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G3PCJ's All Band Local Oscillator

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Taking A Look At RAOTA

Planning Permission

Ham Mobile Stations Targeted by EU Regulations

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75 Years of Heritage & History 1970-1979

Kit Review

Velleman K8048 PIC Microcontroller Programmer

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40/80m, 40/30m, 160m Transceiver Kits

* 40/80m bands * Modes: SSB, CW, Digital
* Power: 1W SSB/CW, 700mW Digital
* Requires PC - works in conjunction with soundcard on PC
* PCB size 88 x 63mm (3.5 x 2.5in)
* PCB version RXTX v 6.1
* Supply 9-12V DC
* Contains surface mount components

The Softrock-RXTX kit contains 1 PCB plus all the components to make up the board. This version of the Softrock has transmit capability (CW/SSB) but the RX essentially works in the same manner as in previous kits. There are three versions 80/40m, 160m and 40/30m. The kits do not include audio cables. There are many more components in these kits including more surface mount components so a certain amount of skill is required plus the right type of equipment (see www.wsplc.com). SoftRock Kit supplied with CD-ROM with builders notes, schematic on PDF and selection of SDR software programs.

Partly Designed By G-QRP Club **£32.95 B**

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* USB, LSB, CW, AM, FM, WFM, Digital (AFSK), Packet (1200/9600 FM)

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Deluxe Base Station HF Transceiver. 1.8 -30MHz, 50-54MHz (160m-10m + 6m Amateur Bands) Tx

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SG-237 £269.95 D
Compact ATU
1.8 to 60MHz, 3 - 100W (PEP) 40W max CW, VSWR: <1.4:1

SG-239 £189.95 D
Mini SmarTuner
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*NFM/WFM/NAM/WAM/USB/LSB/CW
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*8.33kHz airband spacing
*16 programmed steps
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*Telescopic whip antenna
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*66 - 88MHz/108 - 170MHz/ 300 - 470MHz/806 -1000MHz
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100W HF Transceiver

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IC-706 — Buy Now Pay Later!

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HF/VHF/UHF All-Mode Transceiver

£749 D

IC-703 — Buy Now Pay Later!

0% Interest!*

The lovely 10W QRP HF-6m radio with built-in Auto ATU **£449 D**

KENWOOD

TS-2000 — Buy Now Pay Later!

0% Interest!*

All-Mode Multi-Bander

£1295 D

*1.8MHz - 440MHz *1200 MHz Option *100W 1.8 - 146MHz *50W 70cms 10W 23cms *Dual Watch HF/VHF *Comprehensive DSP *DX Cluster Auto Tune *Built-In TNC *Auto ATU 1.8MHz - 52MHz *Transverter Display

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0% Interest!*

100W HF+6m

£679 D

*1.8MHz - 52MHz 100W *Built-In Auto ATU *Removeable Front Panel *Comprehensive DSP *Speech Processor *Quad RF Mixer *CW Message Recorder *PSK31 Compatible

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Noise Eliminating DSP module designed for retro-fit in a number of transceivers, FT-817, TS-50, IC-706MkIIG, FRG-100, DX-77. With Keyboard.

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Icom VHF/UHF Mobile/Base

ICOM IC-E208

VHF/UHF FM Dual Band Mobile Transceiver

*Freq range 144-146MHz, 430-440MHz Tx *55/50W (3 pwr steps each band) *Wideband Rx 118-173, 230-549 & 810-999MHz **£215 D**

IC-910H **£1085 D**
2m / 70cm 100W Base station all - modes with option for 23cm module (**UX-910 £359**)

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2m 55W FM mobile with rugged construction and with digital option.

IC-2725E **£269 D**
Icom's dual band 2m / 70cm radio. Very easy to operate and install and a lovely detachable head.

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KENWOOD TM-271E

2m FM 60W Mobile Transceiver. MIL-SPEC DTMF Mic.

Built-in CTCSS & DCS encoder / decoder.

£185 D

TM-G707E **£199 D**
Dual Band 2m & 70cm with detachable front

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YAESU FT-7800E

*2m/70cms Dual Band Mobile *High power 50W 2m /40W 70cms *Wide receive inc. civil & military air-band *CTCSS & DCS with direct keypad mic. *Detachable front panel *1000 memories

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FT-8900R **£329 D**
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Programming Software For Your Radio

Programme Memories and all your radio's functions from your PC. Includes Windows software and serial lead with adaptor for your Radio.

ADMS-1F for VX-110/1 / **ADMS-1G** for VX-7 **ADMS-1H** for VX-2E / **ADMS-1J** for FT-60E **ADMS-2H** for FT-8900 / **ADMS-2I** for FT-8800 / **ADMS-2J** for FT-2800 / **ADMS-2K** for FT-7800 / **ADMS-3** Programming Kit for VR-500, all **£39.95** with FREE PC Radio Data Lead.

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Up to 6W out with Li-ion battery and **"scanner" style coverage from 100kHz to 1300MHz** including SSB on receive!

£199.95 C

TH-K2E 2m 5W **£105 C**
TH-K2ET 2m 5W FM **£145 C**
TH-K4E 79cm 5W FM **£139 C**

Yaesu VHF/UHF Handhelds

YAESU VX-7R

LIMITED SPECIAL OFFER

Totally waterproof, Wide frequency coverage 500kHz-900MHz AM/FM.

£209 C

VX-6E 2m/70cm wide rx 5W **£169 C**
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VX-2E 2m/70cms miniature **£99 C**
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Software Defined Transceiver

Nothing Else Comes Close!

£6,000 in hardware form - £995 as above! What a choice!

If you have heard my recent talks you will understand how exciting this SDR-1000 software defined transceiver is. Just load the FREE software, connect up the SDR-1000 transceiver to a suitable soundcard and you are ready to go. It will transform your enjoyment. There are regular FREE updates for customers to download. Call our sales desk for a FREE demonstration CD and operate the radio on your PC using a supplied 80m RF sound file. The FlexRadio SDR-1000 would cost you around £6,000 in hardware form! Part Exchange welcome. Peter Waters G3OJV

The Concept:

All modulation and demodulation takes place in your PC. IF filtering and other DSP processes also take place in the PC. Ancillary controls such as AGC, ALC, audio processing, control functions, metering and displays are likewise done within your PC. And everything can be updated FREE as new software versions appear.

