



# RF



VOL. L NO. 12

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

DECEMBER 2009

## The PREZ SEZ:



## SEASONS GREETINGS!

Thanks to all for a Great Year.

The first snow of the holiday season announces the end of yet another great year for the Club.

We had one of our best Field Days and auctions ever, increased our membership and are in financially sound shape. None of these goals could be reached without the help and diligence of our Board of Directors, so my personal thanks to all the directors and members that helped the Club during these (allegedly) "hard times".

The Elections went very well, with more candidates than positions. Congratulations to those elected to serve on the Board next year.

Finally, do not forget the wonderful Xmas Dinner Party on Dec. 11<sup>th</sup> with great food and of course, wonderful prizes.

See you all at the Dinner Party.

**73, de  
Jolly St. Nicholas - AF6CF**

See the picture on page 18 of AF6CF with Thanksgiving snow!



## 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 11<sup>th</sup>  
@ 7:00 PM**

### Congratulations to the 2010 Board of Directors:

<b>President:</b>	
Kristin Dankert	K6PEQ
<b>Vice President:</b>	
Paul Gussow	W6GMU
<b>Secretary:</b>	
Kristine Jacob	KC6TOD
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Dan Dankert	N6PEQ
<b>Membership:</b>	
Loran Dargatz	AF6PS
<b>Publicity:</b>	
Robbie Robinson	KB6CJZ
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Nicholas Haban	AF6CF
<b>Director at Large:</b>	
Larry Mallek	K6YUI



<http://www.w6ze.org>

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**The Next OCARC Breakfast  
& open club Board Meeting  
is on Sat. January 9<sup>th</sup>.**

**This is a Special Date.**

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



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Submit Articles:  
[editors@w6ze.org](mailto:editors@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.):

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

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

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

#### 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.

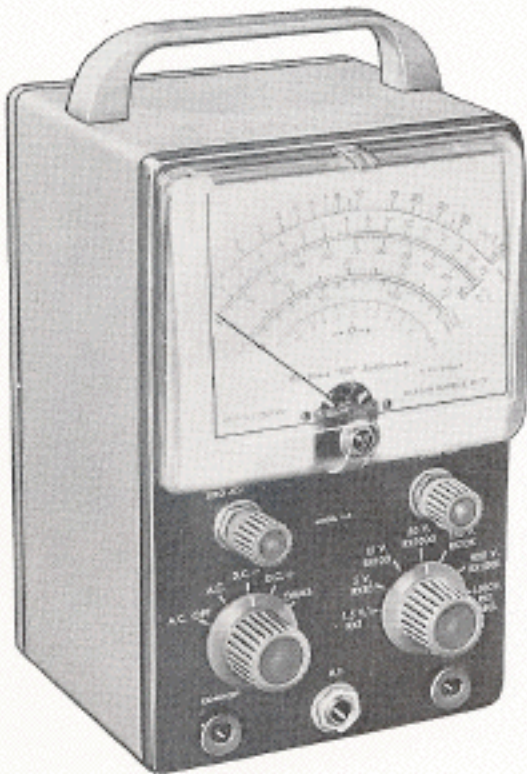
New members joining after midyear may choose to pay for the remainder of the year and the next year at a savings of \$5.

## Heathkit of the Month by Bob, AF6C



## Heathkit of the Month The V-7A VTVM by Bob Eckweiler - AF6C

A very popular older piece of Heathkit test equipment is the V-7A vacuum tube voltmeter (VTVM). The V-7A is the last of a long line of V-series VTVMs manufactured by Heath. The V series was replaced by the IM series (which includes other instruments as well as VTVMs) in the early sixties. An amateur who built a Heathkit transmitter or receiver over the years often found that a VTVM and RF probe were two of the few instruments needed to align or adjust the equipment after it was built. Thus most builder hams had a VTVM as one of their prime test instruments.



MODEL V-7A

### Why a VTVM?

The VTVM features a high input impedance that a standard volt-ohm meter doesn't offer. Typically the input resistance of a VTVM is 10 to 11 megohms. This high impedance creates less interaction between the

circuit and the measuring device. One megohm of the input impedance is created by a resistor right at the tip of the DC test probe, helping isolate and reduce capacitance created by the test leads. This all results in more accurate readings. The high impedance of the VTVM also allows the use of special probes. One probe often required for alignment of ham gear is an RF Probe; Heath offered the 309 series RF probe as an accessory for their line of VTVMs. Let's briefly touch on the earlier Heathkit VTVMs before looking at the V-7A.

### The Heathkit V-1 VTVM:

The V-1 was the first Heathkit VTVM. It was introduced in December 1947 for \$24.50. and was produced until late 1948 when the V-2 was released.

Front panel controls and jacks for the V-1 are:

Meter w/ scales:

- 0 – 1,000 Ohms (10 ohms center)
- 0 – 10 V (AC/DC)
- 0 – 30 V (AC/DC)
- 20 – +15 dB

Power Switch:

**ON / OFF** (toggle switch, replaced in later production by a slide switch)

Selector Switch:

**AC, DC-, DC+ and OHMS**

Range Switch (Five ranges):

- 3V / R x 1, 30V / R x 10,**
- 100V / R x 100, 300V / R x 1000,**
- 1000V / R x 1 MEG**

Potentiometer:

**ZERO ADJUST**

Potentiometer:

**OHMS ADJUST**

Power Indicator:

Jeweled pilot light (#47 bulb)

Input Jack:

Black banana jack **COMMON**  
(Connected to chassis)

Input Jack:

1/4" Phone jack: **D.C.**

Input Jack:

Red banana jack **A.C. OHMS**

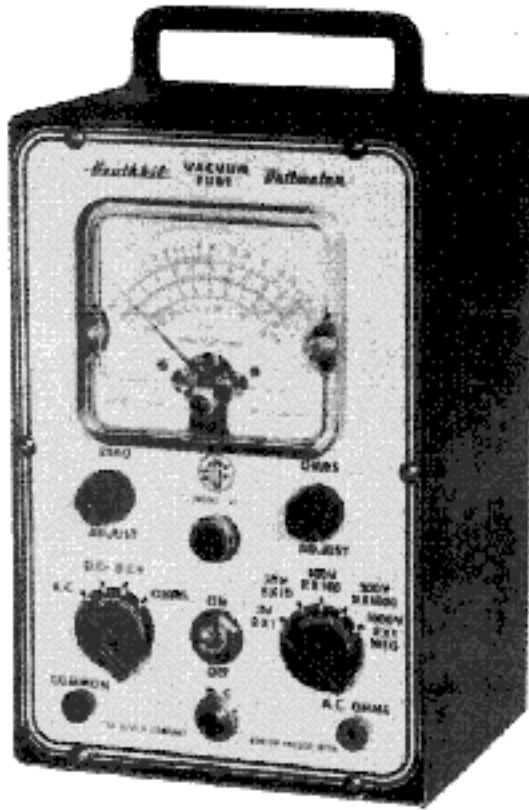
(note: Front panel nomenclature is shown in bold.)

The front panel controls remained similar for the later VTVMs, though new ranges were added, until the V-7 when the on/off function was added to the selector switch, and the pilot lamp was incorporated onto a circuit board and shined through the meter bezel.

