

The newsletter of the
Crystal Palace Radio & Electronics Club

Affiliated to the Radio Society of Great Britain

Meetings are held on the first Friday of each month.

The room opens at 7:30pm for an 8pm start at:

All Saints Parish Church,
Beulah Hill, London, SE19 3LG
(opposite the junction with Grange Road).

Visitors are always welcome.

Web sites: Club: <http://www.g3oou.co.uk/>
Technical: <http://www.gsl.net/g3oou/>
Club Net: Each Wednesday at 20:00 on FM on 145.525MHz (S21) ± QRM
Twitter @BobFBurns or www.twitter.com/bobfburns

Next meeting: 2nd December 2016

Club Construction Project Part II and the Christmas Social

In this issue: *Future & Most Recent Meetings, Freeze Your Camera by 'Theorist', Technical Snippets, , Miscellaneous, Noticeboard, Diary of External Events, News from other Clubs, Local Training Courses, Club Contact Information and List of equipment for sale.*

Dear Reader

Future Club Meetings and Events

2nd Dec M Club Project and Christmas Social
6th Jan 17 M Digital Mode Radio by Damien 2E0EUI
3rd Feb 17 M Annual General Meeting

C = Contest, Co = Committee meeting, E = External event, M = club meeting, R = Rally, T = Training course, V = Visit.

2nd December - Club Project Part II and Christmas Social

Construction work will continue during the evening in parallel with the Christmas Social so please bring along any tools that you think you will need. Please also bring a contribution of seasonal food just sufficient for yourself and any accompanying family or friends which will be placed on a shared table.

19th January 2017 SCRS Big Quiz

We have received an invitation to this event.

On the evening of Thursday 19th January 2017, the SCRS Big Radio Quiz of the Year will take place at Sutton United Football Club. Please join us for a fun evening of radio-related brain teasers, and of course the bar will be open for business as usual. There is a maximum of four people per team and an entry price of £5 per team, with proceeds going towards club funds to help support our outreach programs and other community engagements.

There are currently five quiz rounds planned, including: Radio Knowledge, Radio in Popular Culture, Picture Round, Cryptic Radio, and General Knowledge. A trophy will be awarded to the winning team, and the final results will also be published in our February 2017 newsletter.

Recent Event News

4th November - Club Project - An Arduino Based Frequency Counter by Alan G8NKM

This was a well attended event for which Alan provided kits of parts to each constructor and work commenced as you can see in the following photos.

Hunduma and Geoff working on the project:



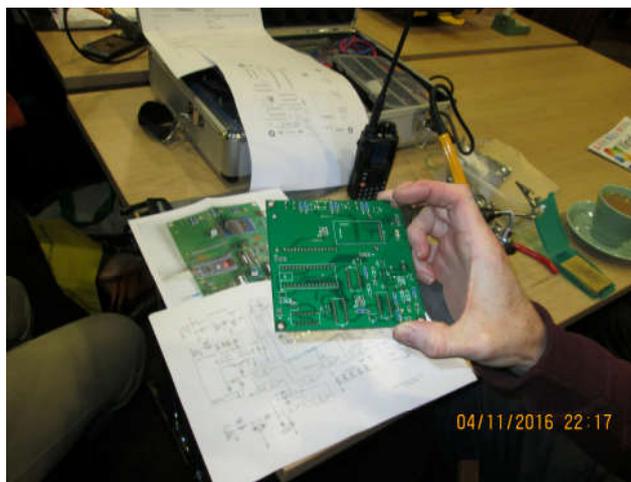
This project is fairly straightforward but does have a few surface mount components that are not easy to solder in place. Magnifying glasses are always useful.

Alan was on hand to solve any problems.

Our Chairman Jim engrossed in his work:



Damien holding his project PC board:



Those taking part in this project are Jim M6BXL, Geoff Godfrey, Damien 2E0EUI, Hunduma Bekele, Lawrence Rance and Andy Hofstedt. So far, none have been completed so construction work will continue at the next meeting. If you would like to take part in this project please contact Alan G8NKM and let him know.