SDR-1000 comprises transceiver (100W or 1W) software and PC control cable connector. You need to add a suitable PC professional soundcard like the Delta-44 and 3.5mm stereo connecting leads (soundcard leads and PC speaker adaptor lead kits recommended) plus any Yaesu 8-pin microphone.

Check These Features!

Rx - 12kHz to 65MHz
Tx - 1.8MHz to 52MHz (Ham)
Power - 1W - 100W (500mW 6m)
IMD - 99dB
MDS - 130dBm (14MHz 500Hz)
Modes - SSB CW AM FM
*Realtime Panadapter
*Click on Spectrum Display Tune
*Filter shape factors 1.05:1
*No ring filters down to 25Hz
*AGC after brick wall filter
*Graphic Equaliser & Compander
*Variable bandwidth Tx filter
*Iambic Memory Keyer

Prices

SDR-1000 100 Watts	£995.00
SDR-1000 1 Watt	£649.00
SDR-1000 Receiver	£649.00
Auto ATU	£199.00
Delta-44 Soundcard	£99.00
Yaesu MH-31B8 mic.	£39.95
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Soundcard leads	£24.95
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Software Defined Receivers

WiNRADiO

* *Unmatched in value and performance*
* *Choose from either internal PCI module (i) or external module (e)*
* *Software included and requires Windows 98 or later with PC speed 500MHz or above*

No hardware design can match them at anywhere near this price!
Uses your exising PC soundcard.

From £385.95!

Welcome to the exciting world of SDR where the power of your PC outperforms anything a hardware design could achieve!

FEATURES OF ALL MODELS:
AM AMN AMS SSB CW NFM 1Hz tuning steps. Real time spectum display, with plug and play installation. The first IF is 45MHz. The 2nd IF and beyond is totally software defined including all selectivity, demodulation and other DSP functions. This makes for easy download updates. You also get *3 scan modes; S-meter reading S-points - dBm or uV; dual Loop variable speed AGC; manual IF gain; unlimited memory; audio filter; dual real-time spectrum scopes; multifunction squelch; plus bandwidths of: 0.5, 2.5, 3, 4, 6, 12 and 220kHz. External module versions connect via USB and need 12V DC. Internal versions mount on a PCI card. Antenna input is 50 Ohms.*

WR-G303 9kHz-30Mhz Dual Conversion

The basic HF receiver that is an ideal for ham radio and general listening and offers amazing value.

PCI Version **£385.95 D** 
External Version **£454.95 D**

WR-G313 9kHz - 30MHz (Upgraded WR-G303)

Additions and upgraded spec inc. *Test & Measure features; Bandwidths variable 1Hz-15kHz; 600 Ohms line output. 180MHz extension option.*

PCI Version **£699.95 D** 
External Version **£809.95 D**

WR-G305 9kHz-1800MHz

An amazing wideband receiver at a really great price. Now includes graphic hit counter.

PCI Version **£469.95 D** 
External Version **£539.95 D**

WR-G315 9kHz-1800MHz (Upgraded WR-G305)

Adds IF Shift & Notch Filter; IF spectrum record, Noise Blanker; Bandwidth variable 1Hz - 15kHz; 90dB dynamic range, 500ch per sec scanning and 0.5ppm 0 - 60C

PCI Version **£1499.95 D** 
External Version **£1699.95 D**

NRD-545 from Japan

100kHz - 30MHz SSB CW FM AM

The Hardware radio with Software IF filtering.

Truly awesome performance with variable selectivity down to 10Hz. Features include up to 106dB dynamic range, DSP notch filtering, direct keypad entry, mute for use with transceiver, triple conversion, (70.455MHz - 455kHz-20kHz), 10Hz tuning steps and readout, RTTY demodulated output via RS-232, 1000 memories, RF attenuator, 50 & 600 Ohm antenna input. AC input 230/115V AC. 330 x 130 x 285mm.

£1399.95 D

Software Defined Receiver £19.95!

NEW SoftRock-Lite v6.2

These are single band designs in kit form
They will outperform many current transceivers and receivers
This is the future of Ham Radio - Experience it NOW!

Here is your chance to experience the power and performance of Software Defined Radio at a crazy price. These designs work with the receiver section of the Power SDR software used by the FlexRadio SDR-1000. You get:
*** Digital readout * Full DSP * Variable IF filtering 20kHz - 25Hz * SSB CW AM FM * Comprehensive metering and AGC etc. Uses your regular PC soundcard.**

**Software CD provided*
**Requires PC - with SoundCard*
**PCB size 38.1 x 38.1mm*
**Supply 9-12V*
**Build Time - approx 3 hours*

Prices

SOFTROCK-Lite-160m	160m Kit	£19.95
SOFTROCK-Lite 80m	80m Kit	£19.95
SOFTROCK-Lite-40m	20m Kit	£19.95
SOFTROCK-Lite-30m	30m Kit	£19.95

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Practical Wirelesscontents

April 2007
On Sale 8 March
Vol. 83 No. 4 Issue 1200
(May 2007 Issue on sale 12 April)

60 Practically Yours
75 Years of Heritage & History
Looking back at some rather special news items, articles and other material covering the period from 1970 to 1979 in *Practical Wireless*.


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April Regulars

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Cover Subject
This month, why not try your hand at constructing the ABLO, as designed by **Tim Walford G3PCJ** or a spot of kit building with the Velleman K8048 PIC Microcontroller Programmer Kit? Also, don't miss Practically Yours – 75 years of Heritage & History, covering 1970-1979.

Design: Steve Hunt
Photographs: Tim Walford G3PCJ, Phil Cadman G4JCP.

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Welcome! Each month Rob introduces topics of interest and comments on current news

Keylines

Rob G3XFD introduces another issue of great radio reading with the news that GB75PW will be on the air soon!

