COULSDON AMATEUR TRANSMITTING SOCIETY

G4FUR

M1FUR

"CATS WHISPERS"

July 2017

Affiliated to the RSGB

CATS Committee

Chairman: Stuart Barber G6CJR ☎

Secretary: VACANT

Treasurer: Steve Conway G7SYO ☎

Members: Terry Giles G4CDY ☎

David Milne G6VMI

Vacancies: Currently still remains at **THREE**

CATS Whispers Editor: Andy Briers G0KZT

email for contributions: newsletter@catsradio.org

Regular Society Meetings: These are held on the second Monday of each month at:

St. Swithun's Church Hall, Grovelands Road, Purley, Surrey, CR8 4LA at 20:15 to 22:15

Society Nets

Sunday mornings - 11:00 - Call on 145.400 MHz ± QRM

Sunday evenings - 17:00 - Call on 3.700 MHz ± QRM

Wednesday evenings - 21:00 - Call on 70.425 MHz

CATS Website www.catsradio.org   Email enquiries@catsradio.org

Forthcoming Meetings

Monday 10th July – Portable Evening on Epsom Downs

Monday 14th August – Annual BBQ at Home of Terry G4CDY

Monday 11th September - TBA

Monday 9th October - Swimming Pool Maintenance by David G6VMI

Monday 13th November - TBA

Monday 11th December – Annual General Meeting

Next Meeting - Monday 10th July

The plan is to take advantage of the current good weather (long may it continue) and spend a club evening doing some practical radio, up on Epsom Downs. Nothing complicated, no tents, masts etc, operating in the open, or from cars, using simple antennae and powered from batteries. (Stuart has a very quiet generator which he might bring along).

The initial plan is to operate on the following bands: -
70MHz – SSB Horizontal Dipole, 145MHz FM Colinear, 3.5/7/14MHz 9 metre vertical
Please feel free to bring any of your own equipment.
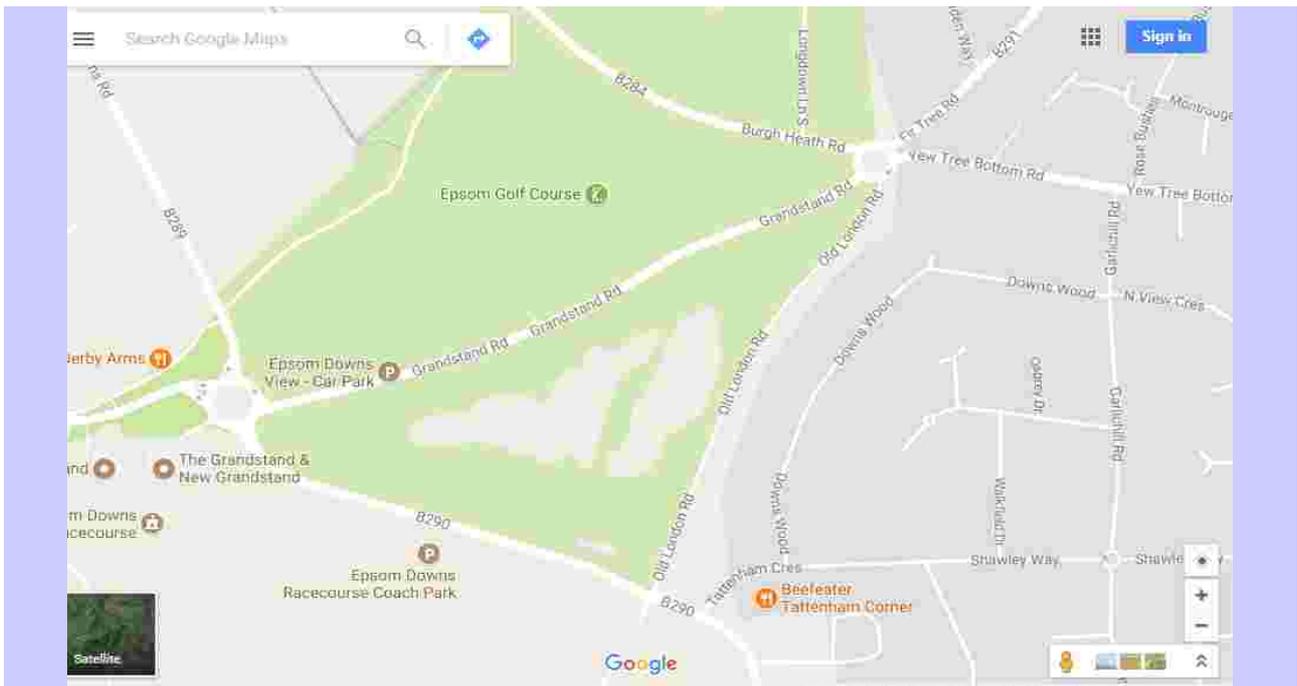
Epsom Down's car parks are always fairly busy in the evening, with dog walkers and people having "in car entertainment", but I think we should be able to find a quiet corner. Terry, G4CDY, will get to the site by about 7pm and try and reserve some space, probably at #1 above, the Hut Café car park, if there is some space at #1, Grandstand Road, we will use that. Please check both locations or call Terry on S22, NS or XP who will provide talk in. Both carparks are very dusty so don't wear your best shoes!

