THE WEST AUSTRALIAN VHF GROUP BULLETIN

MAY 1995

THE WEST AUSTRALIAN VHF GROUP (INC)
P.O. BOX 189 APPLECROSS W.A. 6163

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MAY	*15*	*COMMITTEE MEETING*	*JUN*	*19*	*COMMITTEE MEETING*
	20	*FOXHUNT*		*24*	*FOXHUNT*
	22	*GENERAL MEETING*		*26*	*GENERAL MEETING*
JUL	*17*	*COMMITTEE MEETING*	*AUG*	*21*	*COMMITTEE MEETING*
	22	*FOXHUNT*		*26*	*FOXHUNT*
	24	*GENERAL MEETING*		*28*	*GENERAL MEETING*
SEPT	*18*	*COMMITTEE MEETING*	*OCT*	*16*	*COMMITTEE MEETING*
	23	*FOXHUNT*		*21*	*FOXHUNT*
	25	*GENERAL MEETING*		*23*	*GENERAL MEETING*

Western Australian VHF Group Newsletter P.O. Box 189, Applecross W.A. 6153.

Circulation is 66. This consists of 36 city and 9 country fee paying members, 15 life members some of whom have donated $10 to the club for the bulletin costs and 6 courtesy copies of the bulletin.

CW Keyer Now Available

Due to the efforts of Don VK6HK club members can now purchase a board and circuit diagram and a computer program which will let you program whatever you want your keyer to transmit ready to be burnt into an eprom. This short form kit is available from Ces VK6AO.

5.4 GHz Contacts between VK6ZAY and VK6ZWZ

Al VK6ZAY and Alan VK6ZWZ have had successful contacts on 5.4 GHz over the past several months with contacts of over 9 kilometres with S3 signal reports both ways. These efforts will undoubtably see the record for 5.4 GHz in Western Australia fall.

1296 Beacon Transmitter Completed by Al VK6ZAY

The 1296 MHz beacon transmitter has been completely rebuilt by Al VK6ZAY as part of the upgrade of the beacons by the beacon committee. The 1296 unit has been delivered to Don VH6HK who is rebuilding the exciter.

Satellite Variables Used for Tracking

The elements used by tracking programs are based on a set of variables calculated for one instant of time from radar tracking of every orbiting body by NORAD. The amateur satellites are registered with NORAD as numbered bodies and weekly keplerian elements are published and distributed throughout the world.

Zero Point on Earth

This is the point on the equator where the SUN crosses from south to north on September 21.

1. Epoch Time

This is the time in years and decimal days that the radar image is taken and the time that all the elements are calculated

2. RAAN Right Ascension Ascending Node

This gives the number of degrees east of the zero point that the satellite crosses the equator from south to north.

3. Inclination

This is the angle between the path of satellite and the equator as the satellite crosses from south to north

4. Argument of Perigee (Point of orbit closest to the earth)

This is an angle measured along the ellipse of the orbit from a line drawn from the centre of the earth to the point on equator that the satellite crosses going south to north and a line drawn from the centre of the earth to the perigee point of the orbit measured in the ascending or northward direction. If the perigee point is in the northern hemisphere the argument of perigee would have a value between 0° and 180°, if it were in the southern hemisphere the argument would have a value of between 180° and 360°.

If the satellite has an inclination of 63.4° the argument of perigee stays constant. If the inclination is less than 63.4° then the lowest point of the orbit moves in a positive direction, if inclination is greater than 63.4° then arg of perigee moves negatively.

Oscar 13 currently has an argument of perigee of 2.5 degrees and it is moving north. This means that is passed the equator a few months ago and it means that the southern hemisphere is getting the best pointing angles. It is orbiting in line with the sun. This is why for six months of the year it has to be angled away from the earth to keep the batteries charged.

5. Eccentricity

This is measure of the eccentricity of the ellipse of the orbit

6. Mean Motion

This is number of complete orbits a satellite completes in a day

7. Mean Anomaly

This is an angle measured at Epoch Time that indicates where the satellite is along its orbit. It is measured using the perigee point as zero. This angle changes continuously with time as the satellite moves around its orbit.

Satellite Fun on 2.4 GHz
Construct Your Own Downconverter from the VK5 VHF Group

Three of these units have now been built in West Australia. The first by Arnold VK6VV and this has had many mode S contacts using it with a Downeast Microwave Preamp and a 2 metre dish, the second by Bruce VK6BMD and the third by a long time mode B and 9600 baud microsat user Ron VK6AKI. A fourth and fifth are under construction by two amateurs in the country Homer VK6JHN and Andrew VK6JBL.

The three units built by VK6VV, VK6BMD and VK6AKI have tested out fine and work well. The building is straight forward and with the right test gear and knowledge can be made to work quickly without too much heartache. You just need to solder the right parts in the right places and wind coils correctly. The most important thing is to adjust the coils until they work correctly. You must be extremely patient and work systematically recording the output changes as you adjust the coils.

Hints and Essential Information

1. Make sure you READ ALL supplied instructions very carefully and follow ALL INSTRUCTIONS EXACTLY.

2. Check your kit on arrival for missing parts and get back to Ces VK6AO and he will quickly arrange for the missing parts to be provided.

3. Get a fine tip soldering iron and some fine solder. You are soldering chip components which are easy to do with small irons and fine solder

4. Lay out white paper on your building area and do not open any packet over the floor or over a rough wooden benchtop. These parts are so small that if you drop them on the floor they are lost forever.