I'm delighted to report to readers that our Special Event Callsign **GB75PW** – to celebrate 75 years since the magazine was first published - will be first aired on Saturday 3 March 2007, courtesy of the **Poole Radio Society**. Although only subscribers will have access to the April edition by the 3 March - I hope that we'll work as many of you as possible on that day using single sideband (s.s.b.) on the h.f. bands from 3.5 to 14MHz (depending on conditions, I think it's likely we'll have most inter-G and EI contacts on 7MHz).

It's entirely appropriate that the Poole Society's headquarters - only a little way from the PW Publishing Ltd.'s offices - will host the first airing of GB75PW because we are based within the Borough of Poole itself. Additionally, my *PW* colleague and long time friend **Tex Swann G1TEX** is a stalwart of the club and holds the position of Secretary (he says this gives him the privilege of making the tea and ensuring that everyone gets a cup!). Another friend, **Dave Mason G3ZPR**, the President of the Poole RS, has very kindly arranged that we can use their headquarters (an old Methodist Church hall) in the Creekmoor area of Poole.

At this point, I have to publicly thank the **Amateur Radio Section at Ofcom** for their efforts on our behalf. In the past I have criticised Ofcom but in this case they have come up trumps! My request to operate a Special Event Callsign with the number 75, together with an extended operating period spread over many months, was handled in a most professional way by the Ofcom department. I'm extremely grateful for their kindness and appreciation of *PW*'s support on behalf of Amateur Radio, which was demonstrated by the granting of the privileges associated with GB75PW.

The Notice of Variation (NOV) for GB75PW will enable myself and named Radio Amateurs to run the station from March until the end of September. Named operators involved with the callsign will include **Donna Vincent G7TZB**, G1TEX, **Elaine Richards G4LFM (**Editor of *Radio User*) and **Roger Hall G4TNT** (Advertising Manager/Publisher of *PW*). Incidentally, Roger G4TNT holds the old *Short Wave Magazine* **G3SWM** 'club' callsign and we hope to give that an airing during 2007 too!

Active *PW* supporter and author **Ian Brothwell G4EAN** is also one of the named operators and he and I will be airing GB75PW from the **Junction 28 QRP Rally** at South Normanton in north Derbyshire on **Saturday 10 March**. (I will provide regular updates regarding GB75PW via *PW* and the **Southgate ARC** website during the period the NOV is in operation).

The Break-In Club

Nobody wishes to belong to the 'break-in club', but I'm afraid my wife **Carol** and I joined the not so exclusive 'club' on Monday 5 February. I had a terrible shock when I arrived home to find our almost new patio doors wrenched (literally) from their frames by someone in a drug-crazed frenzy.

The burglar (he had tried a number of break-ins along our road - including our daughter **Charlotte's** home two houses away) targeted my wife's room. A terrible mess awaited my return home but fortunately, very little of value was taken, apart from a Gold watch presented to my wife last year by colleagues in the USA (as it was unusual, Dorset Police consider it will help trace the thief). Incidentally, Dorset Police were quick in their response - their officers were sympathetic, helpful and painstaking in their efforts on our behalf.

However, the most frustrating thing for my wife Carol was the loss of a video camera. Although not new - the camera and the other items stolen with it also included video cassettes with three and a half years worth of recorded research work carried out with children suffering from autistic spectrum disorders. As you'll realise, we hope that these cassettes will eventually be returned as they're of no use to anyone else!

Although unlocked - with the door open - my room cum office/study was untouched (we think the thief was frightened off) but the event left us shaken and very disturbed for many days afterwards and left me thinking! Just how many of us take precautions to protect our equipment and other valuable items? From the broken patio doors my wooden workshop/shack can be clearly seen (and it's clearly vulnerable!) and although the vast majority of the equipment would seem to be useless to the average thief (the Police officers told me they are usually trying to raise quick cash for a drug habit) there's usually something they can take.

How secure is your shack? Have you had your home broken into and radio equipment stolen? In the past I've heard many sad stories from Amateurs and other enthusiasts who've suffered some form of theft. Perhaps your own experience could help others take extra precautions? So, please write-in with your own experiences.

Rob Mannion G3XFD/EI5IW

Send in your thoughts and win a voucher!

letters

Send your moans, groans and even praise when it's due to the editorial address or E-mail: pwletters@pwpublishing.ltd.uk

A great deal of correspondence intended for 'letters' now arrives via E-mail, and although there's no problem in general, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address (unless we are asked to do so), we require it if the letter is to be considered. So, please include your full postal address and callsign with your E-Mail. All letters intended for publication must be clearly marked 'For Publication'. **Editor**

The Star Letter will receive a voucher worth £20 to spend on items from our Book Store or other services offered by Practical Wireless.

Enjoying *PW* History & Promoting Clubs

Star Letter

● **Dear Rob**

I'm writing to say that I very much enjoyed the 75 Years of Heritage and History in the March issue of *PW*. Didn't some of the transceivers look dated? Yet at the time they seemed so futuristic! The prices made for very interesting comparison with the prices of today's transceivers and it's difficult to justify the suggestion that Amateur Radio has become more expensive over the years. I very much look forward to April's issue and the 1970s!

Finally, you will remember of course that we were talking over my suggestion for special pages in *PW* to help promote Amateur Radio Clubs, Societies and directly associated organisations. I know you were 'stuck for space' and *PW* was 'bursting at the seams' when we were discussing it before but is it perhaps time to consider the idea now as I know that you were really keen on the idea!

73, Ian

Ian Brothwell G4EAN/9H3YI
Secretary, British Amateur Radio Teledata Group
www.bartg.demon.co.uk
Secretary & Publicity Officer, Radio Amateur Old Timers' Association
www.raota.org
56 Arnot Hill Road
Arnot
Nottingham
Nottinghamshire NG5 6LQ

The PW *team are pleased you enjoyed the section Ian! (Especially Donna G7TZB, who is looking after the series during 2007). Readers involved with club, societies and organisations associated with Amateur Radio will no doubt be pleased to hear that we have launched the new 'In Focus' club promotion feature (page 25) and that Ian was asked to write the first article! For further details on the new In Focus feature, please join me on the Topical Talk page (81) where I fully discuss the new feature. Thank you Ian for a very good idea!* ***Rob G3XFD****.*

Antennas, Aerials & E-mails!

