CPREC

G2LW

Palace Pulse

The newsletter of the

Crystal Palace Radio & Electronics Club

Affiliated to the Radio Society of Great Britain

Established January 1956

Meetings are held on the first Friday of each month 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.qsl.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: 5th August 2016

Summer Social and Bring & Buy

In this issue: *Future & Most Recent Meetings, Chairman's Notes, Infirmatoin Theirz by 'Theirost', Member's News, Technical Snippetts, Club Project, Miscellaneous, Noticeboard, Diary of External Events, News from other Clubs, Local Training Courses and Club Contact Information, List of equipment for sale.*

See page 6 for club contact information

Dear Reader

Future Club Meetings and Events

5th Aug	M	Summer Social
2nd Sep	M	Short Talks: Geographical Mapping by Nick Stapley and Eutectic Points by Jim Lugsden
7th Oct	M	How to use SDR (Software Defined Radio) by Damien 2E0EUI
4th Nov	M	Club Project - An Arduino Based Frequency Counter by Alan G8NKM
2nd Dec	M	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.

05 August - Summer Social and Bring & Buy

At this meeting we plan to hold a social with some food and beverages, run the club station and provide a bring and buy table. Please bring along a contribution of food sufficient for yourself and any guests that accompany you. We can heat items in the oven if a suitable dish is provided.

Jim is planning to run a knock out shove h penny contest with an important prize.

We hope to have some of Frank Springate's equipment on display for sale. If you have an item you would like to sell please bring along labelled with a target sale price.

If any members have some spare cardboard boxes about five or six inches square that they could spare we could use them to package up some of Frank's project boxes and components ready for sale.

Recent Event News

01 July - High Altitude Balloons by Rick M0LEP

Rick described his interests in launching and tracking high altitude balloons, the equipment that he uses and similar activities by other teams around the world.

Balloons are usually made of latex and filled with helium gas which although slightly heavier than hydrogen gas, does not ignite so is much safer. The typical height that they can reach is 40,000ft and there is sufficient lift to enable them to carry a very low power beacon transmitter, transponder or possibly a small repeater, usually on 70cms and a small solar cell to provide power.

Balloons are partially inflated so that they have room to expand as they gain height and provide a reasonable length flight - a fully inflated balloon at ground level would be more likely to burst before reaching its target altitude.

Balloon Flight B-64 / M0XER-4, 12th July - 23rd November 2014 - see previous picture for path information.

The balloon for this launch was a self-made plastic foil envelope. The balloon successfully circumnavigated the Earth in 19 and a half days then went on to fly past within 9km of the North Pole and 10km of the launch site.

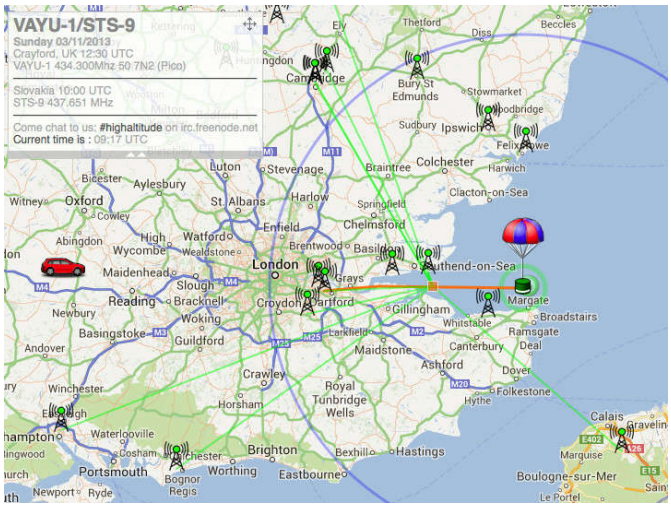
Start time: 12th July 2014 06:51 UTC from Silverstone, UK. Last known position: 23rd November 2014 16:34 UTC over Iceland. Total flight time: 134 days (3225.7 hours).

Project Horus is a high altitude balloon project, based out of Adelaide in South Australia:

Horus 15.5 Horus 15.5 Launch from Cambridge UK. Mark VK5QI, a keen Australian balloon follower, spent some time in the UK and got to conduct a launch of one of his payloads whilst visiting the CUSF team in 2011.