CATS DF Hunt – June Meeting

Due to work commitments, your newsletter editor was unable to attend this year's DF hunt. A report is expected. I understand however that the turn out was exceptionally good.

Future Meetings

Our programe for this year is almost complete and details for September and November will be made known as soon as details are available.

GB3NS Update

EchoLink is now fully enabled on the repeater and the link is working very well. The IRLP code for the repeater is 383403.

CATS 40th Radio & Electronics Bazaar – Sunday 19th November 2017 – 10.00am – 1.00pm

The date of our 40th, yes 40th! CATS Radio and Electronics Bazaar is confirmed as Sunday 19th November and will build on the success of the new venue at the Oasis Academy Coulsdon in Homefield Road Old Coulsdon.

So put the date in your diaries NOW and look out for more news in the forthcoming newsletters.

Sutton & Cheam Radio Society Trip to Bletchley Park - Debrief

A debrief of the trip on Saturday 24th June is eagerly awaited.

DIY SPACE RADAR

By Terry Giles G4CDY

Many good things come out of France, cheese, pate, wine etc, but there is also at least one very useful radio signal. This is on 143.050MHz and so can be received by most 144MHz SSB receivers and with a simple antenna and free software can form a very effective space tracking system for detecting meteors, the ISS, other satellites and the moon.

GRAVES (Grand Réseau Adapté à la Veille Spatiale) is a French radar-based space surveillance system, akin to the American NAVSPASUR. Using radar measurements, the French Air Force is able to spot satellites orbiting the Earth and determine their orbit. The GRAVES system took 15 years to develop, and became operational in November, 2005. GRAVES is a bistatic radar system using Doppler and directional information to derive the orbits of the detected satellites. Its operating frequency is 143.050 MHz, with the transmitter being located on a decommissioned airfield near Broyes-les-Pesmes at 47°20'52"N 5°30'59"E and the receiver at a former missile site near Revest du Bion on the Plateau d'Albion at 44°04'14"N 5°32'05"E.

The transmitter is very high power and beaming to the south from mid-France, using a sectored beam antenna. The effect of the beam switching can be seen as blobs on most traces shown below.

For best results you need to feed the audio from your receiver into an FFT program such as ARGO (http://www.weaksignals.com/) or SPECTRAN (http://digilander.libero.it/i2phd/spectran.html).

You can hear meteor pings without any special software, but the RF Analyser software

makes it much more interesting. At my QTH in Purley I can receive the direct signal, just above the noise level, most of the day and night, reflections form meteors, the ISS and other satellites are very strong. I tune my IC7100 to 143.049MHz using USB, the signal should be at 1000Hz and this can be seen as the horizontal line in the plot below at 1020Hz, the 20Hz error is from the IC7100 local oscillator. For a quick start with SPECTRAN select the QRSS3 setting, which was used for all the plots below.
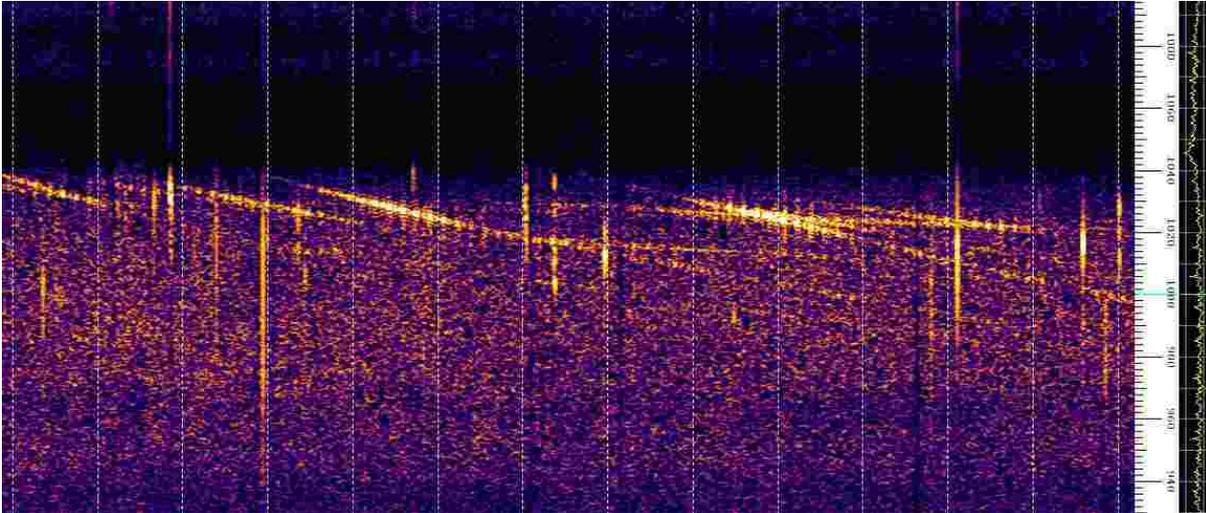