● **Dear Rob**

First I have an apology - I sent this letter to the E-mail address **pwletters@pwpublishing.ltd.uk** and it bounced, so now I'm trying your published address!

Secondly, quite a few years ago I read a letter in a journal of the Institution of Electrical Engineers (now the IET) from somebody who no doubt considered himself as erudite pointing out that 'aerial' is an adjective. This is true but reference to the Kemp's diary from 1897 when he was working with Marconi at the Bristol Channel shows that they also used the word as a noun. This is supported by the *Oxford English Dictionary* (OED) now, and is good enough for me! (Although if you want to talk 'American' or sound more technical - then use the word 'antenna!).

At the beginning of the 20th century when 'aerial' in English dictionaries was only an adjective, an antenna was only found on insects or crustaceans. Of course, there's still a difference in as much as the plural of the insect's antenna is 'antennae', while the accepted plural of a radio antenna is 'antennas'.

Many years ago, when I was a lad and playing with 'wireless', an aerial was needed to receive medium and long wave broadcast transmissions it was never referred to as an antenna. Any British book I have, pre-Second World War, uses the word aerial. However, my 1946 ARRL handbook uses the word antenna, so did the use of antenna come from America? Certainly, when I was in the (British) army even on centimetric wavelengths I can't remember us using 'antenna' back then.

Regarding the reference to a ship's yardarm, the OED indicates that antenna is a variation of the word antenna originating in the 17th century. Regards.

Stephen Cole G3YOL
Winscombe
Somerset

Thanks for your letter on aerials and antennas Stephen. The May issue of PW will carry any final correspondence on this subject and the topic will be then closed for this session! (I've no doubt it will arise again!). Secondly, I'm pleased to report that the E-mail address you quote for letters is now working again after an E-mail setting problem. Incidentally, most readers send their 'for publication' E-mails directly to my E-mail address and I wasn't aware of the problem until a number of readers drew our attention to it. Thanks everyone! ***Rob****.*

Memories of SSB Products Derby

● **Dear Rob**

I, like **Larry Stringer** (*PW* letters March 2007), read with interest **Ben Nock G4BXD's** account of the Sphinx transmitter. However, I must dispute the inference in Larry's letter that **G8BI** was the manufacturer. (Sack cloth and ashes if I'm now proven wrong, but here's my version of events!).

Seeing a Sphinx come up on eBay, I bid and was successful. The unit was in very poor condition, having had many modifications carried out over the years. It appeared to have been used as a linear at some point as the input to the power amplifier was brought out to the front panel. However, never say die is my motto! I set about finding some technical information on the transmitter.

A search on the Internet came up with a source of information down in Cornwall. A quick E-mail not only secured the necessary literature but also an offer of all the remaining bits and pieces that his 'father-in-law' used to produce these transmitters. Needless to say a bank note

portrait of Her Majesty was soon heading down to Truro!

When the parcel arrived I found it contained a quantity of brand new front panels for the Sphinx, in a variety of colours. There was also some Cannonball Top Band s.s.b. transmitter front panels and lots of rusty sheets of thin steel, all scribed with their purpose.

These rusty sheets were the drilling jigs for all the chassis plates etc. However, the parcel also contained the original logbooks of **Norman Birkett G3EKX**, going back (I think) to when he was first licensed. There were also some business agreements between Norman and several long defunct wireless set manufacturers. These were presumably so Norman could offer hire purchase to his customers.

I know that **Norman G3EKX** was the man behind SSB Products of Derby, producer of the Sphinx. His other products included the Pyramid 500W linear and the Scarab filter unit. Norman later transferred the business to Truro in Cornwall.

Since getting the original Sphinx, I have subsequently found another in very good condition along with its control unit. Looking at the standard of build of this second example makes me wonder if my original was perhaps the prototype, as certainly the standard of metalwork was not the same quality of my second example.

Best 73.

Martin Goodrum G3ZQU
Stowmarket
Suffolk

Morse & Modern Appliances

● **Dear Rob**

There are two points I'd like to raise in this letter. I'd like to add a little about modern appliances and hidden Morse code use (**G4GXO** *PW* Feb 2007). I have here some very cheap (£15 a pair from Tesco's!) PMR446 hand-helds sold under the Tecknika brand. No CTCSS or scanning but an excellent receiver, (unlike many others) and the model number is WT431. When the three AA cells are exhausted the radio sends the letter F in Morse. Presumably this means FLAT batteries?

Now to my second point, home-brew components and suppliers. With one well known component supplier deciding in recent times to concentrate more on a basic consumer goods supply, I've been attempting to find alternative suppliers known for having a core business for components instead of disco lights and other paraphernalia.

So, why am I having difficulty in even getting a response from at least two other companies, don't they want my business? And why can't they realise that good old fashioned paper catalogues work nicely when their online catalogue servers are overloaded beyond belief, which is usually most of the time!

I think it's high time component suppliers took a good look at themselves, stop making the cost of components ridiculously high, and thought of ways to recapture a lost market again. There's still plenty of stuff I need to home-brew that cannot be purchased and probably never will be available anyway. I've also been impressed of late with the projects in *PW*, it's good to see them all. Kindest regards

Andy Foad G0FTD
Whitstable
Kent

We are very fortunate indeed with the mail order suppliers advertising in PW *Andy! Without them – it could be very difficult to get what's required. Although suppliers such as Maplin don't advertise with PW anymore, they still carry a large stock of radio components and hardware amongst the consumer electronics and computing equipment. Their on-line catalogue is good and many of us live fairly near to one of their stores. However, the specialists we have in PW are very special! Recently I required some 5m long video extension leads to feed a monitor position in my study at home. A quick telephone call to* ***Will Outram*** *(****Bowood Electronics****) soon led to superb - heavy duty - video leads arriving at my home. Equipped with good quality phono plugs at each end for the sound channels plus the video - they were very substantial. Will had not stocked them before but was prepared to order them for any of his customers. That's the sort of standard we get from PW advertisers. Try them and see - you won't regret it!* ***Rob G3XFD****.*

Assembling The Blue Racer

● **Dear Rob**

My new 'Blue Racer' bug key came at Christmas together with the Vibroplex accessory to slow the machine to about 12/20w.p.m. However, I could not get the dots to be long enough for my comfortable speed. I therefore changed the design to please myself by extending the weight arm and bringing the weights to outside the damper bridge.

