



RF



VOL. LII NO. 12

P.O. BOX 3454, TUSTIN, CA 92781-3454

DECEMBER 2011

The PREZ SEZ:



SEASONS GREETINGS!

December seems to arrive without warning. We had a fine Field Day, terrific speakers, one heck of a great auction and well-attended (and enjoyed) general meetings. The Annual Election went very smoothly... though my favorite part was when Nicholas AF6CF asked for others to compete in each slot. The cricket-song was deafening! Those that did volunteer comprise a top-notch Board which will greatly enhance our enjoyment of our club and our hobby. This year, the Board did an outstanding job, with our newer board members contributing some especially

See: Prez Sez, [page 22](#)

Congratulations to the 2012 Board of Directors:

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Vice President:	
Carl Flint	N8AE
Secretary:	
Ken Konechy	W6HHC
Treasurer:	
Bob Eckweiler	AF6C
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Director at Large:	
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<http://www.w6ze.org>



NO DEC. MEETING:

There will be no December General Meeting. Instead, the Club will hold its **Annual Holiday Party**. Join the festivities and a chance to win some special prizes in the big raffle. Don't miss this event! Details inside.

The Annual Holiday Party is:

Friday, December 9th
@ 7:00 PM

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Click on a page number to go to that page. Works in most versions of Adobe's Acrobat Reader and Apple's Preview.

The Next OCARC Breakfast & open club Board Meeting is on Sat. January 14th 2012.

**THE ORANGE COUNTY
AMATEUR RADIO CLUB, INC.**
P.O. Box 3454, Tustin, CA 92781



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Submit Puzzle Answers:
puzzler@w6ze.org

Monthly Events:

General Meeting:

Third Friday of the Month
At 7:00 PM **except Dec.**
American Red Cross
600 N. Parkcenter Dr.
(near Tustin Ave. & 4th St)
Santa Ana, CA

Club Breakfast (Board Mtg.):

Second Saturday of the
month at 8:00 AM at the
Jägerhaus Restaurant
2525 E. Ball Rd.
Anaheim, CA
(Ball exit west off 57-Fwy)

Club Nets (Listen for W6ZE):

28.375 MHz SSB ± QRM
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 **OVCN**
Sun - 9:00 AM - 10:00 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 January thru December & 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. We prefer you pickup your badge at a meeting.

New members joining after midyear may choose to pay for the remainder of the year and the next year at a savings of \$5.



OCARC 2011 Holiday Party

Friday evening, Dec. 9th - 7:00 pm

JUST IN:

Grand Prize:

An Apple iPad II

Other Larger prizes:

Comet CAA-500 Antenna Analyzer (*Thank you Mick and NCG*)

Yaesu VX-3R 2-band HT

ICOM IC-V8000 2-M Mobile Radio (repack)

Daiwa CN-801HP3 Wattmeter

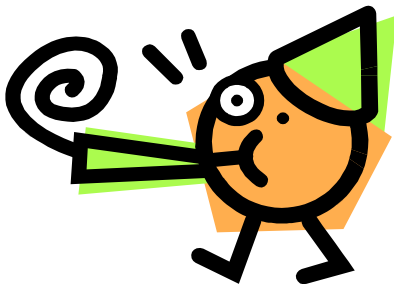
Dan Reports:

"There's other stuff too, but these are the bigger ones."

OPPORTUNITY DRAWINGS

We are going to have two great December opportunity drawings! The main drawing will have a lot of great prizes, and tickets are only a dollar. What a deal! Also, there will be a special ladies drawing. Ladies tickets will not be sold but will be given just for coming. We hope that you will be able to come and share in our fun event!

It's Time to Party!



ALL THE INFO!

WHEN: FRIDAY, DECEMBER 9th

TIME: 7 p.m.

COST: \$26 per ticket

WHAT: Dinner, Beverage, Dessert, Tax and Tip included in ticket price plus one Opportunity Drawing ticket. (Alcoholic drinks are extra.)

WHO: Everyone!

WHERE: Jägerhaus Restaurant

RSVP: Reserve your spot today at the meeting or email Ken - W6HHC at: w6hhc@w6ze.org

Jägerhaus meal will be "Family Style". You get an almost endless array of heaping dishes of food being passed down your table. You choose what you want to try. Selections will include bratwurst, knackwurst, sauerbraten, spätzle, green salad, sauerkraut, German potatoes, carrots and desert. Sodas and coffee are no charge. Wine and good German beer are extra cost.

Ham Radio News:**New 60 Meter Regulations:**

The Federal Communications Commission released a REPORT AND ORDER on November 18, 2011 with new 5 MHz rules for the Amateur Radio Service. The effective date: 30 days after publication in the Federal Register.

The FCC adopted the use of the name "60 meter band", to refer to 5 MHz amateur radio in the frequency range 5330.5 - 5406.4 kHz, but USA hams are still only allowed to transmit on 5 specific channels in the band.

The FCC changed the rules to allow: Phone (Upper Sideband), RTTY, Data, and CW; with specific limitations on the use of these modes.

Amateur radio is a "secondary user" in this band, and must not cause harmful interference to other services! Amateur Radio Service must accept interference from other primary services and other nations services.

Operators transmitting data or RTTY must exercise care to limit the length of transmission so as to avoid causing harmful interference to US Government stations

New 60 meter band 5 MHz Channel List:

General, Advanced, or Amateur Extra Class license only.

Suppressed
Carrier
VFO Dial frequency

5330.5 kHz USB (center of channel = 5332.0)

5346.5 kHz USB (center of channel = 5348.0)

5357.0 kHz USB (center of channel = 5358.5) New!

5371.5 kHz USB (center of channel = 5373.0)

5403.5 kHz USB (center of channel = 5405.0)

Note: FCC deleted 5366.5 USB (center = 5368.0) and added 5357.0 kHz USB (center = 5358.5)

The maximum allowed power level is now 100 Watts PEP (ERP) effective radiated power referenced to a dipole. If another type of antenna is used, the station licensee must maintain a record of either the antenna manufacturer's data on the antenna gain or calculations of the antenna gain.

Upper SideBand Phone, Data, or RTTY transmissions may use dial (VFO) USB suppressed carrier frequency at 1.5 kHz below the center of the channel.

