



International HAM Magazine - 100% HAM RADIO

SPECIAL QRP ISSUE



*French island QRP
DX-Expedition*



*QRP CW transmitter
For 10 MHz*



RV3APM's QRP station

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POST-IT !

The breaking News



HAM-MAG has changed !

As we have not found any business collaboration we have decided to change Ham-Mag. Since January, 21st 2010 Ham-Mag is an association.

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Every OM / YL who will send an article for a publication in Ham-Mag will be active member for free (for 6 months / 6 issues).

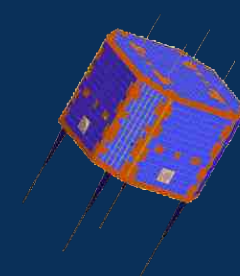
This is the only way we have found to continue this adventure.

SILENT KEY

Rich, W2VU, from CQ Magazine, reports: "It is with great sadness that we report that our friend and longtime colleague, Dave Ingram, K4TWJ, became a Silent Key this morning (Jan. 20), as a result of complications from a massive heart attack he suffered on New Year's Eve. Dave has been writing for CQ at least since 1981 and has been a CQ columnist since 1982, starting with an amateur television column called World of Video. That column eventually broadened its outlook and became World of Ideas, Dave's signature monthly column in CQ. Regular topics included code keys, stealth antennas, building 'new vintage' tube gear and mobiling. In addition, for the past decade, Dave has been CQ's QRP (low power) Editor and 'How it Works' columnist. His enthusiasm for whatever caught his interest was contagious and spread widely through his informal yet educational writing style. Funeral arrangements are not complete as of this writing. We will post additional information on the CQ website news page when it becomes available. Condolence cards may be sent to Dave's wife, Sandy, WB4OEE, at their Callbook address."

NEW AMATEUR RADIO SATELLITE HO-68

On 15 December at 0230 UTC China launched its first Amateur Radio satellite Xi Wang 1 (Hope 1) from the Taiyuan Satellite Launch Center in Shanxi province. It received an official OSCAR (Orbital Satellite Carrying Amateur Radio) designation of HO-68 six days later.



AMSAT China (CAMSAT) ran a special event station BT3WX from Taiyuan to commemorate the launch. They hope that the satellite will inspire radio amateurs and young people to learn about amateur satellite communication technology and space.

The 68 by 48 cm satellite weighs 60 kilograms and is in a 1200 km high Sun-synchronous orbit that enables contacts between stations over 5000 km apart. The communication payload includes a CW beacon and three crossband (145 to 435 MHz) transponders for SSB/CW, FM and digital AX.25 packet operation.

The transponders were activated a few days after launch and hundreds of contacts were made over the Christmas holiday period. The linear transponder, used for SSB and CW working, has proved very popular. It has a bandwidth of 50 kHz which allows about 10-15 simultaneous contacts to take place and sounds like the 20 metre band.

On 30 December Mike DK3WN and Henk PA3GUO showed you could also send pictures through the SSB transponder when they carried out the first Slow Scan TV (SSTV) contact.

Due to Doppler shift the CW beacon can appear to be up to +/- 9 kHz from its nominal frequency of 435.790 MHz and you need to tune your receiver to follow it during the pass. The beacon has been received on simple antennas such as a ¼ wave ground plane but for best results try a small yagi with about 8 elements.

To reduce the effects of Doppler the SSB transponder is inverting. This means that a LSB signal on the uplink becomes a USB signal on the downlink. You don't need much power to work through the satellite, many contacts have been made using 5 watts output. Always use the lowest power possible and ensure your downlink signal is never stronger than the beacon.

Mode	Uplink MHz	Downlink MHz
CW Beacon		435.790
SSB / CW	145.925 - 145.975	435.765 - 435.715
FM (67.0 Hz CTCSS tone required)	145.825	435.675
AX.25 1200 bps AFSK	145.825	435.675

HO-68 video by PA3GUO : <http://www.youtube.com/watch?v=o6oDgUTHCwg>

HO-68 Real Time Tracking (tick draw footprint): <http://www.n2yo.com/?s=36122>

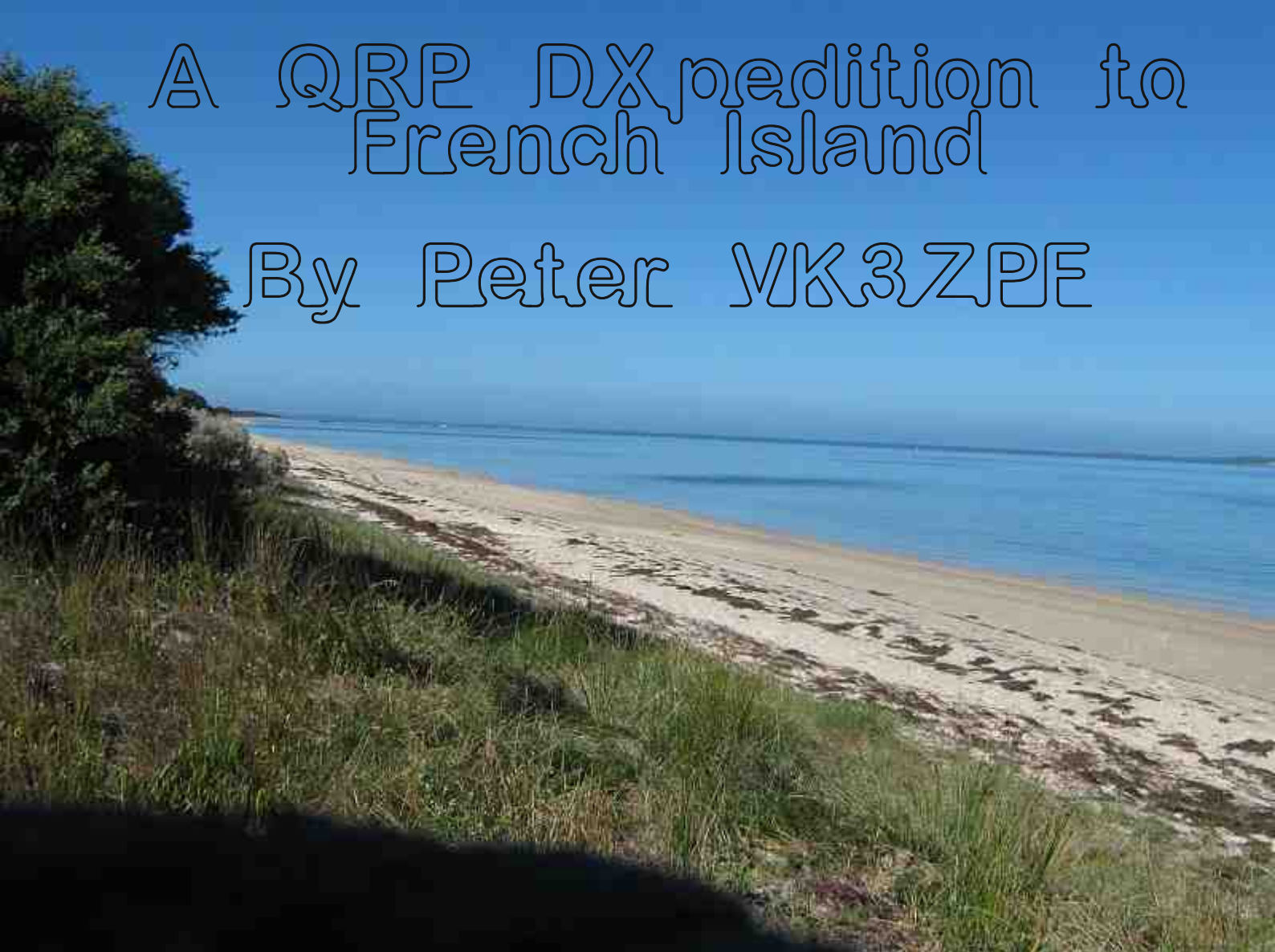
AMSAT-UK: <http://www.uk.amsat.org/>

SSTV pictures exchanged by DK3WN and PA3GUO :



A QRP DXpedition to French Island

By Peter VK3ZPF



French Island is an island in Westernport on the south east coast of Australia. The French Island National Park occupies two-thirds of the island. One weekend in January four amateur , VK3ZPF, VK3FRST, VK3YDF and VK3TST set off to activate the National Park as part of the Keith Roget National Parks Award. The island is between 2 and 5 kilometres from the mainland and can only be accessed by boat.

This is their story.



Saturday morning came around and Peter VK3ZPF made the final adjustments to what he was and was not taking on the trip. He weighed the pack and it came in at 25 kg. This was a bit heavier than he wanted but Adam VK3YDF had said we would have room available to take some stuff if need be.

As Peter headed off up the freeway to pick up Adam he got a text message from Hayden VK3FRST saying that he was unwell and wouldn't be joining us. This was a disappointment as Hayden was the first to put his hand up to join Peter on the island trip. This also meant that the 40/80 m dipole, two batteries, an SWR meter and an IC7000 that Hayden was bringing wouldn't be there either.

Anyway, there was still Peter, Adam and Marcus VK3TST coming along so it was still worth going ahead. Peter picked up Adam and Adam tells Peter that he hasn't got his new camera yet so Peter says he can take some photos with his camera instead. There is about \$1500 difference in the cameras but, having seen the photos Adam took, the quality of the camera is only one aspect of a great photo.

Adam and Peter arrive at Stony Point about 45 minutes early and set about finding where they should park. For \$4.40 per day they can park in the car park at the back of the caravan park. This sounds like a good option so they pay 'Lumpy' at the gate the money. Lumpy is the gate keeper, if you like, and Adam reckons he knows everything that comes and goes from the island.

Lumpy asked Adam and Peter a few questions about what we would be doing on the island. Peter didn't tell him about the radio stuff as sometimes it's just better to gloss over such details. Lumpy warned them to stay on the tracks and keep a lookout for snakes. Lots of snakes on the island was his comment. 'Sometimes you can see them sunning on the beach.'

The group had been warned about the mosquitoes, March flies, and sand flies but nobody had told them about snakes, until now.

After parking the car Adam and Peter went and bought the ferry tickets. \$21 to get over and back. Again they got asked what they would be doing on the island. There seems to be a common theme here.

After a short wait Marcus arrived and he too went and paid for parking and then bought his ferry ticket.

The ferry left right on time and the group were stepping off at Tankerton Jetty 15 minutes later. Already the day had started to warm up and sitting in the ferry was not all that pleasant as it has lots of glass and no air-conditioning.

They loaded our packs on and headed off toward the east. After about 800 m there is a junction with the coast road and the group turned left and head north. The trip to the camp proceeded as planned and they stopped three or four times in the shade to refresh with water and re-apply sunscreen.

Once at the camping ground the group set about finding a suitable place for the antennas and tents.



There were four main options available as some other tents had already been erected.

One area to the south was quite small, covered and shaded, one area to the far north was exposed with no tree cover and two areas, side by side, in the middle. One was exposed with some stumps and the neighbouring area was lightly treed with some shade. This looked ideal for use as it gave room to set the squid pole as a loop or ground plane and gave Marcus a tree or two to set the 30m and 17m dipoles.



Peter started setting up the 20m quad loop and Marcus picked a suitable tree and started throwing my hammer up to try and get a rope over. After 4 or 5 attempts, a couple that got a little stuck, Peter gave it a try and got the hammer very stuck. After pulling the rope in a variety of directions it dawned on the group that they could try using the squid pole to push the hammer out of its position. To Adam's and the other campers amusement, Peter and Marcus managed to get the hammer free and drop it down along with the rope ready for Marcus to hoist the dipoles in the air.

Peter put the squid pole back on the stump and got the 20m quad loop ready for action. Peter made a contact into VK6 after just a couple of calls and this satisfied the award requirements. He then called CQ using VK3SAT and worked one other station on 20m.

Marcus had got his antennas up and started setting up his FT-817 when he realised he had left the microphone at home. So the group now had only 1 radio.

So they were down two radios and the 40/80 dipole, had antennas in the air for 30m and 17m but no radio to work them, no SWR meter to help build an 80m antenna and only 3 instead of 5 batteries. Not the ideal start. However, on the positive side they did have 20m and 40m and the FT-7 was unlikely to flatten all 3 batteries in a weekend.

Peter re-jigged the squid pole to be a 7 MHz 1/4 wave ground plane and they set about making some contacts on the 40m band. This proved to be the most productive band with 20 of the 22 contacts being made on 40m.

Peter worked 40m and the group moved around a little trying to keep out of the sun as best they could. Adam rigged a tent fly as a shelter and this blocked the sun for the few hours that they were exposed.

None of their published skeds on 20m, 40m or 80m gave any contacts. There may have been stations waiting on 17m or 30m but without a radio to work them the group wasn't there.

The group made contact twice with the scout Jamboree station V12AJ2010 on 40m before dark.



In an attempt to keep our Saturday 80m sked Peter added some base load to the 1/4 wave 7 MHz antenna and gave it a try on 80m Without an SWR meter it was just an educated guess. The group got one contact really quickly on 80m but that was it. Nobody else seemed to be able to hear them over their own noise. After calling and getting nowhere on 80m, and just after it got dark, the group headed off to bed.

In the morning 80m was a lot quieter but still no answers to their calls. Again 40m proved to be a very useful band and the group made 8 contacts on 40m for the morning.

Just after 11:00 am they packed up and headed back to the ferry.

The group got to the jetty 5 minutes before the ferry was due and it was 10 minutes late anyway. 20 minutes later the group was back on the mainland having achieved everything they had set out to do, and more.

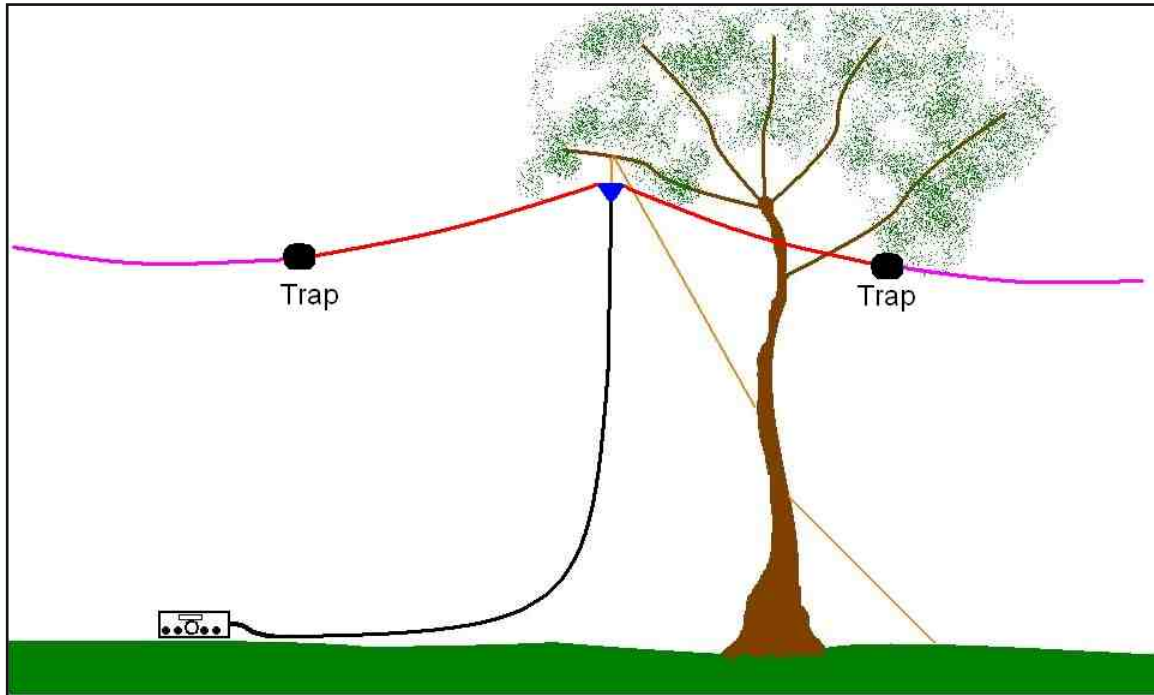
However the group had seen very few mosquitoes or flies and no snakes or koalas.