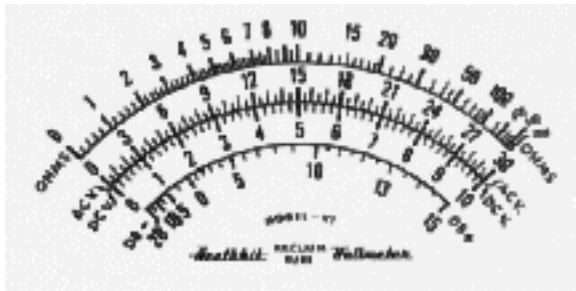
The V-1 uses three octal tubes: a 6X5 power rectifier, a 6H6 dual diode for AC to DC voltage conversion and a 6SN7 dual triode for a balanced bridge amplifier and meter driver. Two flashlight cell batteries provide 3V power for the Ohms circuitry. Resistors in the



voltage divider circuits are 1% precision resulting in reasonably accurate readings for the price of the instrument. The V-1 shipping weight was 8 pounds.



The Original Heathkit V-1 VTVM (Late 1947)



Heathkit V-1 Meter Scale

#### The Heathkit V-2 VTVM:

The V-2 adds an additional position on the range switch that was missing from the earlier unit. Added to the voltage ranges is the 10 V range, and added to the Ohms range is the  $10M\Omega$  ( $10,000\Omega$ )\* range. The other difference is that the meter, thought physically the same size, was improved to a more sensitive  $200\mu A$  movement and the associated meter circuitry changed to accommodate it. The new range switch was marked:

Range Switch:

3V / R x 1, 10V / R x 10,

30V / R x 100, 100V / R x 1000,

300V / R x 10M, 1000V / R x 1 MEG

(\* note: Heathkit used the designation M to symbolize 1,000, and MEG to symbolize 1 million).

#### The Heathkit V-3 VTVM:

In April of 1949 Heath was developing the V-3. It was supposed to be a battery operated version of the V-2 VTVM, and set to sell for \$34.50. But due to engineer problems, probably related to battery cost and life, very few, if any, were manufactured commercially. Prototypes are evidently around.

#### The Heathkit V-4 VTVM:

The V-4 came out in 1950 continuing at the \$24.50 price. It features a larger meter and the 6X5 rectifier tube was replaced by a (then) state-of-the-art 65 ma selenium rectifier. It also includes a modification to the 6H6 AC to DC conversion circuit. Not too long after the V-4 was released, it was replaced by the V-4A

#### The Heathkit V-4A VTVM:

The V4A replaced the V-4 in late 1950 or early 1951. The major change was a further modification to the AC to DC conversion circuit which actually brought the circuit back closer to the original V-1 circuit. The V-4A sold for \$23.50; a dollar less than the earlier models.

#### The Heathkit V-5 VTVM:

The V-5 replaced the V-4A in September of 1951. Again the size of the meter was increased to 4-1/2" almost filling the width of the front panel. The cabinet itself also changed radically. Instead of a flat front panel that screws into a flange on the cabinet, the front panel, rear panel and cabinet are "formed" aluminum with rounded edges. There are no front panel screws; instead the front and rear panels and chassis are held to the cabinet by screws at the back of the cabinet, making a neater appearance and allowing the meter to fully extend from edge to edge. The jeweled pilot light remained on the front panel. Internally the tube lineup changed; the octal 6SN7 tube was replaced with the smaller miniature 9-pin 12AU7 dual triode and the 6H6 was replaced by a 7A6 dual diode in an attempt to improve AC accuracy. The 7A6 is a "loctal" based tube and has a different pin-out than the 6H6. The tube socket and socket wiring were changed to accommodate the new tube. In the Ohms circuit the two batteries (3V) were replaced with a single 1.5 volt cell, and one of the Ohms divider resistors was changed to compensate. Meter ranges remained the same as the V-2 through V4A.

#### The Heathkit V-5A VTVM:

The V-5A replaced the V5 in 1952. It remained on the market until replaced by the V-6 in 1954. The V5A is almost identical to the V-5 except the 7A6 AC to DC

circuit tube was changed back to a 6H6, as was the tube socket and wiring.

#### **The Heathkit V-6 VTVM:**

The Heathkit V-6 VTVM came out in 1952 and remained in production until early 1955. It features a new seven-position range switch. The 1 - 3 voltage decade steps changed to 1.5 - 5 steps. The lowest range decreased to 1.5V and the largest range increases to 1,500V. The AC and DC voltage steps are now: 1.5, 5, 15, 50, 150, 500 and 1,500V. The additional step on the range switch allowed a new resistance range of  $R \times 100K$ . The power supply was also beefed up slightly with a higher value filter capacitor, possibly due to the lower full scale voltage range.

#### **The Heathkit V-7 VTVM:**

The Heathkit V-7 replaced the V-6 in early 1955. The V-7 added a new feature to kit building; it is believed to be the first Heathkit to use a printed circuit board for construction. Also, for the first time since the V-1, the instrument color scheme changed. Prior to the V-7 the front panel was light gray with red nomenclature and trim lines. The V-7 has a darker gray front panel with white nomenclature, no trim lines, and a feather gray cabinet that is somewhat lighter than the gray of the front panel. Starting with the V-7 the #47 pilot lamp is located behind the top of the meter and shines through a piece of red transparent tape and the top of the plastic meter cover. Significant changes to the AC to DC conversion circuit were made including changing the tube to a 6AL5.

#### **The Heathkit V-7A VTVM:**

The V-7 was replaced by the V-7A after about one year. Of all the Heathkit VTVMs, the V-7A remained in production the longest; from 1956 into 1962. The V-7A is believed to be identical to the V-7 with the exception of the circuit board which was improved significantly over the original circuit board.

#### **A Closer Look at the V-7A:**

A closer look at the V-7A shows it uses just two tubes, a 6AL5 dual diode and a 12AU7 dual triode. The transformer powered supply puts out about 130 VDC using a selenium rectifier and 16 $\mu$ F axial electrolytic capacitor. A filament winding on the transformer lights the tube filaments and the #47 pilot lamp mounted to the circuit board. Resistors across the supply output provide a ground reference and provide negative and positive voltages to the circuits relative to common. A small DC voltage tapped from the voltage source is fed back through a very large resistance to the AC to DC converter circuit to buck the contact potential developed in the 6AL5 tube. Since the V-1 Heathkit has been changing the AC conversion circuit

in almost every model. Evidently they felt the need to improve the circuit. With the V7-A the AC circuit evidently met their expectations; and it has remained the circuit used in all the future VTVMs.

The 12AU7 is wired as a balanced differential amplifier. The plate of both triode sections are connected together and to a B+ voltage of about 60 volts. The cathodes are each connected through current limiting resistors to each end of a balance potentiometer whose wiper goes to a B- voltage of -75V. The meter is connected between the two cathodes. Depending on the function switch setting, (AC, DC or OHMS), a different calibration potentiometer is switched in series with the meter. The meter leads are also reversed by the function switch between the AC, DC- and DC+, Ohms settings. The grid of one triode is grounded through a large resistance while the voltage to be measured is applied to the other grid. Bias is provided by the voltage on the cathodes. Since no grid-bias resistor is needed the input impedance to this stage is extremely high. When there is no voltage to be measured the currents in the two triode sections balance and the meter remains at zero, assuming the balance control is properly set. Full meter deflection results when about 1.36 DC volts is applied to the grid. This type of differential amplifier is linear so the meter responds in a linear fashion to the applied voltage. The tube limits the maximum current though the meter, protecting it if improper voltages are applied to the VTVM input.