Horus 16 was another attempt at the amateur altitude record, this time using one of the brand-new MicroNut telemetry boards. Sadly, it failed to reach the expected altitude, but more than made up for it in travel distance.

Listener map of the South East:



Project HAB is a web site describing experiments in high altitude ballooning and may be viewed at.

http://projecthab.co.uk/

Rick's radio monitoring equipment, shown over the page, consists of a Yaesu QRP multiband transceiver, battery and a small yagi aerial as shown below. This is all easily installed in a vehicle and may also be carried in a back pack.

Chairman's Comments

Life member Frank Springate G3BWV has taken up residence in sheltered accommodation where his daughters tell me he is settling in but is unable to do much radio work. They have asked us to sell his gear for him so Bob and I spent an afternoon sorting and clearing. There are some good quality items to be disposed of which are now all at my house. Bob and I are making a list of equipment and components and working out prices. The idea is to take tables at Kempton Park and CATS Bazaar in November. The club will receive a commission on sales for our funds.

When we have a price list worked out Bob will publish it in Palace Pulse. Also when the list is complete members may like to view and buy the items at my house before we take them to the rallies. Ring or email me first for a mutually agreeable time.

The August meeting is the summer social. We plan to run a knock out shove h penny contest with an important prize.

The meeting will also be a "Bring and Buy" so dig out your unwanted treasures. We hope to have some of Franks items there too. We will also run the radio station so help will be needed with the aerial.

Please bring items of food and drink too.

See you on August the 5th, Jim. (M6BXL)

Infirmatoin Theirz by 'Theirost'

The club secretary lent me a very interesting book about Bell labs recently, and this got me interested in the topic I am writing about this month [1]. Suppose you want to send a message to somebody consisting of a string of 1's and 0's. Unlike the title of this article, which has obviously been garbled in transmission to the editor, you would like the message to be received error-free. But suppose each bit has a probability *p* of being received incorrectly, a 1 being received as a 0, or a 0 as a 1. What can you do to reduce errors?

There are two approaches. You could try physical means - get better equipment, increase transmission power or whatever. Alternatively you could try 'clever' methods such as using error correction codes.

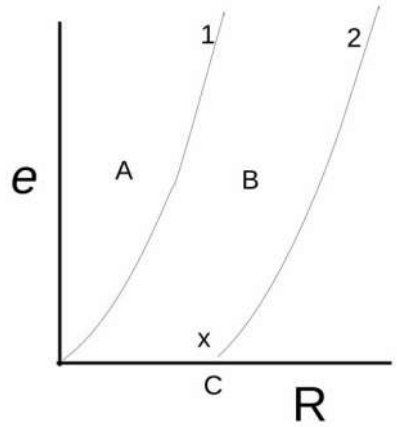
One way you could improve things is to repeatedly transmit each bit more than once, say three times, so that if your message was 1011 you would send 111000111111. On reception each group of three bits would be subject to a majority vote, so that if 110 was received (or 011 or 101) this would be interpreted as a 1. Two bits, or all three, would need to be flipped for an error to occur. Knowing the value of *p* it is not too difficult to calculate the error rate *e*. If this is too high for the purpose you have in mind you could increase the number of repetitions to 5 or 7, or 99 if that gets you the error rate you want. Of course you can never absolutely guarantee that a message will be received error-free, since there will always be a probability that enough bits will be flipped to give an error, no matter how many repetitions there are.

Clearly there is a large overhead in all this. The transmission rate R is reduced to 1/3 in the three repetition case since three times as many bits are sent, and a message takes three times as long to send. With more repetitions the error rate gets closer to zero, but so does the transmission rate, and it is obvious that no matter what coding method you use you will always have this problem. Obvious – but incorrect.

The fact is that in 1945 Claude Shannon, an employee at Bell labs, published a paper which founded a new discipline called information theory, and also found all of the key results. Finding a way to characterise a channel by its bandwidth and noise characteristics, Shannon showed how to calculate the maximum rate at which data can be sent over it with an error rate as close to zero as you require. He called this rate the channel capacity, C, aka the Shannon limit. He showed mathematically that there must be error correcting codes that enable transmissions to approach C with an arbitrarily small error rate [2].