73 - Peter VK3ZPF

<http://vk3zpf.blogspot.com/>

40 & 80 m Portable Trapped Dipole

By VK3PZF



Sometimes the need to operate on two bands from a single antenna is required. Although a combined antenna is a compromise over two separate dipoles, sometimes the available space or supports prohibit such.

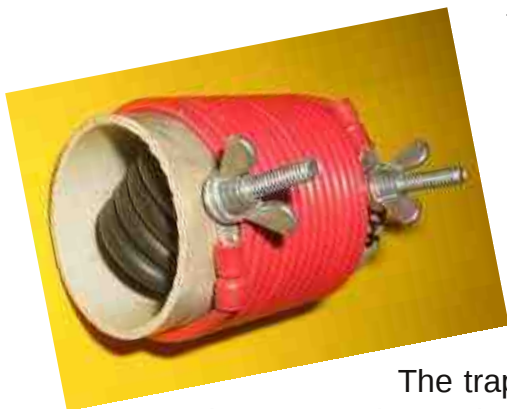
One compromise antenna I have used is a trapped dipole.

A trapped dipole relies on parallel tuned traps to 'disconnect' the additional wire when used on the specified band. The antenna described here is for operation on 40 m and 80 m.

At the resonant frequency the two traps shows a high impedance, in series with the antenna wires, and very little RF energy goes past the trap. As a result the antenna 'looks' electrically shorter than it really is. At frequencies

other than the resonant frequency the traps pass nearly all the RF energy past the trap to the rest of the antenna.

Looking at the sketch above, when working 40 m only the red wires are part of the antenna but when using 80 m the red and purple wires are the antenna.



Making the 40 m traps

The traps consist of 15 turns of insulated wire wound on a 42 mm OD PVC pipe 60 mm long. The wire I used is plastic coated, 2.25mm external diameter. The inner conductor is 24 strands of 0.2 mm diameter copper. The wire is terminated at each end with a crimp eye lug.

Inside the coil is a length of RG58 coaxial cable about 800mm long, open at one end and terminated to eye lugs at the other end.

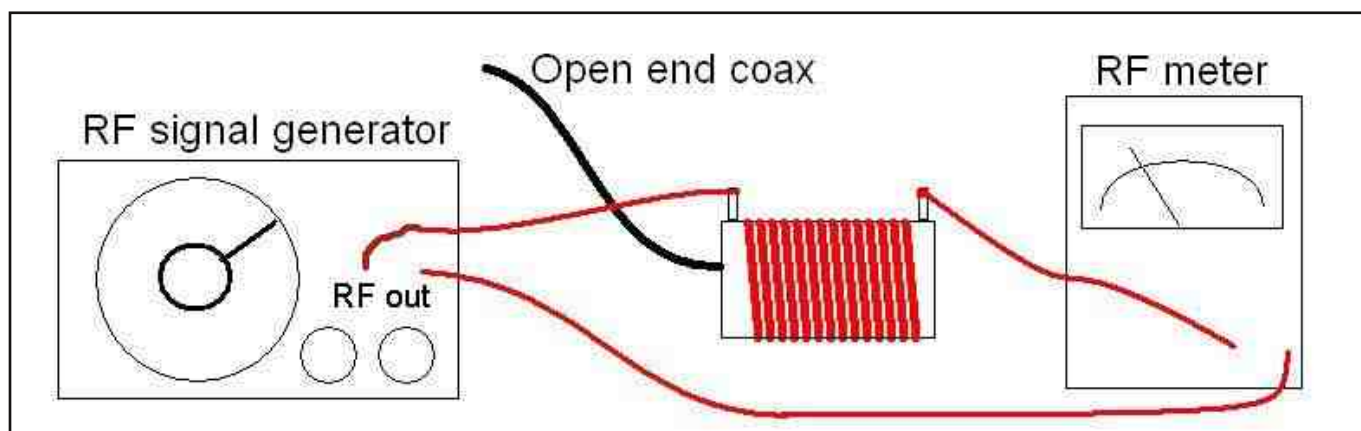
At each end of the PVC pipe I have drilled a hole and a bolt, inserted from the inside, joins the coax lug to the coil lug, with the coax on the inside and the coil on the outside. As this is a portable antenna I have included wing nuts to allow the antenna wires to be easily attached and removed.

Once assembled wrap the coil with PVC electrical tape to hold the coil in position before proceeding to tune the trap.

Once assembled the open ended coax is trimmed until the trap is resonant at the frequency of desired operation. Some texts suggest tuning either higher or lower than the desired frequency of operation, but I have had good results with traps tuned on the frequency of interest.

Tuning the 40 m traps

Tuning can be done with either a GDO or a signal generator and RF meter. I use the latter method.



Using the set up above, tune the RF generator until the RF meter dips sharply. This is where the trap is resonant. This should be below the desired frequency before trimming is commenced.

Trim a small amount off the open end of the coax. Retune the RF generator to the sharp dip again.

Repeat this process until the trap is resonate near your desired frequency. Before reaching the desired frequency tuck the coax inside the pipe, leaving about 50mm sticking out one end. Continue tuning until the desired frequency is achieved. Fine tuning can be achieved by trimming only the braid, as shown above, rather than both the braid and the inner. Once tuned cover the open end of the coax with PVC tape and tuck into the pipe. Repeat with the second trap.

Tuning the antenna

Once the traps are tuned the antenna is constructed and installed into position for final tuning. The 4 antenna wires should start about 11m long before tuning. During the tuning process it is OK to strip and wrap the wire around the bolt until the final trimmed length is achieved. Once the final length is found terminate the antenna wire in an eye lug at each end. I found the best results by first trimming the 40m wires until the SWR was about 1.8:1 on 40 m then tuning the 80 m wires until the SWR on 80 m was about 1.6 :1.

With each band close to tuned I alternated trimming between 40 m and 80 m until an SWR of 1.3:1 or better is achieved on each band. When tuning trim about 20 mm off the wire each time. There is interaction between each wire and you will notice the 80 m SWR is affected each time the 40 m wires are trimmed and a lesser change to the 40 m SWR when the 80 m wire is trimmed. Once the tuning is complete the antenna wires should be terminated in eye lugs for ease of future set up.

Adding 20 m traps

Two 20 m traps can be added to include a third band if desired. For 20 m traps use 9 turns of wire on a 42 mm PVC pipe and 500 mm of RG58 coax to begin with.

The antenna wire lengths before trimming are 5.5 m between balun and 20m trap, 5.5 m between 20 m trap and 40 m trap and 11 m between the 40 m trap and the end of the antenna.

The tuning process is the same as for the 40/80 dipole, except the 20 m wires are trimmed first to an SWR of 1.8:1, followed by the 40 m wires then the 80 m wires. Repeat until the SWR on each band is below 1.3:1.



73's ! VK3ZPF

'Bawdsey Research Station' Commemorations 2010

Special Event Stations

In recognition of the historic events that took place in 1935 and 1940 which played a significant part in Britains war effort, Bawdsey Manor will be activated on three separate occasions during 2010.

During its time as a radar research centre and as an operational station for Chain Home radar, it was known by the acronym BRS – Bawdsey Research Station. Special event callsigns with BRS as the suffix have been applied for to recognise this.

Over the weekend of 26 to 28 Feb 2010, we will be on the air on HF, 6m and VHF, operating CW, SSB and possibly some digital modes too. The callsign requested is GB75BRS, since this operation will commemorate the 75th anniversary of the Daventry Experiment, which resulted in radar development in the UK being based first at Orfordness, then at Bawdsey.

Later in the year we will operate on two weekends to commemorate the 70th anniversary of the start and end of the Battle of Britain in 1940. The callsign GB70BRS has been requested. These weekends will be 5/6 June, and 18/19 Sept. Operating bands and modes will be as for the February event.

Members of the public, and students from the school now based at the Manor, will be welcomed at any of the events, where there will also be display materials relating to Bawdsey's history during this period.

A special QSL card will be issued to those making contact with either of the stations, and a parchment certificate will be available on request to stations who make contact with both callsigns – information about the stations, operation and QSL arrangements can be found on our web site at <http://bawdseyresearchstation.org.uk>

Contact: Dave Powis, G4HUP
g4hup@btinternet.com

tel: 07777 648488

GB75BRS at Bawdsey Manor, Suffolk JO01qx

On the 75th anniversary of the Battle of Britain we are commemorating the work of **Robert Watson-Watt** and his colleagues in the development of airborne radar.

Thank you for the QSO

www.bawdseyradar.org.uk
www.<gb75brs>.org

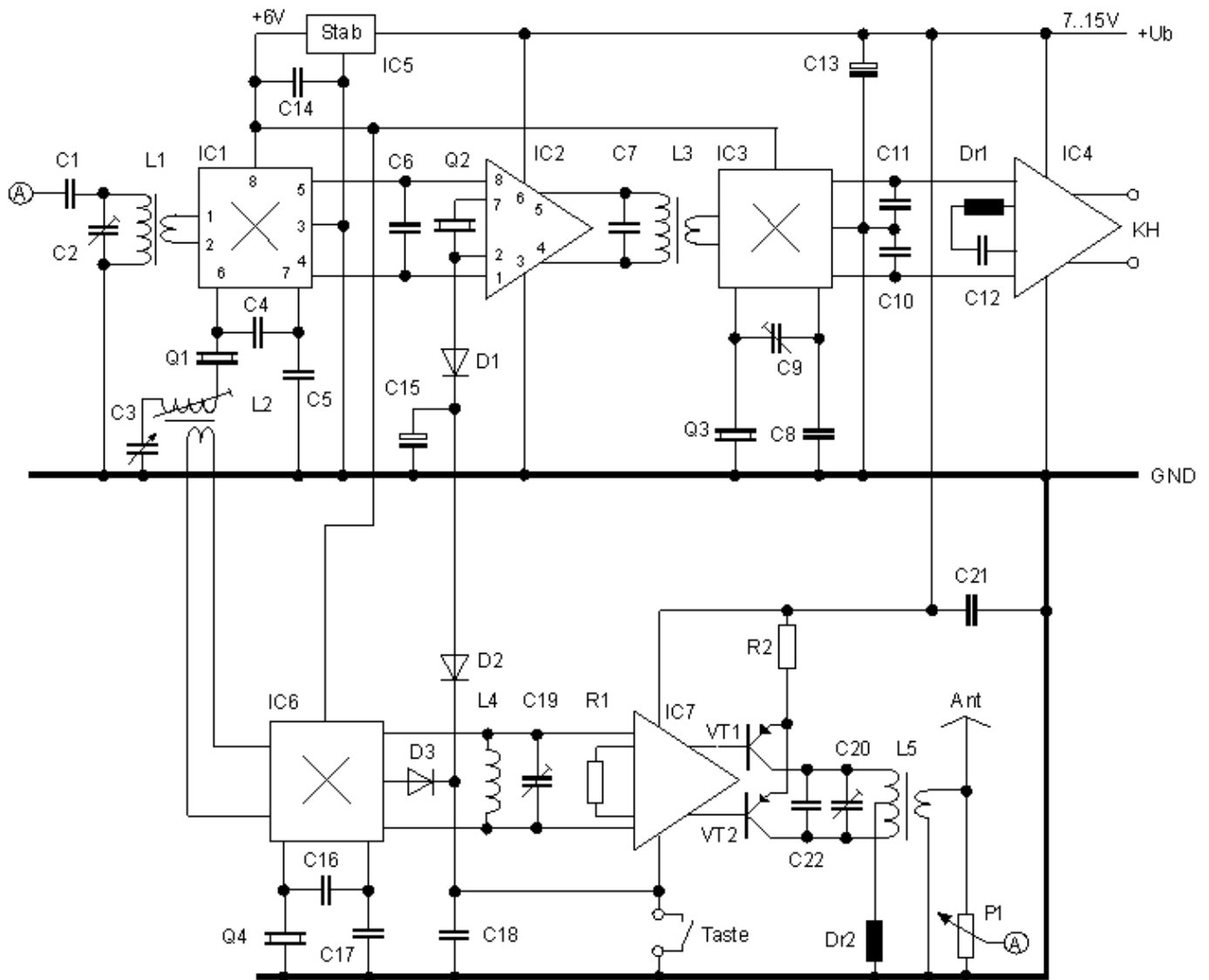
QSO	Date	UTC	MHz	RST	Mode

GM47: SIMPLE 30M BAND QRP CW-TRANSCEIVER

By DL2YEO

This simple QRP transceiver for the 30 m band did not result from a detailed requirement profile. I simply had some NE592 broadband amplifiers in my junk box, waiting for an application. After performing some tests, that application was quickly found: The amps should become part of a superhet transceiver. There is need for amplification in several places in such a rig, starting from the IF, over to the AF, and up to the RF for driving a push-pull final.

Fig.1: Transceiver schematic

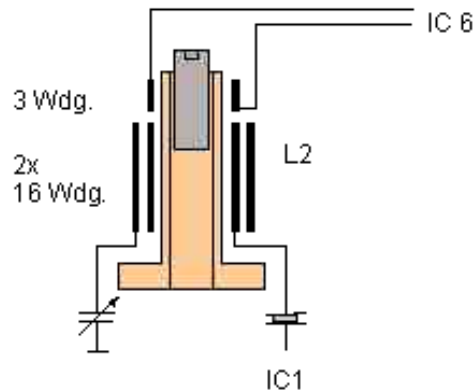


Variable crystal oscillator VXO

The high crystal frequency of 14318 kHz allows a pulling range of 20 kHz without special tricks. You can tune the reception range from 10100 kHz to 10120 kHz using the coil L2. Some tests with the number of turns of the coil are recommended here, such tests are commonplace when setting up a VXO.

The oscillator signal is coupled into the transmitter mixer through a small link winding on L2, so the Tx mixer can be driven symmetrically. I first tried a capacitive connection, for example 10 pF at pin 7 of IC 1, but found that too much of the rig's own radiated RF got picked up that way.

Fig. 2: Detailed view of L2



Rx mixer and IF amplifier

The Rx mixer is followed by a IF stage featuring an NE592. The mixer's balanced output is directly connected to the amplifier's differential input, minimizing component count at this point. I got a sufficiently narrow bandpass action for the selection of the intermediate frequency using a single 4194 kHz crystal as the only Z element.