Transmissions must not exceed the 2.8 kHz bandwidth channel. RTTY modes such as PSK31 must not exceed 60 Hz necessary bandwidth. Data modes must not exceed 2.8 kHz bandwidth. CW bandwidth must not exceed 150 Hz bandwidth and the CW frequency should be at the center of the channel.

Data stations operating under section § 97.221 automatically controlled digital station, are not allowed on these 5 MHz channels.

Tnx to Randy - W6OAR

Logbook of the World Backlog is Clearing:

Logbook of The World (LoTW) is continuing to accept and process logs, including logs from this weekend's ARRL November Phone Sweepstakes Contest. Currently, the processing delay is at 30 hours, down from 45 hours last week. As of November 23, there are approximately 857,000 QSOs in 3,335 logs still waiting to be processed. If you have already uploaded a log, please do not upload it again; by doing so, you will only add to the queue. Do not send entire logs that contain previously uploaded QSOs; use the date range option when signing logs, selecting only those QSOs in a specific date range to upload to LoTW. By following these guidelines, you'll help LoTW process the backlog at a faster pace. Thanks again for your patience.

Tnx: *The ARRL Letter* 11/26/2011

ARRL and Amateur Radio Featured on Fox News:

In a story published on the Fox News website on November 22, reporter Michelle Macaluso called Amateur Radio the "newest trend in American communication." Macaluso cited numbers provided by the FCC that proclaimed that in October 2011, there were more than 700,000 radio amateurs in the US. Read the story on the Fox News website at:

http://www.foxnews.com/scitech/2011/11/17/radio-days-are-back-ham-radio-licenses-at-all-time-high/?cmpid=cmt_email_Gigya_Radio_Days_Are_Back%3A_Ham_Radio_Licenses_at_an_All-Time_High

Tnx: *The ARRL Letter* 11/23/2011

Heathkit of the Month: #36
 by Bob Eckweiler, AF6C



Heathkit SB-301 HF Ham Band Receiver

Introduction:

Shortly after graduating from college and starting a career in aerospace, I felt it was time to get back on the air. College had limited my ham operations significantly. Most of my equipment prior to college did not make the move from the East Coast with me. I still had my Heathkit Apache transmitter (see HOM # 17, July 2009). I knew I needed a receiver. Thus, finding myself planning to get back on the air, and having some discretionary income from my new job, my first priority was to buy a good receiver.

After some thought, I anticipated buying and building a Heathkit SB-301 ham-band only receiver kit. This kit had replaced the SB-300 in 1966 and included a few refinements. On September 5th, 1968 I ordered the Heathkit SB-301 receiver (\$260) and the optional SBA-301-1 AM and SBA-301-2 CW filters (\$20.95 each) from the Benton Harbor, MI factory. Shipping to Orange, CA cost \$4.90.

A little over a week later the kit arrived, and construction began. The SB-301 (Figure 1) was built on the same folding 6' aluminum table that I've used to built many other Heathkits; the same table has been used at just about every W6ZE Field Day from 1970 to present.

The Earlier Heathkit SB-300 Ham Band Receiver: Heathkit introduced the SB-300 (Figure 2) in mid 1964 - their first new high performance HF ham receiver since the RX-1 Mohawk. The SB-300 was introduced at \$265.00 and came with a crystal filter for SSB. Two optional filters, the SBA-300-1 for AM and the SBA-300-2 for CW (\$19.95 each) were also available. A matching



Figure 1: Heathkit SB-301 HF Ham Receiver

speaker, the SB-600, was not released until 1966.

Along with the Heathkit SB-300, Heathkit introduced a matching SSB-CW transmitter, the SB-400, which I plan to cover in a future article along with the later SB-401. These transmitters can operate independently or in transceiver mode with the SB-300 or SB-301. For split operation a switch on the transmitter allows selecting the receiver or transmitter LMO (Linear Master Oscillator).

Since the SB-300 and the later SB-301 receivers are so similar in design, this article will focus on the SB-301 and point out differences in the earlier SB-300 where they occur.

The Heathkit SB-301 Ham Band Receiver:

The SB-301 is a dual conversion superheterodyne receiver. All oscillators are crystal controlled for stability except for the LMO, which comes prebuilt from TRW and linearly tunes from 5.5 MHz down to 5.0 MHz in five full turns of the shaft. The SB-301 receives the five (non-WARC) amateur bands from 80 through



Figure 2: Earlier SB-300 HF Ham Receiver

10 meters in eight bands. Each band is 500 KHz in width so the 10 meter band is divided into four separate 500 KHz segments on the band switch. The SB-301 also has another position on the band switch that covers 15.0 to 15.5 MHz allowing reception of WWV at 15.0 MHz. This band is not available on the SB-300. Table one shows the SB300/301 frequency bands.

Tuning the SB-301 with its 4:1 vernier drive is a pleasure assuming the kit has been assembled well. Proper alignment of the tuning components is critical to smooth tuning. Each 500 KHz band is covered in five turns of the large circular dial, each covering 100 KHz. A linear slide scale marked 0 - 5 above the window for the circular dial shows the current 100 KHz segment. A small knob allows adjustment of the circular dial cursor to correct for any dial inaccuracy and is used in conjunction with the 100 KHz crystal calibrator built into both receivers. The readout is accurate to within a hundred cycles or so. While not as fancy as today's digital readouts, the frequency can be set accurately enough to still be viable today.

The front panel of the SB-300 and SB-301 are very similar in appearance. A few differences, however, do stand out; most noticeably the SB-301 **FUNCTION** switch and **AF GAIN** controls are mounted higher on the front panel. Also

Band	From	To	Heterodyne Crystal Freq.
80M	3.5	4.0	12.395
40M	7.0	7.5	15.895
20M	14.0	14.5	22.895
[WWV*]	15.0	15.5	23.895]
15M	21.0	21.5	29.895
10M	28.0	28.5	36.895
10M	28.5	29.0	37.395
10M	29.0	29.5	37.895
10M	29.5	30.0	38.395

All frequencies are in MHz
 * WWV not included on the SB-300

Table 1: SB-300/SB301 Bands.

Front panel controls are located in three rows.