#### **DC Circuit Operation:**

In the DC modes a series of precision 1% resistors make up a voltage divider chain. The sum of the series resistors is 10 M $\Omega$ . An additional 1 M $\Omega$  resistor, located in the test probe, is also in series with the voltage. As the range switch is switched to higher voltage settings the voltage going to the 12AU7 is tapped further down the 10 M $\Omega$  resistive divider chain. As an example, when on the 15V range the tap is 9 M $\Omega$  down the chain (plus the 1 M $\Omega$  in the probe). Thus the input voltage reaching the 12AU7 grid is 1/11 of the input voltage. Assuming 15 volts is applied to the VTVM input, the voltage on the grid is 1/11 (0.0909) of 15 volts or 1.36 volts. Other DC ranges operate similarly.

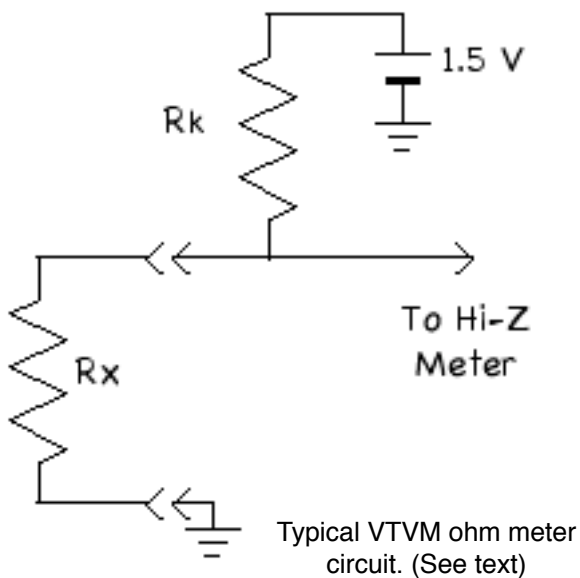
#### **AC Circuit Operation:**

Earlier Heath VTVMs offered high DC impedance (~6 M $\Omega$ ) on their AC ranges. This is not the case on the V-7A. When Heathkit changed the AC to DC tube from the 6H6 to the smaller 7-pin miniature 6AL5 tube they had to limit the voltage going to the tube. The AC input resistance dropped to about 1.5 M $\Omega$  with the addition of a separate voltage divider to re-

duce the voltage on the tube when in the 500 and 1,500 volt ranges. The 6AL5 twin diode is wired as a voltage doubler. Its output corresponds to the peak-to-peak of the AC voltage. The output is then fed to the same voltage divider chain as used for DC. However the 500 and 1,500 VAC ranges are tapped at the same point as the 150 range because of the earlier divider. A separate calibration control sets the AC calibration. The meter has separate scales for both RMS AC volts and Peak-to-Peak AC volts.

#### Ohms Circuit Operation:

The Ohms operation relies on the extremely high input impedance of the 12AU7 differential amplifier. For all practical purposes it can be considered infinite at DC since it is biased so no grid current flows. Operation is rather simple. The internal 1.5 volt battery is connected across a voltage divider made up by a known resistance  $R_k$  selected by the range switch and the unknown resistance  $R_x$ . The output of the voltage divider is fed to the 12AU7 amplifier. When the resistance being measured is infinite (open), the full battery voltage is applied to the tube and the meter reads full scale. When the resistance is zero (shorted) no voltage is applied to the tube and the meter reads zero. And when the resistance being measure is the same as the known resistance the meter reads half-scale. The readings are not linear so the Ohms scale on the meter face is marked accordingly. By adjusting the zero control with the meter leads shorted and the Ohms control with the meter leads open the accuracy can be quite good when using the correct meter scale.



#### Building the Kit:

Being one of the first kits to use a printed circuit board, a part of the typically excellent Heathkit manual is dedicated to proper printed circuit soldering techniques. Construction starts with the range switch;

its numerous resistors are wired first. These components mount directly to the switch and not on the circuit board. Next the controls, jacks and switches are mounted to the front panel, and the wiring between front panel components is added. Then the circuit board is filled with its various components. Conventional miniature tube sockets are used; the solder lugs of the sockets are placed through one large hole for each socket and bent over and soldered to the appropriate spot on the circuit board. Evidently Heath was either getting rid of their existing sockets or PC tube sockets were not readily available at that time. A pre-fabricated wiring harness is then installed between the circuit board and the front panel. The bracket that supports the circuit board, part of the battery holder, the line cord and the front panel to the cabinet is installed next, along with the meter. This bracket is attached by the meter screws to the front panel. An additional small "Z" bracket goes under a third meter screw, the other end holding the circuit board and one leg of the small power transformer. Finally the test leads are assembled. Cabinet assembly is done after checkout, burn-in and calibration are completed.

#### Calibration:

DC calibration relies on a voltage of a fresh carbon-zinc battery being 1.55 volts. The battery is used to set the DC calibration point on the 1.5 volt scale. The remaining scales rely on the precision resistors for their calibration. AC calibration relies on measuring the AC line voltage and it being 117 VAC. No ohms calibration is necessary since the accuracy is determined by the precision resistors and proper setting of the zero and ohms adjust controls on the front panel. Heathkit specifies accuracies of 3% on DC and 5% on AC.

#### Operation:

Measuring voltage is very straight forward. Set the range to the desired position. If the voltage is unknown set it to the highest range and work down. The function switch selects the proper mode: AC, -DC or +DC. In AC the meter scales can be read in RMS volts, peak-to-peak volts or dBm relative to 1 mW into 600Ω. The VTVM can measure AC at frequencies from 42 Hz to over 7 MHz (600 Ω), but the low impedance can affect measurements in critical circuits. The reason Heathkit was not concerned with lowering the AC input impedance is because true RF measurements should be used using an RF probe such as the Heathkit 309-C. This probe allows more accurate RF measurements and is a required piece of test equipment for many transmitter and receiver adjustments. The 309-C sold for \$3.50 in the days of the V-7A.



Ohms operation requires first selecting the desired Ohms range; choose a range that results in a reading near mid-scale for best accuracy. Connect the common lead to one side of the resistance to be measured. Set the Ohms adjust so the meter reads full scale; If full scale cannot be reached chances are the battery needs replacement. Now touch the meter probe to the common meter lead and set the zero adjust so the meter reads zero. Finally touch the meter probe to the other side of the resistance and read the resistance on the Ohms scale on the meter.

### Restoring a V-7A:

Heathkit V-7A voltmeters may be found at swap meets and flea markets at a reasonable price. Even in today's digital world they make an excellent test bench item. Current draw is low so they won't run up your electric bill if left on for a few hours. Their immunity to RF fields is valuable when working on moderate power RF devices. Thus the V-7A is a Heathkit worth restoring.