Product detector and AF amplifier

The second mixer operates as a product detector. It is followed by a NE592-based selective audio amplifier. The RF portion of the mixer's output signal is suppressed by the two capacitors C10/C11. The remaining AF signal is directly fed into the differential input of the NE592.

The AF stage's frequency response is determined by the series resonant circuit DR1/C12. The stage has a gain of 42 dB at a measured center frequency 660 Hz. The volume adjustment takes place with the RF attenuator P1 close to the antenna input.

Headphones with an impedance of at least 1 kOhm are mandatory here, due to the relatively high output impedance of the NE592. A LM386 is actually the preferential component for driving headphones, or a 8 ohms loudspeaker. But I wanted to try something different this time.

Tx mixer, driver and power amplifier

A NE592 does its job also here. Due to its relatively high input impedance, it can be attached directly to the parallel resonant circuit L4/C19. Its 8 mW power output of the broadband amp is sufficient to drive a small push-pull transistor stage.

One pair of PNP transistors 2N3906, together with the tuned tank circuit C20/C22/L5, produce an optically clean sine wave. A measurement of the output spectrum showed the second harmonic to be down -70 dB and the third -37 dB, when compared to the power output at the fundamental frequency. The maximum power output is about 1.5 W when the unit is supplied with $U_b=13.8$ V.

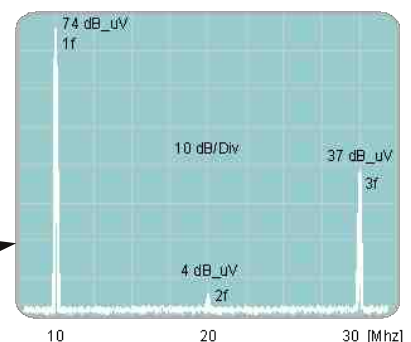


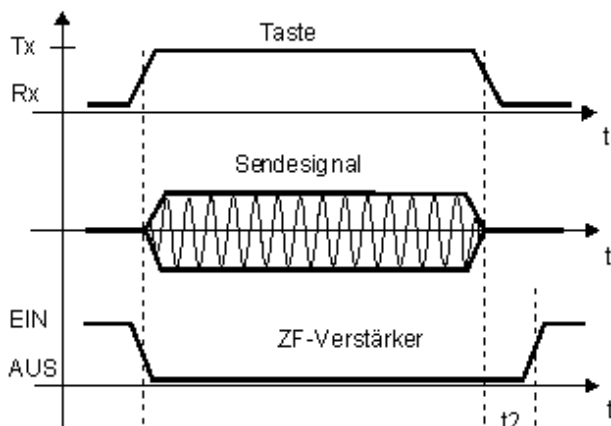
Fig. 3: Measured output spectrum

Rx/Tx control

During transmit, the IF stage is muted with two schottky diodes D1 and D2. Pulling the emitter of the first transistor pair inside the NE592 against ground via pin 2 looks somewhat brutal, but it works. The receiver is almost deaf and only the own transmit signal is audible as a side tone in the background. The delayed starting of the crystal oscillator Q4, and hence the delayed generation of the transmit signal, reduces the intensity of on-clicks. A change from transmit to receive disables the transmit stage by disconnecting the Tx mixer and driver from ground potential. The IF stage becomes operational some delay t_2 later, after C15 has been charged through IC2 and D1. This delay reduces the audibility of switch-off clicks to a tolerable level.

This Rx/Tx control circuit has been found sufficient for a medium keying speed, but requires a low key on resistance. When connecting an electronic key to this rig, a $0.47 \mu\text{F}$ capacitor between pin 1 of IC6 and the cathode of D3 noticeably improves the switch-on behavior.

Fig. 4: Rx/Tx timing



Power supply

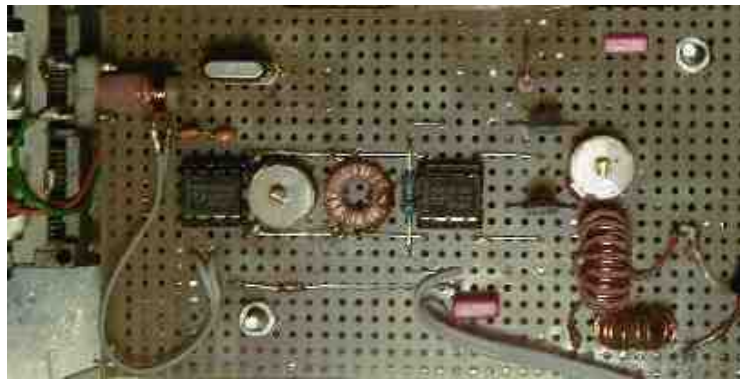
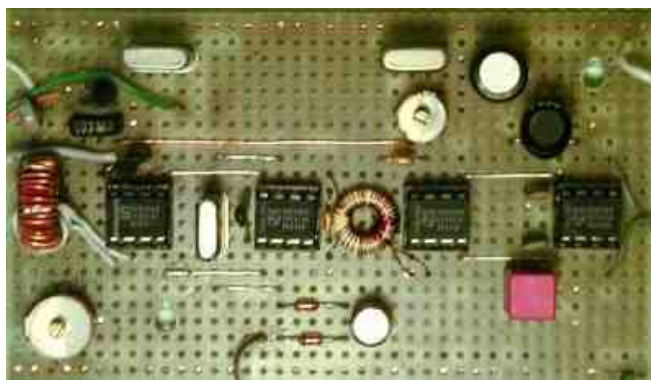
The transceiver operates in a power supply voltage range of $U_b = 8 \dots 15 \text{ V}$. All broadband amps are supplied with U_b , while IC5 provides all mixers with a stabilized 6 V voltage. Diode D3 ensures that the voltage at pin 3 of IC7 can rise up to $+U_b$ during receive mode, without causing harm to IC6. IC7 is then without supply voltage and therefore generates no additional noise.

The transceiver consumes 40 mA during receive and up to 180 mA during transmit. You can reduce the rig's current hunger by 20 mA if you replace the AF amplifier IC4 with a dual op amp, e.g., of the type TL072/082 (see chapter "selective audio amplifier"), and by using a 6 V regulator IC5 with low quiescent current.

Construction

Two strip-board PCB's with dimensions 5 cm x 10 cm were used for the initial construction. The placement of the components on these boards was nearly identical to the one in the schematic. I think, a layout design, e.g., with Eagle light shareware version, or with a graphical editor, should be a relatively straightforward matter.

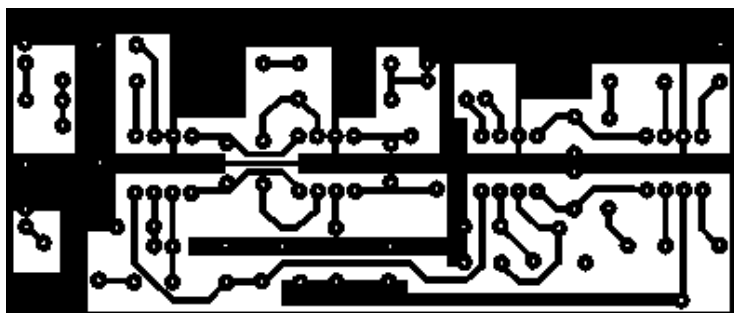
Fig. 5: Initial construction



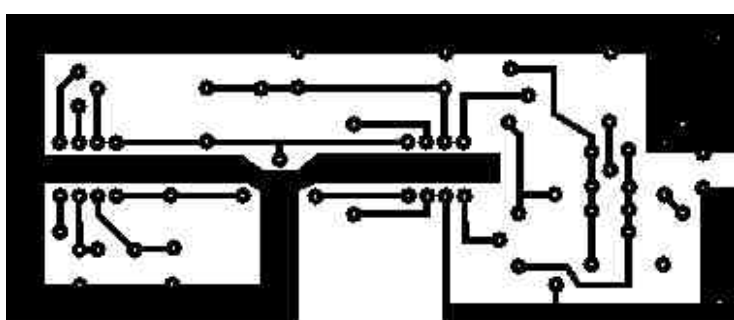
Meanwhile, a semi-professional layout is ready. Here's one picture of the component side and one of the soldering side. This PCB layout is not optimized for minimal space. The target was a simple arrangement, leaving sufficient distance between components.

Fig. 6: PCB layout and assembly

Receiver



Transmitter



Alignment

To align the transceiver, an existing main-station rig and an oscilloscope are sufficient. First tune the VXO frequency with L2 to 14.294 kHz (C3 max.) and 14.314 kHz (C3 min.). Now tune the input resonant circuit with C2 to 10110 kHz; i.e., max. volume of an amateur radio station working on this frequency. C9 determines the BFO frequency offset and thus the pitch of the AF signal.

For maximum AF output level, the frequency offset of the BFO should correspond with the resonant frequency from C12/DR1.

Next, the two trimmer capacitors in the transmitter section are adjusted, first C19 and then C20, on best sine wave and maximum output power, respectively. With a supply voltage of $U_b=13.8$ V, approximately 25 Vss should be delivered to a 50 ohm dummy. Subsequently, check the the value with an adapted antenna. However, the signal may look somewhat noisy, due to superimposed received signals getting in from the antenna.

Parts list

You can get all electrical and mechanical components for less than \$35. You could possibly encounter some difficulties purchasing variable broadcast capacitors and high impedance headphones. But a review of the junk box of a friendly OM, a visit to a ham radio flea market, or stripping an old radio should solve this problem.

PARTS LIST

R2	10 Ohm
P1	2,2 kOhm , linear
C1	3,3 pF
C2, 9, 19, 20 5 ..	90 pF trimmer cap
C3 20 ...	320 pF variable broadcast capacitor
C4, 5, 6	56 pF
C7	330 pF
C8, 17, 22	220 pF
C10, 11	1,8 nF
C12	2,2 μ F
C13	100 μ F, 25 V
C14, 18, 21	0,1 μ F
C15	47 μ F, 16 V
C16	100 pF
L1	T50-2, 30 t primary 3 t secondary
L2	Diameter=4 mm, Hight=12 mm, approx. 2 x 16 t and 3 t (RF pick up)
L3	T37-6, 35 t primary 5 t secondary
L4	T37-6, 35 t
L5	T44-2, 5 t bifilar primary 5 t secondary
Dr1	33 mH
Dr2	FT37-43, 16 t
Q1	14318 kHz
Q2, 3, 4	4194,3 kHz
D1, 2	BAT 42
D3	1N4148
VT1, 2	2N3906 with a small heat sink
IC1, 3, 6	NE612 DIP
IC2, 4, 7	NE592-N8 DIP
IC5	78L06
KH Headphones Ri > 1 kOhm	

Closing Remarks

As there is enough gain available in the IF stage, this design can deviate from conventional QRP schemes by using a very lightly coupled tuned parallel resonant circuit with high Q ahead of the Rx mixer. The resulting preselection, the narrow bandwidth IF filter, and the audio stage's selectivity result in acceptable receiving performance. The output power of 1.5 W isn't much, but operating with such small power is the attraction of QRP work.

73 ! DL2YEO



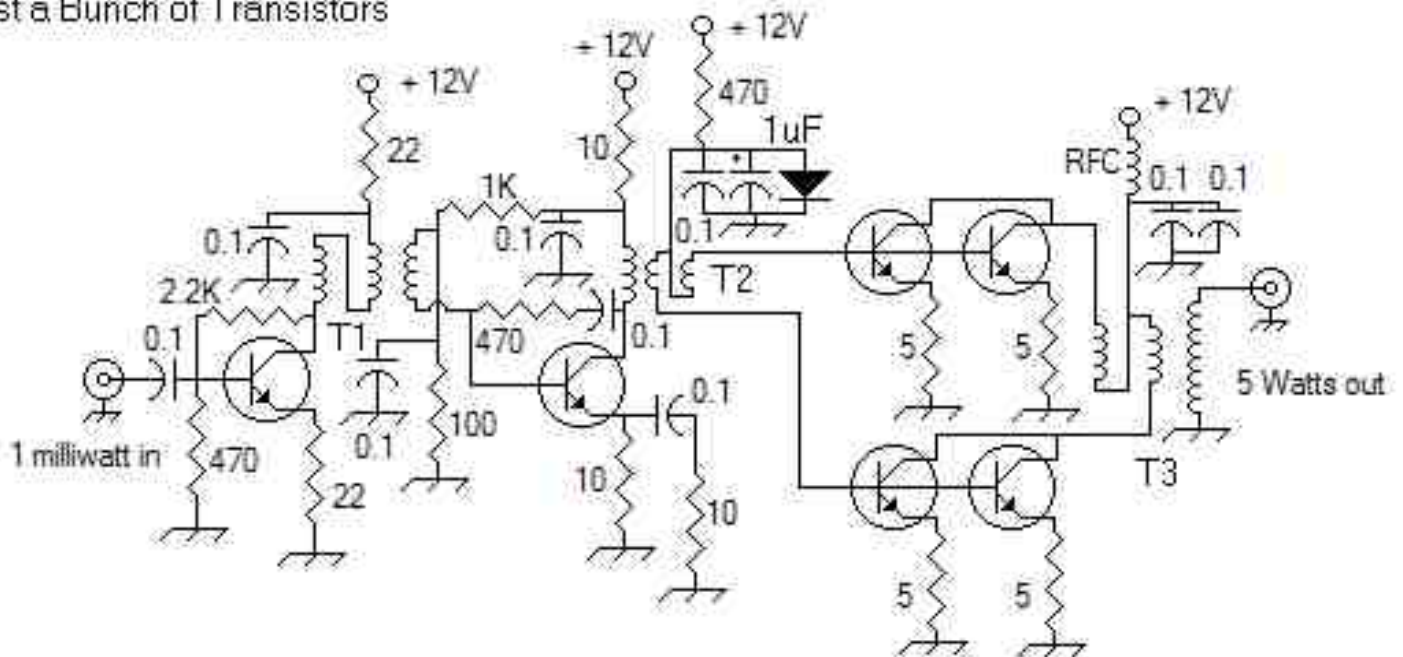


JBOT

An SSB linear amplifier made from Just a Bunch of Transistors By VU2ESE

JBOT stands for Just a Bunch of Transistors. It is a simple, stable and easy to build 5 watts linear amplifier build out of a bunch of ordinary low power NPN transistors.

JBOT QRP Linear
Just a Bunch of Transistors



Note the transformers carefully (All windings are 26 swg)

T1: trifilar winding on TV balun cores (use FT37-43 instead) 7 turns (7:7:7)

T2: primary ten turns, secondary of 3 turns bifilar (10:3:3) on TV balun core (use FT37-43 instead)

T3: Primary 5 turns bifilar. Secondary 10 turns (5:5:10), adjust turns on the secondary for best power

(Use two TV baluns stacked and taped together, or use four FT 37-43s arranged as two stacks of two each)

RFC: 10 turns on TV balun of FT 37-43

All transistors 2N2218 or equivalent. All of them with small clip-on heatsink

(c) Ashhar Farhan, 2009.

YOU may freely reproduce this circuit and the accompanying text as long as you don't change anything and reproduce them together

Why another linear amp?

For many of us, getting hold of high power RF transistors is impossible. They are also expensive and easily blown. In the last decade, hams have pressed the power MoSFETs into use as RF devices. This has been a mixed success. The power FETs (mostly the IRF series for International Rectifiers) have very high input and output capacitance, they need higher drain voltage and they are very non-linear devices. As result, IRF device based RF power amplifiers have remained beyond easy replication for the average homebrewer.