Left to right on the top row:

S - Meter (lighted): meter (0-1 ma)
0, 3, 6, 9 S-UNITS, 20, 40, 60 DECIBELS
FUNCTION: 4 pos. rotary sw.
OFF, STandBY, OPERate, CALibrate
A. F. GAIN: Potentiometer
 (unnumbered gain scale)
 [ANL Pull on sw on pot]
 (No ANL nomenclature on front panel)

Left to right on the middle row:

AGC: 3 pos. rotary sw.
OFF, FAST, SLOW
 MAIN TUNING LMO var. capacitor
 0 - 5 turns scale, 0 - 100 frequency scale
 (both lighted)
PRESELECTOR 4-sec. var. capacitor
 (unnumbered scale)

Left to right on the bottom row:

PHONES: 1/4" phone jack
MODE 4 [5] pos. rotary sw.
[RTTY], LSB, USB, CW, AM
BAND 8 [9] pos. rotary sw.
3.5, 7.0, 14.0, [15.0 RCV ONLY], 21.0, 28.0, 28.5, 29.0, 29.5

SB-300 only:

R. F. GAIN: potentiometer
 (unnumbered gain scale)
 [SB-301 only - Concentric controls:
CONVERTER 3 pos. rotary sw.
VHF-1 VHF-2, HF - inner control
R. F. GAIN potentiometer
 (no gain scale) - outer control]

[SB-301 differences are shown in brackets]

Table 2: SB300/301 Front Panel Controls

several of the SB-301 controls have added features. Table 2 lists the front panel controls and nomenclature, including differences between the SB-300 and SB-301.



Figure 3: Heathkit SB-301 interior view.
Photo complements of Jim - WB2FCN¹

A feature of both the SB-300 and SB-301 is the provision to mount two VHF converters externally on the back of the cabinet. Heathkit made the SBA-300-3 for 6-meters and the SBA-300-4 for 2-meters. These converters cover the first two MHz of the band and can be modified to cover the last two MHz by changing the crystal and retuning the converter. Both receivers have power and antenna connections for the converters. A switch allows selecting normal HF operation or either of the VHF converters. DC and filament power is only delivered to a converter when it is selected. On the SB-300 the switch is less conveniently located on the right rear of the chassis top, making it necessary to raise the top cover to change the switch. This changed on the SB-301 and the switch is relocated to the front panel concentric with the **R.F. GAIN** control.

Heathkit SB-301 Circuit:

The SB-301 uses ten tubes, two of which are multi-section, and nine solid-state diodes. One tube and diode are part of the pre-built LMO assembly. Table 5 shows the list of tubes.

Power Supply:

The power supply is transformer operated. The two primary windings may be wired in parallel or series for operation on 120 or 240 VAC. The secondary has two windings. A 6.3 VAC winding supplies filament power to the ten tubes,

with enough reserve for a converter and three pilot lamps; a high voltage center-tapped winding is used in a full-wave rectifier circuit to produce 150 VDC, and a separate half-wave circuit produces a negative 60 volts for biasing. Silicon diode rectifiers are used in both supplies. Numerous lower voltages are tapped off the 150 VDC supply.

RF Amplifier:

The RF amplifier uses a 6BZ6 pentode tube in a tuned-grid, tuned-plate, amplifier. The band switch selects the proper antenna and plate coils for each band as well as the required sections of the **PRESELECTOR** variable capacitor. A pair of coils covers both 14.0 and 15.0 MHz, and a separate pair of coils covers all four of the 10-meter band segments.

Heterodyne Oscillator:

The heterodyne signal is generated by a crystal oscillator and uses a 6AB4 triode. The band switch selects one of eight or nine crystals for the heterodyne oscillator. Their values are shown in Table 1. The crystal is always 8.895 MHz above the desired band's lower frequency limit. A section of the band switch selects the proper crystal and plate coil for each band.

1st Mixer:

The signals from the RF amplifier and heterodyne oscillator are mixed in a 6AU6 pentode. Only the difference frequency is allowed to pass through a bandpass coupler. The coupler passes 8.395 to 8.895 MHz and comes factory aligned.

The rest of the receiver is basically a single band receiver designed to receive the 8.395 to 8.895 MHz frequencies.

LMO (Linear Master Oscillator):

The only variable oscillator in the SB-301 is the LMO. Manufactured by TRW, it comes factory wired and calibrated. The LMO was modified slightly between the SB-300 and SB-301 receivers changing the tube from a 6AU6 to a 6CB6 and then to a 6BZ6. A few components

were changed as well. These were probably done to further improve very good stability. The LMO tunes *nominally* from 5,500 KHz at the low end of a band down to 5,000 KHz at the high end of the band. It tunes at an accurate and linear rate of 100 KHz per 360° turn of the LMO shaft. The tuning knob has a 4:1 vernier that drives the LMO shaft.

The actual frequency range that the LMO tunes varies by mode. In LSB and RTTY the LMO is 1.4 KHz higher - tuning 5,501.4 to 5,001.4 KHz. In USB, CW and AM it is shifted down by 2.8 KHz - tuning 5,498.6 to 4,998.6 KHz. This shift is controlled by a diode switch inside the LMO. The diode is biased at negative 60 volts in LSB and RTTY and at positive 50 volts in USB and CW. More about the reason for this frequency shift will be discussed in a future section.

2nd Mixer:

The signal from the bandpass coupler and the LMO output mix in the 6AU6 second mixer tube. The output of the mixer is fed into one of three crystal filters, each with a center frequency around 3.395 MHz. which only lets the difference frequency pass.