5. Build the Oscillator first.

The critical requirement of this unit is that the output of the oscillator must be at least 0.6 volts preferably 0.7 volts using the detector circuit shown in the construction article. Without sufficient oscillator input to your x4 multiplier board you will not get enough output (minimum required 0.3 volts preferably 0.5 volts on the detector) and your receiver will be deaf and not work.

Do not install the crystal or the toroid initially. Instead install a 47 ohm resistor in their place and ensure that the tank circuit is oscillating at 94 MHz. It will most likely be oscillating at around 75 MHz and you must adjust the number of turns on the coil until it oscillates at 94 MHz. Try using 6 turns CW on 1/8 " diameter with 10 pF. Then you can install the crystal and toroid.

Measure the output using the detector. It will most likely be only about 0.1 volt. You must adjust the coils L3, L4, L5, L6, L7 and L8 (not the crystal frequency coil) on the board carefully starting with L3. Carefully observe the effect on the output of your adjustments. In my case I had much adjustment of small coils L7 and L8 this brought the output from 0.1 volt to 0.4 volt. Then much adjustment of coils L6, L5, L4 and L3 brought the output to 0.5 volt. I then changed R9 to 180 ohm and this brought the output to 0.64 volt.

Do not progress beyond this point until you have achieved at least this level of output.

6. Coax Cable Lengths Are EXTREMELY Critical.

After much experimentation by both Alan VK6ZWZ and Arnold VK6VV this has been solved and use of the following lengths will give reliable results. Ensure that the coax length between your oscillator and your x4 multiplier board is 275 mm long and between the x4 multiplier board and the receiver is 225 mm long.

6. Build the x4 Multiplier Board.

This is very straight forward. Drill the board so that the Mars chips can sit flush with the board. Similarly for the diode. I held down the chip caps with a toothpick and soldered each end of them with a very fine soldering iron I then used a solder sucker to suck up the excess solder so that the Mars chips could lie flat on the board.

It is extremely important that you solder at least 25 mm wide brass strips on either side of the board. I did not bother to solder any onto each end. Without the 25 mm wide strips this board will not work.

If you do not have at least 0.3 volts output go back and check that

a) Your oscillator is Oscillating at the correct frequency. The x4 board rejects all incorrect frequencies.
b) You have at least 0.6 volt at the oscillator board using the detector.
c) The length of the coax between the oscillator board and the x4 board is 275 mm long.
d) You have correctly fitted 25 mm wide plates along each side of the board for the full length.

If all of the above are satisfactory then you must adjust the coil L1. Try winding the coil on a smaller drill and monitoring the effect of all changes. Continue until the output is at least 0.3 volts.

7. Build the receiver board.

Drill holes for the Mars chips but not for the 1302. Again use a toothpick to hold down the chip capacitors while soldering. Carefully cut the leads on the 1302 to suit the 2 x 10pF through the board connections. You will not have to make any adjustment to the copper strip stub on the gate of the 1302. Experimentation by Arnold VK6VV and verification by Bruce VK6BMD and Ron VK6AKI shows that there is no requirement for this to be adjusted. Ensure you fit the toroid T12-6 in the drain and make the coils exactly as detailed on the drawing.

I soldered an N connector directly onto the receiver board. This required cutting away 3/4 of the protruding piece of the connector to ensure the connector was flush with edge of the board and to clear the 4 turn coil. I screwed it onto a piece of brass soldered at right angles to the board with reinforcing edges going onto the board for stiffness. I made a similar bracket out of brass for a BNC connector which I mounted above the board so that the 1 nF capacitor soldered into it. This enabled me to mount the receiver board and x4 multiplier board onto one side of a 150 mm x 90 mm double sided copper board with the oscillator board on the other side.

8. Signal Source for 2.4 GHz

Make use of the 100 MHz board found in the 70 cm exciters sold by the VHF group. Make yourself a crystal oscillator using a 24 MHz, 25 MHz, 48 MHz, 50 MHz, 96 MHz, 100 MHz or 150 MHz crystal. These all multiply up to 2400 MHz.

9. Test Antenna

The reflector can be made from 125 mm square or round 1.6 mm Aluminium plate.

The helix is 3.3 mm diameter copper wire which can be 1/2 meter of the inner of Belden 9913. Wind about 4 turns onto a 40 mm former. You can use a socket from a tool kit or any container from the kitchen. Wind it left hand that is opposite to a normal screw thread. Now carefully stretch the helix to a turn spacing of 28 mm. Cut off about 1/4 turn so that any distorted piece is removed. Bend the first 1/4 turn so that it is parallel to the reflector. This will form the matching section. Solder onto this first 1/4 turn a piece of brass shim 6 mm wide to follow the curve of the 1/4 turn.

You should now have a helix which has a piece of brass shim soldered to its first 1/4 turn essentially flat to the reflector. Cut off the surplus turns so that you have a total of 2 1/4 turns including the matching section. Finally solder the helix to an N connector attached to the reflector so that the helix is set at the middle of the reflector. The spacing of the matching section should be 1.2 mm from the reflector at the N connector to 3 mm at the end of the 1/4 turn match.

Without this antenna you will not be able to hear the source as you must have a correct antenna to receive signal.

10. Final Results

The VK5 satellite receiver was then tested against my UEK2000 from SSB. With the same antenna receiving my signal source the UEK2000 gave a signal strength of S9 and the VK5 satellite receiver gave S7. This was compared with the original VK5 transverter 2.4 GHz receiver which gave S2. All three units have no S metre reading on the Yaseu 290R with the source switched off. There is a considerable improvement in the satellite version of the 2.4 GHz unit over the original transverter receiver and its performance compares favourably with a commercial unit which publishes noise figures of 0.6 dB.

Ron VK6AKI has built the 1 metre dish that was previously published in this bulletin.