Here are some points to look for when choosing a flea market acquisition: First, check the integrity of the meter and look for cracks or scratches on the meter face. Static buildup on the meter can cause the meter to appear erratic even when the device is off and the meter is in good shape. A little dishwasher detergent wiped on the meter face should clear it up. Be sure the meter returns to the same point each time it is deflected and that the manual meter zero control can bring the pointer to the meter scale zero mark. If you can peek inside the unit, make sure the battery has not leaked and corroded the cup or spring. the positive contact is just a #6-32 bolt and can be replaced. Finally check the 6AL5 tube and adjoining circuitry for damage that could be caused by measuring high AC voltages in the wrong range position. Finally check the 9.1 ohm resistor on the back of the range switch. This often gets damaged if the meter is used to measure voltage when in the **OHMS** position. It is a standard value resistor and is easy to replace. If it is damaged, check the other resistors in the ohms chain for possible damage; usually the 9.1 ohm resistor acts as a fuse and protects the other resistors.

When restoring a V-7A, first check and replace the line cord if it shows damage or wear. Remember that the VTVM **COMMON** lead is connected to the VTVM chassis so if you use a modern 3-wire grounded cord you are connecting the common lead to power ground! Next replace the 16  $\mu$ F electrolytic in the power supply; it is a cheap part and probably is not up to snuff after 50 years or so. You'll probably only find a 20 or 22 $\mu$ F today, which will work fine. Also check, and preferably replace, the 0.01  $\mu$ F 1600V tubular capaci-

tor used in the AC circuit. You don't want this capacitor to be leaky if you are measuring high AC voltages. Be sure the battery holding spring and cup are clean and provide good contact. Put in a new flashlight battery and mark the date on a label and attach it to the unit; leaky batteries can do a lot of damage. Check and replace the tubes if necessary, making sure their pins are straight and clean.

Proper operation of the switches is important for stable readings. The two wafer switches (range and function) have silver plated contacts. The switch contact surfaces should clean up using a good brand of switch contact cleaner. Take your time and be careful not to over extend any of the spring contacts. Check that none of phenolic wafers are cracked or broken. If you use abrasives to clean the contacts you are just wearing away the silver and assuring additional trouble in the future. Check, and tighten if necessary, the switch hardware. Loose switch hardware, especially the long rods, cause misalignment and intermittent switch operation.

When the VTVM is turned on to the AC position. The meter should swing down scale then up towards full scale and, after the tubes warm up, return to the low end of the scale. Make sure the meter can be zeroed with the front panel ZERO ADJ. and that the OHMS ADJ. allows the meter to reach full scale in the OHMS function position.

Do a preliminary calibration using the procedure from the manual and check that the meter operates properly. If it does, let it sit on for 24 hours and repeat the calibration. You now have a viable piece of test equipment. If you can find a 309-C RF probe add it to your instrument accessories. If you can't, they are easy to build.

### Heath VTVM Accessories and Spares:

Over the years Heathkit made a series of probe kits and other accessories for their line of VTVMs. Here are the major players:

1. 309, 309-A, 309-B, 309-C RF Probe (309C \$3.50 - 1956) (In later years the probe was replaced by the PK3 around 1975).
2. 310 10KV High Voltage Probe (310 \$4.50 - 1949)
3. (Replaced by the 336 probe).
4. 336 30KV High Voltage Probe (336 \$4:50 - 1956)
5. 338, 338-A 338-B 338-C Peak-to-Peak Probe (338-C \$5.50 - 1956).
6. IM-8-1 Solid State vacuum tube replacements. A set of two metal cans that plug into the 6AL5 and 12AU7 tube sockets and turn the Heathkit VTVMs (starting with the V-7) into a solid state

voltmeter with instant on capability. The 12AU7 plug-in uses four FETs and the 6AL5 plug-in uses two special silicon diodes. (IM-8-1 \$17.95 - 1976).

A circuit board repair kit and a replacement meter cover were also available.

#### In Closing:

The V7, V7-A and later model Heathkit VTVMs make a fine piece of test equipment that is worth having if you dabble at all in the field of electronics. Don't turn down an older, less refined, V1 - V6A VTVM if one is offered either. To give some idea of the versatility of the VTVM, Heathkit was still selling the IM-5228, a bench model VTVM based almost totally on the V-7A circuit, until 1990, shortly before they went out of the kit manufacturing business.

de AF6C



#### Correction to Last Month's Heathkit of the Month:

In last month's Heathkit of the Month - **The IT-1 Isolation Transformer** - I referred to the typical home power drop as *two-phase power*. Cliff - K6CEO, a fellow Boeing retiree, sent me an interesting email saying:

*There is only SINGLE (ONE) PHASE power distributed to any American home I ever heard about. The 240 VAC drop to homes is single phase, as are the two, 120 VAC - 2 wire circuits. This is so because you either use the 240 VAC pair of wires, which are surely single phase or you use one of the 120 VAC, 2-wire circuits, which is also single phase.*

Cliff is right. The term I should have used is **split-phase power**. *Two-phase power* is sometimes incorrectly used to describe home power because the two 117 volt circuits are 180° out of phase with each other relative to neutral. I fell into this trap!

Cliff goes on to say: *I know of no two phase power used anywhere on earth.*

I did some research after receiving Cliff's letter and found that two-phase power did exist, though it is now well antiquated. Two-phase power was delivered using four leads. A three lead variation also existed with the neutral lead heavier, since it had to handle the vector sum of current from both phases. The power in each of the two lead pairs (or between each lead and the neutral lead in the case of three wires) were 90° out of phase with each other. In industrial use the

two-phase power made for simple self-starting motors. The original generators at Niagara Falls (circa 1895) were two phase generators. In later years three-phase power quickly became the standard as it required less copper to deliver the same power and had additional benefits.

You may wonder what benefits multiphase power has. If you look at single-phase power, there are two points in each cycle when the voltage is zero. At this point no power is being delivered. With multiphase delivery, when one phase is at the zero voltage point the other phase(s) are delivering power. This results in higher mean power being delivered.

I thank Cliff for pointing out my error.

de AF6C



#### Morse Code is Alive!

***The following email was sent to a prestigious Boston financial firm by their ailing boss. I have to wonder if he is a ham or an aspiring ham to be? - The RF Editor.***

"My cold has laid me too low to be in the office today. I will be checking emails throughout the day. If you call, bone up on your Morse code first because all I can do is grunt. And please make your questions simple. "No" is one long grunt and one short grunt, followed by three long grunts. "Yes" is a long grunt, a short grunt and two long grunts followed by a short grunt and then followed by three short grunt. Is it easier to say "no" so please form your questions accordingly."

#### Get A Club QSL Card

Check into one of our January 2010 Nets and be one of the first club members to receive the new club QSL card. Nets are on Wednesday evenings. The Ten meter net starts at 7:30 PM local time on 28.375 ±QRM and the 2 meter net starts at 8:30 PM on 146.550 simplex.

For the real hams that's:  
Thursday at 0330Z for the ten meter net &  
Thursday at 0430Z for the two meter net.





## OCARC HOLIDAY PARTY Fri. December 11<sup>th</sup>, 7 p.m.

You are invited to the OCARC Holiday Party to enjoy some great food, enter a great raffle and support our club! The grand prize this year is an FT-857: Mobile HF/VHF/UHF Rig!



We will also be raffling off an "A" stock IC-92AD: D-Star HT, an IC-2820H: Dual Band Mobile and an IC-R5 Sport: Handheld RCVR and many other great prizes! You must be present to claim the raffle prize so don't miss out!