Crystal Filter(s):

The SB-300 and SB-301 both come with only a SSB crystal filter. AM and CW crystal filters are optional. The supplied and optional crystal filters for the two radios are different. Most noticeably, the SB-300 filters are physically larger, though they both mount in the same hole pattern. Electrically they both have the same center frequency but the later optional filters for the SB-301 have narrower skirts. The AM and SSB filters have a center frequency of 3,395.0 KHz, and the CW filters have a center frequency of 3,395.4 KHz. Wider AM and SSB filters associated with the SB-310 SWL receiver can also be used with the SB-300/301. The optional SB-301 filters can be used in the SB-300 but the optional SB-300 filters cannot be used in the SB-301 without mechanical modifications due to their larger size. Table 3 lists the filters:

Part #(s)	BW @ 6dB/60dB Receiver model	Center Freq.
404-200	SSB 2.1/5.0 KHz SB-300 (Supplied)	3,395.0 KHz
SBA-300-1 (404-201)	AM 3.5/14 KHz SB-300 (Optional)	3,395.0 KHz
SBA-300-2 (404-202)	CW 0.4/2.5 KHz SB-300 (Optional)	3,395.4 KHz
404-283	SSB 2.1/5.0 KHz SB-301 (Supplied)	3,395.0 KHz
SBA-301-1 (404-285)	AM 3.75/10 KHz SB-301 (Optional)	3,395.0 KHz
SBA-301-2 (404-284)	CW 0.4/2.0 KHz SB-301 (Optional)	3,395.4 KHz

Table 3: SB-300 & SB-301 Crystal Filters

IF Amplifier:

The IF amplifier consists of two high-gain stages, both incorporating 6AB6 tubes. Voltage from the automatic gain control circuit (AGC) adjusts bias on both tubes reducing the IF gain on strong signals. This reduction in gain is measured by the S-meter to indicate signal strength. The two stages are coupled with an L-C network mounted in an IF transformer can and a coupling capacitor. A second identical network couples the output of the second IF tube to the AM detector, the product detector and the AGC circuit.

Noise Limiter:

An automatic noise limiter (ANL) is included on the SB-301, but not the SB-300. It is activated by pulling out the knob on the **AF Gain** control. The ANL is not a noise blanker like the ones found on today's equipment; instead it is a self-biased diode clipper that is across the second IF LC network. I've found the noise filter to be effective in certain circumstances. It is much less effective than a noise blanker.

AM Diode Detector:

The AM detector is a simple but very effective diode detector using a 1N191 germanium diode. Heathkit has a recommended modification to improve AM audio on the SB-301. It is simple;

just place a 470K 1/2w resistor across the detector diode (D3). This modification appeared in *Heath News and Views*. It does improve the AM audio. The reason this modification is not well known is because most of the SB-301 receivers do not have the AM filter installed.

BFO and Product Detector:

CW and SSB signals are detected by heterodyning the IF signal with a BFO signal in a product detector. These circuits use a 12-pin 6AS11 Compactron tube containing three sections. A triode section is the product detector, a second triode is the BFO oscillator and a pentode section is a BFO amplifier.

The BFO oscillator in the SB-301 has three crystals, one each for RTTY and LSB, and a third for USB, CW and AM. Their frequencies are: 3,392.110, 3,393.6 and 3,396.4 KHz respectively. The SB-300 does not have RTTY capability and uses only two crystals.

Output from the BFO is coupled to the cathode of the product detector triode section. It is also coupled to the grid of the pentode BFO amplifier section. This amplifier drives the external

BFO output connector on the rear of the receiver, and is used by the transmitter in transmitter mode on SSB .

The signal from the IF is fed to the grid of the product detector section where it heterodynes with the BFO signal producing audio.

Audio Output Stages:

Audio is selected from either the AM diode detector or the product detector by the mode switch and fed through the **A.F. GAIN** control to a two-stage audio amplifier. The first stage uses the triode section of a 6HF8; the output stage uses the pentode section. The audio output transformer has two taps. 500Ω for the headphones and external **ANTI VOX** output and 8Ω for the speaker. Negative feedback from the 500Ω tap is coupled to the cathode of the 1st stage to reduce distortion. Audio output is specified as 1 watt at less than 8% distortion.

Automatic Gain Control (AGC):

The signal from the output of the IF amplifier is also coupled to the AGC circuit where it is rectified to produce a negative voltage. Bias voltage to the RF stage and both IF stages de-

	Rcv'd Freq	1st MIXER	LMO LSB	LMO USB/CW	BFO LSB	BFO USB/CW
Rcvr Tuned Freq:			28,375.000	28,375.000		
Osc Freq:		36,895.000	5,126.400	5,123.600	3,393.600	3,396.400
USB				2nd MIXER		
Carrier (suppressed)	28,375.000	8,520.000		3,396.400		0.000
Low Tone - 500 Hz	28,375.500	8,519.500		3,395.900		0.500
Hi Tone - 2300 Hz	28,377.300	8,517.700		3,394.100		2.300
LSB			2nd MIXER			
Carrier (suppressed)	28,375.000	8,520.000	3,393.600		0.000	
Low Tone - 500 Hz	28,374.500	8,520.500	3,394.100		0.500	
Hi Tone - 2300 Hz	28,372.700	8,522.300	3,395.900		2.300	
CW						
Carrier (Zero beat)	28,375.000	8,520.000		3,396.400		0.000
Carrier (1,000Hz Tone)	28,376.000	8,519.000		3,395.400		1.000

Table 4: USB & LSB frequencies in KHz for a two-tone (500 Hz & 2,300 Hz) signal, and for a CW signal, as they appear within a properly tuned SB-301 (See Text).

termines the receiver's overall gain. This bias is set by the **RF GAIN** control. Should the AGC voltage exceed the threshold set by this bias the gain is further reduced. The gain reduction is very fast but the operator can select **FAST** or **SLOW** release depending on the type of signal being listened to. This selection is done by the **AGC** switch on the front panel that selects different time constants; it also has a third position - **OFF** - that disconnects the AGC circuit so RF gain is only controlled by the **RF GAIN** control.

Muting:

Muting is controlled by a normally grounded circuit at the **MUTE** connector on the rear panel. When transmitting, this connection is opened by the transmitter. When open a large negative bias is placed on the audio output stage, the 1st mixer stage and the AGC line, effectively biasing those circuits to cutoff and muting the receiver. The receiver **FUNCTION** switch must be in **STANDBY**. In the **RECEIVE** and **CALIBRATE** positions of the **FUNCTION** switch the mute line is grounded internally in the receiver.

100 KHz Crystal Calibrator:

A 100 KHz crystal oscillator with strong harmonics through the HF band is built into the receiver. It is used for calibration of the tuning dial and can be used in place of a signal generator to align the receiver. The oscillator uses a 6AU6 tube.

SB300/301 Rear Connectors:

The rear panel of the SB-300 and SB-301 have a myriad of connectors including nine active RCA jacks, a connector for the AC line and an octal connector for powering accessories. Both receivers come with additional RCA jacks marked **SPARE**; the SB-300 has two and the SB-301 has four. Table 6 lists the connectors and their use.

