optional
4/5	Yes	No	Optional	Optional
5/6	Yes	Yes	Optional	Optional
8/9	Yes	Yes	Optional	Optional
9/10	Yes	Yes	Optional	Optional

Table 3 – Value of BCH "inflation" for 64,800-bit Frame

FEC Rate	Frame lengths	CR_{BCH}
1/4	16,008 / 16,008 + 192	**0.98815**
1/3	21,408 / 21,408 + 192	**0.99111**
2/5	25,728 / 25,728 + 192	**0.99256**
1/2	32,208 / 32,208 + 192	**0.99407**
3/5	38,688 / 38,688 + 192	**0.99506**
2/3	43,040 / 43,040 + 160	**0.99630**
3/4	48,408 / 48,408 + 192	**0.99810**
4/5	51,648 / 51,648 + 192	**0.99630**
5/6	53,840 / 53,840 + 160	**0.99704**
8/9	57,472 / 57,472 + 128	**0.99778**
9/10	58,192 / 58,192 + 128	**0.99780**

Digital Modulation Symbols and Symbol-Rates

Digital modulation technologies like BPSK (an example is PSK-31), QPSK (Quad Phase Shift Keying), 8PSK and 32APSK (Amplitude and Phase Shift Modulation with 32 "constellation points") have the ability to put more information into a more narrow frequency spectrum than analog modulation. The complexity of the digital modulation scheme, allows us to pack more "data bits" into each SYMBOL. **Table 4** lists out how many data bits can be packed into a symbol for several well known digital modulation technologies.

Table 4 – Symbol Bit-Packing for Various Digital Modulation Technologies

Modulation Scheme	Data Bits per Symbol (Me)
BPSK	1
GMSK	1
QPSK	**2**
8PSK	**3**
8-VSB	3
16APSK	**4**
QAM-16	4
32APSK	**5**
QAM-64	6
QAM-256	8

The higher-order modulations schemes, like 16APSK and 32APSK, can "pack" more bits into the symbol rate than QPSK. But, the complexities for 16APSK and 32APSK modulation make them more susceptible to noise and interference than QPSK. The DVB-S2 protocol provides for QPSK, 8PSK, 32APSK, and 32APSK (marked in **BLUE** in **Table 4**. The drawings in **Fig 2**, **Fig 3**, **Fig 4**, and **Fig 5** are intended to give an appreciation of the increasing complexities for these modulation schemes.

Notice in **Fig 4** and **Fig 5** that not only is the angle from the origin to the state important, but the amplitude from the origin is critical, also. Think of APSK as a modulation that is similar to QAM modulation...but providing a circular constellation.

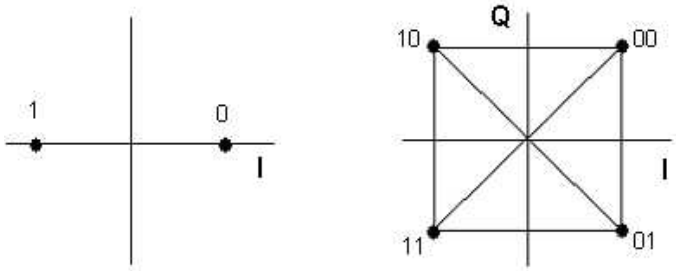


Figure 2 – The modulation constellations of BPSK (on the left) with two states and by QPSK with four states.

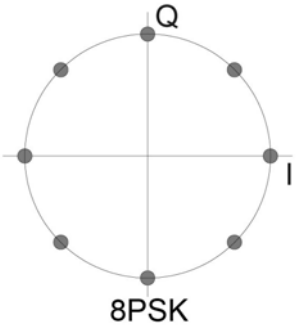


Figure 3 – The constellation for 8PSK modulation contains 8 states. Each state defines three bits of data.

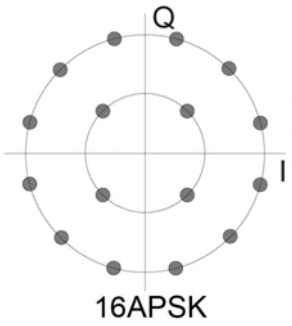


Figure 4 – The constellation for 16APSK modulation contains 16 states. Each state defines four bits of data.

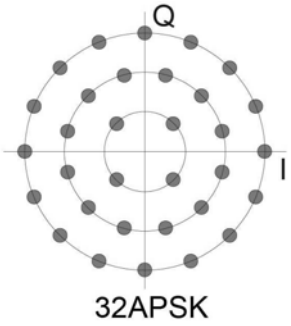


Figure 5 – The constellation for 32APSK modulation contains 32 states. Each state defines five bits of data.

Hans Hass DC8UE in Hamburg has conducted DATV testing to compare DVB-S2 to DVB-S. When testing with DVB-S (QPSK with FEC equal 1/2) he needs the signal to be 5.5 dB above the noise (C/N). With DVB-S2 QPSK (FEC = 1/2) he needed C/N = 2.2 and with 8PSK (FEC = 3/5) he needed C/N = 6.5. Clearly the more complicated 8PSK modulation is more susceptible to noise.

For commercial DVB-S2 satellite broadcasting, only the QPSK and 8PSK modulations are currently being used. Stefan DG8FAC of SR-Systems explains that commercially, "16APSK and 32APSK modulations are only for Ground Links [and for portable Uplinks] at the moment". I do not know of any ham DATV installations that are currently using 16APSK or 32APSK modulation.