All I have done is to take one connector out of a terminal block with 5/32in bore and put that onto the end of the weight arm. Then I ground the flutes off a new

Bernard Bellringer G3JYF Silent Key

● **Dear Rob**

May I, through your pages, report the death of **Bernard Bellringer G3JYF**. Bernard sadly died at the Royal Cornwall Hospital, Treliske, Truro, at 0530 on Wednesday, 17 January 2007, having been admitted following a respiratory problem, which developed over the Christmas period. Bernie will be sadly missed by Amateurs and listeners, having been very active over the years, both professionally and as an Amateur. During his working life, Bernie saw service in New Zealand, Western Australia, Saudi Arabia and Latin America, to name but a few.

He worked as a radio operator in the Merchant Navy, and had vast experience servicing air band, marine, and PMR equipment and always encouraged would-be Amateurs in their hobby. His favourite mode was c.w. but he was forever trying new modes. I know there will be many people far and wide who will miss hearing the call sign G3JYF and those of us locally who have been helped over the years, will certainly miss his visits. I have attached a picture of Bernard, taken by **David G4FKI**, when Bernard accompanied him on business to a local broadcasting transmitting station in Redruth, in October 2004. Thank you.

Ivan Hoskin G4GDU
Redruth
Cornwall

Sorry to hear the news Ivan, Bernie was a great character and the Amateur Radio community will certainly miss him. Please pass on our sympathies to his family. ***Rob G3XFD****.*

5/32in twist drill to provide an accurate arm extension so that I have about 5/16in register in the block for both arms. The tightening screws just miss the swinging damper arm and the speed is much better for me. I may choose to use one weight or two along about one inch of shaft. I would not be able to make a fast change of speed but I find that quite a lot of people take the same attitude as you and settle for either 12/15 or 15/20w.p.m. and my new arrangements fits nicely in there.

Incidentally, like you Rob G3XFD, I do not have a tape recorder brain either! And my hearing-brain-to-fingers connection for touch-typing is not up to scratch either (unfortunately) but I enjoy c.w. operating! The attached picture shows the end result.

Alan Lovegreen GM4FLX
Renfrewshire
Scotland

Well done Alan! I hope you enjoy using your 'Blue racer' on the air. I have received a great deal of feedback from readers all over the world regarding the March PW Keylines Morse theme. The vast majority of those contacting me were supporting my stance where I was asking the faster operators to slow down a little to encourage newcomers to the Morse mode. I was also delighted when ***Dave Sumner K1ZZ****, the President of the* ***American Amateur Radio Relay League*** *(ARRL) wrote to ask if the ARRL could use the comments from Keylines (the Morse requirement is about to be dropped in the USA) and of course I was pleased and rather flattered to agree. I get great pleasure in learning that the Morse mode is thriving on the Amateur Bands and that new Amateur friends are 'dipping their toes in' to try it for themselves.*
Rob G3XFD*.*

Droitwich Off Air Frequency Standard

● **Dear Rob**

I have read the article Off Air Frequency Standard by Stefan Niewiadomski ' in the *PW* issue for November 2006. I agree wholeheartedly that this is a most useful, highly accurate frequency source for which any Radio Amateur (or professional) would find a whole range of applications.

In fact, there are frequency standards produced commercially using this same idea and I understand that they work well and are highly regarded by their purchasers.

One point does, however, need clarification and it involves the effect of the phase modulated coding that's superimposed on the 198kHz signal – as has been so clearly outlined by **Keith Weevil G4UKW** in the March issue of *PW* (letter pages).

Initially, when a simple carrier is transmitted, the 2kHz output in the Off Air Frequency Standard's crystal oscillator and its dividers is presented to the 4046 phase locked loop i.c. (pin 4) and **the phase** of this is locked to **the phase** of the frequency-dived carrier that's presented to the 4046 (at pin 3).

When, due to the data modulation, **the phase** of the carrier is shifted, the output of the 4046 (pin 2) will change, trying to correct this new phase difference and return it to its original value. This is achieved by the 10MHz oscillator, adjusting itself back and forth **in frequency** until the phases are the same as they were before the modulation was applied, i.e., there is a short shift **in frequency** of the 10MHz oscillator until the phase of the signals again correspond to those in the 'locked' situation.

This effect is, no doubt, smoothed out considerably by the one second time constant of R33 and C33 but nothing is perfect and some residual ripple must be resented to the varicap diodes. This then results in a frequency 'jitter' of all the output signals.

Although this jitter is probably insignificant when used for Amateur Radio applications, it may be unacceptable for high quality professional use.

Summing up, if the 198kHz carrier at Droitwich **is phase modulated**, some frequency modulation of the 10MHz oscillator is inevitable and its importance should be assessed in the light if the envisaged application. I hope this will help resolve the point!

Reg Irish G4LUF
Wooler
Northumberland.

rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations.

March 10
The 7th Junction 28 QRP Rally
Contact: **Mark Vardy 2E0IQO**
Tel: **(07976) 967221**
Website: **www.snadarc.me.uk/index.htm**
The South Normanton Alfreton and District Amateur Radio Club in association with the G-QRP club will be hosting the 7th Junction 28 QRP Rally at the Village Hall Community Centre, Market Street, South Normanton, near Alfreton, Derbyshire DE55 2EJ. Includes Amateur radio, electronics and related items, Bring & Buy, Specialist Interest Group stalls, outdoor flea market (weather permitting) and refreshments. Door open 1000, fully signed, just five minutes from M1 Junction 28 and the A38.