Frequency Operation:

Table 4 traces three signals through the receiver - USB, LSB and CW. Sideband signals are shown modulated by a two-tone signal with

audio tones of 500 Hz and 2,300 Hz (Column 1). On USB, with the transmitter and receiver tuned to the club's 10-meter net frequency of 28,375.0 KHz, the two tones are actually being received at 28,375.5 and 28,377.3 KHz (Column 2). Since the carrier is suppressed nothing is received at 28,375.0 (This is where the carrier would be.) These signals are mixed in the first mixer with the heterodyne oscillator that is running at 36,895.0 KHz, producing difference frequencies of 8,519.5 and 8,517.7 KHz (Column 3). These frequencies are passed by the bandpass coupler to the second mixer.

The LMO nominally operates from 5,500 down to 5,000 KHz. Actually though on LSB it is shifted down by 1.4 KHz and on USB/CW it is shifted up by 1.4 KHz. Thus on USB, when the receiver is tuned to 28,375.0 the LMO is not at 5,125.0 KHz, but actually at 5,126.4 KHz. This frequency mixes with the frequencies from the bandpass coupler creating difference frequencies of 3,395.9 and 3,394.1 KHz for the two tones (Column 5). These both pass through the SSB crystal filter whose 6 dB points are 3,393.95 and 3,396.05; however the frequency of the suppressed carrier is at 3,396.4 and any remaining carrier will be further suppressed.

Finally the signals are mixed with the BFO oscillator in the product detector. On USB the BFO frequency is 3,396.4. The resulting difference frequencies are the two tones of 500 and 2,300 Hz, which are sent on to the audio amplifier.

LSB operates similarly except the frequencies generated by the tones are below the suppressed carrier frequency, the LMO is 1.4 KHz above its nominal frequency and the BFO frequency is switched to 3,393.6 KHz.

CW uses the same oscillator frequencies as USB. However the center frequency of the CW filter is at 3,395.4 KHz. Table 4 includes rows for CW reception, both at zero beat and when the receiver is tuned up 1.0 KHz producing an audible tone that is right in the center of the optional 400 Hz BW crystal filter. CW reception can also

be received with the mode switch in USB. Here the SSB filter is used and the selectivity is broader. Note that zero beat will be outside the filter passband when using the CW filter.

SB-301 Kit Construction:

The assembly of the receiver is divided into five sections. Small parts for each section are packaged separately to aid parts identification. In the first section the IF printed circuit board is assembled; it contains three tubes, the two IF stages (V6 and V7) and the dual audio stage (V10). A small board containing four parts for the ANL circuit is also assembled and soldered to the IF board (SB-301 only).

The RF circuit board is assembled next; it contains five tubes, the RF stage (V1), the heterodyne oscillator (V4), the 1st and 2nd mixers (V2 and V3) and the crystal calibrator (V8). The 8.395 to 8.895 MHz bandpass filter transformer mounts on this circuit board.

In the third section the chassis assembly is begun. First the 19 coils for the antenna, RF amplifier and heterodyne oscillator are installed on the top of the chassis with their appropriate capacitors. A coil cover shield with partitions is then assembled and mounted over the coils

protecting them during further assembly. Next, most of the parts that mount on the chassis are installed including transformers, terminal lugs and crystal sockets, rear panel connectors, etc. Also mounted are the two circuit boards assembled in sections 1 and 2, along with the SSB crystal filter. If you bought the optional AM and/or CW filters they are mounted at this time too. Hardware for their mounting is supplied with the kit. The socket for the only chassis mounted tube (V9) is also mounted.

No.	Type	Function
V1	6BZ6	RF Amplifier
V2	6AU6	1st Mixer
V3	6AU6	2nd Mixer
V4	6AB4	Heterodyne Oscillator
V5	6AU6	LMO (most SB-300)
V5	6CB6	LMO (some SB-300/301)
V5	6BZ6	LMO (most SB-301)
V6	6BA6	1st IF Amplifier
V7	6BA6	2nd IF Amplifier
V8	6AU6	100 KHz Xtal Oscillator
V9A	1/3-6AS11	Product Detector (triode)
V9B	1/3-6AS11	BFO (triode)
V9C	1/3-6AS11	BFO Amplifier (pentode)
V10A	1/2-6HF8	1st Audio Amp (triode)
V10B	1/2-6HF8	Audio Output (pentode)

Table 5: SB-300/301 Tube Line-up

Connectors are listed from left to right as viewed from the rear.

The first eight RCA jacks are mounted vertically in pairs and are listed top then bottom:

HF ANT:	Antenna connector
SPARE:	Not used
VHF NO 1:	Ant. from converter 1
VHF NO 2:	Ant. from converter 2
MUTE:	Ground to un-mute
SPARE:	Not used
ANTI VOX 500Ω:	Audio to Transmitter
SPKR 8Ω:	Audio output
AC INPUT:	2-pin male AC socket.

The next three RCA jacks are **OUTPUTS:**

HET. OSC.:	To SB-400/401 for xcv
LMO:	To SB-400/401 for xcv
BFO:	To SB-400/401 for xcv

Octal Accessory socket for VHF converters

Pin 1:	6.3 VAC VHF NO 2
Pin 2:	GND
Pin 3:	140 VDC VHF NO 2
Pin 4:	AGC
Pin 5:	NC
Pin 6:	140 VDC VHF NO 1
Pin 7:	GND
Pin 8:	6.3 VAC VHF NO 2

[The next two RCA jacks are SB-301 only:

SPARE:	Not used
SPARE:	Not used]

Table 6: SB-300/301 Rear Connectors

The fourth section involves the under chassis wiring and the installation of the large band and mode switches. A prewired harness simplifies some of the wiring. In this section many of the small leaded components are wired.

Top wiring is done in the fifth section. The LMO (with V5) is installed along with the tuning drive components. Alignment of these parts is critical for a smooth tuning receiver. Next, parts are mounted to the front panel and the panel is attached and wired to the chassis.

After a series of resistance check the moment of truth arrives. Crystals, tubes, pilot lamps and the fuse are installed and the unit is turned on. Two choices of alignment are available. The first uses the built-in 100KHz crystal oscillator, the other requires a signal generator. After alignment the receiver is installed in its cabinet.