DVB-S2 Bandwidth

Table 4 shows for example that 8PSK modulation will pack three data bits into each symbol being modulated. If we know the final output data-bit-rate (I will call this inflated data rate the "Gross Data-Bit-Rate") we need for the television signal, then the "symbol-rate" we need is exactly one-third of that gross data-bit-rate. That is: each symbol will produce three bits of data.

For example:

Gross Data-Bit-Rate = 4.5 Mbits/sec

Symbol-Rate Needed = 1.5 Msymbols/sec

The formula to calculate the Symbol-Rate setting that is needed for a DVB-S2 transmitter is:

$$\textbf{Symbol-Rate Needed} = \textbf{NDBR} / (\textbf{Me} \times \textbf{CR}_{\textbf{LDCP}} \times \textbf{CR}_{\textbf{BCH}})$$

Where:

- **NDBR** = Net Data Bit Rate (aka the information rate) Same as MPEG-2 output data rate in Fig 1
- **Me** = Modulation Efficiency (3 for 8PSK in Table 4)
- $\textbf{CR}_{\textbf{LDPC}}$ = Correction Rate setting for LDPC (1/2, 3/4, etc)
- $\textbf{CR}_{\textbf{BCH}}$ = Correction Rate value for BCH found in Table 3

I will now calculate an example for 8PSK modulation where the output of MPEG-2 encoder is 2.4 Mbits/sec and the FEC rate is set to a value of 3/5.

$$\textbf{Symbol-Rate Needed} = \frac{\textbf{2.4 Mbit/sec}}{\textbf{3 bits/symb * (3/5) * (0.99506)}}$$

$$\textbf{Symbol-Rate Needed} = \frac{\textbf{2.4 Mbit/sec}}{\textbf{1.791 bits/symb}}$$

$$\textbf{Symbol-Rate Needed} = \textbf{1.34 Msymbols/sec}$$

The final formula is for DATV Bandwidth (BW). The "roll-off" factor affecting $\textbf{BW}_{\textbf{allocation}}$ for DVB-S2 is 0.2; compared to DVB-S where roll-off is 0.35. For the DVB-S2 modulations, the formula for (allocation) RF BW is:

$$\textbf{RF BW}_{\textbf{allocation}} = \textbf{1.2 x Symbol-Rate}$$

Figure 6 shows a spectrum analyser capture of a 1.2 GHz DVB-S2 signal, using 8PSK modulation (13.5MSymb/sec, FEC=3/5, Pilots ON, RollOff = 20%). The Bandwidth shown is about 16.2 MHz.

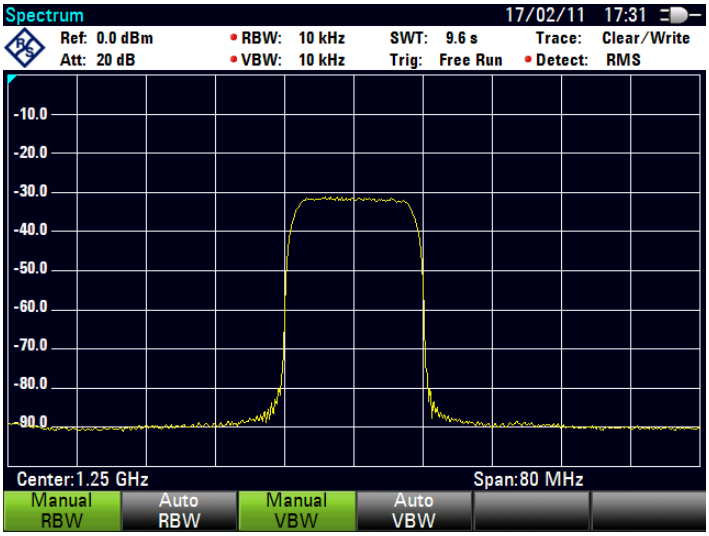


Fig 6 - A DVB-S2 MidiMOD2 exciter 8PSK output transmission is seen on a Spectrum Analyzer (Courtesy of Stefan DG8FAC)

The Net-Data-Bit-Rate (NDBR) capacity that can be supported in a particular bandwidth is listed in **Table 6**. Note that these values do not include the overhead introduced by inserting Pilot Tones for improved receiving robustness.

Receiving DVB-S2

In **Fig 1**, the block diagram shows a typical DVB-2 receiving station used for DATV. The DVB-S2 SetTopBox (STB) can be purchased on e-bay and other online stores here in the USA. The output of many S2 STB's include: composite video, S-video, component video, and HDMI interfaces. It is interesting to note that the DVB-S2 STB usually will receive old DATV DVB-S transmissions using a "modified 8PSK mode" setting that is backward compatible to DVB-S.

PRO's and CON's

Table 7 attempts to compare the strengths and weaknesses of DVB-S2 against DVB-S for Digital-ATV. There is no question that DVB-S2 provides a more robust signal and can pack multiple TS video streams into a small bandwidth. But, most of the DVB-S2 STB receivers currently are not designed to tune down below 10 MSymb/sec, and so this limitation makes it difficult to receive a signal with a 2 MHz bandwidth.