To put it another way, he proved that providing R < C then codes exist that allow the error rate at the receiver to be made *arbitrarily small*. In theory it is possible to transmit information virtually without error at any rate below the limiting rate C, and therefore within a finite time. [3]

The sketch to the right should make things a bit clearer. Line 1 is indicative of what can be achieved with repetition codes, but by going through the origin it also represents the 'obvious' limits that would have been expected before Shannon's work.
All points in region A are achievable.



Line 2 represents the Shannon limit – Shannon proved that points in region B are achievable with efficient codes. The point marked X is near ideal, with a low error rate and transmission rate near the channel capacity C. Unfortunately Shannon did not provide any details of an efficient code – he just proved that they must exist and as it happened, good practical codes took a surprisingly long time to develop.

When they did come, improvements in the 1980's allowed increased modem speeds, but the real breakthrough came in 1993 when the first codes to approach the Shannon limit were found. The best modern algorithms are the Reed-Soloman and Low-Density Parity-Check (LDPC) codes [4]. Initially these were of limited use since these better codes require a good deal of processing power to be useful in real time - the coding and decoding processes have high computational complexity. They require specialized microprocessors called digital signal processors (DSPs); your mobile phone will have one.

Next time you use your phone, play a scratched CD/DVD, read or write to your computer hard drive, use the internet or watch TV, remember that none of this would be possible without Shannon's theory.

[1] So blame Alan if you don't like it!

[2] Shannon's 'noisy-channel coding theorem'

[3] If you try to send information at a rate greater than C, then all codes will have an error rate greater than a certain minimum value, which increases with R

[4] I hadn't heard of them either

Technical Snippets

a) Off Air Frequency Standard

The completed version of the Off Air Frequency Standard described in the last newsletter is now working correctly and just requires some decorative changes to the chrome bolt and poorly fitting grey knobs on the front panel.

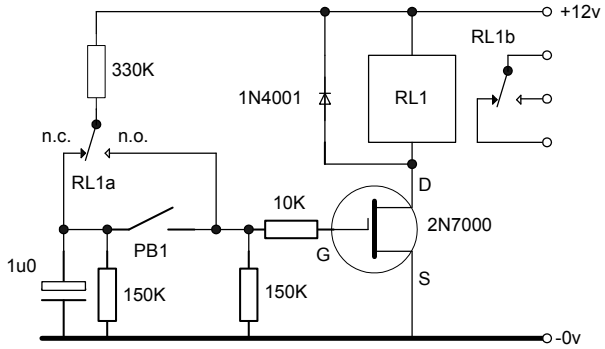
The internal low drop out regulator and battery charger are working well and the unit may be operated from the internal battery with or without float charging or an external 12v DC supply.

It takes at least 30 seconds to lock to the incoming 198KHz signal and then shows no change on a local oven controlled frequency counter when displaying 10.0MHz to 0.1Hz resolution. Some thought is being given to an alternative lock indicator as the meter only shows very small movements after a few seconds making the locked condition difficult to confirm.

The rear panel holds a switch to provide selection of the internal ferrite rod aerial or an external aerial, the ferrite rod preset tuning trimmer and external power connector.

b) Latch Facility for a Momentary Push Button Switch

The following circuit enables a low current momentary switch to drive a latching circuit with a much higher current control capability. The circuit always powers up in the off condition.



PB = low current momentary push button switch
RL1 = 12v DPCO relay

The contact ratings of relay RL1 should be selected for each application. The circuit always powers up in the off condition. Pressing switch PB1 causes the relay to be energised and pressing it again will de-energise the relay.

Club Project

Our secretary Alan G8NKM is working on the development of a new club project which is an Arduino based frequency counter with an LCD display and a temperature compensated crystal oscillator to provide a reasonable measuring accuracy without the need for an oven controlled frequency source. The prototype is working and has been tested with the off air frequency standard mentioned above.

Alan is now concentrating on raising the maximum frequency of operation and improving his PCB layout skills using the Kikad CAD package to produce a commercial standard PC board.