Finishing Up:

As I've found with most of the Heathkits I've built, the receiver worked well right off the bat. The parts were all well identified and none were missing. Assembly order was well planned and none of the assembly steps required the skills of a brain surgeon.

Alignment instructions were well written and the procedure appeared solid. I used the alignment procedure that used the built-in calibrator. Since then I've aligned it using a good signal generator with no notice in improvement.

SB-301 Operation:

I used the SB-301 as my primary receiver into the early nineties when I bought a used Kenwood TS-440SAT from W6NGO. The SB-301 receiver has been solid and sensitive over the whole period. Selectivity was very good and far better than I ever experienced with older receivers.

My only maintenance over those twenty plus years was having to clean and re-lubricate the LMO capacitor bearings which developed an

intermittent sliding ground contact that caused erratic tuning.

Since the SB-301 was put on standby behind the TS-440SAT I've used it occasionally to keep it working. In that time two additional problems cropped up. The first problem was a partially failed 6AS11 tube, easily repaired with a new tube - and the only tube I've replaced in the receiver! And the other problem was a sudden increase in hum. My fear was a failing filter capacitor (Four-section can-type that is hard to replace); I traced the problem to a poor ground connection to the RF board. Tightening the hardware mounting the board cleaned up the hum. The board was removed, the contact between the board and chassis cleaned and the board reinstalled and soldered to the chassis ending the hum problem.

Summary:

The SB-301 remains a viable receiver 43 years after it was bought and assembled. What it is missing is coverage of the WARC bands introduced years after the SB-301 and the later SB-303 were discontinued. It is also lacking a noise blanker - though circuits are available on the Internet.

I expect to cover the SB-400/401 as well as the SB-303 in future articles; also possibly, some accessories will also be covered in the future.

Notes:

1. I'd like to thank Jim Walker - WB2FCN for letting me use his photo as figure 3. Visit the ham section of his website at: <http://128.205.126.49/>

73, from AF6C



This article is copyright 2011 R. Eckweiler and The OCARC Inc.

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

Thanks - AF6C



? ? PUZZLER ? ?

Here's a puzzle to keep you thinking over those long winter nights when the bands are dead!

There is a very, very long hallway. On the ceiling of the hallway are many, many lights in a row; one million in all. They are all in good maintenance and work properly. Each light has a chain hanging from it. Pulling the chain alternately turns the light on and off.

We start with all the lights off.

One million people walk the length of the tunnel, one at a time. The first person pulls every chain. The second person pulls every second chain, the third person pulls every third chain, etc. They all start at the first light so the first person pulls the chain on lights 1, 2, 3, 4...; the second person pulls the chain on lights 2, 4, 6, 8...; the third person pulls the chain on lights 3, 6, 9, 12...; and so forth. The last person (the one-millionth person) only pulls the chain on the last (one-millionth) light.

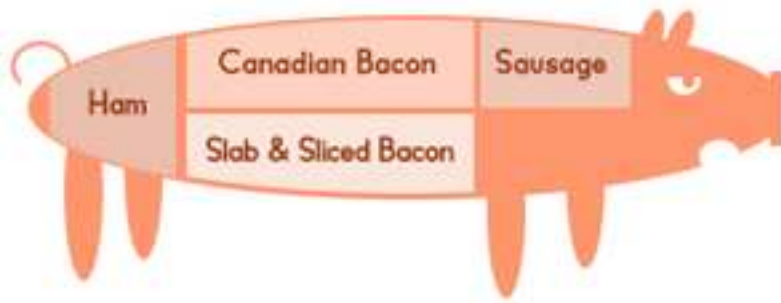
After the last person finishes:

- 1: ***Is the 508,369th light on or off?***
- 2: ***How many of the one-million lights are on?***
- 3: ***How many lights are off between the second to last light that is on and the last light that is on?***
- 4: ***What is an easy test to see if a particular light is on or off?***

A hint: Solve the fourth question first.

Submit your answers to puzzler@w6ze.org. You do not need to be a club member to submit an answer. The name and call of the first ten people with correct answers will be published along with the solution in the January RF. – Good Luck.

? ? PUZZLER ? ?



Ham Cuisine

by Kristin, K6PEQ

Apple-Stuffed Pork Chops

Ingredients:

2 pork ribs chops, 1 1/4-inches thick
 2 tablespoons butter, divided
 1/3 cup diced apple
 1/8 teaspoon dried sage
 2 teaspoons cornstarch
 2/3 cup apple juice
 2 teaspoons grated orange zest

2 tablespoons minced onion
 1/2 cup soft breadcrumbs
 2 tablespoons orange juice, divided
 1/8 teaspoon ground black pepper
 1/8 teaspoon ground cinnamon
 2 tablespoons raisins

Cooking Directions:

Heat oven to 425 degrees F. Cut an opening in each chop from the rib side, widening the pocket without cutting through to the other side of the chop; set aside. For stuffing, in a medium saucepan cook onion in 1 tablespoon butter over medium heat until tender, stirring, about 2-3 minutes. Remove from heat; stir in breadcrumbs, apple, 1 tablespoon orange juice, sage and pepper. Fill pocket of each chop with an equal amount of stuffing, place in a shallow baking dish, brush with remaining tablespoon orange juice. Roast for 20 minutes or until browned.

Meanwhile for sauce, in a small saucepan melt remaining tablespoon butter, stir in cornstarch and cinnamon; whisk in apple juice. Add raisins and orange zest. Cook, stirring, over medium heat until thickened and bubbly. Serves 2.

Wine suggestion: Serve with a chilled Chardonnay or if you prefer a red wine, a Pinot Noir.

Serving Suggestions:

Autumn-inspired stuffing of apple and sage fills these roasted chops, which are served with cinnamon and orange-scented sauce. Serve chops with sauce, roasted potato wedges, buttered broccoli and warm dinner rolls.