Table 6 - Net Data Bit-Rates for DVB-S2 at a given RF Bandwidth

Modulation	FEC Coderate	DVB-S2 RF BANDWIDTH for DATV (RF BW = SymbolRate x 1.2)						
		1.5 MHz (SR = 1.25 MS/sec)	2.0 MHz (SR = 1.67 MS/sec)	2.5 MHz (SR = 2.08 MS/sec)	3.0 MHz (SR = 2.5 MS/sec)	4.0 MHz (SR = 3.33 MS/sec)	5.0 MHz (SR = 4.17 MS/sec)	6.0 MHz (SR = 5.0 MS/sec)
QPSK	1/4	~~0.62~~	~~0.83~~	~~1.03~~	~~1.24~~	~~1.65~~	2.06	2.47
	1/3	~~0.83~~	~~1.10~~	~~1.37~~	~~1.65~~	~~2.20~~	2.76	3.30
	2/5	~~0.99~~	~~1.33~~	~~1.65~~	~~1.99~~	2.64	3.31	3.97
	1/2	~~1.24~~	~~1.66~~	~~2.07~~	2.49	3.31	4.15	4.97
	3/5	~~1.49~~	~~1.99~~	2.48	2.99	3.98	4.98	5.97
	2/3	~~1.66~~	~~2.22~~	2.76	3.32	4.42	5.54	6.64
	3/4	~~1.87~~	2.50	3.11	3.74	4.99	6.24	7.49
	4/5	~~1.99~~	2.66	3.32	3.99	5.31	6.65	7.97
	5/6	~~2.08~~	2.78	3.46	4.15	5.53	6.93	8.31
	8/9	~~2.22~~	2.96	3.69	4.43	5.91	7.40	8.87
	9/10	~~2.25~~	3.00	3.74	4.49	5.98	7.49	8.98
8PSK	3/5	~~2.24~~	2.99	3.73	4.48	5.96	7.47	8.96
	2/3	2.49	3.33	4.14	4.98	6.64	8.31	9.96
	3/4	2.81	3.75	4.67	5.61	7.48	9.36	11.23
	5/6	3.12	4.16	5.18	6.23	8.30	10.39	12.46
	8/9	3.33	~~4.44~~	5.53	6.65	8.86	11.10	13.30
	9/10	3.37	4.50	5.60	6.74	8.97	11.23	13.47
16APSK	2/3	3.32	4.43	5.52	6.63	8.84	11.07	13.27
	3/4	3.74	4.99	6.22	7.47	9.95	12.46	14.94
	4/5	3.99	5.33	6.64	7.98	10.64	13.32	15.97
	5/6	4.15	5.55	6.91	8.31	11.07	13.86	16.62
	8/9	4.43	5.92	7.38	8.87	11.81	14.79	17.74
	9/10	4.49	6.00	7.47	8.98	11.96	14.98	17.96

(NOTE-1: NTSC Analog Camera produces about 2.1 to 2.4 Mbits-per-sec of MPEG-2 output for Ham Radio type broadcasts)

(NOTE-2: The Net Data Bit-Rate values inside the Table need to be at 2.4 Mbps or larger to support the expected camera data rate coming from MPEG-2 encoder)

(NOTE-3: The Net Data Bit-Rate values inside the Table shown in RED (with strikethrough) are Net Data Bit-Rates that will not support the video data stream of 2.4 Mbits/sec.)

(NOTE-4: The Net Data Bit-Rate values are based on using a DVB-S2 FEC FRAME length of 64,800 bits.)

(NOTE-5: 16APSK and 32APSK modulations are currently not used for commercial TV broadcasts. 16APSK is shown only for comparison.)

Table 7 – Comparing DVB-S2 with DVB-S

	DVB-S2	DVB-S
PROs	Quasi-Error-Free operation at about 0.7dB to 1 dB from the Shannon limit 1xTS Bandwidth can be as small as 1 or 1.5 or 2 MHz with 8PSK Cheap Set Top Boxes (STB) on eBay and online 3 MHz bandwidth can support multiple video streams	1xTS Bandwidth can be as small as 2 or 3 MHz Cheap FTA Set Top Boxes (STB) on eBay Wide-spread experience and knowledge is provided by European hams on the Internet Newer DVB-S2 STB will receive DVB-S
CONs	Most DVB-S2 STB receivers will only tune down to 10 MSymbol/sec (12 MHz bandwidth) Currently DVB-S2 exciter board is 100% more expensive than DVB-S	QPSK modulation requires larger bandwidth than 8PSK modulation

Conclusion

I am not yet convinced that DVB-S2 is the correct technology direction for ham D-ATV. Most new features provided by DVB-S2 technology (like "news gathering" and "data content trunking") are not of much interest to ham DATV. My main DATV interest is fitting narrow DATV 1xTS bandwidth into crowded ham band spectrum plans. I can envision placing three 2 MHz DATV repeater signals into the band space that used to be occupied by a single 6 MHz analog ATV signal. But, the STB inability to tune in a 1.5 MSymb/sec signal…blocks my goal. Certainly DVB-S2 can provide a great technology for multiple video streams that can be used by DATV repeater operators.