The ISS (International Space Station) is a very big target and shows up very well on the SPECTRAN display. You can get good prediction of ISS passes from the Heaven Above (www.heavens-above.com), don't forget to select "All Passes" rather than just the visible ones!

ISS - All Passes

Search period start: 05 July 2017 00:00
Search period end: 15 July 2017 00:00   `<` `>`
Orbit: 401 x 408 km, 51.6° (Epoch: 05 July)

Passes to include: ◯ visible only ⦿ all

Click on the date to see the ground track during the pass.

Date	Brightness (mag)	Start			Highest point			End			Pass type
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.	
05 Jul	-	05:17:51	10°	S	05:19:47	15°	SE	05:21:44	10°	ESE	daylight
05 Jul	-	06:52:32	10°	WSW	06:55:45	54°	SSE	06:58:58	10°	E	daylight
05 Jul	-	08:28:54	10°	W	08:32:11	83°	N	08:35:29	10°	E	daylight
05 Jul	-	10:05:24	10°	W	10:08:40	62°	SSW	10:11:55	10°	ESE	daylight
05 Jul	-	11:42:23	10°	W	11:44:42	18°	SW	11:47:02	10°	S	daylight
06 Jul	-	06:00:31	10°	SW	06:03:34	38°	SSE	06:06:40	10°	E	daylight
06 Jul	-	07:36:38	10°	W	07:39:54	89°	NNW	07:43:13	10°	E	daylight
06 Jul	-	09:13:08	10°	W	09:16:26	90°	SSW	09:19:43	10°	ESE	daylight
06 Jul	-	10:49:48	10°	W	10:52:38	27°	SSW	10:55:28	10°	SSE	daylight
07 Jul	-	05:08:40	10°	SSW	05:11:26	26°	SSE	05:14:15	10°	E	daylight
07 Jul	-	06:44:22	10°	WSW	06:47:38	79°	SSE	06:50:56	10°	E	daylight
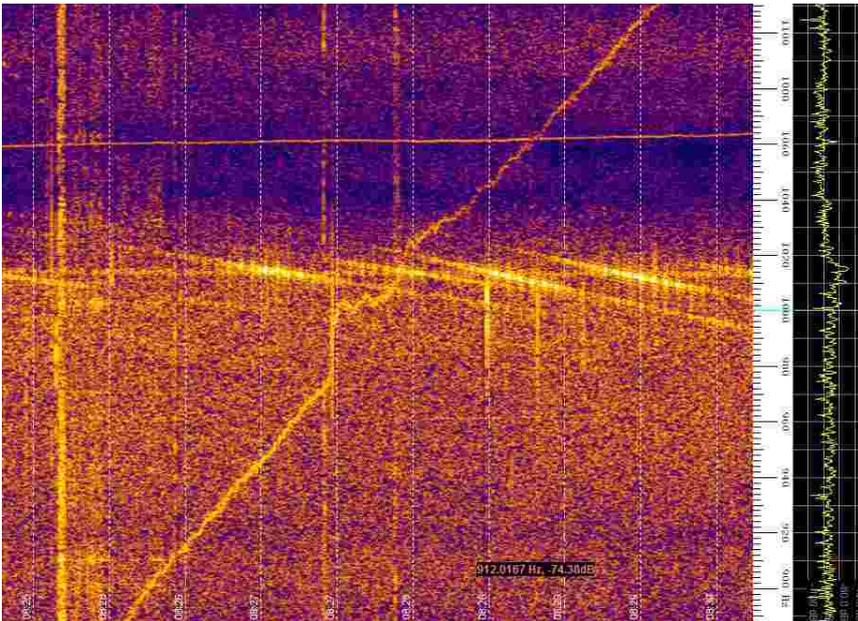
I have failed to get any echoes from the moon, but others have succeeded. I estimate the doppler shift could be as much as +/-300Hz.

Good luck and please contact me it you need help or get any super plots.

Terry G4CDY terry@g4cdy.co.uk

PAINTING AND SOLDERING by Steve G3WZK
A new hi-fi system

PART THREE: MORE FOR THE SECOND BOX
It was then I remembered that I had bought a Raspberry Pi (RPi) after Chris M0TCH had given a talk to CATS about the RPi back in March 2014. I hadn't done much with my RPi as my PC screen doesn't have an HDMI input and none of the HDMI to VGA adaptors I could find worked in a satisfactory way. Unfortunately, tweaking the RPi system for different screen sizes hadn't solved the problem and I had given up trying. I began to wonder whether it might be possible to resurrect the RPi and use it to access our Wi-Fi to listen to internet radio stations. At that stage, I simply had no idea if that would be possible, so I simply entered "Raspberry Pi Internet Radio" into my favourite search engine, pressed return on the keyboard and waited.