See Kristin, K6PEQ, at an OCARC general meeting or club breakfast or contact her at **714-544-9846** or via email at [k6peq@w6ze.org](mailto:k6peq@w6ze.org) to arrange purchasing your holiday party dinner tickets. Remember to bring your spouse and friends too! Dinner tickets are only \$24 per person and include a great meal and 1 free raffle ticket!

Mark the date on your calendar!

Friday, December 11<sup>th</sup> at 7:00 p.m.

RSVP to Kristin, K6PEQ by Friday, December 4<sup>th</sup>!

Location: Jagerhaus Restaurant

2525 East Ball Road, Anaheim CA 92806

Located on Ball Road, just west of the 57 Freeway

[www.jagerhaus.net](http://www.jagerhaus.net), 714-520-9500

Raffle tickets will be sold at the door. So RSVP now for a great night of friends, food and prizes!

**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/>

**ADI / Pryme Radio Products**

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

**Burghardt Amateur Center**

<http://www.burghardt-amateur.com/>

**The DX Store**

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

**Elecraft**

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

**Ford Electronics**

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

**Ham 4 Less.com**

<http://ham4less.com/>

**Ham Radio Outlet, Anaheim, CA**

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

**Hamstore.com**

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

**Heil Sound**

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

**Hobby Radio stop**

<http://www.bearcat1.com/scanners.htm>

**ICOM Elmer.Com**

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

**M<sup>2</sup> Antenna Systems**

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

**MFJ Enterprises**

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

**NGC Company / Comet**

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

**Nifty Ham Accessories**

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

**Photo QSLs.com**

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

**Universal Radio**

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

**Vibroplex**

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






**OCARC General Meeting Minutes  
for: November 20, 2009**

The OCARC November General Meeting was held at the Red Cross complex in Santa Ana at 7:00 pm on Friday evening November 20th, 2009. There were a total of 42 members and guests present.

Nicholas AF6CF opened the meeting with the Pledge of Allegiance. Nicolas welcomed all the members and guests. He then turned the meeting over to Kristin to introduce our guest speaker, Gordon West WB6NOA. Before Gordon's presentation – Kristin, on behalf of the club, presented to Gordon the club *Certificate of Appreciation* for his support of the ham radio booth at the OC Fair and his devotion to promoting Amateur Radio.



**Gordon- WB6NOA - Accepts club award.**

Gordon then presented to the club a trophy for OCARC's participation at the Orange County Fair. It is a great looking trophy.



**Gordon - WB6NOA at his Table of Tricks,**

Gordon West WB6NOA's presentation which is always fun, this evenings presentation was aptly titled "Gordon West & His Bag of Tricks".

As you can see from the picture of the table with all the "Goodies" from the Bag of Tricks" the moment Gordon starts to the very end everyone is amazed at how he presents Amateur Radio and his wonderful sense of humor...

Gordon makes Ham Radio fun and he keeps the audience involved! From the sources of radio signals, sounds and even cooking a pickle which Dan N6PEQ assisted. Thanks to Chip Margelli K7JA and Dan Dankert N6PEQ for helping Gordon with his tricks.



**Dan - N6PEQ Lights the Pickle.**

Chip Margelli K7JA gave the Field Day report which had just been published in QST with the W6ZE Field taking #3 in the nation overall and #1 in 9A (info can be found on page 67 of December QST).

Field Day 2010 plans are starting to brew, the club is looking for a Field Day Chairman or Co-Chairman... if we can find two volunteers. Please think about what you can do for Field Day 2010!

Kristin K6PEQ reminded everyone to make your reservations for the OCARC Holiday Party on December 11<sup>th</sup>, 2009. Contact Kristin if you are planning on attending.

Bob Eckweiler AF6C happily told the membership the QSL cards are here and he will be busy sending out the long overdue cards. Thank you Bob for the good work!





Bob - AF6C Shows off the new club QSL Card.



The Trophy Gordon Presented to the Club for our efforts at the O.C. Fair



**ELECTIONS:**

The elections for 2010 were held after Gordon's presentation, and the results are:

**OCARC Officers for 2010**

<b>President</b>	Kristin Dankert	K6PEQ
<b>Vice President</b>	Paul Gussow	W6GMU
<b>Treasurer</b>	Ken Konechy	W6HHC
<b>Secretary</b>	Kristine Jacob	KC6TOD
<b>Activities</b>	Dan Dankert	N6PEQ
<b>Membership</b>	Loran Dargatz	AF6PS
<b>Publicity</b>	Robbie Robinson	KB6CJZ
<b>Technical</b>	Bob Eckweiler	AF6C
<b>Director at-Large</b>	Nicholas Haban	AF6CF
<b>Director-at-Large</b>	Larry Mallek	K6YUI

Motion to adjourn made by Paul W6GMU, seconded by Larry K6YUI; meeting adjourned 9:00 PM.

Raffle to follow.

*Respectfully Submitted by:  
Kristine Jacob - KC6TOD  
OCARC Secretary*

**OCARC Board Meeting Minutes for: December 5, 2009**

The OCARC Board meeting was held at the JagerHaus Restaurant, 2525 East Ball Road, Anaheim, at 8:15AM Saturday, December 5th, 2009. There were a total of 9 directors and 4 visitors – Diane Konechy, Larry K6YUI, Loran AF6PS & Steve N1AB. There was a quorum of directors present, with Rich KE6WWK – Director-at-Large

**DIRECTOR REPORTS:**

- Treasurer Paul W6GMU reported \$5,252.18.
- Kristin K6PEQ updated the board as to the Christmas party – she was very pleased that 45 people have confirmed so far. Kristin has already lined up speakers for the first quarter and will provide for the new Vice President – Paul W6GMU a list of perspective speakers.
- Dan – N6PEQ said that activities are all set
- Bob AF6C reported our membership is over 87 hams at this time. Bob has everything in order to hand off to Loran AF6PS the new incoming Membership Director. He also reminded Loran (who joined us at the board meeting) that he should have a hand held programmed to 146.55 for those members/guests who arrive late and need to have the door unlocked.

**TechTalk #79**  
**Comparing DATV Repeater Designs - Part I**  
 by Ken W6HHC & Robbie - KB6CJZ

This latest TechTalk article on DATV (Digital-ATV) technology looks at the design of three different types of D-ATV repeaters. First, we will look at a very simple DATV repeater design that is proposed for the OCARC club in the future. Then we will look at the first operational DATV repeater in the US, WR8ATV in Columbus, Ohio. Finally, we will look at the design of the first DATV repeater in Australia to go 100% DATV transmissions, VK3RTV near Melbourne.

**Proposed W6ZE DATV Repeater Design**

If testing of cross-town DATV simplex portable session by W6HHC and KB6CJZ continues to go well, then there are future plans being proposed to add DATV repeater for OCARC use. This repeater has a very simple design compared to later ones we will look at:

- DVB-S Uplink on 1.2 GHz
- DVB-S Downlink on 3.4 GHz
- Downlink RF Bandwidth is 3 MHz
- One Transport Stream Channel (1xTS)

The choice of the 3.4 GHz downlink frequency here is highly influenced by crowded band-plan condi-

tions here in Orange County, near the city of Los Angeles.