(see interesting DATV URL links on next page)

Interesting DATV Links

- Digital Video Broadcasting organization (DVB commercial standards) – see **www.DVB.org**
- Digital Video Broadcasting standard for DVB-S2 – see ETSI EN 302 307 specification
- TAPR PSR Quarterly Journal Issue 111 on DVB-S Modulation – see **www.TAPR.org/psr.html**
- British ATV Club - Digital Forum – see **www.BATC.org.UK/forum/**
- German portal for DATV streaming repeaters and downloads – see **www.D-ATV.net** (in German)
- AGAF D-ATV components (Boards) – see **www.datv-agaf.de** and **www.AGAF.de**
- Complete ready-to-go DATV transmitters – see **www.d-atv.org/D-ATV-Modulator.pdf**
- SR-Systems D-ATV components (Boards) – see **www.SR-systems.de**
- DGØVE microwave amps, up-converters, down-converters – see **www.DG0VE.de**
- Down East Microwave RF amplifiers – see **www.DownEastMicrowave.com**
- Orange County ARC TechTalk76-DATV on DVB-S modulation – see **www.W6ZE.org/DATV/**
- Orange County ARC TechTalk86-DATV on DVB-T modulation – see **www.W6ZE.org/DATV/**
- Orange County ARC newsletter entire series of DATV articles – see **www.W6ZE.org/DATV/**
- Wikipedia on DVB-S2 – see **http://en.wikipedia.org/wiki/DVB-S2**
- Wikipedia on H.264/MPEG-4 – see **http://en.wikipedia.org/wiki/H.264**

COAR RACES plans Communications Support
for Orange Police Running Team
for 2011 Baker-2-Vegas Race

April 16-17

Come join us for

"Portable in the Park"!

WHO: All OCARC members!

WHAT: Operate solar- and battery- powered Ham radios in a beautiful park!

WHERE: Jeffrey Open Space Preserve in Irvine, CA (33.703564,-117.753804)

WHEN: Saturday, April 23rd, 2011 9:00 AM to 5:00 PM

Please join us for a fun day of Ham operating in a peaceful park setting located in North Irvine!

This is the perfect opportunity to try out that new antenna you've been working on for Field Day or to dust off your old portable equipment to make sure it's still in good working order. There's no substitute for getting on the air and these events aim to educate those new to portable operating. See how it's done, ask questions, do some operating, then build your own portable station and bring it out to a future event! Members will be able to operate in a relaxing, NO PRESSURE atmosphere!

Jeff, W6UX, will be bringing his 100w battery powered station with a multi-band dipole or possibly a vertical wire antenna this time around. Nicholas, AF6CF, will be trying out a new portable loop antenna and a new 50w solar panel. There is plenty of room for others to bring their portable stations out!

Bathrooms are close by and there is a small picnic area with several tables (please bring your own food and drinks).

Don't forget to bring your logbook!

Directions to the Park:

Take INTERSTATE 5 to the JEFFREY ROAD Exit in Irvine
Right on JEFFREY ROAD
Right on LONG MEADOW
Left on VINTAGE
Left on LAMPLIGHTER
Right on GRASSLAND BUNGALOW
Park between TRIPLE and SHEPARD; the park is on the left.
Take one of the two short dirt trails to the picnic tables.

Visit maps.google.com and paste **33.703564,-117.753804** into the search box to get a satellite overview of the area.

BE SURE TO MARK SATURDAY APRIL 23, 2011 ON YOUR CALENDAR!

Heathkit of the Month #27:
by Bob Eckweiler, AF6C

Heathkit MP-10
AC Power Inverter.

Introduction:
In the 1960's AC inverters that convert 6 or 12 volt battery power to 117 VAC 60 Hz power were not nearly as readily available as they are today. Heathkit filled this need with the MP-10. Originally one of the Heathkit marine products to allow boat owners to use TVs and small appliances while away from shore power, the MP-10 quickly found numerous other uses. Radio hams, campers, car enthusiasts and emergency preparedness groups found the device versatile for their needs.

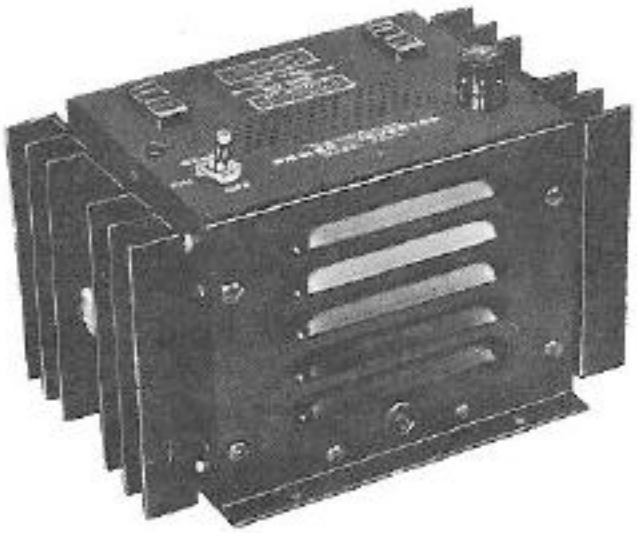


Figure 1: Heathkit MP-10 AC Power Inverter

The MP-10 experienced one of the longest Heathkit production runs. It was manufactured for twenty-two years without any upgrade or model change. The MP-10 was introduced in 1960 and remained in production until at least mid 1982. The MP-10 sold for $29.95 in the March 1965 catalog, $34.95 in the Christmas 1973 catalog, and $49.95. In the summer 1982 catalog. Retail Heathkit stores usually sold the kit at an additional $5.

The MP-10 Power Inverter:
The Heathkit MP-10 (Figure 1) requires either 6 VDC or 12 VDC power and converts it to 117 VAC power. The output is a square wave, not the sinusoidal power normally available from the AC mains (See the Sidebar). The MP-10 is rated at 120 watts output when running off 6 VDC, and 175 watts when running off 12 VDC. On 12 volts it can supply up to 240 watts intermittently. The efficiency of the inverter varies with power delivered. From about 80 watts to 200 watts (120 watts when using a 6V source) the efficiency is around 80%. At the full 240 watts it drops to about 70%. Low power output (around 20 watts) results in an efficiency around 50%. With no load the inverter draws about 18 watts. The MP-10 draws 25 amps under maximum rated load for the given input voltage.