2012 ARRL Southwestern Division Convention

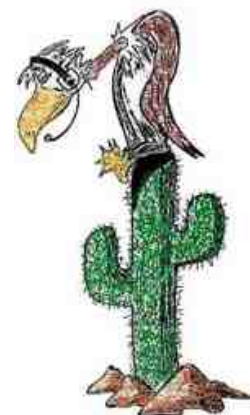
8th Annual

Yuma Hamfest & Arizona State Convention

Yuma, Arizona

Feb. 17 & 18, 2012

Yuma County Fairgrounds
2520 East 32nd Street, Yuma, Arizona



www.yumahamfest.org

Check the Website for Additional Information
and a Current Schedule of Activities and Seminars

<p>Gates Open for Camping Thursday, 2 pm Vendor Setup Friday, 7 am - Noon</p>	<p>Event Hours Friday, Noon - 5 pm Saturday, 8 am - 5 pm</p>	<p>Buzzard BBQ & Grand Prize Drawing Saturday Night 6:00 - 8:00 pm</p>
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Vendors & Exhibitors
Consignment Sales
License Testing
Hourly Door Prizes
On-site RV Camping
Famous Buzzard BBQ
ARRL Forum
\$5.00 Admission

Tailgating (Swap Meet)
Full Seminar Schedule
DXCC Card Checking
Grand Prizes worth \$10K
Emergency Preparedness
iPad 2 Admission Prize
Hospitality Area
Antenna Clinic & T-Hunt

Hamfest Talk-In Frequency: 146.840 (-) PL 88.5 Hz

Email Contact: info@yumahamfest.org



We are proud to have the Amateur Radio Council of Arizona (ARCA) as a sponsor of our event.

Presented by the Yuma Amateur Radio Hamfest Organization (YARHO). The Yuma Hamfest is an American Radio Relay League (ARRL) sanctioned event.



Construction Project Solder Class:

For the past year the Technical Director has been looking for a learning project that our members can build. I've received many ideas from members, many of which were a bit complicated for beginners or not useful to club members. Talking to some of our new members I've found many do not have practical soldering skills. This is nothing to be ashamed of as it is a talent you acquire by doing. Since a basic soldering class would be mundane for many of our members who work in the electronics field or have been home-brewing for years, a second, more advanced, soldering class idea came to mind.

I am sending away for a basic practical soldering class course for evaluation as well as an advanced practical SMT (surface mount technology) soldering class course.

The basic soldering kit currently sells for about \$10. Students will need to purchase or borrow tools for the class; I'm sure some of our members can help out here. The course itself includes a training manual, circuit board, components to solder and practice exercises. Students will also need a standard nine-volt battery to power their project.

Possibly after the project is completed we could add a session to learn how to solder PL-259s to either RG-8 or RG-58. Students would end up with a UHF - UHF jumper cable of desired length.

The SMT class is a bit more expensive at about \$23 for the class. You will also need tools for this class, the most expensive of which is probably a magnifier. A low heat soldering iron with a fine tip and special



Typical personal soldering station with tip cleaning sponge

tweezers are also a requirement. Once the kits arrive I'll have a better idea of what else is necessary for each of the classes.

If you are interested in either class, please let me know at: rf_feedback@w6ze.org. We will probably need a minimum of five people per class and a maximum of ten people. If you'd like to assist with the class, we will need a couple of experienced solderers as assistants.

The SMT class will be a learning experience for most of us.

Note: that there are other soldering course kits available. I am not yet firm on the one I selected above. You might want to go to our vendor website at:

http://www.w6ze.org/HR_Suppliers.html

and surf around in the **Kit Manufacturers** section, and let me know if something appeals to you.

de Bob, AF6C
Technical Director



OCARC Cash Flow - YTD

1/1/2011 through 11/25/2011

11/25/2011

Category Description	1/1/2011- 11/25/2011
INFLOWS	
ARRL Membership Income	\$115.00
Auction In	1,140.35
Badge Income	41.00
BADGE MAILING	2.00
Christmas Dinner Ticket Sales	516.00
Donations - FD	555.00
Dues, Family	307.50
Dues, Future	180.00
Dues, Membership	1,090.00
Interest	2.66
Opportunity Drawing - Monthly	720.32
TOTAL INFLOWS	\$4,669.83
OUTFLOWS	
ARRL Membership Expense	\$98.00
Auction Expense	6.45
Auction Payout	323.87
Donations - OC FAIR	100.00
Dues - OCCARO	20.00
Field Day Equipment	432.99
Field Day Food	973.03
Field Day Other	55.32
Field Day Rental - Tent	58.72
Field Day Rental - U-Haul	340.49
Flowers Expense	63.51
Misc.	32.86
Opportunity Drawing - Monthly	1,088.33
Opportunity Drawing - Christmas	211.18
PO Box Rental	42.00
Supplies	101.32
Web Site Hosting	143.88
TOTAL OUTFLOWS	\$4,091.95
OVERALL TOTAL	\$577.88

Bank Balance around \$6,244



SUPPORT OUR SPONSORS

The following organizations support our club's events in numerous ways. Please consider them when making your Amateur Radio and Electronics purchases:

A&A Engineering

<http://www.a-aengineering.com/>

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<http://www.pryme.com/>

Burghardt Amateur Center

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<http://www.m2inc.com/>

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<http://www.mfjenterprises.com/>

NGC Company / Comet

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Nifty Ham Accessories

<http://www.niftyaccessories.com/>

Ham Projects.com

<http://www.photoqsls.com/>

Universal Radio

<http://www.universal-radio.com/>

Vibroplex

<http://www.vibroplex.com/>



OCARC Board Meeting Minutes for: November 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 8:15 AM Saturday, November 12, 2011. Roll was called by Doug Britton, W6FKX (Secretary), there were a total of 7 directors and 2 visitors – Nicholas Haban, AF6CF and John Roberts, W6JOR. With 7 directors present at the meeting, a quorum was met.

DIRECTOR REPORTS:

- **Vice President** George Jacob, N6VNI – present – George reported that this month's general meeting speaker would be Peter Putnam, presenting a review of his attendance at the Friedrichshafen Hamfest held annually in Germany. George also mentioned that he would arrange a speaker for the January 2012 club meeting.
- **Treasurer** Ken Konechy, W6HHC – present, Ken reported that the club auction sold \$1,140 worth of gear, paid out \$330 to sellers, yielding the club a profit of \$810. The result is that the club finished the year out at approximately \$250 above expenses. Ken submitted a year-to-date financial statement. A question was raised about the cost for the monthly opportunity drawings and whether they exceeded the income generated from the sale of tickets; Ken reported that in general income from the sale of tickets is equal to the cost of prizes. He pointed out that this year may be anomalous, where the purchase of prizes exceeded ticket sales.
- **Secretary** Doug Britton, W6FKX – present, no report.
- **Activities** Kristin Dankert, K6PEQ – present, Kristin reported that she was working on the prizes for the annual club Christmas

party, made a motion that the board approve a budget of \$1,000; Paul, W6GMU seconded, the motion passed unanimously.