What I found was a delightful treasure trove of designs. On YouTube were countless videos of how to construct an RPi radio, with demonstrations of how they worked. I also found a useful website http://www.bobrathbone.com/raspberrypi.htm which tells you all you need to know and includes a complete builder's guide as a 163 page PDF with many tempting photos of RPi radios that various people had built:
http://www.bobrathbone.com/raspberrypi/Raspberry%20PI%20Radio.pdf
In these radios, the RPi uses Wi-Fi to access radio stations that broadcast over the internet. Software in the radio uses a small screen (which could be as simple as a 2 x 16 character LCD display) to display a simple menu, and push buttons to scroll up and down to select the required station. The radio then outputs a stereo signal to a sound card of your choice and then on to loudspeakers. You could do this with a PC but this would be

wasteful and a little RPi hidden in a Maplins' box would, I hoped, be much better.

So the plan now was that the radio box of our hifi system would contain a homemade (but, to be honest obsolescent) VHF FM Radio and an internet radio which should hopefully be much more futureproof.

The trouble was that Bob Rathbone's PDF, well written as it was, seemed quite daunting at first. Nevertheless, I decided to give it a go – one stage at a time. I would only buy components for the next stage of the construction process when I had managed to make the previous one work.

The first step, said the manual, was to obtain an SD card, 8 GB or larger (I chose 16 GB) and install an operating system called Raspian Jessie on it. Downloading Jessie to my Windows 7 PC was straightforward enough, although there was an error the first time and I had to repeat the process. The downloaded file then had to be unzipped to a folder on the PC to create an image of the operating system. I then downloaded some image writing software to the PC which I used to copy the image to the SD card. As my PC doesn't have an SD card slot, I used a simple USB adaptor which Windows recognised, in my case as the G: drive. The creation of a bootable image file on the SD card then went without a hitch.

Before I could begin to test the RPi with the new Operating System, I had to switch off my PC and connect its screen to the RPi via an HDMI to VGA adaptor. I also plugged a spare mouse and keyboard into the RPi. The RPi with SD card inserted then booted up okay and I began making changes to its settings. However, whenever I found a problem, it was extremely frustrating and annoying to have to power down the RPi, reconnect the screen to my PC, boot up, and search on the internet for a solution; and then, having found out what to do next, to reconnect the screen to the RPi and try again. Luckily, I discovered that there is a software package called PuTTY which you can install on a PC and use to control an RPi over a network.

I therefore downloaded and installed PuTTY on my PC and was delighted to find that it worked like a dream, either when directly connected to my router or via the domestic Wi-Fi. This meant that I would no longer have to bother swapping the screen between computers – nor did I need a separate mouse and keyboard for the RPi. It was simply a matter of running PuTTY from the PC and logging in to the RPi remotely, using SSH for security.
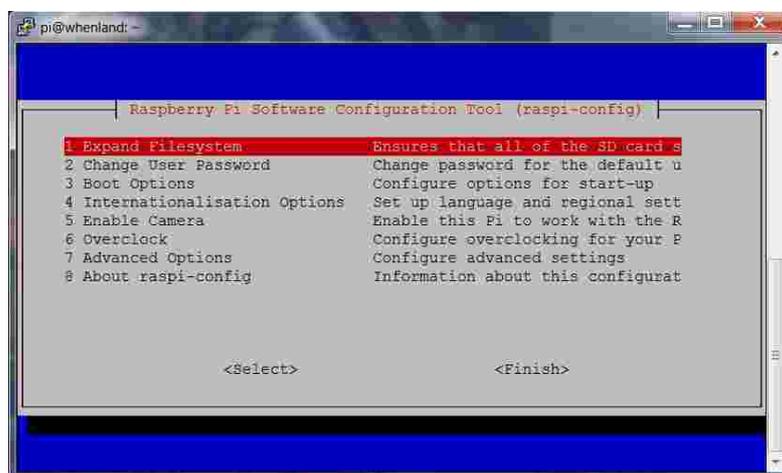
Screen grab of the PC, logged on remotely to the RPi using PuTTY

One key aspect of using the RPi as the "engine" in an internet radio is that you need some

sort of user interface. There are many ways of doing this and the simplest is to use an LCD display of some sort. I chose to use an LCD display with two rows of 16 characters. I obtained this, together with a small interface board: search for "Adafruit LCD Shield Kit w/ 16x2 Character Display".