March 11
The Wythall Radio Club 22nd Radio & Computer Rally
Contact: **Chris G0EYO**
Tel: **(07710) 412819**
E-mail: **g0eyo@blueyonder.co.uk**
Website: **www.wrcrally.co.uk**
The Wythall Radio Club 22nd Radio and Computer Rally will be held at Woodrush Sports Centre, Shawhurst Lane, Hollywood, Nr Wythall, Birmingham B47. There will be radio and computer traders, a Bring & Buy and refreshments all under cover in the Sports Hall as well as good on-site parking. Doors open from 1000 to 1500 and admission is £1.50.

March 18
Norbreck Amateur Radio Electronics & Computing Exhibition
Contact: **Peter Denton G6CGF**
Tel: **0151-630 5790**
The Norbreck Amateur Radio Electronics and Computing Exhibition, which is organised by the Northern Amateur Radio Societies Association (NARSA) takes place at the Norbreck Castle Exhibition Centre, Queens Promenade, North Shore, Blackpool, Lancashire FY1 2HB. Over 120 trade and club stands, Bring & Buy, free car parking, Morse tests on demand. Doors open 1100 (1045 for disabled visitors). Admission £3.50, OAPs, £2, under 14s free. Don't miss the largest single day exhibition in the country.

April 1
The Northern Mobile Rally
E-mail: **rsars@hotmail.co.uk**
Website: **www.rsars.co.nr**
The Northern (formerly Harrogate) Mobile Rally will be held at Richmond School, Darlington Road, Richmond, North Yorkshire DL10 7BQ. There will be trade stands, catering and a flea market. Doors open at 1000 for disabled visitors and 1030am for everyone else.

April 15
The 23rd Yeovil QRP Convention
Contact: **George Davis**
Tel: **(01935) 425669**
Website: **www.yeovil-arc.com**
The 23rd Yeovil QRP Convention will take place in Digby Hall, Hound Street, Sherborne, Dorset DT9 3NL. Follow the black on white road signs to Town Centre. The Digby Hall adjoins the central shopping car parking. Doors open at 1000 and there will be trade stands, a Bring & Buy as well as refreshments available.

April 15
The West London Radio & Electronics Show
Contact: **Paul M0CJX**
Tel: **(01737) 279108**
E-mail: **info@radiofairs.co.uk**
Website: **www.radiofairs.co.uk.**
The West London Radio & Electronics Show will be held at Kempton Park racecourse, Sunbury-on-Thames, Middlesex TW16 5AQ. Doors open at 1000. There will be trade stands, a flea market and car parking is free.

If you're travelling a long distance to a rally, it could be worth 'phoning the contact number to check all is well, before setting off. Look out for representatives from *Practical Wireless* and *RadioUser* at rallies printed in bold.

SPECTRUM COMMUNICATIONS

TRANSVERTERS for 2 or 4 or 6 metres from a 10 metre rig, or 4 or 6 metre from a 2 metre rig. Includes new overtone local oscillator, and integral interface unit. 20dB receive gain, 25W transmit power. Low level drive, dual drive IF versions **TRC2-10dL, TRC4-10dL & TRC6-10dL**, high level drive, single cable IF versions **TRC2-10sL, TRC4-10sL, TRC6-10sL, TRC4-2sL, TRC6-2sL, Complete kit £163.00. Built £244.00.**

TRANSMIT AMPLIFIERS, for 2 or 4 or 6metres, single stage switched class AB linear. Diecast box with SO239 connectors. **TA2SA**, 3W in 20W out, **TA4SA, TA6SA** 2.5W in 30W out, **Complete kit £59.00; Ready Built £82.00. TA2SB**, 10W in 35W out, **TA4SB, TA6SB**, 5W in 55W out, **Complete kit £65.00; Ready built £88.00.**

TRANSMIT AMPLIFIER & RECEIVE PREAMP, for 2 or 4 or 6metres. Receive gain adjustable 0-26dB gain. Switching for either part or straight through. RF & DC switched on transmit. Diecast box with SO239 connectors. **TARP2SA** 3W in 20W out, **TARP4SA & TARP6SA**, 2.5W in 30W out, **Complete kit £72.00; Ready Built £109.00. TARP2SB**, 10W in 35W out, **TARP4SB; TARP6SB**, 5W in 55W out, **Complete kit £75.00, Ready built £112.00.**

TWO TONE OSCILLATOR As featured in *PW* March 2005. A necessary signal source used with an oscilloscope to set up AM, DSB, & SSB transmitters. **PCB & hardware kit £25. Ready Built £52.50.**

AUTO TONEBURST 1750Hz tone board for repeater access. 7-10, or 10-14V operation. **Type AT1750. PCB Kit £5. PCB Built £7.50.**

STATION PREAMPS for 2 or 4 or 6metres. RF & DC switched. Adjustable 0-26dB gain. 100W power handling. **RP2S, RP4S, RP6S, PCB & Hardware kit £29. Ready Built £47.**

MASTHEAD PREAMPS, for 2 or 4 or 6meters. 20dB gain 1dB NF. 100W through handling. RF switched & DC fed via the coax. Heavy duty waterproof masthead ABS box. Includes a DC to RF station box with SO239 connectors. **RP2SM, RP4SM, RP6SM, PCB & boxes & hardware kit £38.00, Ready Built £57.00. New masthead fitting kit £6.00**

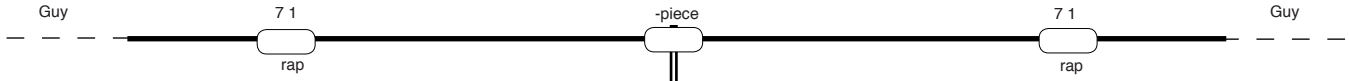
DSB 7MHz RECEIVER as featured in Doing It By Design Jan 2007 *PW*. A simple but sensitive receiver with Mosfet RF & Mixer and an IC audio amplifier. Works in conjunction with the Portland VFO detailed below. **PCB and parts with volume control and audio transformer £19.50.**

PORTLAND VFO as featured in March 2006 *PW*. 7-7.2MHz as local oscillator for a 40m direct conversion receiver or transceiver. Otherwise as 7.9-8.4MHz to use in conjunction with a mixer-vfo system as local oscillator for a 4 meter receiver/ transmitter with a 9MHz or 10.7MHz IF. Available with Buffer 2 to drive a diode ring mixer directly or with Buffer 1 suitable for IC and mosfet mixers, including the MIXER-VFO unit. **VFO PCB with Buffer 1 or Buffer 2 PCB and parts kit with potentiometer £14.50. PCB and parts kit with drilled box £23.50.**

SPEECH PROCESSOR increases the average sideband power of SSB transmitters without driving the PA into clipping. Includes filtering to enhance the higher voice tones to increase intelligibility, and it sounds nice too. Panel control for clip and output level. Supplied with plugs & sockets to suit the rig of your choice. Type **SP1000, PCB & Hardware kit £29.00, Ready built £63.50.**

3N201 MOSFET equiv. 40673 £2.25 each, P&P 75p any quantity.