Often, the RF power amplifiers are run flat-out without any attempt at stabilizing the performance, This has to lead to a lot of grief.

The BITX's linear amplifier painfully illustrates both these issues. The IRF510 takes a lot to get it going. Many of those who scratch build it on their own often found themselves struggling with stability and insufficient power output.

The inspiration from this power amplifier came from watching a colleague assemble an incredibly fast computer by adding together a number of ordinary hard disks and old mother boards. By stringing them all together, he was able to extract an amazing performance. When I asked him what kind of architecture this was, his reply was "It is JBOD (Just a bunch of disks)".

Paralleling transistors is not new to hams. I can recall an article by Doug (sk W1FB) in a 1970s QST where he had paralleled up six 2N3904s to generate a single watt of power. Harry's small linear amplifier pumped up to 23dBm out of general purpose NPN transistors.

In this design, the attempt is to apply these principles to higher power output from the 2N2218 variety of transistors to get 5 watts of clean, stable and linear output from a 1milliwatt signal.

What is JBOT?

JBOT stands for Just a Bunch of Transistors. This linear replaces one big RF power device with a bunch of smaller, ordinary transistors.

Each transistor handles less power, simple clip-on heat sinks are enough.

Each output transistor has its own emitter degeneration, making the configuration very stable.

Any general purpose NPN transistor rated for more than 500 mA current with metal can will work.

The drivers are biased for higher than usual current to prevent saturation and good linearity.

Circuit Design

The circuit is a quite simple and straight forward three stage amplifier.

The first stage is set to a collector current of 50mA. This is on the higher side. It drives a trifilar transformer in the output.

The second stage is biased for almost 100 mA of current. This helps preserve the signal linearity. The bias for the base is routed through the secondary of the T1. The T2 transformer is a little tricky, the primary winding is simple 10 turns while the secondary winding consists of 3 bifilar turns around the core. The secondary is wired such that it becomes a center-tapped 3 + 3 turn winding.

The final stage uses four transistors in push-pull with two transistors on each side. Each transistor has a separate emitter degeneration resistor of 5 ohms. Each side is expected to push out 3 watts. This makes the output impedance of each side 25 ohms. The two sides in push-pull will add up their impedances and we will have 50 ohms across the primary winding of T3. The T3's primary consists of 5 bifilar turns (5 + 5 = a total of 10 turns). Against this, the T3 a secondary winding is normal 10 turns.

Though the circuit is stable and works well throughout the HF spectrum (I haven't measured it below 4MHz and above 28 MHz), be careful of operating it without load. The 2N2218s cannot handle more than 30 volts across them, so never operate without a proper load.

Construction:

For a change, nothing is critical in this power amp! The transformers need to be explained. Here goes,

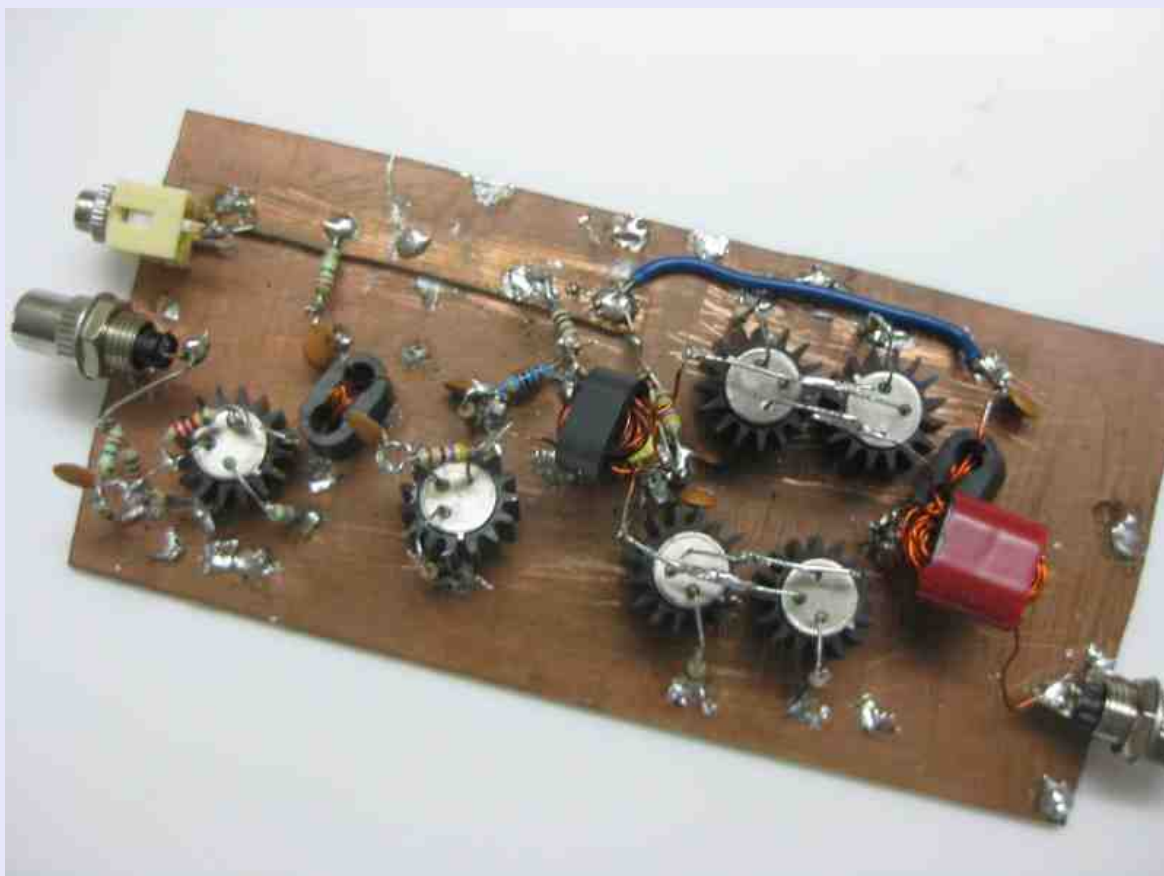
T1: This is easy, it is a trifilar winding. If you imagine that the three wires of the transformer are A-B, C-D, and E-F. Then short B and C to make the center tap. Use A and D as the opposing ends of the primary and use D-E as the secondary.

T2: First wind three turns of twisted, bifilar wire as the secondary. Over this, wind ten turns as the primary. Short the two opposing ends of separate bifilar windings as the center tap and use the remaining, opposite ends of the secondary as the outputs that go to the output transistor bases.

T3: The output transformer is constructed out of two TV baluns stacked and taped together. Alternatively, the core can be made by first stacking two FT 37-43 and forming a cylinder, then two such cylinders are held parallel to each other and taped tightly. This forms a 'double barrel' through which the windings are made.

All transistors have small clip on heat sinks. Check the picture.

Tip: The 5 ohms resistor on each of the transistors should show a little more than half a volt across it, if it doesn't you can assume it is blown.



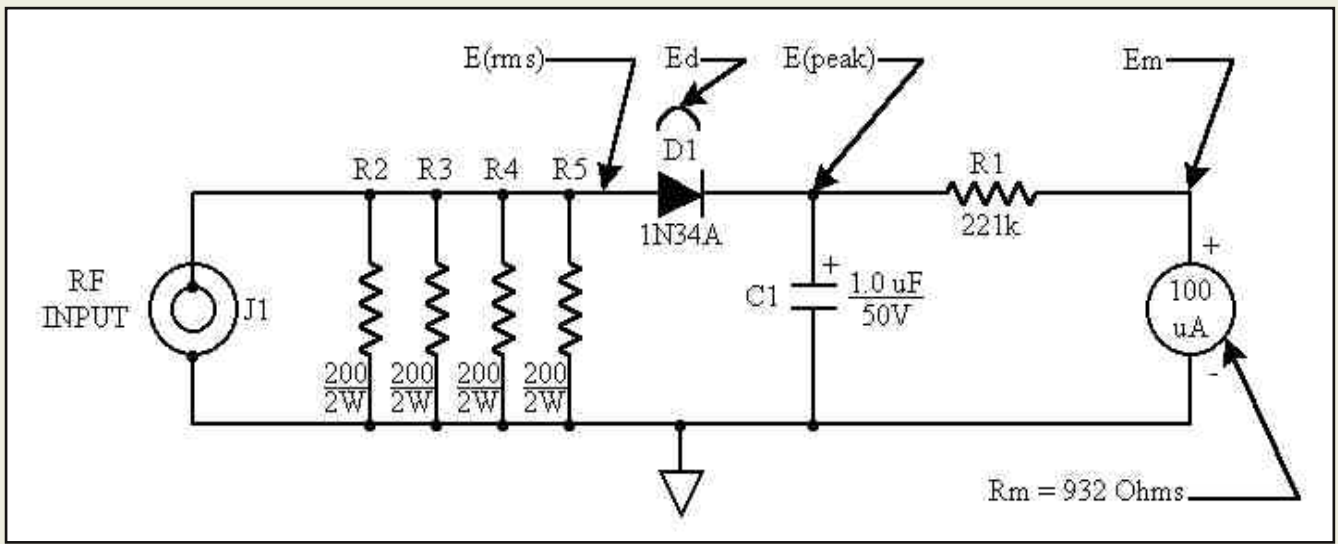
Best 73's !
VU2ESE

QRP POWER METER AND DUMMY LOAD BY STEVE AASTB



Many years ago I acquired a antique field strength meter and probe kit that did not function. However, the meter had a fast response time and a good enclosure and I thought it would make a good piece of test equipment. I designed the following circuit around what I had and it has worked out well for me.

The schematic below is of my QRP power meter and dummy (50 Ohm) load combination. The 50 Ohm load consist of resistors R2 through R5. The four 200 Ohm resistors in parallel combine to make 50 Ohms. I used four resistors because this minimizes the component lead inductance of the resistors as well as distributing the power dissipation. The meter is simply a current meter with a known internal resistance configured as an RF voltmeter. D1 rectifies the RF voltage across the load resistors and C1 charges to the peak of this rectified voltage. The capacitance of C1 is chosen so that the time constant of the RC circuit consisting of C1, R1 and the meter's resistance is long compared to the RF cycle. R1 is chosen so that when the RF power applied is 5 Watts the meter reads full scale.



The calculations are as follows:

$E = \text{Voltage (Volts)}$
 $P = \text{Power (Watts)}$
 $R = \text{Resistance (Ohms)}$
 $I = \text{Current (Amperes)}$

$$E_{(rms)} = \sqrt{PR}$$

$$E_{(rms)} = \sqrt{(5W)(50)} = \boxed{15.81 \text{ V}_{rms}}$$

$$E_{(peak)} = E_{(rms)} \sqrt{2} = 15.81 \text{ V}_{rms} \sqrt{2} = \boxed{22.36 \text{ V}_{peak}}$$

$$E_m = E_{(peak)} - E_d = 22.36 \text{ V} - 0.2 \text{ V} = \boxed{22.16 \text{ V}}$$

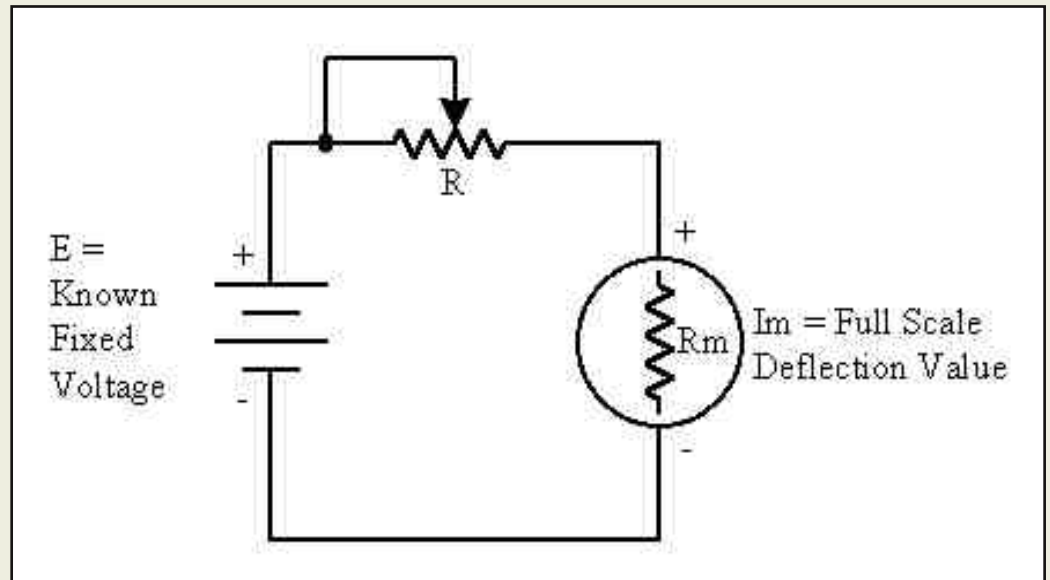
$$R = E_m / I_m = 22.16 \text{ V} / 100 \text{ uA} = \boxed{221.61 \text{ K Ohms}}$$

$$R_m = 932 \text{ Ohms}$$

$$R_1 = R - R_m = 221.61 \text{ K} - 932 = \boxed{220.675 \text{ K Ohms}}$$

$$R_1 @ 1\% \text{ STD Value} = \boxed{221 \text{ K Ohms}}$$

The internal resistance (R_m) can be found by constructing the simple circuit below and performing the following calculations:



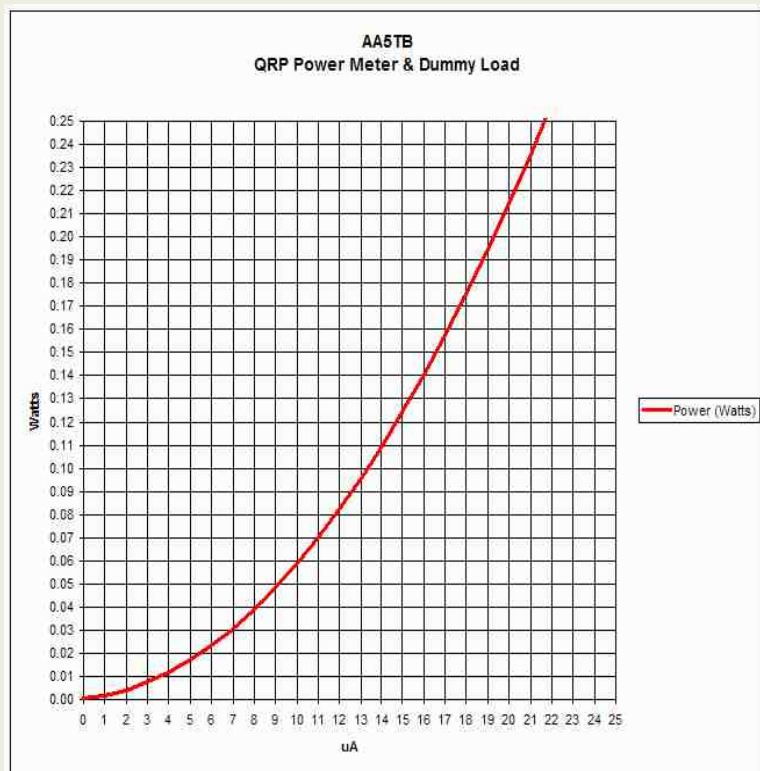
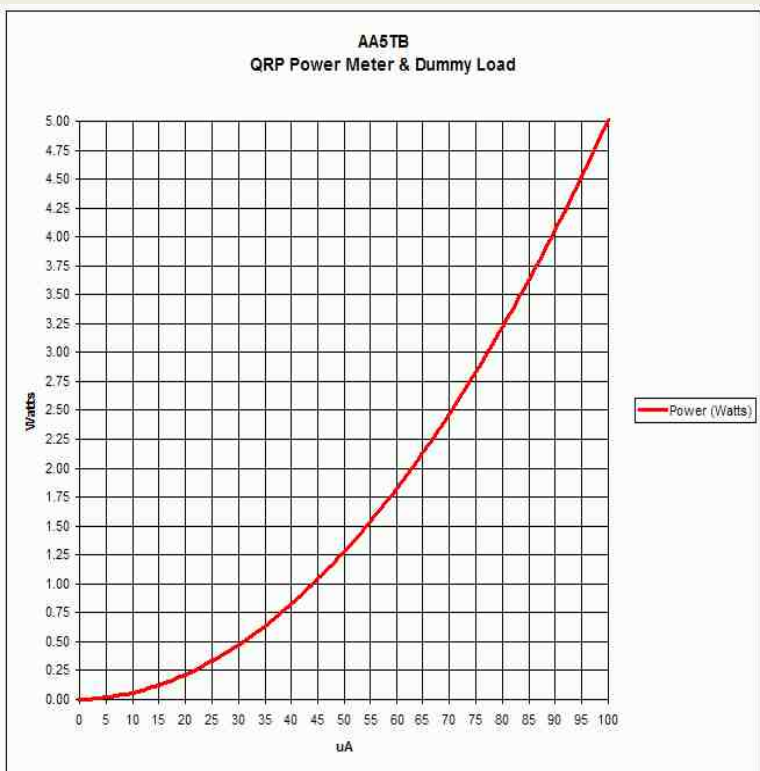
Adjust R until the meter reads it's full scale value. Be sure to start with R at it's maximum value to prevent damage to the meter. Solve the following equation to find the meter's internal resistance.

$$R_m = \frac{E}{I_m} - R$$

The formulae below are to convert the reading on the microampere meter to watts and back. Please note that the possible error caused by the diode's nonlinear response below about 100 mW has been ignored. The scale in the region of tens of milliwatts could be calibrated against a known calibrated power meter or signal source if desired. For more information regarding the very low power measurements with a diode detector you may want to check out "Square Law Diode Detectors in 50 ohm Systems" presented by Glen, VE3DNL.

$$P \text{ (Watts)} = \left\{ \frac{[I(\mu\text{A}) / 4.513 + 0.2]}{10} \right\}^2$$

$$I(\mu\text{A}) = 4.513 [10 \sqrt{P \text{ (Watts)}} - 0.2]$$



73's from AA5TB, Steve.

ON AIR

DX NEWS

From the Web (opdx)



5I, TANZANIA

Igor, UA3DJY, is once again back in Dar Es Salaam, and is operating from the DIT Communications Club station, 5I3A, until March 1st. He will try to be active on all bands. This past weekend Igor was on 40/20/15 meters CW and 17/15 meters SSB. QSL via RK3AOL.



5I, TANZANIA

After the Tonga operation as A35HA and his Falkland Island operation as VP8BUH, Uruguayan globetrotter Bert, CX3AN, will visit Tanzania during the first 2 weeks of February. Look for him on the bands, joined by Igor/UA3DJY and Paul/5H3PF to activate the Dar Es Salaam's Institute of Technology (DIT) radio club station 5I3A. Activity will be mostly SSB and CW using a FT-1000 MP and a log periodic between 20-10 meters.



6V7, SENEGAL

Luc, F5RAV, will be active from La Somone between February 18th and March 1st. He will operate from Jean-Francois, 6W7RV, QTH as 6W7RV. QSL via only direct to his home callsign.



AO1, SPAIN (Special Event)

Spanish operators will activate the special callsign AO1ANT between February 22-28th. Activity is to celebrate the international event "Seventh Antarctic Week". Their reference number will be WAP-180 and their activity will be on SSB, CW, PSK31 and RTTY modes, using all the amateur bands from 160-10 meters. Operators mentioned are: Javier/EC1KV, Daniel/EB1LA, Jose/EA1CUB, Jose/EA1CS, Juanjo/EA1WX, Juan/EA1AUM, Gil/EA1HFM and Fernando/EA1GHT. QSL via EA1GHT, direct or by the Bureau. For more information, visit: <http://www.qrz.com/db/ao1ant> or <http://www.waponline.it>



C6, BAHAMAS (Correction)

Operators Bob/N4BP (C6AKQ), Mike/K4RUM (C6AUM) and Tim/N4UM (C6ARU) will be in Freeport, Lucaya, Bahamas, beginning Monday, February 15th, with Kevin/K4PG (C6APG) joining them on Thursday, February 18th. The operators will enter the ARRL International DX CW Contest (February 20-21st) as individual entries (Bob/C6AKQ on 80 meters, Kevin/C6APG on 40 meters and Mike/C6AUM possibly on 160 meters. Tim will announce his entry when he knows). Prior to the contest they will be operating on the 30/17/12 meter bands, HF bands using CW and the Digital modes. QSL direct to their home callsigns with SASE and/or LoTW.



C9, MOZAMBIQUE

David, GI4FUM (EI4DJ/3DA0DJ), who has recently returned from a visit with his family to the Mpumalanga region of South Africa which included 5 days in the Kruger National Park, announced that he is planning a DXpedition to Mozambique in October 2010, to operate in the CQWW DX SSB Contest and also possibly the JOTA. Watch his Web page for updates at: <http://www.3da0ss.net>



KH2, GUAM (OC-026)

Look for members of TIARA (Tokyo International Amateur Radio Association) to once again be active as homecall/KH2 between February 25th and March 1st. Operators mentioned are: Yoshiyuki/JF1TEU (AB2ST/KH2), Ken/K0EN and Toshio/KG6WTW. Activity will be on all HF bands. They will mainly be looking for Europe. QSL via JF1TEU, by the JARL Bureau or direct.



KP2, U.S. VIRGIN ISLANDS

Jeff, VA3QSL, will be active as KP2/VA3QSL from St. Thomas (NA-106, USI VI004S) and St. Croix (NA-106, USI VI002S, WLOTA LH-2477) between February 6-14th. His activity will be "vacation style" on or near the IOTA frequencies on 40-15 meters using CW, SSB and PSK. QSL to his home callsign, direct or by the Bureau.



NP3, PUERTO RICO

Sergio, NP3QE, will be active during the CQWW WPX SSB Contest (March 27-28th) as a Single-Op/Single-Band (20m) entry. QSL via his home callsign.



OR4, ANTARCTICA

Karel's, OR4TN, stay at the Princess Elisabeth Station in the Antarctica has been extended now until February 25th. His license was only valid until end of January. Thanks to the concerned authority in Belgium for their very fast reaction, the OR4TN license has now been extended also to the end of February 2010. QSL via ON5TN. Updates on OR4TN can be found regularly on:

<http://www.qrz.com/db/or4tn> or <http://www.antarcticstation.org>



PZ, SURINAME

Peter, PA1LP, will be active as PZ5LP from Nieuw Nickerie between February 26th and March 26th. Specific bands or modes were not provided, but he will be using a FT-857 w/100 watts into a G5RV and LDG Z100 tuner. QSL via eQSL.



SI9, SWEDEN (Special Event)

Special event station SI9AM from the King Chulalongkorn Memorial in Utanede, Sweden, the largest Thai Pavilion in the world outside Thailand, will be active between February 5-6th, (from 1700-1400z). Operators will be Jan/SM3CER and Jorgen/SM3FJF. The activity is to celebrate the 10th anniversary of SI9AM. They plan to operate on 80-17 meters using CW and SSB. QSL via SM3CVM, direct or by the Bureau. For more information, visit the SI9AM Web page at: <http://www.si9am.se>



TM7, FRANCE (Special Event)

Francois, F8DVD, will be active using the special callsign TM7AAW between February 13-28th. Activity is for the 7th Antarctic Activity Week (February 22-28th). His WAP reference number is WAP-185. Operations will be from his home QTH in Macon, the eastern part of France. A special color QSL card showing a view of Antarctica will be issued. QSL via F8DVD, by the Bureau or direct (SAE with 1 IRC or 2 USDs) to: Francois Bergez, 6, Rue Liberte, F-71000 MACON, FRANCE. For more details, please visit his Web page at: <http://tm7aaw.monsite.orange.fr> Or send an E-mail to him at: a.pole@laposte.net



V3, BELIZE

- Robert, N7MSU, will be active as V31SU from various locations in Belize (NA-123) between February 4-23rd. Activity will be mainly 40 and 20 meters using CW and SSB. QSL via his home callsign, direct (see (QRZ.com)) or by the Bureau.

- Art, NN7A, will be active as V31JZ/p from Turneffe Islands (NA-123) between February 24th and March 3rd. His operation will be mostly CW on 40-17 meters (including 30/17/12m), with some 160/80 meters and some ssb on 20/15 meters on the usual IOTA frequencies if possible, conditions permitting. QSL via his home callsign, by the Bureau or direct to: Art Phillips, P.O. Box 73, Eckert, CO 81418 USA.



VK9N, NORFOLK ISLAND (OC-005)

Andrew, VK2ACC, will be active as VK2ACC/9 between February 4-9th. Activity will be holiday style on 406 meters using SSB and possibly PSK. He will operate with only 100 watts into a Buddipole and end-fed wire. QSL via his home callsign, by the Bureau or direct.

SM3CVM Presents :



THE DXCALENDAR

ANGOLA; D2CQ by CT1ITZ will be back to Porto Amboim in February, this time with a 5-band beam. He expects to be working in Angola for the next few years. QSL via CT1IUA (he has the paper logs and is entering them into an electronic log, then he will start sending cards out).

BAHAMAS; by N4BP (C6AKQ), W4RUM (C6AUM) and N4UM (C6ARU) will be in Freeport, Lucaya, Bahamas, beginning Monday, February 15th, with K4PG (C6APG) joining them on Thursday, February 18th. The operators will enter the ARRL International DX CW Contest (February 20-21st) as individual entries (C6AKQ on 80 meters, C6APG on 40 meters and C6AUM possibly on 160 meters. Prior to the contest, they will be operating on the 30/17/12 meter bands, HF bands using CW and the Digital modes. QSL direct to their home call signs with SASE and/or LoTW.

HAITI; HH/F4EGS. F4EGS will be joining the International Forces and Non-governmental organizations (NGO) which are working to help the survivors in Haïti after the earthquake. He will be staying around the Port au Prince Airport area. Phil will be taking his FT-100 and a dipole and may be on the air passing ham traffic as HH/F4EGS. Amateur radio operators are asked to keep the frequencies 3720, 3977, 7045, 7265, 14265 and 14300 kHz clear for emergency traffic.

MALAWI; 7Q7HB. QSL Manager G0IAS informs that G0JMU is again heading to the warmer climate of Malawi for a period of 3 months or so. He was stuck in Nairobi but was hoping to be in 7Q-land via Lusaka on Thursday. Activity will probably be on the Digital modes and CW. QSL as usual is ONLY DIRECT to G0IAS with sufficient funds for return cards. NO BUREAU cards. NO eQSLs. Just old fashioned paper cards DIRECT!

MINAMI TORISHIMA; JD1BMM by JA6GXX from Marcus Island (IOTA OC-073, JIA OC-073-001) until mid-February. Activity is usually on all bands and modes. QSL by the Bureau or direct (QRZ.com address). PLEASE NOTE: A report states that this may be "the last chance to make a QSO with JD1/M" for some time. The Japanese Coast Guard radio station on the island is closing down on December 1st, and the amateur radio club station will close in February.

SOUTH SHETLAND IS; DT8A tested his R7 antenna on 21 January and made a few QSOs with stations in Europe, North and South America. He is stationed at the Korean Antarctic base King Sejong on King George Island, AN- 010, and hopes to have more time to spend on the bands. QSL via HL2FDW.

SWEDEN; SI9AM by SM3CER and SM3FJF. They plan to operate CW and SSB on 80-17 metres on 5-6 February. The activity is to celebrate the 10th anniversary of SI9AM. QSL via SM3CVM, direct or via bureau.

1/2 - 31/3 CANADA; VG, XK, XJ and VX

The following prefixes will be available for use to commemorate the 2010 Olympic Winter Games in British Columbia. Canadian stations with a VA prefix can use VG, VY can use XK, VO can use XJ, and VE can use VX. Known announced activities are: VX9NC - VE9NC will operate during that time using primarily digital modes on all HF bands. QSL via his home callsign. VG7G - VE7XS will be operating during this time. See below. VG7W - VE7OM will be operating as VG7W between now and January 31st.

1/2 - 31/3 CANADA; VG7G

The Vancouver Olympics Amateur Radio Group (VOARG) will activate three special calls to celebrate the Olympic Winter Games and Paralympics which will take place in Vancouver/British Columbia in Feb/March 2010. This is the third special call. A website will go online soon, all logs will be uploaded to the LoTW. QSL cards can be sent via bureau or direct to: VOARG, 9362-206A St, Langley/BC, V1M 2W6, Canada.

3/2 - 8/2 MARIANA IS; KHØ/JA3EGZ OC-086

from Saipan. He plans to concentrate on 40 and 80 metres.

3/2 - 15/2 N. COOK IS; E51WWB OC-014

from Manihiki by AD7AF. Activity will be 40-15 meters using mainly CW. SSB and the Digital modes will be used as propagation conditions allow. Also, 80 and 10 meters will be used if conditions are favorable. He will use a K3 operating barefoot into a vertical and wire antennas. QSL via AD7AF.

4/2 - 10/2 HAWAII; N7I

from Honolulu (Oahu Island HI-008S) by WL7MY and KL7JR. Activity is in celebration of the 16th anniversary of the U.S. Islands Awards program. Main frequency will be 28460 or 14260 kHz. They use a TS-50 and a vertical on mag mount. QSL Manager is KL7JR. For additional info: <http://www.usislands.org/>

6/2 - 14/2 OGASAWARA;

JM1YGG/JD1, JA2ZL/JD1, JD1BMV and JD1BNB AS-031 from Chichijima. They will operate CW, SSB and RTTY on 80-12 metres. QSLs direct or bureau, JM1YGG/JD1 via home call, JA2ZL/JD1 via home call, JD1BMV via JK1EBA and JD1BNB via JA3MCA.