Miscellaneous

Light Engineering: Off-grid communities such as those in sub-Saharan Africa can pay thousands of times as much as the rest of us for their energy. Designer Jim Reeves has developed a simple, low-cost gear-train and generator that uses a descending weight to power a perpetual light source. Children can do their homework and study, families and friends can eat together and interact after dark adding new dimensions and possibilities to their lives. [Source: Facebook and the Guardian]

https://www.facebook.com/theguardian/videos/10154275707536323/

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 £3 each to non members.

One of Victor's neighbours has donated the following items for sale for which offers are invited with proceeds going to club funds:

1. Armstrong Amplifier 621 (see below)
2. AKAI Compact Disc Player CD-M88
3. Maraiz Disc Player CD-67II (see below)

Contact Victor on 020 8653 2946 or victor(at)jmail.co.uk

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G3OOU

Diary of External Events

06 Nov - West London Radio & Electronics Show (Kempton Rally)

Kempton Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ. Opens 9.50/10am. Details from Paul, M0CJX on 08451 650 351 or by email to info@radiofairs.co.uk or www.radiofairs.co.uk

20 Nov - CATS 39th Radio & Electronics Bazaar

Location: Oasis Academy Coulsdon, Homefield Road, Old Coulsdon, CR5 1ES. Just £1.50 entry which still includes a free tea/coffee! Second Hand Equipment,
Flea Market Tables, Refreshments, Trader Stalls, Fully accessible facilities, CATS Bring & Buy. Contact enquiries@catsradio.org or visit www.catsradio.org for more information.

News from other Clubs

Club Secretaries – please send your meeting programs to our newsletter editor Bob G3OOU. 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.

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. Web: www.bdars.co.uk

16 Aug Aerials, Construction, Testing, and On Air! - Changed! Please note!
20 Sep Digital Mobile Radio
18 Oct Setting up your station
15 Nov "Toilet-roll TRF" (Construction)

Chelmsford Amateur Rado 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 Web: www.g0mwt.org.uk
02 Aug Constructors Competition by Carl G3PEM
06 Sep Millimetric Microwaves by Chris Whitmarsh G0FDZ
04 Oct Annual General Meeting

Coulsdon Amateur Transmitting Society (CATS)
8:15pm on 2nd Monday each month. Contact: Mike Buckley, M1CCF on 020 8654 2582, m1ccf(at)talktalk.net or secretary(at)catsradio.org. Web site: http://www.catsradio.org/
08 Aug CATS Annual BBQ
12 Sep One Man & His Guide Dog by Paul Harman
10 Oct TBA
14 Nov ICQ Podcast by Martin Butler M1MRB/W9ICQ

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 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 secretary[at]cvrs.org .Web www.cvrs.org
04 Aug Current Spectrum issues – Murray G6JYB
08 Sep '999 Emergency' – Steve G3ZPS
22 Sep Old fashioned 'Junk' Sale - Nigel G1BUO

Dorking & District Radio Society
Meetings at 7.45pm. Contact: David Browning (M6DJB) at djb.abraxas(at)btinternet.com. Web site: http://www.ddrs.org.uk
26 Jul South Downs evening
23 Aug Social Evening

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
28 Jul On-Air / CW Practice / Bring & Buy / Natter Night

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 at sionet3344(at)hotmail.co.uk or http://herc-hastings.org.uk/
27 Jul On air operating and chat
24 Aug Construction Contest
28 Sep "Learning the Code" by Phil G3MGQ

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 or http://www.harc.org.uk/
04 Aug Keith Evans G3VKW - Old Radios
01 Sep TBA
06 Oct Junk Sale

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 or www.msars.org.uk
05 Aug Noise cancelling etc by Graham Somerville of bhi ltd
02 Sep Radio Night & Table Top Sale

South East Essex Amateur Radio Society (SEARS)
Contact Dave G4UVJ on: 01268 697978 or email: secretary(at)southessex-ars.co.uk. Web: http://www.southessex-ars.co.uk/
Meetings: 7pm 2nd Tuesday each month at Swans Green Hall in Hart Road, SS7 3PE. See web site.
09 Aug Talk with the members of the Essex CW Club
13 Sep Update on DMR Radio with Mark M6RKC and Vince G8YPK.* TBC
11 Oct Talk by Carl Thomson G3PEM on "Antennas and Propagation."