As shown in **Fig 1** below, there is a single DATV uplink receiver on 1.2 GHz feeding a single DATV transmitter on 3.4 GHz. The DVB-S receiver planned for the W6ZE repeater is a “satellite” Set-Top Box. This type of STB is commonly called “Free-To-Air” (aka FTA) and can be easily found used on e-Bay.

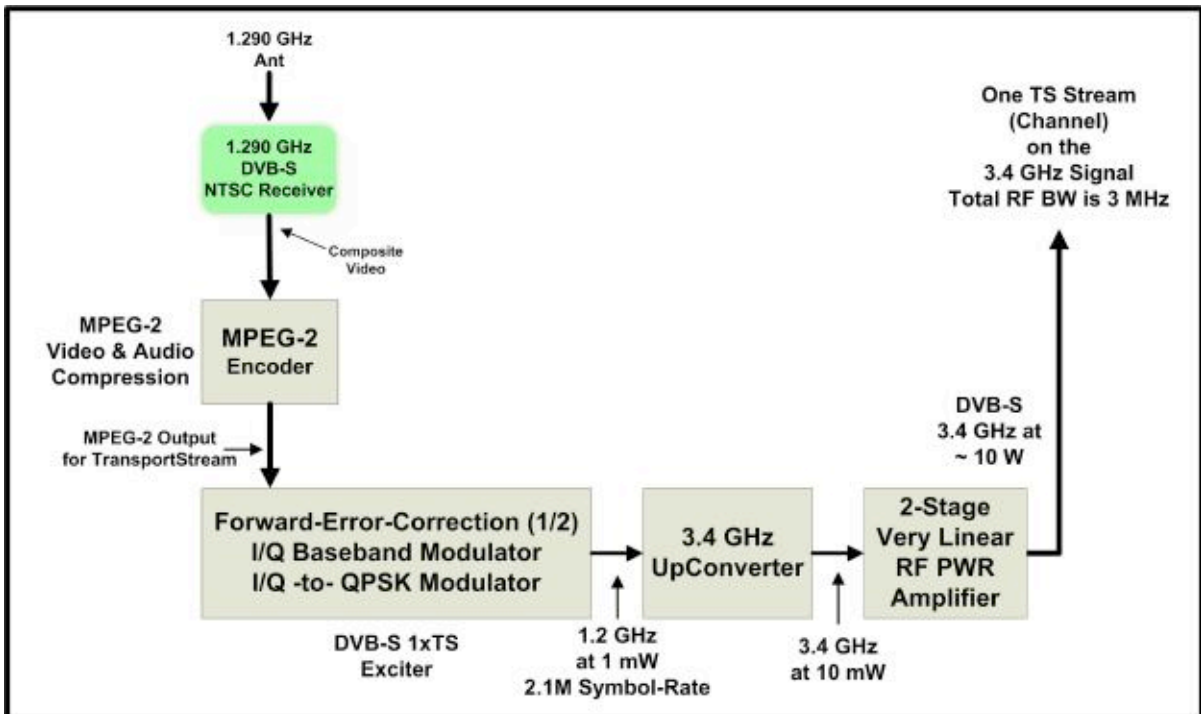
The choice of symbol-rate of 2.1 M Symbols/sec for NTSC and a Forward Error Correction setting of 1/2 provides a significant error correction redundancy factor of 1/2 while still obtaining a narrow DATV RF bandwidth of only 3 MHz.

**WR8ATV DATV Repeater Design**

A block diagram of the current WR8ATV DATV repeater in Columbus, Ohio is shown in **Fig 2** on the following page. The Amateur Television of Central Ohio (ATCO) runs the only currently active DATV repeater in the United States. The WR8ATV repeater design is more complex than the simple repeater design that we showed in Fig 1:

- DVB-S Uplink on 1.2 GHz
- Analog uplink on 439 MHz, 1.2, 2.4 & 10 GHz
- DVB-S Downlink on 1.2 GHz
- Downlink RF Bandwidth is 4 MHz
- Two Transport Stream Channels (2xTS)

**Figure 1 – Block Diagram Showing Simple Planned DATV Repeater Design for W6ZE**



In January of 2004 the ATCO Group in Columbus, Ohio installed a DVB-S digital output to their repeater which has been in service 24-7 since then.

The WR8ATV DATV repeater design allows two channels to be simultaneously interleaved on one DATV transmission signal. The choice of a symbol-rate of 3.125 M Symbols/sec and a Forward Error Correction setting of 3/4 allows packing two channels into a narrow DATV RF bandwidth of only 4 MHz. Each channel uses 1.5625 MS/sec symbol-rate that will support an MPEG-2 video output stream Net-Data-Bit-Rate of 2.16 mbps (when configured at FEC 3/4).

Figure 3 – DATV Test Pattern of WR8ATV



**VK3RTV DATV Repeater Design**

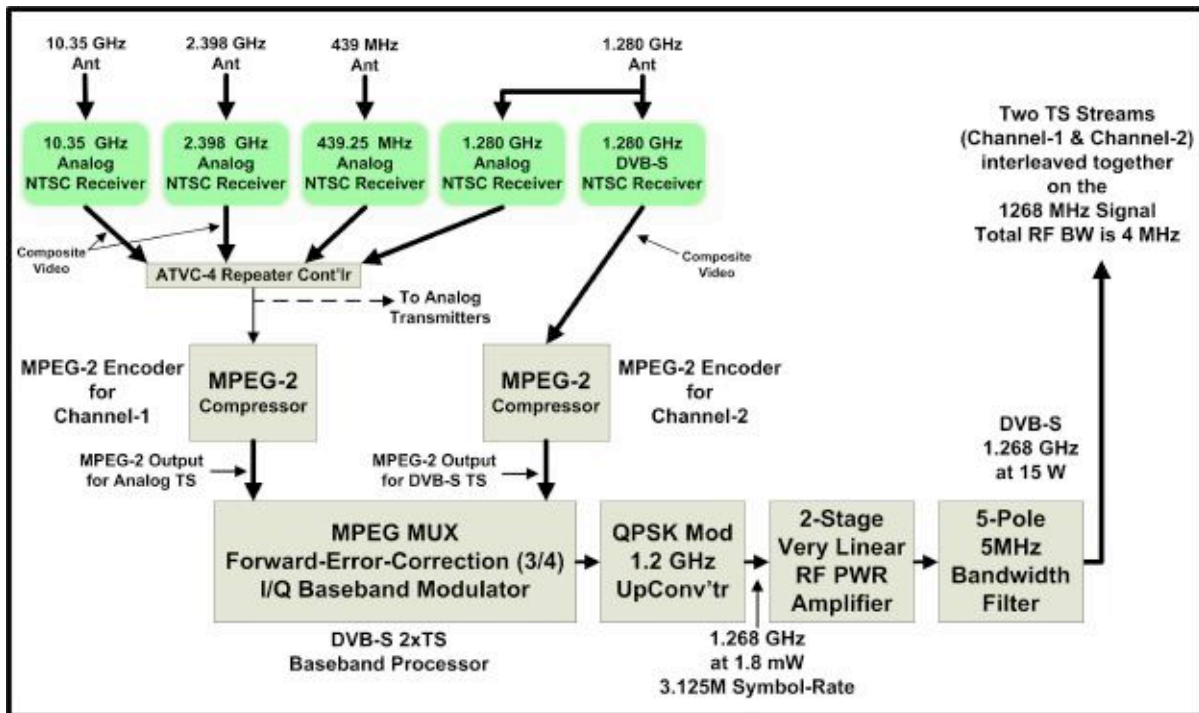
The VK3RTV Amateur TV repeater near Melbourne has been transmitting analogue ATV pictures for 30 years. In September 2009, VK3RTV began transmitting only Digital-ATV using the terrestrial standard, DVB-T. As Peter-VK3BFG, custodian for the VK3RTV repeater, told us "...The quality has taken a quantum leap over the old analogue to analogue system, although I felt a bit of a 'pang' when I decommissioned [the analogue repeater output]..."