The kit was simple to assemble and connect up. In common with similar kits, it was supplied with tactile buttons. (These buttons give a reassuring "click" that you can feel through your fingertips when you press them.) If you intend to box the kit up, the buttons as supplied are too small to pass through or even reach the front panel, so one option would be to use conventional push buttons mounted on the front panel and wire these back to the board. However, I managed to find a source of tactile buttons on eBay that were 19 mm high and so could be arranged to project through the front panel when soldered to the kit's PCB. I bought 15 of them for £1.79 including postage and used them instead. Apart from that there were no issues in assembling the board.

Tactile Buttons: L – as installed by G3WZK; R – as supplied in the Adafruit kit

It was then necessary to sequentially download a considerable number of software packages to the RPi and make a number of changes in the RPi settings, as described in the PDF file. One of the most important is to set the RPi to boot to console instead of booting to the desktop, as clearly there will be no desktop when the unit is functioning as a radio. There were a lot of changes required, but fortunately the PDF explains what has to be done, and in what order, very well indeed.

It was then a matter of plugging in the Adafruit board, powering it up, and making a few more changes, including adjusting the audio settings to play out through the 3.5 mm stereo jack. I decided to mount the LCD display behind the front panel and connect it to the RPi (mounted on the base of the box) using ribbon cable. Finally, it was time to plug the project into my powered computer speakers and boot up, fingers crossed!
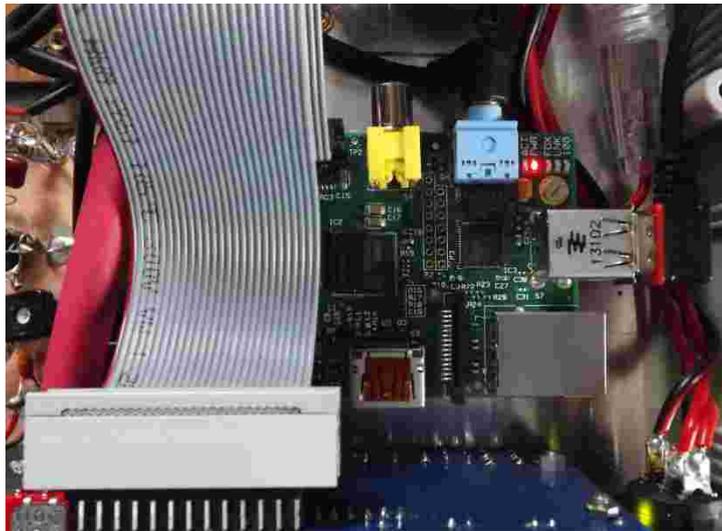
The RPi Internet Radio installed in the radio box – Wi-Fi dongle at right

The RPi Internet Radio took about 30 seconds to boot up and connect to our Wi-Fi and after a further 30 seconds or so began to play the first station on its list - BBC Radio One. Using the tactile buttons described above, it was possible to scroll through all the BBC's national channels and BBC Radio Bristol as well. There were also stations from Belgium, France, Germany, Italy and the Netherlands. The sound quality was good with no drop-outs, but what was really impressive was how quickly the unit could change channels even between two overseas stations. There were two buttons to control the volume settings and the backlight brightness could be adjusted using the menu. In addition, the Radio displayed the title of each track as it played. The next step was to add some radio stations of my choice, such as Classic FM and Magic, if I could work how to do it.

The key to adding my own stations was that you need a URL ending typically in ".m3u" or ".pls".
For example, to access Radio Jackie the RPi needs to access the site at:
http://radiojackie.com:12614/listen.pls
While to access Magic, the RPi needs to access http://tx.whatson.com/icecast.php?i=magic1054.mp3.m3u
The relevant information can then be added to the "stationlist" file using a text editor such as "nano". You then run a file called "create_m3u.py" to generate a play list and then reboot.

There seems to be no practical limit on how many stations you can have on your play list. Bob Rathbone's PDF also explains how to add ATC (Air Traffic Control) as one or more of the pre-set stations. There are no UK ATC's that broadcast on the internet, but Dublin does. Sadly, I still haven't managed to get this to work properly. All I have managed to get is a few seconds of audio from (for example) Dublin approach before the audio mutes itself and you see the airport's weather report scrolling across the LCD screen.   I have also tried to listen to Schiphol but got the same effect.

However, there were more goodies to be discovered, as the RPi can also play music (as MP3 files) from a memory stick. This needed no extra setting up and worked perfectly. (The unit will also play MP3 files from a network drive, but I have not tried this yet.)
The next challenge was to install the two radios in the second Maplins' box. They were by now both working fine, but the RPi was powered from a plugtop USB PSU plugged into its micro USB socket, while the VHF radio needed several batteries: two AA cells for the radio itself, a 9V PP3 battery for the frequency display unit and a separate 9V PP3 battery for

the tuning voltage for the varicap diode.   I decided to build a conventional transformer-based PSU to generate the required voltages.