Hunduma rejoined the club at this meeting having been unable to attend some previous meetings due to being unwell - welcome back Hunduma.

West London Radio & Electronics Fair - 6th November at Staines Road East, Sunbury on Thames, Middlesex TW16 5AQ.

Web site: <http://www.radiofairs.org.uk/>

This is a well attended event which takes place in April and November each year and features a mix of commercial, private and club stands with a wide range of new and second hand equipment and components on sale.

The following picture shows the club stand during its preparation.



Club members Jim M6BXL, Alan G8NKM and Bob G300U manned the club stand for the duration of the event. Sales were brisk and a lot of items were sold. We all took turns to wander round the exhibition looking for interesting items.

Intermediate Exam on 19th November

Congratulations to our chairman Jim who passed his intermediate exam at the end of this course. He is now waiting to claim his new 2E0 callsign and is investigating a higher powered rig.

CATS Bazaar - 20th November at the Oasis Academy in Old Coulsdon. The stand was manned by Alan G8NKM, Jim M6BXL, Damien 2E0EUI and myself. We managed to sell the remainder of Frank's equipment and parts and Doris is preparing accounts of those sales.

Speaking to visitors to our stand, the consensus was that the new venue was very good so great things are expected for next year.

CPREC Officers and Committee

Our Chairman Jim has been doing a bit of gentle feeling of elbows (not really arm twisting!) and we have two 'volunteers' offering their services for the posts of Chairman and Treasurer at our AGM next February when Jim and Doris stand down as both officers and committee members.

Freeze Your Camera by 'Theorist'

The modern printing press was invented by Gutenberg in 1450 and rapidly copied by others. A history book I have says that within 50 years more books had been produced than were in existence prior to that date, estimated at about 20 million. Some years ago I read a similar

statistic along the lines of "in the last two years more photographs have been taken than in the entire history of photography until now". Whatever the true quote was, a significant proportion of the population had begun to carry a digital camera with them at all times, in the shape of a mobile phone, so this was believable.

The sensors in most digital cameras are CCD or charge coupled devices, although some are CMOS type. They are divided into an array of pixels, a bit like a giant chessboard. Each pixel is sensitive to the intensity of light falling on it, not to a particular wavelength. This is not like film photography where different chemicals on the film respond to different colours of light; the CCD in a digital camera is at heart black and white. All pixels are equal, in the sense that every pixel on the CCD sensor has the same ability to detect light as any other.

To get them to detect colours, a carefully aligned array of filters, called a mask, is placed over the entire sensor area to give each pixel its own filter. Each pixel's filter will only allow one colour of light to pass through, either red, green or blue (RGB). In this way each pixel will only respond to one band of colour. I will call a 'red pixel' one that has a red-pass filter over it, and similarly for 'blue' and 'green' pixels.

A group of four pixels (in a square) usually consists of two green, one red and one blue pixel. There are two green pixels because our eyes have evolved to be more sensitive to green light than any other colour. Indeed the spot produced on a screen by a 1 mW green laser pointer will look 30 times as bright as a 1 mW red laser pointer spot.

Without going into the physics of it, you can think of each pixel as like a capacitor. As light lands on a pixel a charge is stored, and when the photo has been taken the amount of charge in each pixel is measured. Some cameras, usually the high end professional models, have the capability of storing these values directly in so-called RAW format. Most cameras do not have this capability and do some processing before storing the image on a micro SD card or similar. The usual procedure is that for each pixel some sort of average of its stored intensity with that of the eight pixels around it is taken, allowing for the 'colour' of the pixels. This is converted to a number and stored, where each number corresponds to a unique colour in the final image. Additionally some compression of the image then takes place to store the familiar JPEG file. This is a lossy but more compact version of the RAW image, suitable for most everyday purposes.