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. Web: http://g3src.org.uk/
05 Sep Test Equipment by Bob G3OOU
03 Oct Autumn Surplus Equipment Sale
07 Nov The GB3XP Repeater Project by Neil, M0ZEY

Sutton & Cheam RS
8pm on 3rd Thursday every month. Contact John Puttock G0BWV on 020 8644 9945 or email info(at)scrs.org.uk Web: http://scrs.org.uk/. SCRS run a practical group most Monday evenings at the Bandstead Scout Hut.
18 Aug Kite & Balloon Supported Antennas with Roger Stafford – G4ROJ + EGM
15 Sep AROS (Amateur Radio Observation Service with Vince Shirley – G0ORC

Wimbledon & District Amateur Radio Society
Meet 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

Please replace the (at) with @ when using any email ad-

Local Training Courses

Licence Level	Start	End	Location	Club Provider	Format	Further details
Full	28 Aug 2016	20 Nov 2016	Bromley, Kent	Bromley & District ARS	9 half days (Sun)	www.bdars.org
Foundation	14 Sep 2016	28 Oct 2016	Swanley, Kent	Darenth Valley RS	7 evenings (Wed)	www.darenthvalleyrs.org
Foundation	18 Sep 2016	25 Sep 2016	Bromley, Kent	Bromley & District ARS	2 days (Sun)	www.bdars.org
Intermediate	5 Nov 2016	19 November 2016	Eltham, SE9	Cray Valley RS	3 days (Sat)	www.cvrs.org
Foundation	4 Feb 2017	11 Feb 2017	Eltham, SE9	Cray Valley RS	2 days (Sat)	www.cvrs.org
Intermediate	tba Mar 2017		Bromley, Kent	Bromley & District ARS	3 days (Sun)	www.bdars.org
Full	2 Oct 2017	25 Nov 2017	Eltham, SE9	Cray Valley RS	2 evenings (Mon) + 4 days (Sat)	www.cvrs.org

CPREC Committee Contact Information
Officers:

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

The following equipment is now available for sale and anything that remains unsold will be taken to Kempton Park and the CATS Bazaar events later in the year. Please contact Jim M6BXL if you are interested in any items. Jim will bring some of these along to the August meeting.

G3BWV Equipment List

Description	Model or Part No	Manufacturer	Est'd Price £
Aerial - 4ft telescopic whip with PL259			£2.00
Aerial base - Mag mount plus approx 3m of coax and PL259, no whip.			£10.00
ATU - 300W HF type	AT300CN	Palstar	£80.00
ATU - Home made tuner with two large variable capacitors			£2.00
ATU - QRP HF type in black plastic box with 2 x SO-239 connectors			£10.00
ATU - Versa Tuner II, HF type	969	MFJ	£100.00
Batteries - 2 x 12v 7Ah sealed lead acid gel rechargeable type, £5 each			£10.00
Battery charger – large solar type			£5.00
Bench magnifier			£5.00
Bench viewer – swivel type			£5.00
Bhi noise eliminating speaker	NES 10-2 Mk3		£40.00
Book - RSGB Handbook			£5.00
Books - 24 assorted at £1 each minimum			£24.00
Buried cable finder			£5.00
Cable - Approx 20ft of 50ohm coax	RG58		£3.00
Cable - Approx 7m of 300ohm ribbon in 2 lengths			£3.00
Charger 14v 800mA			£5.00
Compass – Lensatic in metal case			£5.00
Components – Blue box of new and used Rs and Cs			£5.00
Components – Grey box of components and small tools			£20.00
Connector – BNC coaxial splitter	TE114949 PNS-F2		£10.00
Connector – CDX coaxial lightening surge protector			£5.00
Connectors – box of approx 40 assorted jack plugs and sockets			£10.00
Connectors – box of approx 50 assorted coax connectors BNC, PL259 few B&Lee			£15.00
CRT - 1inch type with socket	CV2302		£5.00
CW reader, pocket type (flat battery)	MFJ-461	MFJ	
Digital caliper, looks new		Powerfix	£5.00
Drawing compasses, 5 in metal case			£10.00
Drill stand, drill and assorted drill bits			£20.00
Feeder and cable ties			
Ferrite rings - 2 x 1.5inch			£2.00
Frequency Counter - 500MHz with LED display		Microwave Modules	£25.00
GDO boxed with coils but no ear piece	TE-15	Tradiper	£15.00
Headphones – low impedance old style			£5.00
Helping hand tool with magnifier			£6.00
L & C meter			£10.00
LCR meter with LCD display	Atlas LCR40	Peak	£40.00
Log Amp kit of three ICs incl AD8307			£10.00
LPF - 30MHz and small	FL-30		£5.00
LPF - HF type in long case		KW ?	£10.00
LPF - HF type with SO239	TVI-30	Vanco	£5.00
LPF – small, HF bands	FL-30	Palstar	£5.00
Magnifier – Folding magnifier			
Magnifier – folding type on stand Good lens			£6.00
Meters, 7 assorted, 3 x 1mA, 50-0-50uA, 50mA, 50uA, 100uA at £1 each			£7.00
Microcode DSP with LCD readout		Cumbria	£15.00
Micrometer (new)		M & W	£12.00
Micrometer 0-1” New cond.		Moor and Wright	£6.00
Microphone – Desktop	444	Shure	£30.00
Microphone - Dynamic type, MH-31 a8j			£10.00
Microphone - fist type	MH-31		£5.00