The unit itself measures 7-3/8" L x 5-1/8" W x 4-3/4" H. A heavy heat sink adorns both ends, and mounted to each heat sink is a power transistor. The heat sinks may be mounted in two different orientations so, depending on whether the unit is mounted on a horizontal or vertical surface, the heat sink fins may be oriented vertically for best cooling. The front and rear of the unit have louvered ventilation slots and the top contains the power **OFF - ON - START** switch, a 3AG fuse holder for a 25 amp fuse, and two two-prong AC power outlets. The power switch START position is a momentary position and is used for starting when using a six-volt power source. Underneath the unit are two terminal strips for selecting either 6 or 12 VDC operation by jumper wires, and two #10-24 studs with wing nuts for connecting the input power. Heath recommends using heavy #10 wire with a short 10 foot maximum run to the battery to reduce external losses.

While the #10 wire is not included in the kit, the kit does include a #28 drill and two special studs. Instructions are given for drilling holes in the center of the battery terminals so the studs may be pressed in. The wire leads can

then be attached easily to the battery using a supplied thumbnut that screws onto the stud. If you need to turn the inverter on remotely, the manual suggest placing the MP-10 near the battery and using an automotive relay to turn the unit on and off.

Figure 2: Heath MP-10 Manual

The Circuit:

The circuit is shown in figure 3. The heart of the circuit is T1, a specially wound transformer. When power is applied any small differences in the transistors or transformer feedback windings will cause one of the transistors to turn on. The windings on the transformer are arranged so that as the transistor turns on more current is supplied to the base of that transistor turning it on fully; meanwhile the other transistor is driven deeply into cutoff, preventing it from conducting. The transformer core characteristics are such that, after a time, the core goes into saturation and the transistor that was on turns off, and the other transistor turns on. The strong positive feedback to the base of the transistors cause them to switch quickly from off to full on. Since no power is dissipated when the transistor is off and only a little is dissipated when the transistor is fully on, most of the heat is generated by the transistor while in the process of switching. The faster the switching occurs the better the efficiency and the less heat is generated. R2 provides the starting current. R3, switched in when the Power Switch is in the **START** position, provides additional starting current to assist when using low input voltage, and may be required to start oscillations under certain loads. The capacitors prevent transient spikes from damaging the transistors.

The two switching transistors used carry the Heathkit Part # 417-60 and are described in the manual as having commercial part # of SP-838 or CRT-3602A. I could not find a data sheet or source for these transistors on the web. As would be expected, high power (100W) high current (25A) germanium PNP transistors are no longer in heavy demand. Looking at a kit, I saw the transistors were made by Lansdale Semiconductor and carried a date code of 1982. Lansdale is a house that will do production runs of outdated semiconductors, so even Heathkit had to find a new source near the end of their production run. Numerous web pages do suggest alternatives, some costing more than the whole kit for one transistor.

My first encounter with the MP-10 occurred when I was in high school. One of my older ham friends was leaving for college and passed along his MP-10 to me. Not owning a boat, I first used it to power a borrowed Clegg VHF radio and ran my first portable station. Of course the owner of the Clegg came along and we made a few two-meter AM contacts. There aren't many tall hills on Long Island! On numerous other occasions it was put to good use including a trip to Gilgo Beach (east of the famous Jones Beach) to run a record player at our senior beach party. Yes we got a couple of jocks to lug two car batteries from the parking lot out into the sand. The 60 Hz frequency of the MP-10 varies with load so it took some adjusting to get the frequency close enough so Elvis sounded like Elvis and not "The Chipmunks"!

I don't recall what I did with that MP-10 from the early sixties? Perhaps it is back in the hands of the person who gave it to me. In 1965 I was moving to California and gave away a lot of goodies from that era. Today I have a different MP-10 Power Inverter, unbuilt and still in the box - part of my small collection of unbuilt Heathkits. Maybe someday I'll make a YouTube video of it being assembled.