6/2 - 19/2 TEMOTU PROVINCE;

H4ØFN (CW), H4ØFK (Digi-mode) and H4ØMS

(SSB) OC-065 from Ngarando/Reef Islands by DK9FN, DG1FK and DL2GAC. Activity will be focused on 160/80m (using their famous LOBSTER 2-element multi-band vertical), but they will operate on 160-6 meters depending on the band conditions. QSL H4ØFN via HA8FW, H4ØMS via DL2GAC and H4ØFK via DG1FK. QSL cards will be sent out automatically via the Bureau. However, for those who want to receive their QSL cards directly, a minimum of 2 USDs for postage is requested. Donations are most welcome. For more details, updates and pictures/details of Siegfried's last visit to Temotu, please visit the following Web page at http://hari-ham.com/seiten/h40fn_expedition/index.php

8/2 - 5/3 ANTARCTICA TOUR; VP8, VP8/G, VP8/H, VP8/O and KC4

W2APF will be traveling on board the ship "National Geographic Explorer" heading to the Antarctica region. He is expected to be operating under the following callsigns (specific dates were not provided):

W2APF/C6A/MM - While on board the ship "National Geographic Explorer"; http://www.expeditions.com/Ship_Detail92.asp?Ship=20/

W2APF/KC4 - While in Antarctic territories - VP8DML - While in the territory of the Falkland Islands (VP8) including South Shetlands Islands (VP8/H), South Orkney's Islands (VP8/O) and South Georgia Islands. QSL all activity via W2APF.

9/2 - 22/2 BONAIRE, CURACAO; PJ2/W8AV SA-006

from Island of Curacao. He plans to be on 160-10 meters using CW and RTTY. He will also be one of the PJ2T operators during the ARRL International DX CW Contest (February 20-21st) and possibly in the CQWW WPX RTTY Contest (February 13-14th), depending on the station maintenance work schedule.

9/2 - 24/2 FRENCH POLYNESIA; TX4T OC-046

from Tahiti by F6BEE, G3TXF and VE2TZT joining FO8RZ (F5PHW). They will include participation in the CQ WW WPX RTTY and ARRL CW DX Contests. They will be active on 160-10 metres CW, SSB and RTTY, with a focus on 160 and 80 metres. Plans are to have two complete stations QRV simultaneously. QSL via G3TXF, direct or bureau. The logs will be uploaded to LoTW. Further information can be found at <http://www.fo2010.org/>

10/2 - 16/2 PALAU; T88SM and T88HS OC-009

from Koror by JA6EGL and JA6KYU. They plan to operate CW and SSB on 80-10 metres. QSL via home calls, direct only.

10/2 - 23/2 GRENADA; J38XX

by DL5AXX. Activity will be focused on the lower bands, but also in the ARRL International DX CW Contest (February 20-21st) as a Single-Op/All-Band entry. QSL via home call, direct or bureau (the OQRS for bureau cards can be found at <http://www.dl5axx.de/dxlog/>)

A logsearch will be available at <http://www.clublog.org/>

12/2 - 25/2 KENYA; 5ZØH AF-040 and AF-067

from Lamu Island and Wasini Island by 5Z4ES, IK8TEO, IK8UHA and IK8VRH are planning to be in Kenya and activate two IOTA islands. QSL via LoTW, by the Bureau or direct to IK8VRH: P.O. Box 173, I-80016 Marano (NA), Italy. Visit the 5Z4H Web page at <http://5z4h.sitonline.it/>

16/2 - 25/2 NICARAGUA; YN2WW, YN2DD, YN2TX and YN2LJ

by AC8W (YN2WW), K8DD (YN2DD), KB8TXZ (YN2TX) and N8LJ (YN2LJ). Their activity will include the ARRL DX CW Contest (February 20-21st) as a Multi-Single entry using the callsign YN2WW. Operators will be active on all bands before and after the contest. Look for: YN2DD on CW and RTTY 17m, YN2WW primarily on 30m, YN2LJ on the low bands CW and YN2TX on SSB. QSL YN2DD and YN2WW via K8DD. QSL YN2TX via KB8TXZ and YN2LJ via K8ESQ.

17/2 - 23/2 BELIZE; V31RR

by AA4NC. Activity will be on the HF bands including 30/17/12m using CW, SSB and RTTY. His activity will also include the ARRL DX CW Contest (February 20-21st) as a Single-Op entry. QSL via his home callsign or LoTW.

17/2 - 10/3 TOKELAU IS; ZK3 OC-048

by N7OU and W7YAQ. The exact dates of their operation may change because the only access to the Tokelau Islands is by boat. Their activities will include an entry in the ARRL International DX CW Contest (February 20-21st). Operations will be on 160-10 meters but mainly on CW, with some SSB and RTTY, using 100 watts and vertical antennas. Also, look for them to operate from Apia, Samoa (5W), before they sail to Tokelau and after between February 10-16th and March 11-15th. All callsigns are to be announced. QSL via their home callsigns.

18/2 - 22/2 NICARAGUA; YN2GY

by K9GY during the 2010 ARRL DX CW Contest (February 20-21st). Outside of the contest, look for CW activity on 30/17/12 meters. QSL via LoTW or to his home callsign, direct or by the bureau.

- 1/2 S. COOK IS; E51WWA OC-013
from Rarotonga Island by AD7AF. QSL via homecall, see QRZ.com.
- 2/2 LIBERIA; EL8RI
by ZS6RI. This will be his last trip to Liberia, as he has been transferred to another country in Africa where he expects to be working on a six week on, six week off schedule.
- 2/2 JUAN FERNANDEZ Is; XRØZA SA-005
by JA8BMK. He plans to operate CW, SSB and digital modes on 160-10 metres, with a focus on the low bands.
- 3/2 FERNANDO DE NORONHA; PY2XB/PYØF SA-003
Activity will be on all HF bands using CW, SSB, RTTY and PSK. His activities will include the CQ 160M CW Contest (January 29-31st), but he will sign as PQ0F. QSL via PT7WA.
- 4/2 DOMINICA; J79WWW
by KK4WWW, back to Dominica for a mission trip. She is active as much as possible during her spare time. QSL via N4USA.
- 5/2 AUSTRAL I; TX3D OC-014
from Raivavae by DL1AWI, DL3APO and DL5XU. They plan to operate on all bands, with a special emphasis on 160-30 metres. The German team started activity from without essential parts of their equipment, which were lost in transit. QSL FO/DL3APO via DL3APO, QSL TX3D via DL1AWI. Further information, logsearch included, can be found at [HTTP://dl9awi.de/fo.htm](http://dl9awi.de/fo.htm)
- 8/2 UNITED ARAB EMIRATES; A6/VE6LB
Activity will be holiday style with low power using wire antennas and mainly on 40-15 meters CW. QSL direct via his home callsign or LoTW.
- 10/2 CANARY ISLANDS; EA8/homecall AF-004
from Tijoco Bajo, Tenerife Island by ON5JV and ON6AK. Activity will be on 40-10 meters during their evenings. They plan to use 100 watts into a vertical 14AVQ. QSL via their home callsigns, the bureau is preferred.
- 12/2 ST. VINCENT; J8/K2CM NA-025
from the Grenadine island Bequia. He will work in CW/SSB mostly on 20m and maybe also in CW on 40m. QSL via homecall (direct/bureau).
- 14/2 TUNISIA; TS8RW
Activity is to celebrate the "Ariana Rover Scout Leader" (ARSL) organized event called ROVER WEEK. This is an activity for adults (Rover Scout Leader) which include amateur radio workshops, cultural activities and conferences on "Radio Scouting - Service for Others".
- 20/2 ANTARCTICA; KC4USV AN-011
from McMurdo Station by K7MT. He will be on the HF bands on 14243 kHz, Sundays at 0000z. He will also be active on PSK-31 (on 14070 kHz) and CW (14043 kHz) if time permits. He has also mentioned that he will take an Arrow II antenna and his Kenwood TH-7 to work the Amateur Satellites into VK and ZL land. He also has plans to be on APRS VHF/HF with a Kam Plus, so you might just see him driving around on the Ross Ice Sea as K7MT-7 on APRS. QSL via K1IED. Visit his home page for some interesting pictures at <http://www.mt.net/~k7mt/>

- 23/2 CHILE; CE1/K7CA

He will be very active on 160m again and intends to take part in the Stew Perry Topband Distance Challenge and the CQ 160m CW Contest. He is running 1 kW into a 3L SteppIR Yagi and a vertical for the lowbands. He is working almost only in CW, but SSB QSOs may be arranged via sked. Unfortunately his QSL manager NW7O confirms only direct.

- 28/2 BELIZE; V31YN and V31GW

by DJ4KW (V31YN) and DK9GG (V31GW), including a number of contests. On 2-7 February look for V31YN/p to be active from NA-180. QSL via home call (direct or bureau), or LoTW.

18/2 - 26/2 MOROCCO; CN2MR

by MJ0ASP. Activity will be on the HF bands using mostly CW. He likes to contest, so he will probably be in the ARRL International DX CW Contest (February 20-21st). QSL via his home callsign (see QRZ.com).

20/2 - 27/2 CHRISTMAS I; VK9X/G6AY OC-002

by G3SWH and G3RTE. They will operate CW only on 80-10 metres (no activity on 160 metres). Propagation permitting, they plan to have two stations on the air for as many hours every day as is possible. QSL via G3SWH, direct or bureau (requests for bureau cards can be submitted by using the relevant form on. Please visit <http://www.g3swh.org.uk/christmas-island.html> for further information.

22/2 - 3/3 BRUNEI DARUSSALAM; V88/DL7JAN

from Bandar Seri Begawan. Activity will be on 160-10 meters using CW, SSB and RTTY. QSL via DL7JAN, by the Bureau or direct.

24/2 - 3/3 BELIZE; V31JZ/p NA-123

from Turneffe Islands by NN7A. Activity will be holiday style. QSL via his home callsign, by the Bureau or direct to: Art Phillips, P.O. Box 73, Eckert, CO 81418 USA.

25/2 - 28/2 UNITED STATES OF AMERICA; K NA-066

from Santa Catalina Island (USI CA016S, WLOTA LH-2912, Los Angeles County, California). Activity will be on the usual IOTA frequencies, mostly 20 meters SSB, using CW, RTTY and/or PSK31. QSL direct to K6PV (Palos Verdes Amateur Radio Club) or by the Bureau. They will have a special K6PV IOTA card for this activation.

28/2 - 13/3 MONTSERRAT; VP2MPR and VP2MPL

by W1USN and AA1M. W1USN will work mainly SSB and PSK31. AA1M will operate mostly CW. QSL both operators via their home callsigns.

2/3 - 11/3 ST. LUCIA; J68JA NA-108

by W5JON. Activity will be on 160-6 meters (including 60m) on SSB. He will use an ICOM IC-7000, KL-400 Amp (350 watts) into the following antennas: ZS6BKW design multiband dipole, and a 3 element yagi on 6m. Activity will also include the ARRL International DX Phone Contest (March 6-7th) as a Single-Op/All-Band entry. QSL via W5JON.

3/3 - 10/3 COCOS (KEELING) IS; VK9 OC-003

by NL8F. Activity will be on 80-10 meters, plus 6 meters, and an entry in the ARRL International DX Phone Contest (March 6-7th). He will be using a vertical antenna. He does not know what his callsign will be, but he is hoping for VK9COF (or possibly VK9C/NL8A). QSL via K8NA.

GO SW - SO ME DX NEWS BY OZ6OM

Guinea-Bissau, J5. Laci, HA0NAR and his wife Susan will be visiting Guinea-Bissau. Look for J5NAR on 7-13 February. Expect activity on the HF bands CW, SSB and RTTY, with a focus on the low bands during operations from the mainland. Activity on 6 and 2m will depend on the local situation. QSL via HA0NAR, direct or bureau.

Dodecanese, SV5. Willi, DJ7RJ will be active from Kos Island from 24 February until 17 March. He will operate CW and SSB on 160-6 metres, with a focus on the low bands. QSL via home call.

Australia, VK. The Hellenic Amateur Radio Association of Australia will be active as VI2BI from Broughton Island on 5-7 February. The team will include Tommy/VK2IR, Peter/VK2NN, Allan/VK2GR, Raffy/VK2RF, Paul/VK2HV and John/VK3JHA, and they plan to operate CW, SSB and RTTY on 160-6 metres. QSL direct to VK2CL. They have a web page at www.vi2bi.blogspot.com

Denmark, OZ. Hello Guys, I (OZ6OM) will be QRV in the Nordic Activity Contest Thursday evening (February 11 th.) between 18 and 22 UT. I intend to be QRV from JO55EJ at an alternate QTH running 100 w. into a 5 or 6 element Yagi.

In any case I intend to keep activity round 50.173 MHz (SSB/CW) and 50.230 MHz / 50.236 (JT6m).

(The reason I'm operating this way is, my attempt at setting up reasonable antennas at my QTH have so far ended in a law suit (Latest, case appealed to the domestic court after a no from the council review board). - so the antenna at my QTH is very modest at this time. The given permit says maximum height at 1.8 m. agl.)

Hope to see You down the log ... vy 73 de Matt OZ6OM

Temotu, H40. Operators Siegfried/DK9FN, Bernhard/DL2GAC and Hans-Peter/DG1FK will be active as H40FN (CW), H40MS (SSB) and H40FK (Digi-mode), respectively, from Ngarando/Reef Islands between February 6-19th (2010). Activity will be focused on 160/80m (using their famous LOBSTER 2-element multi-band vertical), but they will operate on 160-6 meters depending on the band conditions. QSL H40FN via HA8FW, H40MS via DL2GAC and H40FK via DG1FK. QSL cards will be sent out automatically via the Bureau. However, for those who want to receive their QSL cards directly, a minimum of 2 USDs for postage is requested. Donations are most welcome. For more details, updates and pictures/details of Siegfried's last visit to Temotu, please visit the following Web page at: <http://hari-ham.com/h40fn>

Maledives Islands, 8Q. Dan, HB9CRQ, did send MMMonVHF an first Pre-Announce for the upcoming EME Expedition to th Maledives Islands in march 2010. Operator will be of Pierre, HB9QQ and Dan, HB9CRQ and maybe other Members of the HB9Q Team. Mainwork will be 144 MHz but as well 6m and 23cm band will be joined. If there are more Operators maybe as well 70cm will be activated (if any OP will have interest to join the Team please pass an info to Dan, HB9CRQ). Flights and Bungalows are booked already. Soon MMMonVHF will spread out more detailed informations (<http://www.mmmonvhf.de/latest.php?id=2896>) tnx to Dan, HB9CRQ, Team of HB9Q direct to MMMonVHF

St. Lucia, J6. Look for John, W5JON to be active as J68JA from Marigot Bay, island of St. Lucia, Grid FK93 on 2-11 March, 2010. QRV 160-6 meters (also 60m), including a Single-Op entry in the ARRL DX SSB Contest (6-7 March). His equipment will consist of an ICOM IC-7000, KL-400 Amp (350 watts); Antennas: Alpha Delta DX-LB and DX-EE Dipoles, and 3 Element yagi on 6m. As in the past, XYL Cathy (W5HAM) will be very busy pool side. QSL via home call. (Andy N8OFS GOT6???)

Release. 'Bawdsey Research Station' Commemorations 2010

GB75BRS Special Event Stations JO01QX

In recognition of the historic events that took place in 1935 and 1940 which played a significant part in Britain's war effort, Bawdsey Manor will be activated on three separate occasions during 2010.

During its time as the radar research centre and as an operational station for Chain Home radar, it was known by the acronym BRS – Bawdsey Research Station. Special event callsigns with BRS as the suffix have been applied for to recognise this.