Conventional wisdom has it that three main factors are significant in digital camera performance. One is the quality of the lens, the second is the number of megapixels (MPs) the sensor has, and the third is the physical size of the sensor. Other things being equal, which they never are, a physically larger 10MP sensor will be better than a smaller sensor also with 10 MP, because each pixel is effectively a bigger capacitor. This enables a greater dynamic range of light levels to be recorded since it is less easy to fill or saturate any individual pixel. A bigger capacitor also gives a better signal to noise ratio.

A good lens will ensure that focussed light ends up where it should, without spilling over onto neighbouring pixels. More pixels are better because the resultant

image will have more detail, but the lens must be of sufficient quality to make good use of this.

I said that a particular masked pixel will only respond to one band of colour, either red green or blue, and this is true for visible light reaching the sensor from the lens. However the sensors are sensitive to other wavelengths of electromagnetic radiation, in particular thermal radiation. Basically anything that has a temperature (and everything in the universe does have a temperature) will radiate depending on its temperature. When a picture is taken, some charge is generated in each pixel due to the heat radiation from inside the camera. Taking a picture inside a closed dark room will produce a speckled image mainly due to this effect. The noise can be reduced if you lower the temperature of the camera, perhaps by placing it in a freezer before use. Do not try this at home.

When it comes to space cameras thermal effects need to be dealt with since even a tiny bit of thermal noise could be interpreted as a star or extremely remote galaxy. Some space telescope cameras are therefore cooled, even though the outside temperature is only a few degrees above absolute zero anyway. The cameras used are extraordinary. For example the new Gaia satellite, which is mapping the galaxy, has a camera with nearly one billion pixels. There are 106 individual CCDs, each more than 8 MPs. The sensor area is a whopping 0.38m² – the largest ever put into orbit. I can't see a camera like this being on sale at your local Curry's megastore or John Lewis anytime soon. Look forward to some spectacular images soon.

Technical Snippets

a) When you develop and construct a low voltage regulated power supply (PSU) there are some less than obvious conditions that need to be considered in order to minimise any risks of failure of the power supply or the equipment that is being powered. The three most obvious conditions that come to mind (not in any significant order) are:

- The output voltage holding up for longer than the input voltage resulting in the regulator devices becoming reverse biased. This can happen if there is a battery or high value capacitor connected to the output
- An inductive load on the output that generates a high voltage spike when the magnetic field collapses.
- Catastrophic failure of the regulator

The solutions to the first two cases are very easy and low cost - two high peak current diodes with a reverse breakdown voltage that is greater than the maximum output voltage of the power supply.

The first condition requires a diode connected from the unregulated input to the regulated output so that under normal operation the diode is reverse biased. When the output voltage exceeds the input voltage the diode conducts and ensures that the maximum voltage across the regulator is less than one volt.

The second condition requires a minimum of one diode connected across the regulated output so that it is reverse biased under normal operation i.e. the cathode is

connected to the positive line and the anode to the negative line. Any pulse at the output that attempts to reverse the output polarity will cause the diode to conduct. The back emf resulting from the collapse of the magnetic field will normally be in the opposite polarity to the voltage applied to the inductor.

However, if you think that your external circuit could generate a pulse in the same polarity as the applied voltage then a power zener diode will be required with a working voltage that is, say 10%, above the maximum possible output voltage of the PSU.

In all of these cases the diode(s) must be rated to be able to absorb all of the expected energy from the external circuit. The 1N5400 - 1N5408 series have a non-repetitive peak current rating of 200amps but larger diodes are available.

The third condition requires a more complex solution called a crowbar. A very high current silicon controlled rectifier (SCR) is used to place a short circuit across the output when the fault condition is detected to protect the equipment being powered. The SCR must be able to safely absorb the maximum possible peak output current from the power supply until the fuse blows.

For a typical 13.5v 25amp PSU this could be several hundred amps until the PSU smoothing capacitors have discharged. Thankfully, high current SCRs are not very expensive. The sensing circuit must promptly detect any over-voltage condition and provide sufficient current to trigger the SCR. Once triggered, the SCR stays in the conducting state until the voltage across it has reduced to a very low level.