The block diagram for the VK3RTV DATV repeater design is shown in Fig 4, on the following page. The VK3RTV DATV repeater design is also very complicated (in our minds):

- DVB-S Uplinks on 1.250 GHz and 1.280 GHz
- Analogue uplinks on 1.2 GHz and 10 GHz
- DVB-T Downlink on 446.5 MHz
- Downlink RF Bandwidth is 7 MHz
- Two Transport Stream Channels (2xTS)

The VK3RTV designers chose the DVB-S standard for the digital uplinks as DVB-S transmitters are currently a lot cheaper than DVB-T transmitters. Because the Aussies have a lot bandspace in Australia, they are using a symbol-rate of 5 M Symbols/sec for the DVB-S uplink transmitters that produces an RF bandwidth of 7 MHz. Most Europeans seem to be using 2 M symbol-rate for PAL which pixelates on very fast camera-pan motion.

Figure 2 – Block Diagram Showing WR8ATV DATV Repeater Design





The DVB-T downlink transmitter technology is easily able to interleave two channels of video (VK3RTV1 and VK3RTV2) on the same 446.5 MHz signal within a total RF bandwidth of 7 MHz. Channel VK3RTV1 displays either the input from the analogue 1.250 GHz receiver or the input from the DVB-S STB tuned to 1.250 GHz. If no signal is present from either receiver, a microprocessor controlled input selector switch inserts a TEST PATTERN. Channel VK3RTV2 displays either the input from the analogue 10.41 GHz receiver or the input from the DVB-S STB tuned to 1.280 GHz. If neither receiver signal is present, the input selector switch inserts a TEST PATTERN. The microprocessor input switching has DTMF inputs for controls and can also switch in a camera or DVD.

One aspect that we think is very clever is that the VK3RTV team decided to cut-off analogue repeater transmissions and go to 100% DATV output, but continued to allow the analogue uplinks. DATV Set-Top Boxes are cheap. This move forced all members to buy low-cost TerrestrialSTBs as STEP 1. But, at the same time this first move did not cut-off their home analogue ATV transmitters. It al-

lows members to migrate to the more expensive DATV home transmitters at their convenience. A very neat migration plan for moving from analogue-ATV to Digital-ATV!!!

Figure 5 – VK3RTV Screen Shot from First Tests

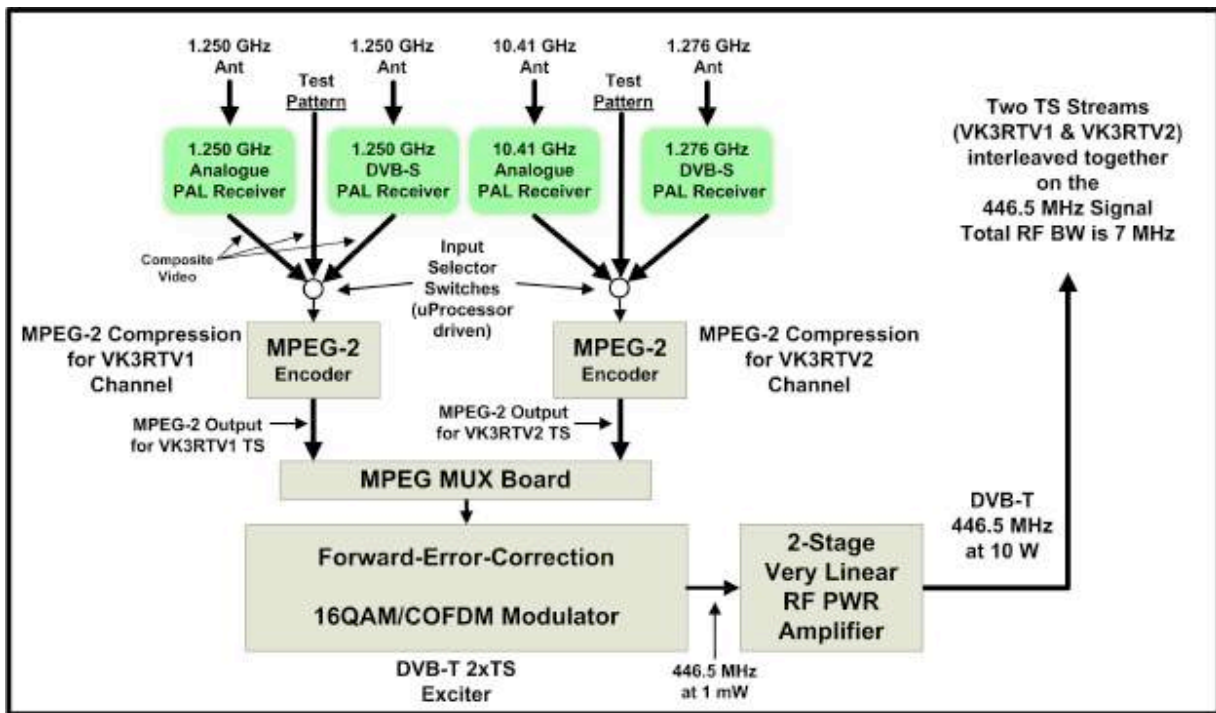


**Acknowledgments**

We would like to give special thanks to Peter Cossins VK3BFG for sharing detailed information on the VK3RTV DATV repeater and for answering our many questions, and also to Art Towslee WA8RMC for sharing detailed information on the WR8ATV DATV repeater and answering our many questions.