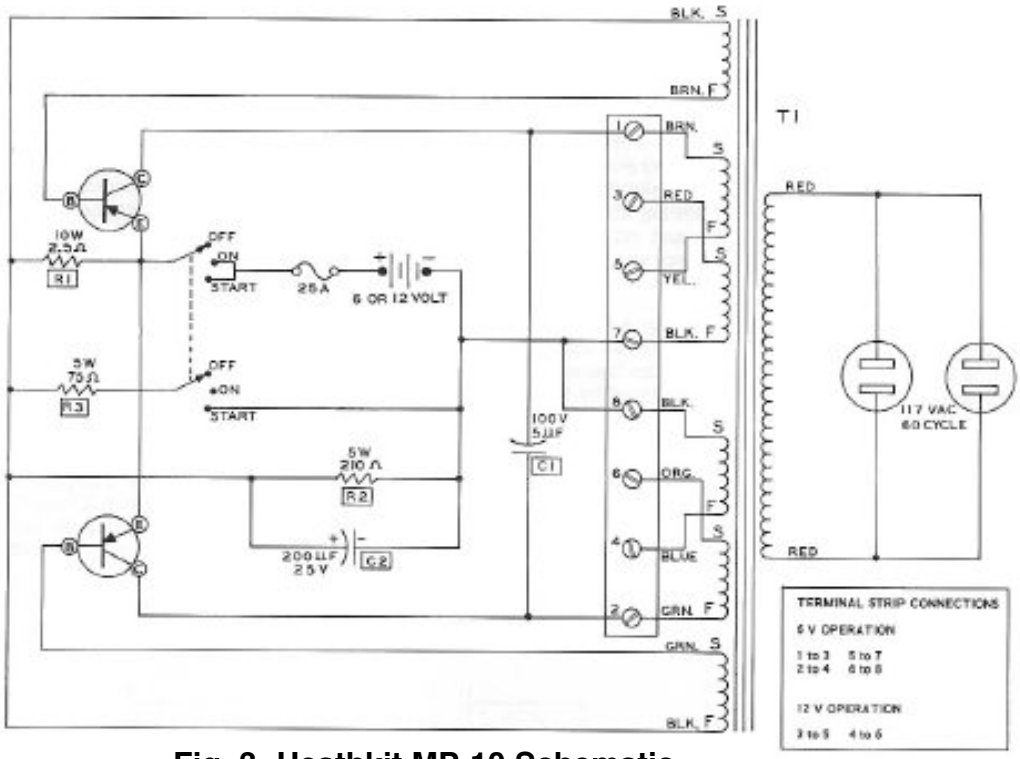


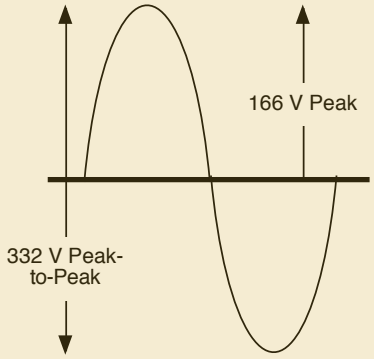
Fig. 3: Heathkit MP-10 Schematic

UH OH, next month is April. I'll have to come up with a special Heathkit for the occasion!

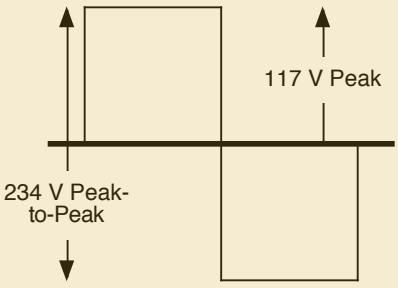
73, from AF6C

Sine vs. Square waves:

The 117 VAC power that is delivered to homes in the US is sinusoidal in shape, reaching peaks of 166 volts positive and negative alternately as shown in figure 4a. The MP-10 and most modern AC inverters output a square wave, where the voltage jumps rapidly between positive 117 volts and negative 117 volts as shown in figure 4b. If you were to mathematically examine the area under the two curves you would find that they are equal and the power delivered is the same. However, square wave power has some drawbacks. It is made up of numerous odd harmonics of the fundamental frequency, and can produce radio noise; it doesn't work well with some loads and some newer cheap power supplies that rely on the impedance of a capacitor to drop voltage. On tube equipment, many of the power supplies are capacitor input and rely on the peak voltage to create the nominal supply voltage. A square wave will produce a lower voltage from these power supplies, but in most cases the device should work adequately.



AC Power - Sinusoidal Wave
Figure 4a



AC Power - Square Wave
Figure 4b

OCARC

GENERAL MEETING MINUTES

2011-02-18

The OCARC February General Meeting was held at the Red Cross complex in Santa Ana at 7:04 pm on Friday evening, February 18th, 2011. There were a total of 34 members and visitors present. Seven club officers were present for a quorum.

Club President Paul Gussow, W6GMU, opened the meeting with the Pledge of Allegiance and then introduced our speaker for the evening, Janet Margelli, KL7MF, who spoke on the history of Ham Radio Outlet.

Janet KL7MF presents talk on HRO

Numerous photos of the founders, past and present employees, and stores were shared. HRO was founded by Bob Ferrero, W6RJ, an officer of the California Highway Patrol, in 1971. The first store was located in Burlingame, CA. Jim Rafferty, N6RS (SK) and Bob Lochmer, W9KNI were involved with the company very early on. Janet became a manager in 1993 while looking for a more permanent job in the broadcasting industry. Luckily for us, she has stayed at HRO! The company is now owned and operated by Bob's son Robert Ferrero Jr., W6KR. HRO is the one of the largest Amateur Radio supply companies in the world and they strive to provide the best customer service possible.

Show & Tell:

Janet Margelli, KL7MF, shared a tool used to calculate beam headings and determine DX prefixes. This is what ham operators used before the internet integrated call-sign databases with logging and rig control software.

Janet KL7MF provides show-and-tell on the "Second OP", a historic DX tool

Janet KL7MF (L) and Tom KI6GOA display the contents of the Red Cross comm "Go-Kit"

Tom Woodard, KI6GOA, shared the "go-kit" the Red Cross has standardized on. HRO helped put the kit together. The kit includes a power supply, multiple hand held transceivers, and a lot of backup batteries. A separate "foot locker" contains coax, antennas, and support masts.

Nicholas AF6CF showed off the OCARC certificate for 75 Years of ARRL Affiliation for show-and-tell
(Full-size photo can be found on last page of Newsletter)

Good of the Club

Club President Paul Gussow, W6GMU asked for a volunteer to serve as 2011 Field Day Captain. Art Reno, K6MIV was nominated and he is considering the position.