G2DYM Aerials



Full size Trap Dipole, 108 feet overall length, for 80-10m parallel fed, also 160m as T configuration. Comprising two inner wires, two outer wires, two 7.1MHz traps, a centre piece, two end insulators, and 70 feet of 75 ohm twin feeder. All version 400W continuous rated.
Light duty, for sheltered environment, 2.5sq.mm stranded PVC covered top wire, not including feeder **£152.00.**
Light duty, for sheltered environment, 4.1sq.mm hard drawn bare top wire, not including feeder **£160.00.**
Medium duty, for typical inland site, 6sq.mm stranded PVC covered top wire, not including feeder **£170.00.**
Heavy duty, for exposed site, 10sq.mm stranded PVC covered top wire, not including feeder **£192.00.**

BALUN 1:1 ratio 160 – 10 metres, air cored, 2kW rated. Low impedance in and out. **£43.00.**

Half size Trap Dipole, 54 feet overall length, 40-10m parallel fed, also 80m as T configuration. Comprises two inner wires, two outer wires, two 14.15MHz traps, a centre piece, two end insulators, and 35 feet of 75 ohm feeder. 400W continuous rated. Prices include Special Delivery or Carrier cost.
Light duty, for sheltered environment, 2.5sq.mm stranded PVC covered top wire, not including feeder **£133.00**.
Light duty, for sheltered environment, 4.1sq.mm hard drawn bare top wire, not including feeder **£135.00**.
Medium duty, for typical inland site, 6sq.mm stranded PVC covered top wire, not including feeder **£142.00**.
Heavy duty, for exposed site, 10sq.mm stranded PVC covered top wire, not including feeder **£158.00**.

75 OHM FEEDER 35ft £10.50, 70ft £15.00, 96ft £18.50, 108ft £20.00, 128ft £22.50, 140ft £24.00. Carriage £3.00.

Mail order only. Prices include postage unless stated. Cheques payable to A.J. & J.R. Nailer.

12 WEATHERBURY WAY, DORCHESTER, DORSET, DT1 2EF. Tel & Fax 01305 262250.

e-mail tony@spectrumcomms.co.uk Web site www.spectrumcomms.co.uk

Amateur, CB, Hospital Radio Links, OB Links.

news & products

Send all your news and club info to Donna Vincent G7TZB at the *PW* editorial offices or E-mail: **pwnews@pwpublishing.ltd.uk**

Air Cadets Celebrate

Six Air Cadets from **44F Squadron Bradford**, West Yorkshire are celebrating, following their Foundation Licence examination success. The cadets, aged between 13 and 19 completed a nine week course at Keighley College, West Yorkshire through the Constructive Partnerships project to gain their Foundation Licences.

The course, which took place using the College's STAR Centre facility, involved both practical and theory elements that the students needed to have a keen grasp of the fundamental physics involved. Following their success the Cadets will now be able to make use of the radio equipment that they have at their Cadet base.

Simon Davison 2E0HTS a Radio Society of Great Britain registered instructor was extremely pleased with the results saying: "The students have worked hard and deserved to pass. It will be good to hear some new voices entering the hobby."

Simon Wilkinson, Daniel Drew, Nik Lansbury-Palmer, Tutor Simon Davison 2E0HTS, Joseph Clapham, Richard Wilkinson and Dan Leedham.

New Icom Rig

The IC-E2820 is the successor to the popular IC-2725E transceiver and inherits several features from its predecessor including; v.h.f./v.h.f., u.h.f./u.h.f. simultaneous receive capability, wideband receive, independent tuning knobs and a separate controller. In addition to this Icom has introduced new features including diversity receive capability, a full dot-matrix display and 50W output power in both v.h.f. and u.h.f. bands.

The IC-E2820 is a true dual-band transceiver with v.h.f./v.h.f., u.h.f./u.h.f. as well as v.h.f./u.h.f. simultaneous receive being possible. It features a diversity receive mode, which is useful for mobile operation where received signal strength changes continuously and compares the signal strength and chooses the antenna with the better signal to maintain good sound and receive quality.

When the optional UT-123 Digital/GPS unit is installed the IC-E2820 is capable of both D-STAR Digital Voice and GPS operation. At the time of going to press the price of this new transceiver is yet to be announced. Watch this space for more news as it happens and we hope to review the IC-E2820 very soon here in *PW*.

Icom (UK) Ltd., Unit 9 Sea Street, Herne Bay, Kent CT6 8LD.
Tel: (01227) 741741. Website: www.icomuk.co.uk

Rob on the Radio Road

Rob Mannion G3XFD thoroughly enjoys his trips around the country visiting the various Amateur Radio Clubs and promoting *PW* as he goes. Recently. Rob was welcomed by the **Shefford and District Amateur Radio Society** (SDARS) members, as they invited him to present his talk entitled '75 Years of *Practical Wireless*'. There was a surprise in store too, as the Society Chairman, **Ken Amos G4YRF** presented Rob with a hand-made wooden commemorative *PW* plaque featuring a 1932 penny!