I bought a 12VA 12 volt mains transformer and fed its output into a bridge rectifier. The output was smoothed by a nice big electrolytic capacitor and bypassed to RF with a 100 nF disc ceramic. The smoothed DC was fed separately to each of four 1 amp three-terminal regulator ICs, to generate two 9 volt supplies and two 5 volt supplies. The output of each regulator IC had a 100 uF electrolytic for smoothing and a 100 nF bypass capacitor. As part of the design for this, I had determined how much current my RPi consumed at 5 volts from a USB power supply by using a recently-bought in-line ammeter/voltmeter. This is called a "Charger Doctor" and cost me only £2.98 including postage from eBay. Using this very handy little gadget I had determined that my RPi consumes just under 0.5 amps at all times. (Search for "USB Charger Battery Doctor Mobile Power Detector Tester Voltage Current Meter.")
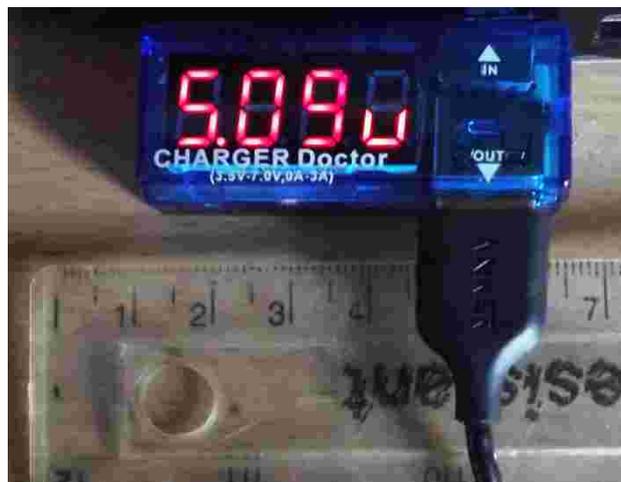
The "Charger Doctor" In Use at G3WZK – indicating that its input voltage is 5.09 volts

It was a fairly simple matter to construct this quad-output power supply and it worked first time. The four regulator ICs were mounted on a common heatsink that I had made out of a piece of scrap aluminium. However, I discovered that this was getting rather too hot for my liking when the RPi was connected. I therefore enlarged the heat sink considerably with more scrap aluminium and a commercial heatsink bolted on for good measure.
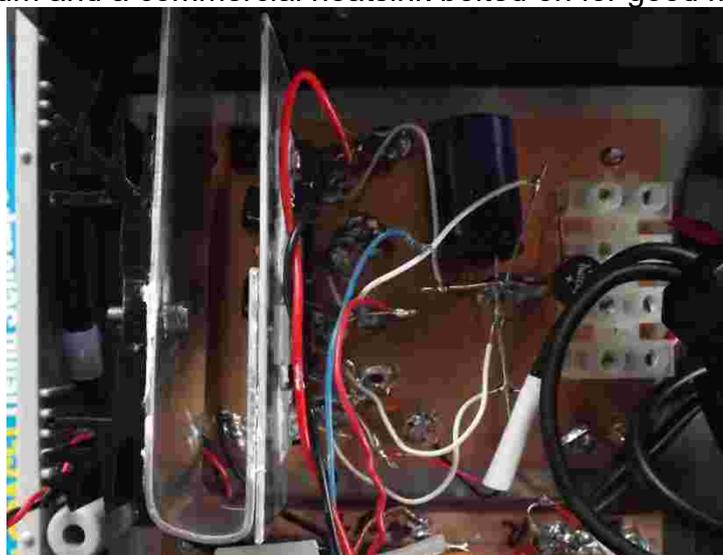

The PSU section of the radio box, with heat sink at left

Earlier, I mentioned the annoying hum in the main amplifier. I needed a permanent solution for this too as it is simply not on to use cooking foil in a plastic bag other than for testing purposes. I had obtained some aluminium sheet and set about cutting a piece of this to place at the bottom of the plastic amplifier box. If this didn't work to cure the mains hum, it was my intention to construct a shield from more ally sheet to place over the preamp section. Fortunately, simply lining the base of the plastic amplifier box with the grounded ally sheet was enough to reduce the hum in the amplifier to an insignificant level. I therefore cut a second piece to fit in the base of the radio box. I fit all mains-powered equipment that I build nowadays with a chassis mounted IEC socket, and these two hi-fi units were no exception. As the power consumption of both boxes is quite low, I incorporated a fuse in series with the Live connection inside each box – rated at 100mA for the radio and at 1000 mA for the amplifier. (A 500 mA fuse kept blowing due to the switch-on surge). I don't like to rely on plugtop fuses if a better alternative is possible.