- **Membership** Jeff Hall, W6UX – absent, Jeff submitted a report via Email; read by Paul, W6GMU. Jeff reported the club roster up to date at 109 members including 4 honorary members.
- **Publicity** open – Position is open. Doug W6FKX assuming duties for the year. Club flyers were restocked at HRO and suggested that the club's flyers be updated with new photographs and newest club logo. Doug will work with Bob, AF6C to update flyer after the new year.
- **Technical** Bob Eckweiler, AF6C – absent, no report.
- **Directors-at-large:**
 - Dan Dankert, N6PEQ – present, no report.
 - Larry Mallek, K6YUI – absent, no report.

OLD BUSINESS:

- **RF Newsletter "Rotating" Editors** – thank you to all who volunteer!
 - December – Bob, AF6C
 - January – Nicholas, AF6CF
 - February – Kristin, K6PEQ
 - March - TBD
- **2011 Field Day Thoughts plans for next year** – Should the club plan a large field day or not? This issue will be presented to the club during a general meeting after the new year, perhaps a small effort in 2012 and a large effort in 2013.
- **Portables – In – The – Park** – no plans at this time.
- **Bob, AF6C's Kit-Building Class** – no plans at this time; Bob continues to find a suitable kit for the first class.

- **November Club Director Elections** – Nicholas is nearly complete with the list of director candidates. The list will be presented to the club at the November general meeting, and along with additional nominations if any, voted on. Thank you Nicholas for putting together a list of candidates.
- **Holiday Party Preparations** – OCARC Christmas party confirmed for December 9 at 7 PM. Ken, W6HHC is keeping track of RSVP's, collecting the money, and communicating with Kristin on the final count. An announcement will be made at the November general meeting, and an Email will be sent to the club's membership requesting RSVP's.

OCARC General Meeting Minutes November 18, 2011

The OCARC November General Meeting was held at the Red Cross complex in Santa Ana, called to order by OCARC President Paul Gusow, W6GMU at 7:02 PM on Friday evening, November 18, 2011. There were a total of 39 members and visitors present. Nine club directors were present for a quorum.

Paul, W6GMU opened the meeting with the Pledge of Allegiance and then introduced our speaker for the evening, Peter Putnam, NI6E. Peter attended the European HAMFEST held annually in Friedrichshafen, Germany this last June 2011 and shared his experience with the club.

Peter reported that the theme of this year's HAMFEST was "Morse Lives" or "Morsenlegt!" Throughout the venue, the support for the use of Morse code was in evidence, from the signs, the talks, the vendors displaying various keys, to the musicians at the entrance sounding out Morse code using different instruments. Peter showed us photographs of the large vendor area and flea market halls, the wall of QSL cards, several countries' ham clubs, and the staffed kit building tables set up for kids to learn and develop interest in electronics. Attendance at the very international HAMFEST was around 16,000. Thank you Peter for sharing your trip with us.

After a quick break the general meeting continued with the attendees introducing themselves. Nicholas Haban, AF6CF then introduced the list of candidates for the OCARC board of directors. The entire board for 2012 was unanimously voted in (see the list of the directors elsewhere in this newsletter). It was also noted that there would not be a board meeting in December (originally scheduled for the Saturday morning following the club's Christmas party); board meetings to resume in January 2012.

NEW BUSINESS

- **Board Discussion** – Ken, W6HHC proposed 3 changes or amendments to the club's bylaws, documenting two significant duties of the club treasurer, and clarifying the requirements for making amendments to the club's bylaws. George, N6VNI suggested a 4th change that reflects new board directors be voted in September rather than November. Nicholas, AF6CF offered that rather than changing or amending the bylaws for the specified treasurer duties, that instead a document should be created listing all the specific duties of the club directors; suggesting that this would eliminate the need for the club's members to vote on changes to the club bylaws. This will be brought up at the November general meeting.

GOOD OF THE CLUB – no submittal.

Motion made to adjourn meeting, seconded and unanimously approved.

Meeting adjourned 9:15 AM

Respectfully submitted:

Doug Britton W6FKX,
OCARC Secretary



[2012 elected board are:

**President - W6GMU, V. President - N8AE,
Secretary - W6HHC, Treasurer - AF6C,
Activities - W6FKX, Membership - W6UX,
Publicity - K6GEP, Technical - W6JOR,
Dir. at Lrg. - K6PEQ, Dir. at Lrg. - AF6CF**

-ed.]

Ken Konechy, W6HHC presented to the club three suggested changes or amendments to the club's Bylaws; two changes that document significant treasurer duties, and one amendment that clarifies the requirements for making amendments to the Bylaws. It was suggested that perhaps a separate document be created listing specific director duties rather than list specifics in the Bylaws that might change again. This subject will be further discussed.

GOOD of THE CLUB –

Just a reminder that the OCARC Board Meetings will be held on the second Saturday of each month at 8:00 AM at the Jägerhaus Restaurant, 2525 East Ball Road Anaheim. Visitors are welcome. The next scheduled board meeting will be January 14, 2012.

A motion to adjourn meeting at 8:14 pm was made by Larry Mallek, K6YUI, seconded by Ken, W6KOS, and unanimously agreed.

And thanks again Ken, W6HHC for providing the photo!

Respectfully submitted:

Doug Britton W6FKX,
OCARC Secretary



Peter NI6E shows us photographs from the Friedrichshafen HAMFEST

Prez Sez from page 1:

great ideas. I can't wait to see what is in store for next year! I wish to thank each and every Board member for their fine efforts.

We now have a terrific Holiday party to look forward to, to be held at the Jägerhaus. Fun and much revelry will be coming very soon!

Our Club membership has grown by eight this year (so far), pushing 100 members. Here's hoping that this trend will continue.

I wish to thank the entire Club membership for allowing me to serve as your President this year. It has been an honor and a privilege to do so, and also to continue serving throughout 2012.

Happy Holidays and all the very best for 2012!

de Paul - W6GMU
President, OCARC



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