Club Treasurer, Ken Konechy, W6HHC announced the club has gained several new members. Additionally he needs someone to take over custodianship of the club's trailer and generator. Tom Woodard volunteered to see if the Red Cross could store the trailer on condition it could be used by them during an emergency.

Submitted by Jeff Hall, W6UX
OCARC Membership Chairman

Frank Smith WA6VKZ

(5-Time OCARC President)

is

Silent Key

It is with deep sadness that the club reports it received a report from former-member Phil Andersen N7PA that past president Frank Smith WA6VKZ died of a heart attack on March 02.

Frank WA6VKZ first joined the club in 1977 as he was returning from Vietnam and retiring from the US Marine Corps in Orange County. He claimed to have been the only OCARC member to ever operate from the Antarctic; he had operated as KC4USX from Williams-Antarctic for two seasons and as KC4USB from Byrd Station-Antarctic for 6 weeks. He enjoyed ham radio and the OCARC and Field Day and always volunteered to do whatever the club needed. Serious health problems began to interfere with his OCARC involvement around 2003. But, his enjoyment of the club allowed him to donate the grand prize for the OCARC 2009 Christmas opportunity drawing - a brand new Yaesu FT-857D.

Frank WA6VKZ holds the record for being OCARC president more times than any other member in the club history! He was president five different years:

1981 1986 1989 1992 1997

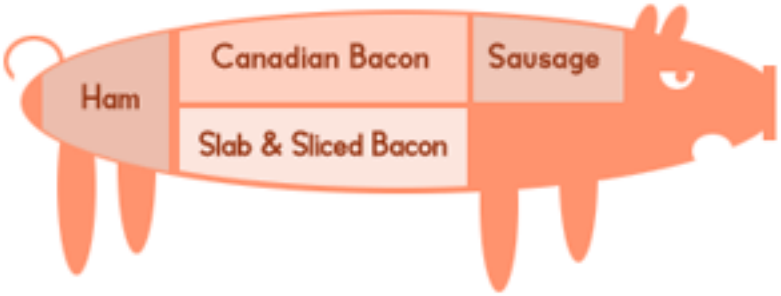
Renew Your OCARC Membership

It's that time of the year again. Time to renew your OCARC membership for 2011, if you have not already done so.

Help continue to support your growing club. There are many entertaining monthly meetings, speakers and events planned for this year. But it can't happen without your support for OCARC.

Dues can be paid at the monthly club meetings, club breakfasts or via snail mail. Regular dues are only $20. Additional family members are $10 (Total). Membership for teenagers under the age of 20 is only $10 as well. What a deal!

OCARC
P.O. Box 3454
Tustin, CA 92781



Ham Cuisine

by Kristin, K6PEQ

Traditional Irish Ham & Cabbage Dinner

In honor of St. Patrick's Day, we are bringing together ham & the Irish! Enjoy!

Ingredients

- 4 -5 lbs smoked ham
- 1 large onions
- 6 carrots, peeled and sliced
- 8 potatoes, peeled and cubed
- 1 teaspoon dried thyme
- 1 bunch fresh parsley
- 1 head cabbage, cut into quarters

Directions

1. Place thyme, parsley, and onion in a cheese cloth for easy removal after cooking.
2. Put ham into a large pot and cover with cold water.
3. Add all other ingredients except cabbage and bring to a boil.
4. Turn to simmer and cook until veggies are tender.
5. Remove the herb bag.
6. Add cabbage, simmer for 20 minutes.
7. or until cabbage is cooked.
8. Remove ham and cut in to pieces.
9. Place on the center of a large platter.
10. Strain the cabbage and season it with pepper.
11. Surround the ham with the cabbage, carrots, and potatoes.

Enjoy!

Serving Suggestion:

Drink with a Guinness!

OCARC Board Meeting Minutes

for

February 12, 2011

The OCARC Board meeting was held at the JägerHaus Restaurant, 2525 East Ball Road, Anaheim, and called to order by Paul Gussow W6GMU (President) at 8:15AM Saturday, February 12, 2011. Roll was called by Doug Britton W6FKX (Secretary), there were a total of 7 directors and 3 visitors – Steve Bachmann KJ6LHA, Ping Gee (attending with Steve, no call sign), Nicholas Haban AF6CF, and Kristine Jacob KC6TOD. There was a quorum with the directors' present.

DIRECTOR REPORTS:

- **Vice President** George Jacob N6VNI – reports that the Walter Knott field day site has been confirmed for OCARC's 2011 Field Day and will deliver the required forms and information to the school district when ready, reported that Janet Margeli KL7MF of HRO Anaheim will be presenting the history of HRO at this months general meeting, March will be a communications presentation by the Civil Air Patrol [note – has cancelled], April will be a DVD presentation on the Scarborough Reef DXpedition, Steve Schneider from the Santa Ana Fire Department will present in May, and June is open for Field Day preview.
- **Treasurer** Ken Konechy W6HHC – handed out YTD (year to date) financial statement, total inflow at $739, total outflow at $212.90, balance for the year $526.10. Ken reported that about ½ of club members have paid 2011 dues, and dues are continuing to come in.
- **Secretary** Doug Britton W6FKX – reported that he would not be able to attend the February general meeting and asked for someone to take general meeting minutes and provide the report – Jeff W6UX volunteered.
- **Activities** Kristin Dankert K6PEQ – absent.
- **Membership** Jeff Hall W6UX – membership roster current as of Jan. 31st. Portables in the Park confirmed for April 23 and published in the January RF Newsletter. Asked that the event and others be advertised in each RF issue to keep the club members informed. Member spotlight article was started with Dan N6PEQ featured in the January RF, Jeff will be featured in the February RF, one other questionnaire was returned for a later publication.
- **Publicity** Steve Brody N1AB – Steve stopped by one of the local high schools, left message with the science club, inviting them to our monthly meeting. It was discussed that some monthly meetings would be more interesting than others to the highschool students and that Steve could coordinate with George when to invite the clubs – perhaps set up an operating station for the students to observe. Ken W6HHC asked about that the club's tri-fold brochures be checked on at HRO and replenished if needed.
- **Technical** Bob Eckweiler AF6C – absent
- **Directors-at-large** Dan N6PEQ – absent
  Larry K6YUI – no report