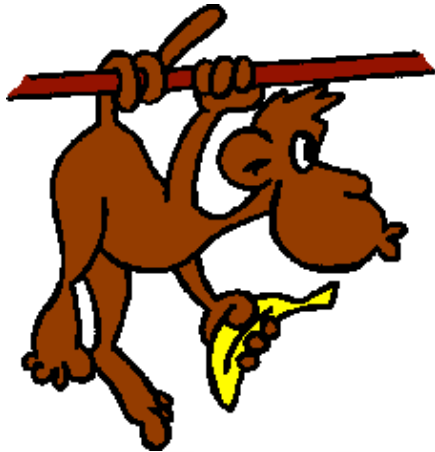


Figure 4 – Block Diagram Showing VK3RTV DATV Repeater Design



**Useful DATV Links**

- Melbourne DATV Station VK3RTV – see [www.VK3RTV.com/latest.html](http://www.VK3RTV.com/latest.html)
- British ATV Club - Digital Forum – see [www.BATC.org.UK/forum/](http://www.BATC.org.UK/forum/)
- Amateur Television of Central Ohio WR8ATV – see [www.ATCO.TV](http://www.ATCO.TV)
- OCARC newsletter series of DATV articles – see [www.W6ZE.org/DATV/](http://www.W6ZE.org/DATV/)
- TAPR Digital Communications Conference free proceedings papers – see [www.TAPR.org/pub\\_dcc.html](http://www.TAPR.org/pub_dcc.html)
- Ultimate Resource for Digital Amateur Television – see [www.D-ATV.com](http://www.D-ATV.com)



# Cooking at 2.4 GHz

*by Bob, Af6C*

## Monkey Brains\*

### Ingredients:

4 green bell peppers – medium sized (about 1 lb.)  
 1 pound of 85% lean ground beef  
 1/3 cup of finely chopped onion  
 1/4 cup of water  
 1 can (15 oz.) of tomato sauce  
 3 tbsp. of Parmesan cheese, grated.  
 1/4 tsp. of salt (or more to taste)  
 1/8 tsp. of ground black pepper  
 1/2 cup precooked rice (Minute Rice)

### Cooking Directions:

Prepare the four peppers by slicing in half lengthwise. Remove internal seeds and white matter. Rinse thoroughly.

Break up ground beef and put in a skillet. Brown meat over medium-high heat on stove, stirring in onions; drain. Stir in 1/2 of the tomato sauce, water, 1/2 of the Parmesan cheese, salt and pepper. Cover pan and heat over medium heat for five minutes.

Slowly stir in rice. Recover and let stand for 5 minutes.

Place prepared green peppers in a coverable glass microwave safe dish. Fill green pepper halves with the meat and rice stuffing. Use remainder of tomato sauce and Parmesan cheese to top the stuffed peppers. Heat covered in microwave for 10 to 12 minutes. Test peppers with fork to see that they are tender. Let stand, covered, in microwave for 5 minutes.

Serves 4 with a good sense of humor; 6 or more without!

### \*Name History:

Monkey Brains (originally *Stewed Monkey Heads*) is from an early *Calvin & Hobbes* Cartoon. Calvin's mom renames the Stuffed Green Peppers she's preparing to get Calvin interested in eating his dinner. Calvin is enthralled with this esoteric meal, but his Dad loses enthusiasm and his appetite.



**Board Minutes** continued from page 12.

- Ken W6HHC reported that we have had 5700 visitors to the ORARC website with the primary two pages were HAM Supplier Page and New to HAM Radio Page. He has also been busy with digital amateur television. He and Robbie KB6CJZ have written several articles regarding digital amateur television.
- Hank W6HTW reported some soldering issues have been remedied.
- George N6VNI told the group that he appreciated the appointment to the board and has enjoyed his time as Director-at-Large; he will continue to support the club in any way possible. He was disappointed that he lost but he knows the club will be in good hands with Larry K6YUI.

**OLD BUSINESS:**

- **RF Newsletter “Rotating” Editors**
  - December – Bob AF6C
  - January – Nicolas AF6CF
  - February – Kristin K6PEQ
  - March – Paul W6GMU
  - April – Kristine KC6TOD
- **Guest Speakers** – Kristin has the first 4 months – confirmed with speakers
- **QSL Mailing Status** – the club is up to date on QSL card mailings, suggestion for all who check into the January net will receive a club QSL card.
- **Morse code Class:** Morse code class to resume in February – the club will be asked at the next meeting “who might be interested.” Also, everyone needs to read Bob’s article “Why Morse Code is not dead!”
- **2010 Field Day Plans & Suggestions** – the board will put together a description of the duties of Field Day Chairman (Kristine was approached by a member at the November meeting regarding what needs to be done). This format will give a clear picture of what the Chairman/Co-Chairman would need to fulfill. Paul has volunteered to help with the plans of requesting the Walter Knott School in Buena Park as he had experience from last year. The Walter Knott School would be great because of the location and the amenities (such as grass, shade, parking and overall comfort).
- **Christmas Dinner date and preparations** – The Christmas dinner will be held on Friday night December 11<sup>th</sup> at 7:00 pm at the Jägerhaus Restaurant on Ball Road in Anaheim. Kristin K6PEQ is thrilled to have 45 people signed up for the Christmas party. She and Dan reported that the prizes are all taken care – great selection of nice prizes including a Yaesu FT-857. The restaurant provides the microphone and podium.

**NEW BUSINESS**

- **Audit Committee members** will be Ken W6HHC, Kristin K6PEQ, Kristine KC6TOD and George N6VNI
- **Honorary member’s renewal** – the motion was made by Paul W6GMU to renew the existing honorary members, seconded by Bob AF6C.

- **End of the year reports** - Nicolas AF6CF said that we had a great year with a very compatible board, he thanked everyone involved.
- **Red Cross Donation** – the specifics of writing the check will be clarified and will be handled as soon as possible.
- **Digital Amateur Television** – Ken would like to use the W6ZE license with the possibility of obtaining a [DATV -ed.] repeater. All this is in the planning stage.
- **REMINDER** – January Board Meeting – January 9<sup>th</sup>, 2010. [One week later than our normal date -Ed.]

Motion to adjourn by Bob AF6C, seconded by Paul W6GMU.  
Meeting adjourned 9:25AM

Respectfully submitted:  
*Kristine Jacob KC6TOD*,  
Secretary



**OCARC WEBMASTER REPORTS  
7,300 Visitors in 12 Months**

Last year on Dec 2nd 2008, the OCARC web site reached a magic number of 50,000 visitors since the club visitor counter was initiated in May of 1998. On Dec 02, 2009, twelve months later, another 7,300 visitors had come to our web page bringing the counter up to 57,300. Our web site front page uses a “Scotch visitor counter”, so even more visitors probably came. The statistics engine provided by our web-host, **1and1**, reports that we really had a total of 17,678 visitors to the home page of [www.w6ze.org](http://www.w6ze.org) in 2009 and had a total of 158,200 page views in 2009.

The two most popular pages on our web site are *Ham Radio Suppliers* followed by *New to Ham Radio*. Our newsletter is well read and many people look at our Field Day pictures.

As reported numerous times before, the club’s web site always earns DXCC from visitors each year. The top seven international countries to visit our website in 2009, listed in descending order are:



A sample of six of the less-common DX visitors include:







Left:

Club President Nicholas - AF6CF enjoys the snow over Thanksgiving weekend at the Mt. Piños Country Club (Near Frazier Park in California)

**COMMENTS FOR RF NEWSLETTER?**

Send your comments and corrections to:

[rf\\_feedback@w6ze.org](mailto:rf_feedback@w6ze.org)

**Next RF Deadline is: JAN 4<sup>th</sup> 2010**  
**[Board Minutes excepted]**

The **ORANGE COUNTY AMATEUR RADIO CLUB, INC.**  
P.O. BOX 3454  
TUSTIN, CA 92781-3454

***First Class Mail  
Time Dated Material.  
Please Expedite!***

***<http://www.w6ze.org>***

***December 2009 - RF Page 18 of 18***

**SPECIAL NOTE:**

Due to the proximity to New Year's Day and the many board members being out of town, the Breakfast / Board meeting has been moved one week for this month only. It will be held on the second Saturday January 9, 2010.