Motorola developed a special driver IC, the MC3423, to drive a crowbar SCR and this is still available from some suppliers. It has sufficient output current to drive an SCR, a presettable trigger voltage threshold, a remote control option and a filter option to avoid unnecessary triggering by local fast pulses that do not represent a fault condition.

Example SCRs:

2N6504 50v 25A rms, 250A pk (10mS)

MCR69-2 50v 25A rms, 300A (10mS), 750A (1mS)

In all of these features the protection device must have a current rating that is many times the current rating of the power supply to avoid its own failure and the PSU wiring must support the maximum possible fault current.

As a minimum safety feature, a suitably rated fuse must be installed in the primary feed to the mains transformer. You may also fuse the DC feed to the regulator circuit but due to the high circuit current this may have to be a chassis mounted fuse.

b) Red versus Green LEDs - Theorist commented on the difference in light intensity required to see that same brightness between red and green light sources this month. I noticed the same issue when working on my push button processor boards, one of which has both red and green illuminating LEDs in the push buttons. The LED current required to produce a similar level of illumination in a green LED is about 10-15% that required for the red LED.

Miscellaneous

a) **CATS** announced in their last newsletter the sad news that founder member Frank Emery G3ZMF had become a silent key. I attended the funeral in early November to represent Crystal Palace Club in the company of some 40-50 other friends of Frank. I also assisted CATS in the sorting out and disposal of Frank's crystal collection which exceeded 8200 units. A number had already been individually sold and the updated list was on the club website in the Noticeboard section.

The remainder of the crystal collection was sold to a dealer at the CATS Bazaar.

b) James Dyson Award 2016

A folding, recyclable, rain resistant bicycle helmet made from recycled paper has won the 2016 international James Dyson Award. The EcoHelmet is made from paper woven into a honeycomb structure that protects the wearer's head from impact from any direction. It is also covered in a biodegradable coating that makes it water resistant for up to three hours.

Inventor Isis Shiffer said the EcoHelmet was aimed at city bike share users, such as London's 'Boris bikes'. The folding helmet could be sold for \$5 (£4) at the cycle stations, she said.

Source: <http://www.itv.com/news/2016-11-17/paper-bike-helmet-wins-2016-international-james-dyson-award/>

Notice Board – Wanted and For Sale

The Notice Board is for all club members to use so if you have one or more items that you wish to buy or sell then please send in the details. The current list of items may be viewed at: <http://www.g3oou.co.uk/> in the "Notice Board – Wanted and For Sale" section.

For Sale

CPREC has a large bank of fundamental and overtone quartz crystals, from 1.0 – 99.91MHz. The list has now been updated, sorted in frequency order and placed on the club web site notice board. Prices are £1 each to club members and £2 each to non members.

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G300U

Diary of External Events

12 Feb 2017 - HARWELL AMATEUR RADIO SOCIETY RADIO AND ELECTRONICS RALLY

Didcot Leisure Centre, Mereland Road, Didcot, OX11 8AY. Talk-in on 145.550. Free parking. Opens at 10am entry £3 (children under 12 free). Details from Ann G8NVI on ann.stevens@btinternet.com or www.g3pia.org.uk

26 Feb 2017 - (BRATS) RAINHAM RADIO RALLY

Rainham School for Girls, Derwent Way, Rainham, Kent, ME8 0BX. Just off the A2 and M2 J4. Talk in on 145.550MHz. Opens 10am, entry £2.50. Information from Trev@wig1.co.uk or www.brats-qth.org

30 Apr 2017 - WEST LONDON RADIO & ELECTRONICS SHOW (Kempton Rally)

Kempton Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ. Talk in and on site car parking. Opens 10am. Trade stations, Bring & Buy and special interest

groups. Details from Paul, M0CJX on 0845 165 0351, info@radiofairs.co.uk. www.radiofairs.co.uk

News from other Clubs

Club Secretaries – please send your meeting programs to our newsletter editor Bob G300U. This newsletter is published about ten days before the club meeting and closes for editorial contributions a few days before publication. Due to differing publication dates and short lead times it is sometimes difficult to include other clubs' specific events although we will endeavour to do so if advised in time.