Microphone – old style with cable (looks like a D104)			£10.00
Miniature drill complete with burrs and grinding discs and stand.(Similar to the Dremmel)		Minicraft	£30.00
Mitre saw			£10.00
Morse Key - black fully enclosed			£5.00
Morse Key - brass on wooden base			£10.00
Morse Key - Marconi			£25.00
Morse Key - miniature on marble base			£5.00
Multimeter – Analogue type in box	TP-5S	TMK	£5.00
Multimeter – digital type with probes	DD6010	Altai	£10.00
Multimeter – digital type with probes	DT-830B	Hilic	£3.00
Multimeter – Very old V & A AC & DC			£5.00
Multimeter with LCD display			
Nuts, screws, bolts and washers, assorted in plastic case. Looks new			£5.00
Paddles – Electronic key paddles		Bencher	£80.00
Picaxe micro-controller project with pcb and box			£5.00
Power Meter - 1.8-200MHz Fwd and Ref with SO-239 connectors	SX-200	Diamond	£30.00
Power meter – Forward and reverse QRP type with 2 meters and BNC connectors in two linked boxes			£10.00
Power meter – HF 1-200W FSD		Spectrum Communications	£10.00
Project box – Alloybox			£1.00
Project box – steel with unknown project			£1.00
PSU - 3-15v 30A		Lowe Electronics	£40.00
PSU 0-24v 0.5A in blue steel case – regulator fault			£3.00
PSU 13.8v 3A		Selmar	£3.00
Receiver – unknown condition, has 4 gang variable capacitor and epicyclic drive		Green ECE Ltd	£3.00
RF Analyst with LCD display	RF-1	Autek Research	£30.00
RF Field Indicator tunable with telescopic whip			£3.00
Scope - Single beam 4MHz		Heathkit	£25.00
Solder - 1 large and one small reels of 60/40 solder			£8.00
Solder - Reel of 60/40			£10.00
Soldering Iron - 230v		Henley Solon	£5.00
Soldering iron – 230v		Rawl Plug	£5.00
Soldering Irons - 2 x 230v irons with 3 spare bits and iron holder		Antex	£15.00
Soldering irons – assorted			
Soldering Station - 50W	N78AR	Maplin	£12.00
Soldering station – precision			
Swivel vice with 3” clamp			£5.00
SWR meter SO239 connectors	SWR-3	Hansen	£12.00
Tap and die set Metric New			£7.00
Test leads			
Tone dialler – pocket type		Tandy	£5.00
Transceiver – 100W HF with PSU	KW-2000A	KW	£100.00
Transceiver – QRP HF bands, looks complete	HW-9	Heathkit	£40.00
Vacuum cleaner – mini type			£5.00
Valve 1	ECL80		£1.00
Valve 1	EF85		£1.00
valve, 1 with no matching base	QQVO3-20A	Mullard	£4.00
Valves - 2 with bases, £6 each	832		£12.00
Wire – 3 reels solderable enamelled copper, £2 each			£6.00
Wire - 4 reels assorted tinned copper £1 each			£4.00
Yellow thing that bleeps, 6” long			