I was very impressed with the performance of the RPi as an Internet Radio. As it stands the RPI Radio I built beats our commercial DAB portable radio hands down. The sound quality is good, but can be improved by using a stand-alone high quality sound card. Also, the number of stations you can listen to is virtually limitless. In my view, Internet Radio has to be the way forward for broadcasting to people's homes.

Both boxes are now installed in our sitting room and working well. The XYL is pleased. She is also glad that I built the amplifier part when I did as when I started stripping wallpaper in the dining room, large chunks of plaster began to fall off the walls. To cut a long story short, the room had to be professionally re-plastered, so that what I had expected to take only a week lasted more like a month. If I had started a fortnight before Christmas, the roast turkey dinner would have been ruined and my name mud. The electronics project had been suggested to me at just the right time!

The completed dual VHF/RaspberryPi radio under test, but before applying any labels to the front panel. Classic FM is being received on VHF (left hand radio) and also via the Internet (right hand radio.)
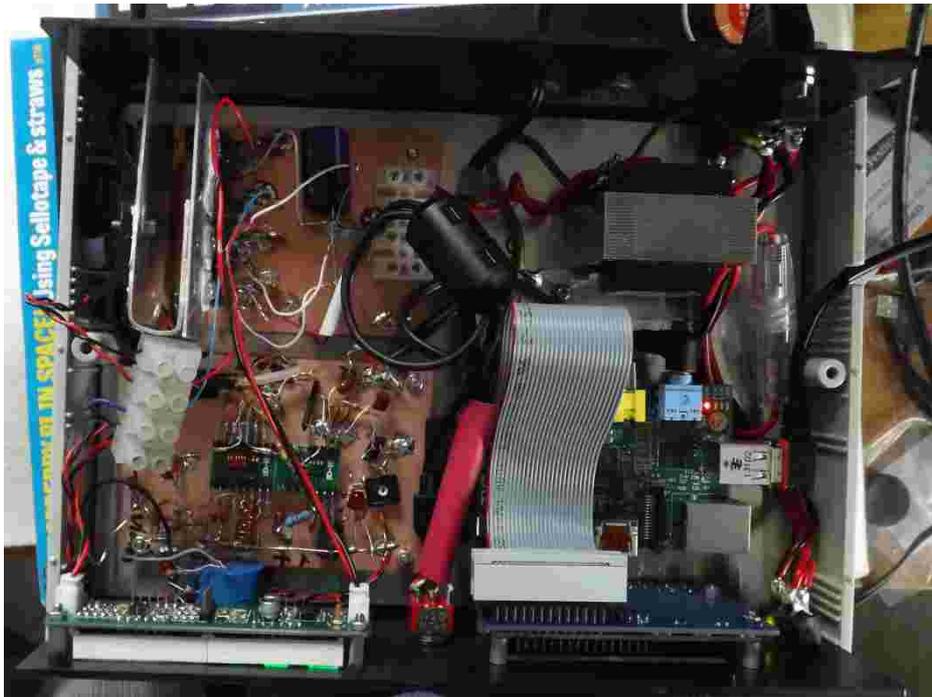
The completed dual VHF/RaspberryPi radio under test. Top left - PSU; Top right - Mains Transformer; Bottom Left - VHF FM Radio; Bottom Right - Raspberry Pi Radio. Mounted on the inside of the front panel are (left) frequency display unit for the VHF radio and (right) Adafruit control board with 16 x 2 LCD display for Raspberry Pi radio. In the middle of the front panel is the toggle switch used to select the radio of use.

The complete radio box – still awaiting legends

CONCLUSIONS:
Soldering SMD integrated circuits was much easier than I expected – why not give it a try! It was great fun using the RPi for the basis of a project; building a RPi radio was well worth the effort and I learned a lot. I am already thinking about constructing another RPi radio, only this time building it into a vintage radio box with rotary encoders for tuning etc and a high quality sound card – Bob Rathbone's PDF describes this too!

The completed system

Steve Beal G3WZK

Rallys & Events

***14-16 July 2017 Hamtronic Show, Friedrichshafen, Germany* [Friday-Sunday]**
Messe, Friedrichshafen, 88046, Germany
Open 09:00-18:00. Admission €9.00, (other ticketing formats available).SIGs. Trade.
IARU Member Societies' stands. Lectures, some in English. Large flea market.RSGB
books.
Details:http://www.hamradio-friedrichshafen.de

16 July 2017 McMichael Rally
Reading Rugby Club, Holme Park Farm Lane, Sonning Lane, Sonning-on-Thames,
Reading RG4 6ST.
Open 09:30. Entry £3. Talkin S22. Tables & car boot spaces £10. Trade. SIGs.
Catering/bar on site. No dogs allowed - venue rules (assistance dogs excepted).
Details: Andy, 07775-940016 or Min, 07715-771665 http://www.mcmichaelrally.org.uk/