I am having increasing difficulties in getting future meeting details from the newsletters or websites of some of our corresponding clubs in time for our newsletter publication. Please ensure that the details are sent to me in time.

If you plan to visit one of these club meetings please check with the club concerned in case any last minute changes have been made.

Bromley & District Amateur Radio Society

19:30 on the third Tuesday of each month at the Victory Social Club, Kechill Gardens, Hayes, Bromley, BR2 7NH. Contact Andy G4WGZ on 01689 878089 or

[enquiries\(at\)bdars.co.uk](mailto:enquiries(at)bdars.co.uk). Web: www.bdars.co.uk

20 Dec Quiz and Mince Pies

17 Jan 17 Programme Planning & AGM

Chelmsford Amateur Radio Society (CARS)

19:30 on the first Tuesday of each month at Oaklands Museum, Moulsham Street, Chelmsford, Essex, CM2 9AQ.

Contact: [secretary\(at\)g0mwt.org.uk](mailto:secretary(at)g0mwt.org.uk) Web:

www.g0mwt.org.uk

06 Dec Christmas Social

03 Jan 17 Riding the radio waves - Jane Humphreys

07 Feb 17 Talk on Diplomatic Wireless - by Peter Grimshaw, M0HSG

07 Mar 17 Classic Computers - Andy Chapman, G7TKK

Coulsdon Amateur Transmitting Society (CATS)

8:15pm on 2nd Monday each month. Contact: Mike Buckley, M1CCF on 020 8654 2582, [m1ccf\(at\)talktalk.net](mailto:m1ccf(at)talktalk.net) or [secretary\(at\)catsradio.org](mailto:secretary(at)catsradio.org). Web site:

<http://www.catsradio.org/>

12 Dec AGM

09 Jan 17 CATS Annual Dinner – Chateau Nepolian Croydon

Crawley Amateur Radio Club (CARC)

Every Wednesday 20:00 – 22:00, every Sunday 11:00 – 13:00. Formal events are on the last Wednesday of the month, 7-30pm for 8pm. Phil M0TZZ on 07557 735265 or [secretary\(at\)carc.org.uk](mailto:secretary(at)carc.org.uk) or Web: <http://www.carc.org.uk/>

Cray Valley Radio Society (CVRS)

Meets at 8pm on the 1st and 3rd Thursday of each month at 1st Royal Eltham Scouts HQ, Rear of 61 - 71 Southend Crescent, Eltham, London, SE9 2SD. Contact: Richard on [secretary\[at\]cvrs.org](mailto:secretary[at]cvrs.org). Web www.cvrs.org

01 Dec Antenna Clinnic

15 Dec Christmas Social

Dorking & District Radio Society

Meetings at 7.45pm. Contact: David Browning (M6DJB) at [djb.abraxas\(at\)btinternet.com](mailto:djb.abraxas(at)btinternet.com). Web site:

<http://www.ddrs.org.uk>

02 Dec Christmas Dinner (no meeting later in the month)

Echelford Amateur Radio Society

Meetings on 2nd and 4th Thursdays of each month at the Weybridge Vandals Rugby Football Club. Enquiries to John

at jho_g4gsc(at)btinternet.com or 01784 451898. Web site:
<http://www.qsl.net/g3ues/index.htm>

- 08 Dec Christmas Party
- 22 Dec No meeting
- 26 Jan 17 'The Cassini Mission to Saturn & the landing of Huygens on Titan' - Professor David Southwell

Hastings Electronics & Radio Club

Meetings held at the Taplin Centre, Upper Maze Hill, St Leonards on sea, TN38 0LQ, 7pm for 7:30 on the fourth Wednesday of each month. Information from Gordon Sweet M3YXH on 01424 431909, email: sionet3344(at)hotmail.co.uk Web: <http://herc-hastings.org.uk/>

Horsham Amateur Radio Club

meets on the first Thursday of each month at the Guide Hall, 20 Denne Road, Horsham, West Sussex, RH12 1JF. NRQ TQ172304 at 20.00hrs local time. Contact Alister Watt G3ZBU at [g3zbu\(at\)hotmail.com](mailto:g3zbu(at)hotmail.com) or <http://www.harc.org.uk/>