Over the weekend of 26 to 28 Feb 2010, we will be on the air on HF, 6m and VHF, operating CW, SSB and possibly some digital modes too. The callsign requested is GB75BRS, since this operation will commemorate the 75th anniversary of the Daventry Experiment, which resulted in radar development in the UK being based first at Orfordness, then at Bawdsey.

Later in the year we will operate on two weekends to commemorate the 70th anniversary of the start and end of the Battle of Britain in 1940. The callsign GB70BRS has been requested. These weekends will be 5/6 June, and 18/19 Sept. Operating bands and modes will be as for the February event.

Members of the public, and students from the school now based at the Manor, will be welcomed at any of the events, where there will also be display materials relating to Bawdsey's history during this period.

A special QSL card will be issued to those making contact with either of the stations, and a parchment certificate will be available on request to stations who make contact with both callsigns – information about the stations, operation and QSL arrangements can be found on our web site at <http://bawdseyresearchstation.org.uk>

50 MHz Operators are M1DUD / OZ3RE and 2E0IAF / OZ9SP. Modes of Operation on 50 MHz will be SSB/CW/WSPR/JT6M (MS)/ RTTY and possibly a demonstration on SSTV if time permits!

73 de OZ3RE

Maldives Islands, 8Q. More. Here is some preliminary information about the upcoming 8Q7QQ 6m EME DXpedition March 24-31, 2010. Pierre HB9QQ has been very busy optimizing the 6m EME station he will be taking next spring for his JT65A operation. He will be using a low noise external preamp, 500w Falcon amplifier and a 7 element yagi overlooking the ocean. Watch for details to be coming in the future, but plan now to be available for this great chance to contact a rare one! There are some great horizon-only windows for NA stations with Pierre while he has ground gain on the horizon at the same time! EME CNDX also are optimum during their period of operation ;-)

GL and VY 73, Lance (MMMonVHF Newsletter 2009-10-02)

Guadeloupe, FG. Serge FG/F6AUS, is working on 160m-6m from Guadeloupe until March 2010. He will sign TO4D in the WWDX CW Contest. QSL via homecall.

Tonga, A3, [Update]. Paul, A35A, informs OPDX on December 2nd, that Dave/W6ZL (A35KL) was leaving Ha'apai on December 3rd. Dave should be in New Zealand by the time you read this. Paul states, "Dave probably won't be QRV again from Tonga until perhaps April 2010. He may be able to get on the air from ZL, when he visits some of his radio buddies down there. I'll let him fill you in if/when that happens." He also mentions, "All antenna work here at A35A is 99% complete. The SteppIR yagi (w/6m add-on) is up and working fine; the 4 element 6m beam has been cleaned up and is working fine; the SteppIR BigIR vertical (w/80M add-on) is up, but I still have some tweaking to do on the elevated radials to get a good impedance match. I intend to be more active from now on, especially on 80m. I want to finish up on 5BDXCC before my QSL manager (W7TSQ) gets tired of waiting! HI... The 6m Es season is fast approaching down here, so that should provide some excitement....especially since both North and South Cook Islands (E51CG and E51WL) are now QRV. Incidentally, our announced move to Vava'u has been postponed indefinitely, and perhaps cancelled altogether. A35A remains QRV from Lifuka Island, Ha'apai until further notice. QSL via W7TSQ or LoTW."

Bahama Isl., C6. Tom, C6ANM is active since January through April 160-6 metres CW and SSB, including participation in the CQ WW 160-Meter DX Contests (CW and SSB) and in the ARRL DX SSB Contest. He will primarily operate from Nassau. QSL via LoTW (preferably) or direct to WA2IYO.

Build A 10 Amp 13.8 Volt Power Supply By N1HFX

Sometimes amateurs like to home-brew their power supplies instead of purchasing one off the shelf at any of the major ham radio retail dealers. The advantage to rolling your own power supply is that it teaches us how they work and makes it easier to troubleshoot and repair other power supply units in the shack. It should be noted that there is no real cost advantage to building your own power supply unless you can get a large power transformer and heat sink for a super low price. Of course rolling our own gives us the ability to customize the circuit and make it even more reliable than commercial units. The circuit in Figure 1 will give us 10 amps (12 amps surge) with performance that equals or exceeds any commercial unit. The circuit even has a current limiting feature which is a more reliable system than most commercial units have.

Just like other commercial units, this circuit uses the LM723 IC which gives us excellent voltage regulation. The circuit uses 3 pass transistors which must be heat sinked. Resistor R9 allows the fine tuning of the voltage to exactly 13.8 volts and the resistor network formed by resistors R4 through R7 controls the current limiting. The LM723 limits the current when the voltage drop across R5 approaches .7 volts. To reduce costs, most commercial units rely on the HFE of the pass transistors to determine the current limiting. The fault in that system is that the HFE of the pass transistors actually increases when the transistors heat up and risks a thermal runaway condition causing a possible failure of the pass transistors. Because this circuit samples the collector current of the pass transistors, thermal runaway is not a problem in this circuit making it a much more reliable power supply.

The only adjustment required is setting R9 to the desired output voltage of anywhere between 10 and 14 volts. You may use a front panel mounted 1K potentiometer for this purpose if desired. Resistor R1 only enhances temperature stability and can be eliminated if desired by connecting pins 5 and 6 of IC-1 together. Although it really isn't needed due to the type of current limiting circuit used, over voltage protection can be added to the circuit by connecting the circuit of Figure 2 to Vout. The only way over voltage could occur is if transistors Q2 or Q3 were to fail with a collector to emitter short. Although collector to emitter shorts do happen, it is more much more likely that the transistors will open up when they fail. I actually tested this and purposely destroyed several 2N3055's by shorting the emitters to ground. In all cases the transistors opened up and no collector to emitter short occurred in any transistor. In any event, the optional circuit in Figure 2 will give you that extra peace of mind when a very expensive radio is used with the power supply.

The circuit in Figure 2 senses when the voltage exceeds 15 volts and causes the zener diode to conduct. When the zener diode conducts, the gate of the SCR is turned on and causes the SCR to short which blows the 15 amp fuse and shuts off the output voltage. A 2N6399 was used for the SCR in the prototype but any suitable SCR can be used. While over voltage protection is a good idea, it should not be considered a substitute for large heat sinks. I personally feel the best protection from over voltage is the use of large heat sinks and a reliable current limiting circuit. Be sure to use large heat sinks along with heat sink grease for the 2N3055 transistors.

I have used this power supply in my shack for several months on all kinds of transceivers from HF, VHF to UHF with excellent results and absolutely no hum. This power supply will be a welcome addition to your shack and will greatly enhance your knowledge of power supplies.

73's DE N1HFX

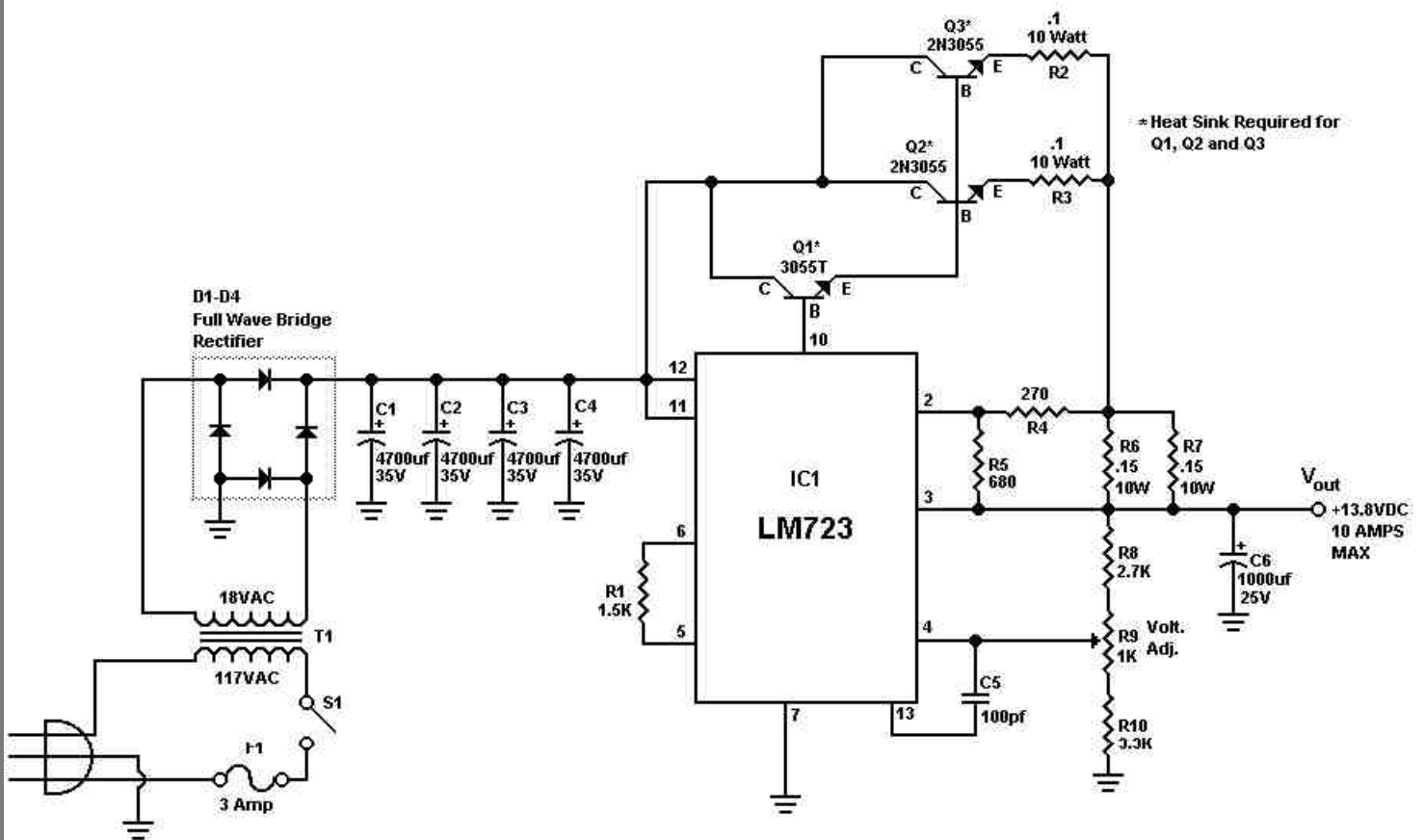


Figure 1

Parts List

- R1 1.5K ¼ Watt Resistor (optional, tie pins 6 & 5 of IC1 together if not used.)
- R2,R3 0.1 Ohm 10 Watt Resistor (Tech America 900-1002)
- R4 270 Ohm ¼ Watt Resistor
- R5 680 Ohm ¼ Watt Resistor
- R6,R7 0.15 Ohm 10 Watt Resistor (Tech America 900-1006)
- R8 2.7K ¼ Watt Resistor
- R9 1K Trimmer Potentiometer (RS271-280)
- R10 3.3K ¼ Watt Resistor
- C1,C2,C3,C4 4700 Microfarad Electrolytic Capacitor 35 Volt (observe polarity)
- C5 100 Picofarad Ceramic Disk Capacitor
- C6 1000 Microfarad Electrolytic Capacitor 25 Volt (observe polarity)
- IC1 LM723 (RS276-1740) Voltage Regulator IC. Socket is recommended.
- Q1 TIP3055T (RS276-2020) NPN Transistor (TO-220 Heat Sink Required)
- Q2,Q3 2N3055 (RS276-2041) NPN Transistor (Large TO-3 Heat Sink Required)
- S1 Any SPST Toggle Switch
- F1 3 Amp Fast Blow Fuse
- D1-D4 Full Wave Bridge Rectifier (RS276-1185)
- T1 18 Volt, 10 Amp Transformer Hammond #165S18 (Digi-Key HM538-ND)

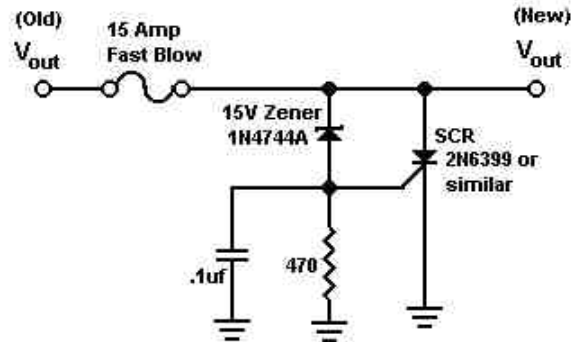


Figure 2

AMPLIFIED SPEAKER FOR MP3 PLAYER

By Slo-go'en

This amplified speaker fits into an Altoids sized tin box, runs on three "AAA" batteries, weighs 3.4 oz (with batteries) and can produce room filling sound with remarkable fidelity when combined with an acoustic "bass enhancing" resonator (empty plastic peanut butter jar).



front



inside



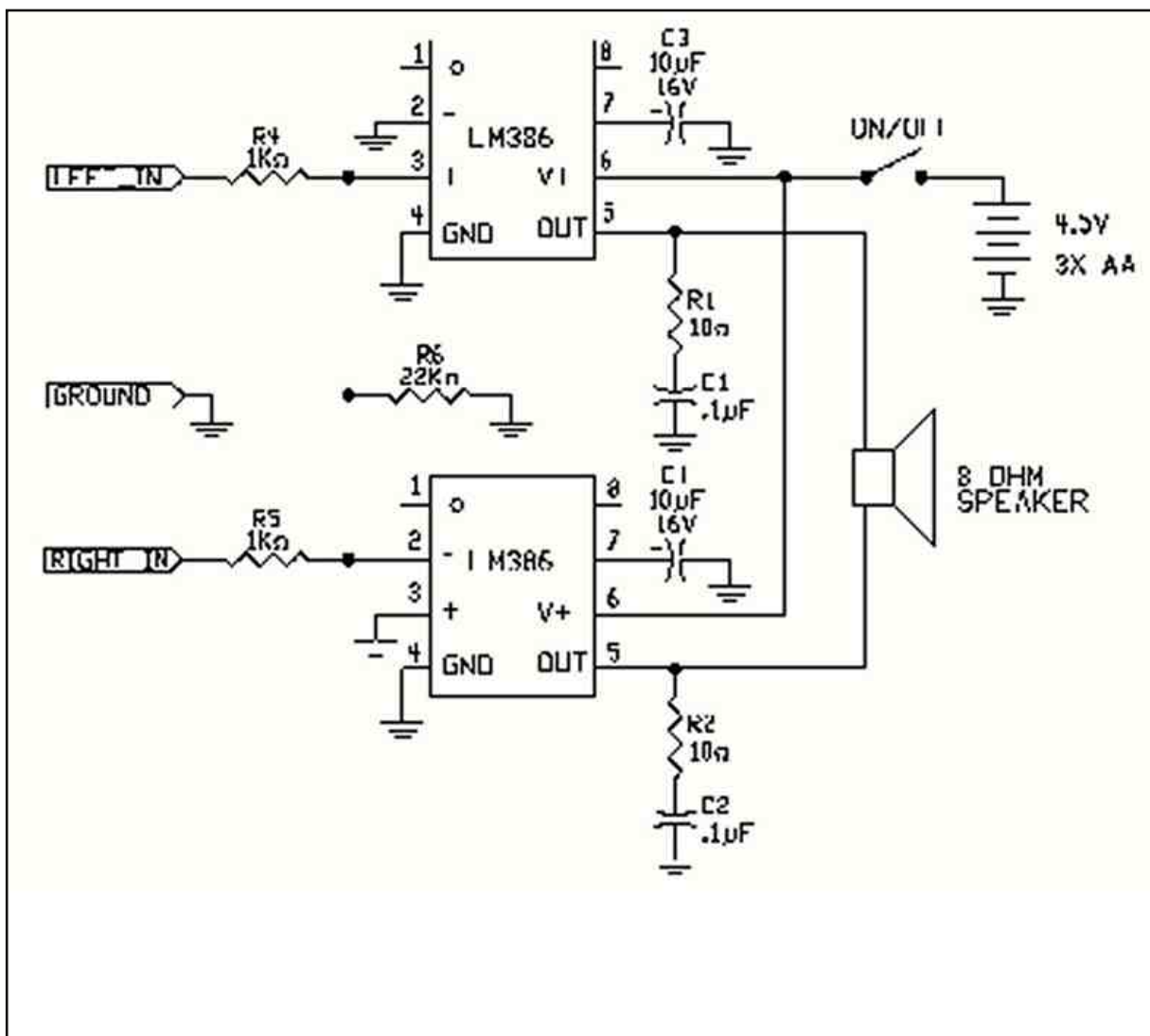
in use

As noted above, the best sound is obtained when the speaker is placed over the open top of a 18 oz. empty peanut butter jar and the lid of the tin is opened slightly. The peanut butter jar enhances the bass and the open lid of the tin enhances the treble, which comes out of the top of the speaker. As a bonus, the tin will just fit inside the peanut butter jar for transportation, so you don't need to carry an empty jar! By the way, this same idea can be used with any device with a small speaker. A nalgine bottle will work too. The improvement in sound quality and volume is remarkable.