30 July 2017 Chippenham and District Amateur Radio Club Rally

Kington Langley Village Hall, Church Road Kington Langley, SN15 5NJ.
Open 10:00 to 13:00/07:00 Sellers. Entry £2/kids free. Talkin S22-145.55 MHz.
On-site parking. Disabled facilities. Tables inside £8, car-boot pitches £6
for cars & vans, payable on entry. On-site catering.
Details: Brian, g6huim3hui@gmail.com Club Website:http://G3VRE.org.uk

Other Club News & Contact Information

BROMLEY & DISTRICT ARS
Website: www.bdars.org.uk/

Email: info@bdars.co.uk

Club Net: Wednesdays 9:00pm - meet on 145.500 MHz FM and QSY

Meetings: 3rd Tuesday of every month at Victory Social Club, Kechill Gardens, Hayes, Kent, 19:30 for 20:00.

Jul. 18 Morse Code G4NPD

CRYSTAL PALACE & DISTRICT RADIO SOCIETY
Website: www.qsl.net/g3oou/ or http://www.g3oou.co.uk/

Club Net: Wednesdays 20:00 on 145.525 MHz

Meetings: 1st Friday at All Saints Parish Church, Beulah Hill at 19:30

7th July – GPS by Nick Stapley followed by another short talk TBA
4th Aug - Summer Social
1st Sep - Antenna Modelling by Quin Collier G3WRR
6th Oct - SDR Without Maths by Alan G0TLK
1st Dec - Christmas Social

CRAWLEY ARC
Website: www.carc.org.uk

Meetings: Every Wednesday at Hut 18, Tilgate Forest Recreational Centre, Tilgate Forest, Crawley from 19:30, and Sundays, 10:30 to 13.00.

CRAY VALLEY RS
Website: www.cvrs.org
Contact: Richard Cains G7GLW rcains@btinternet.com
Club Net - 10m Sunday morning net @ 10:00 local: 28.570 MHz +- QRM
4m net – Fridays in weeks where there is no club meeting @ 20:30 local: 70.450MHz, then QSY to 70.425 or 70.475MHz
Meetings: 1st and 3rd Thursdays at 1st Royal Eltham Scouts HQ, Rear of 61 - 71 Southend Crescent, Eltham, London, SE9 2SD.

Thursday 20th July - DXing without the luxuries – Richard G8ITB

DORKING & DISTRICT
Website: http://www.ddrs.org.uk Email: ddrs.secretary@yahoo.co.uk
Contact: George Brind, G4CMU
Club Nets: Sunday 08:15 on 3.770 MHz & Thursday 20:00 on 144.775 MHz
Meetings: Friends Meeting House, Butterhill, South Street Dorking at 19:30

HORSHAM ARC

Website: www.harc.org.uk
Club Nets: Saturdays 21:30 on 144.725MHz and Sundays 10:00 on 3.722 MHz
Meetings: 1st Thursday at The Guide Hall, Denne Road, Horsham, Sussex

MID SUSSEX ARS

Website: www.msars.org.uk
Club Nets: Sundays 08:00 on 3.740 MHz and at
11:00 on 145.350 MHz, Wednesdays 20:00 on 145.350
MHz and Daily 13:30 on 21.330 MHz
Meetings: Every Friday at Cyprus Hall, Cyprus Road, Burgess Hill, West Sussex for 19:45

SURREY RADIO CONTACT CLUB

Website: www.g3src.org.uk
Contact: John Kennedy G3MCX, 020 8688 3322 email secretary@g3src.org
Club Net: Sunday 09:30 on 1905 kHz , 70.300 MHz Thursday 8:00 pm, 145.35 MHz +/-
25kHz Friday 8:00 pm
Meetings: 1st & 3rd Mondays at Trinity School, Shirley Park, Croydon CR9 7AT 19:30 for
19:45.

Monday 10th July – Summer Barbeque

Sutton & Cheam Radio Society

Sutton United Football Club. The Borough Sports Ground, Gander Green Lane, Sutton,
Surrey, SM1 2EY
Web site: http://www.scrs.org.uk General Enquiries e.mail: info@scrs.org.uk
Nets – Wednesday 20.00hrs 145.500 MHz , Saturday 10.00 7.125 MHz, Saturday 11.00
145.500 MHz

20th July - The Icom IC7300 SDR Transceiver by Mike Davies G0KAD. (revised date)
17th August 20th - ICQ PodCasts by Martin Butler M1MRB (revised date)
2nd & 3rd September – SSB Field Day

Wimbledon & District Amateur Radio Society

Meets on the 2nd and last Friday in the month at Matin Way Methodist Church Hall, Martin
Way Merton Park, London,SW19 9JZ at 19:30hrs for 20:00hrs.
Contact: Andrew G4ADM on 020 8335 3434 or andrew.maish(at)ntlworld.com

CATS fully support the RSGB Child Protection Policy

CATS are twinned with the Crescenta Valley Radio Club
Glendale California USA www.qsl.net/cvrc