- 01 Dec Club AGM
- 03 Dec Christmas Bash - The Chequers - Rowhook

Mid-Sussex Amateur Radio Society (MSARS)

Meet most Fridays in the Millfield Suite, Cyprus Hall, Burgess Hill, RH15 8DX from 7.30pm till 10.00. Contact Stella on 01273 844511, [M6ZRJ\(at\)msars.org.uk](mailto:M6ZRJ(at)msars.org.uk) or www.msars.org.uk

- 25 Nov Video Night
- 02 Dec Christmas Quiz
- 16 Dec Radio Night and Table Top Sale

South East Essex Amateur Radio Society (SEARS)

Contact Dave G4UVJ on: 01268 697978 or [secretary\(at\)southessex-ars.co.uk](mailto:secretary(at)southessex-ars.co.uk) or <http://www.southessex-ars.co.uk/>

Meetings: 7pm 2nd Tuesday each month at Swans Green Hall in Hart Road, SS7 3PE.

- 13 Dec Christmas Social
- 10 Jan 17 32nd Canvey Radio Rally Preparations
- 14 Feb 17 Confessions of a Radio and TV Engineer, Part 2 PMR Radio with Dave G4UVJ
- 14 Feb 17 Peter Walters from W&S - "SteppIR and other antennas."

Surrey Radio Contact Club (SRCC)

7.30 for 7.45pm on 1st. and 3rd. Mondays every Month. Contact John Kennedy G3MCX on 020 8688 3322 or [secretary\(at\)g3src.org.uk](mailto:secretary(at)g3src.org.uk). Web: <http://g3src.org.uk/>

- 05 Dec Club Construction Contest
- 09 Jan 17 3D Printing by Gareth G4XAT

Sutton & Cheam RS

8pm on 3rd Thursday every month. Contact John Puttock G0BWV on 020 8644 9945 or email [info\(at\)scrs.org.uk](mailto:info(at)scrs.org.uk) Web: <http://scrs.org.uk/>. SCRS run a practical group most Monday evenings at the Bandstead Scout Hut.

- 08 Dec Christmas Junk Sale (2nd Thursday of the month, this month only)
- 19 Jan SCRS Big Radio Quiz of the Year 2017 - details on page 2 of this newsletter

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](mailto:andrew.maish(at)ntlworld.com)

Please replace the (at) with @ when using any email addresses shown in this newsletter.

Local Training Courses					
Licence Level	Dates	Location	Club Provider	Format	Further details
Foundation	4 & 11 Feb 2017	Eltham, SE9	Cray Valley RS	2 days (Sat)	www.cvrs.org
Intermediate	5 & 19 Mar, 2 Apr 2017	Bromley, Kent	Bromley & District ARS	3 days (Sun)	www.bdars.org
Foundation	17 Sep & 8 Oct 2017	Bromley Kent	Bromley & District ARS	2 days (Sun)	www.bdars.org
Full	2, 9, 14 Oct & 4, 11, 18 Nov 2017	Eltham, SE9	Cray Valley RS	2 evenings (Mon) + 4 days (Sat)	www.cvrs.org
	= course commenced				

CPREC Committee Contact Information Officers:

Chairman: Jim Lugsden M6BXL 21 Overhill Way Beckenham Kent BR3 6SN 020 8650 7758 james.lugsden531(at)btinternet.com	Secretary: Alan O'Donovan G8NKM 2 Mackenzie Road Beckenham Kent BR3 4RU 020 8778 9660 alan.odonovan(at)btinternet.com	Treasurer: Doris Bailey 21 Overhill Way Beckenham Kent BR3 6SN 020 8650 7758 doris.bailey531(at)gmail.com
Committee Members: Bob Burns G3OOU Damien Nolan 2E0EUI Nick Stapley	Newsletter Editor	01737 552170 or G3OOU(at)AOL.COM