OLD BUSINESS:

- **RF Newsletter "Rotating" Editors –**
  (thank you to all who volunteer!)
  - February – Kristin K6PEQ
  - March – Ken W6HHC
  - April - Nicholas AF6CF
  - May – Doug W6FKX
  - June – Kris KC6TOD

- **Field Day Update –** See VP's report above. Steve N1AB volunteered to captain the GOTA station, plans to have a presentation about amateur radio at the site, and educational handouts. The possibility of teaming with WARA for Field Day was discussed – no decision yet. Emphasizing emergency preparedness on Field Day was discussed.

(cont'd next page)

- **Field Day Cont'd -** Jeff W6UX made an initial contact with Irvine about using "Great Park" in Irvine as a possible backup field day location. A quick list of details needed about the site as a possible field day locations was discussed. Jeff also volunteered to be a band captain for one of the upper bands (10m or 15m) as needed. Paul W6GMU volunteered as band captain for the 20M CW station. Finally, a Field Day organizer ("chairman") is needed.
- **OCARC equipment inventory** – Ken W6HHC agreed to provide an update to the inventory at the next board meeting.
- **Portables – in – the – Park** – See the Membership Chair's report above.
- **Drive–in mobile amateur event** – Suggested this event be held during the summer month as one of the monthly general meetings (it was decided to hold it for the July general meeting). George N6VNI cleared it with the Red Cross to hold the event in the parking area.
- **OCARC Facebook update** – page is up, plan to add a link on the clubs website to the Facebook page. Thanks again Kristin!
- **OCARC Bank signature cards** – management postponed until next meeting.

NEW BUSINESS:

- **OCCARO** – Kris KC6TOD, OCARC's delegate to OCCARO attended their meeting Wednesday evening. OCARC needs to renew their membership by paying the $20 annual dues and the board needs to consider continuing the annual donation for the Orange County Fair. Kris KC6TOD made a motion that the club renew membership at $20 and make a donation of $100 for the OC Fair amateur radio booth sponsored by OCCARO. Steve N1AB seconded the motion, it was unanimously approved by the board. Kris informed the board during the discussion that the booth at the fair this year would be doubled in size and be better positioned. Kris is also putting together a list of possible general meeting speakers (her goal is to have 300) for OCCARO to provide to clubs in the area as a resource.
- **Club trailer and old generator** – Ken W6HHC asked the board to consider what to do with the trailer and old generator; it needs either to be repaired and the clubs new generator put on it, or sold. If repaired, and this would require someone willing to take the project on, it needs a new home for storage. To be followed up on

GOOD OF THE CLUB

Nicholas AF6CF is planning to bring a new Loop antenna system for Portables in the Park this year.

Motion made to adjourn meeting by Paul W6GMU, seconded by George N6VNI and unanimously approved. Meeting adjourned 9:30AM

Respectfully submitted:
Doug Britton W6FKX, Secretary

Icom Month at HRO

Right now, and during the month of March, take advantage of lower prices on some Icom items, live demonstrations of any Icom radio in which you have an interest by an HRO employee, and refreshments while you wait. See our in-store D-Star repeaters and ask Phil or Ted about D-Star operation.

Purchase any Icom Amateur product during Icom Month (March 2011) and get DOUBLE the manufacturer's warranty! That's two years of warranty support through HRO on any new Icom Amateur radio or accessory (usual restrictions apply regarding misuse or abuse).

Come in for a visit, Monday through Saturday, 10AM-5:30PM, and let us help you with your ham radio needs. Remember, we ship orders worldwide, so you can give us a call at 1-800-854-6046 if you are unable to make the trip; most orders over $100 HRO pays the UPS ground freight for you. You can also take advantage of our updated website, www.hamradio.com, for product information or online ordering.

Let's have some fun with ham radio this spring!

Kind 73 de
Janet Margelli, KL7MF

Charter of Affiliation

Whereas it is the desire of the American Radio Relay League to establish bonds of affiliation with noncommercial Amateur Radio organizations of kindred aims and purposes to make possible unity of action in matters affecting the welfare of Amateur Radio and lend mutual strength; and Whereas

Orange County Amateur Radio Club

Has declared its sympathy with and allegiance to the aims and policies of the League in its efforts to strengthen and advance Amateur Radio Communication and Experimentation, and has expressed its willingness and desire to cooperate therein.

Now therefore, under the policies of its Board of Directors, the ARRL as of this date hereby declares the said organization to be an affiliated body, and issues this charter in token thereof.

Celebrating 75 Years of ARRL Affiliation

March 15, 1934 to March 15, 2009

Affiliated

ARRL The national association for AMATEUR RADIO

David Sumner
Secretary

Joel Harrison, W5ZN
President