A 2" diameter "flat" mylar speaker is mounted inside the tin. One large hole and a number of smaller 1/4" holes are drilled over the speaker to let the sound out. The speaker can not be mounted directly to the bottom of the tin, it must be spaced a little off the bottom so the cone does not touch. I used a piece of 1/4" thick foam core construction board to make a spacer for the speaker. The speaker is simply hot glued to the construction board. A piece of black felt cloth is then glued to the spacer to protect the speaker cone and make it look better. This speaker assembly is then hot glued into the bottom of the tin, over the holes drilled for the speaker. There is just enough room left to place a three cell "AAA" battery holder in the other end of the tin.

The amplifier to drive the speaker is made from two LM386 low voltage amplifier chips. These are configured as a “bridge” amplifier, where the speaker is placed between the outputs of the two amplifiers. This doubles the amount of power which can be delivered over using just one amplifier for the same battery voltage. The left and right channels from the MP3 player are “summed” by three resistors to the inputs of the amplifiers, which converts the stereo signals from the player into a monaural signal because only one speaker is used. A headphone cable clipped from a cheap pair of headphones is used to connect between the amplifier and the player.

I built the amplifier circuits using tiny SMT (surface mount technology) parts because there wasn't much room left in the tin after adding the speaker and batteries. An experienced circuit builder could likely use larger “through hole” parts and make the profile low enough to fit the amplifier over the battery holder. If you are knowledgeable about electronics and making that kind of stuff, the following schematic diagram should be all you need to duplicate this.



Foam board mounting

A 144MHz Pocket Antenna by F3WM

Foreword

The hand held transceivers are very usefull for portable operation, for the vacations or when backpacking. They are all afflicted by a common shortcoming : their sausage type antenna is very inefficient. A simple dipole will make better.

This led me to search for a simple antenna, easy to build and wich can be taken in a suit case, a backpack or even in a pocket, but performing better. I finally decided on a supple dipole antenna made entirely with coaxial cable. It may be rolled, folded, squeezed and packed very tightly. Used suspended, so in vertical polarization, it is omnidirectional and allows traffic via relays that are otherwise inaccessible.

Fig 1 (**figures are at the end of the text**) shows a dipole fed in his center by a coaxial line. This layout is simple and efficient although the adaptation is not perfect, 50 ohms at the output of a transceiver versus 73 ohms at the center a of a dipole. If the feeder is short, the losses may be neglected.

One can think of designing a dipole as on Fig 2. The part a - b of the external surface of the braid of the coaxial line being one leg of the dipole. The fact that the braid is not limited to b, and so can't defines a $\lambda / 4$ leg as we wish, is a problem by itself. So this layout is not an antenna and the tests conducted with an antenna analyzer prove it conclusively.

A solution would consist in inserting in the external surface of the braid an LC parallel circuit or trap (Fig 3) tuned for the operating frequency, therefore the internal surface keeping to assume the continuity for the HF currents at the frequency involved. Not a simple affair.

Yet it exists a means to do it with an astonishing simplicity. It is enough to coil a given lenght of the coaxial line to constitute a localized inductance, the spread capacitance between the turns will contribute to get the tuning. The axial conductor and the internal surface of the braid will continue to insure their function as a transmission line. The curvature radius being large versus the space between internal and external conductors, the changes in characteristic impedance may be neglected.

Implementation

- * Cut a lenght of 2.50 m in a stock of RG58/AU coaxial cable.
- * From one end, make a mark at 470 mm,(a1 sur Fig 4), (a dispenser of office white correcting fluid is very convenient for this).
- * Make another mark at 940 mm (b1 sur Fig 4).
- * Remove the external insulating layer and the braid from all the B length. Keep in place the internal insulating layer.
- * Take a PVC pipe \varnothing 32 mm external, a model used in plumbing works, and cut in a sufficient length to make the H device, Fig 5. The winding is made of 4.6 turns, that dictates the location of the holes \varnothing 5,5 spaced of 20 mm on the generating line and 1656° on the circumference, let 36° beyond the opposing generating line. Chamfer the edges of the holes at the location where the cable will be bended. This operation is a very important one, it allows you to easily slide the cable into the holes and tighten the turns.
- * Introduce the naked end the cable into the lower hole h2, passing by the inner side of the pipe, pull a sufficient lenght, then roll the 4.6 turns keeping many slack, lastly slip the naked end into the upper hole h1 by the outer side of the pipe.

* Set the b1 mark at the upper hole h1 level. Then slip gently the cable in the lower hole h2, tightening progressively the turns. So designed the coil is very robust and no other fastening or clamping is necessary.

* Install a BNC connector at G location.

* Install a length of 50 mm of hot-shrinking sleeve at C location.

Tuning

Hang up the antenna, the naked end up, at about 2 meters above ground. Search for a minimum VSWR and cut this naked end by bits of 5 mm as far as to get this minimum in the middle of the band. Remind you that the VSWR will never be less than about 1.3 following the imperfect impedance match I highlighted here above in "Fundamentals". That goes without saying that a little antenna analyzer, e.g. an MFJ-259 or other, is a valuable tool for these tests.

The tuning phase being finished, a ring terminal may be soldered or crimped at A location in order to hang up easily the antenna by the means of an insulating string. Do not forget to shorten first the end A by a length equal to the length of the ring terminal diminished of the length of the soldering or crimping zone.

The results

An VSWR of 1.3 has been obtained at 145.000 MHz and less than 1.5 from 143.500 to 147.000 . As one can see the bandwidth is great enough. Listening at stations or relays the gain versus the original "sausage" antenna amount to several S units on the bargraph of the transceiver. Though this do not give a true measure, the gain is obvious. The weight of this antenna is only 105 grammes.

Remarks

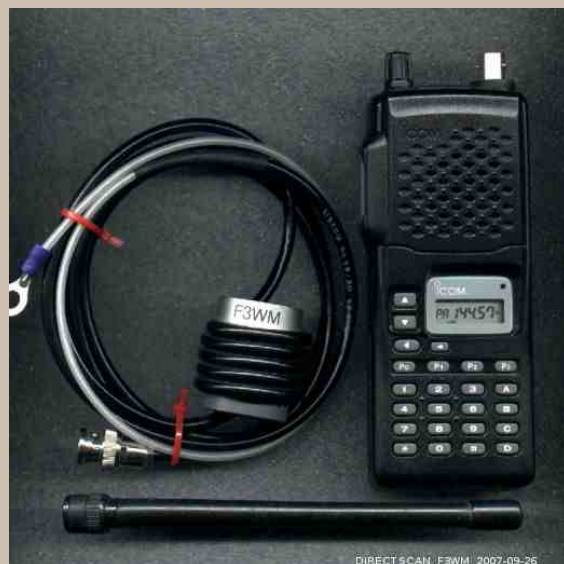
I designed also another antenna from a length of 3.90 m of cable. The results were the following : VSWR minimum at 143.800 and less than 1.5 from 141.800 to 146.500 . Its weight is 159 grammes.

A theoretical quarter wavelength at 145.000 MHz would be 517 mm. As one can see, the lengths of the parts B and D are lesser, so the velocity factor is less than 1. This is related to the presence of the internal insulating layer of the coaxial line onto B and the external insulating layer onto D and also to the fact that the tests are not conducted in true free space. To work out antennas for other bands, take account that the initial lengths for parts B and D, in mm, are about equal to $68000/F$, with F expressed in MHz.

Rolf Brevig, LA1IC made some work on this type of antenna which largely inspired my own design. He also described a design of this antenna for the 50 MHz band beginning with an initial length of 728 cm. He used 11.8 turns onto a coil form \varnothing 50 mm.

Thanks to Daniel, F6GUL, his help was appreciated at the test time. At ma location, 4.5 watts, at F6GUL, 20 watts in a 5/8 lambda antenna. Distance 60 Km with hills between us, operating frequency 145.500 MHz. With the pocket antenna my report was 52, with the sausage antenna hardly if some words where heard, the S meter frozen to zero. Not miraculous, but the contact was made possible.

73's from F3WM



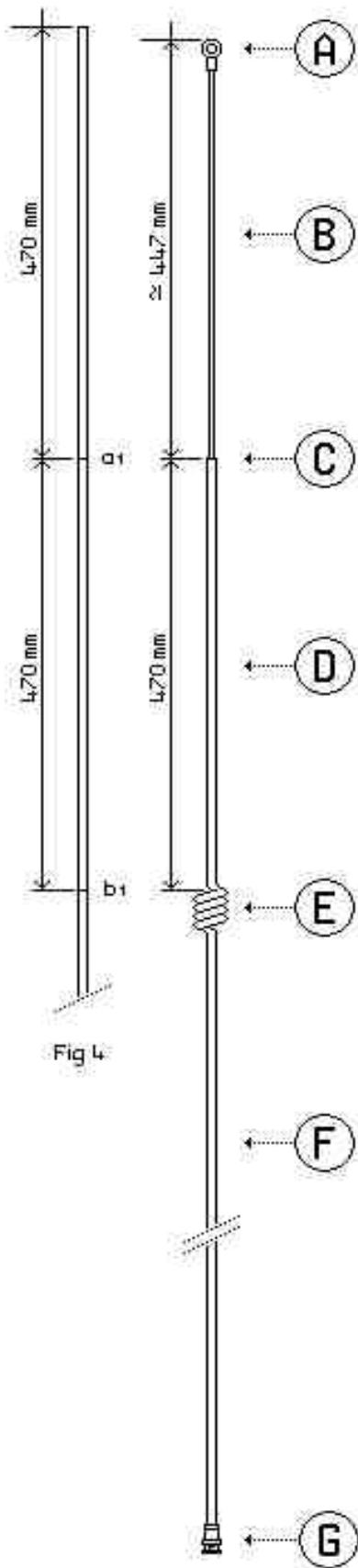


Fig 4

Fig 6

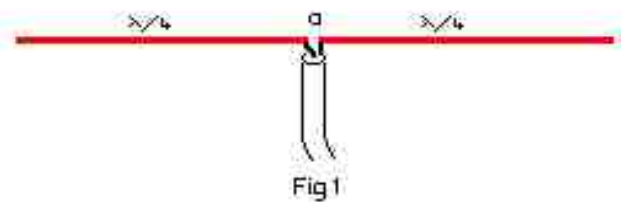


Fig 1



Fig 2



Fig 3

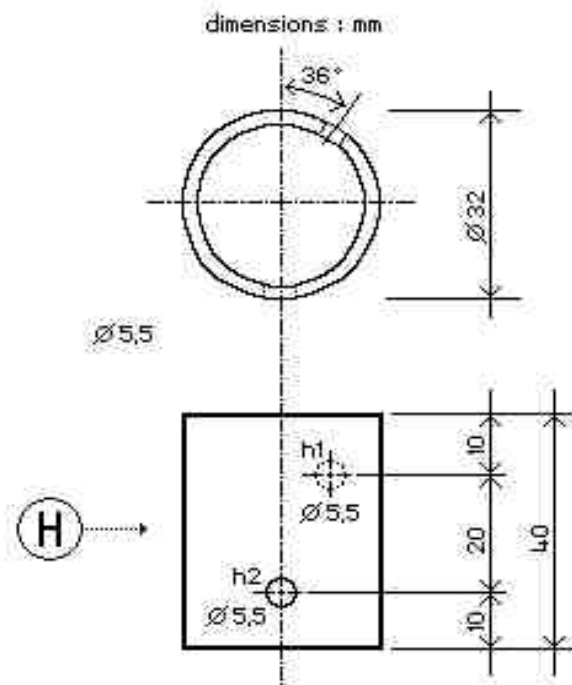


Fig 5

The HAM-MAG'S HALL OF FAME

List of generous Donators

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PAØNCV, Nick
K6LCS, Clint
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VK2ETA, John
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KE4IAP, Don
K3PB, Pat
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WR5T, Anthony
Urszula Gandor-Graham
EA7LL, Manuel
work-sat.com (K6LCS, Clint)

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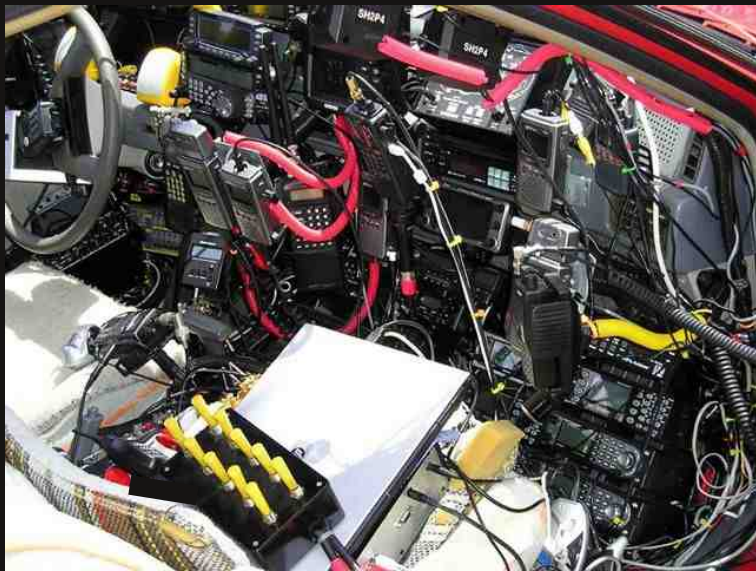


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