Shefford & District Amateur Radio Society Chairman Ken Amos G4YRF, presented a specially made, engraved, commemorative PW 75th Anniversary plaque to Rob Mannion, G3XFD, on the occasion of his visit

news snippets

Course Promotion
The Chelmsford Amateur Radio Society (CARS) is making use of local radio to promote its Foundation courses. The manager of community radio station Chelmsford Calling 104.4, **Jim Salmon M3RMI**, has agreed to run a series of adverts to promote the courses.

The members of CARS meet at 1930 hours on the first Tuesday of each month at the Marconi Social Club (MASC), Beehive Lane, Chelmsford CM2 9RX. Visitors are most welcome, entrance and car parking are free and a bar is available for refreshments.

For more details on enrolling on a course or to find out more about the Society contact **Clive Ward G1EUC** on **Tel: (01245) 224577** or check out **www.g0mwt.org.uk/training/**

Morse News
The Federal Communications Commission has decided to remove the five words per minute Morse requirement from US General and Amateur Extra-class licences with effect from February 23 this year. Applicants will now only have to pass a written examination. This change brings the USA into line with the growing number of countries that no longer require Amateurs to demonstrate Morse code proficiency to access frequencies below 30MHz.

International Marconi Day
International Marconi Day takes place this year on Saturday 28 April. The event is not a contest but participants can qualify for award certificates by contacting special stations. These stations must operate on or close to a site where **Guglielmo Marconi** carried out experiments or where Marconi equipment was used prior to his death in 1937.

If you would like to operate one of these special award stations, it is essential that you register the station by E-mailing **webmaster@gb4imd.org.uk** prior to the event with full details of the station. Further information can be found at: **www.gb4imd.org.uk**

East Suffolk Wireless Revival
The **East Suffolk Wireless Revival** takes place on Sunday 17 June with the gates opening at 0930. The event takes place at the Suffolk Showground (Trinity Park), Felixstowe Road, Ipswich, Suffolk IP3 8UH, which has ample car parking and well signposted access.

The main attraction will be the radio car boot sale. In addition there will be a Bring and Buy sale, Bookstall, h.f. station and local club stalls. Food and refreshments will also be available. For further information please see the website at: **http://www.btinternet.com/~thomassg/eswr.htm** or contact **John Quarmby G3XDY** on **(01473) 717830** or **Steve Thomas M1ACB on (07720) 412648.**

news & products

Send all your news and club info to Donna Vincent G7TZB at the *PW* editorial offices or E-mail: **pwnews@pwpublishing.ltd.uk**

Annual EUCW/FISTS QRS Party

The FISTS CW Club invites all Radio Amateurs to take part in the annual EUCW/FISTS QRS Party over five days, Monday 23 April 0001UTC to Friday 27 April 2007 2359UTC. This is not a contest, just a chance to enjoy plenty of slow Morse activity for a period of five days. You can work any station, including members of EUCW clubs but send only in QRS. Standard QSOs with non-participating stations can also be included.

The recommended areas of activity are ±10kHz of the FISTS calling frequencies, including WARC bands but contacts can be made on any frequency. Non-QRP stations should avoid calling CQ on the popular QRP frequencies.

Logs should show Date, Time, Callsign, Name, QTH and EUCW Club/Number (if applicable) of the stations worked/heard, and may include up to three votes for Most Readable Morse Heard (one vote per station).

A certificate will be awarded to the three participants working/hearing the most stations in each class. Certificates of Merit will be awarded to the three operators receiving most votes for the Most Readable Morse Heard, provided the operators nominated have also submitted a log. If the operators receiving the most votes have not submitted a log, the certificates of merit will be awarded to the qualifying operators with the next highest number of votes.

All completed logs should be sent to: FISTS/EUCW QRS Party Organiser, **Robert Walker M0BPT, 125 Devereux Road, West Bromwich B70 6RQ** or via E-mail: **m0bpt@blueyonder.co.uk** by surface mail or E-mail no later than 31 May.

To find out more about the FISTS CW club and how to get involved check out **www.fists.co.uk/**

Go Portable!

Every year, the **Summits On The Air** (SOTA) Beams run a competition for young Radio Amateurs. The objective is to encourage them to try portable radio operating within the Summits on the Air award programme.

The winner for 2006 is 14-year old **Jimmy Read M3EYP**. Jimmy activated 84 hills in 2006 - a feat that puts him high up in the overall table of activators for the year. Along with this feat, Jimmy also walked the Pennine Way with his father, **Tom M1EYP**. Jimmy wins a SOTA Beam and 7m pole.

The competition will be running again during 2007 so keep an eye on **www.sotabeams.co.uk** for full details.

A Wizard Battery Charger

Nevada of Portsmouth informed *PW* that, "They are pleased to announce the release of the new Powerex C9000 'Wizard One' comprehensive battery charger-analyser from Maha USA. The C9000 has four independent slots - it's like having four charger-analysers in one for either AA or AAA NiMh/NiCad batteries.

The unit will display each batteries' capacity in mAh, voltage, current and charge time. The manufacturers say with this unit it's possible to accurately match batteries to reduce run-time when poorly matched batteries have been used.

There are five modes of operation; charging, refresh, analyse, discharge and cycle, everything you need to take full care of your batteries. The C9000 also comes with a world-wide power supply (110 - 240V) and can also be powered from a car using the optional 12V cigarette lighter adaptor."

The C9000 is priced at £49.95 and is available now from Maha's UK importers and distributors, Nevada, tel: **(02392) 313090,**
E-mail: sales@nevada.co.uk Website: www.nevada.co.uk

Muckleburgh Collection

The **North Norfolk Amateur Radio Group** (NNARG) at the Muckleburgh Collection in North Norfolk has created a working 1950s vintage Amateur Radio station based around a Tiger TR200 200W a.m./c.w. transmitter (far left in the photograph). Made by Tiger Radio in the 1950s, it was built around three self-powered modules. In its time, the transmitter would have been quite expensive and the one at Muckleburgh is probably only one of a handful left in existence.

Using the Group's permanent special event call, **GB2MC**, the Tiger went on the air for the first time, on 3.5MHz, on Wednesday 10 January with a G5RV antenna. Calling with a.m., nine stations were worked, most of which were using vintage equipment. All proving that 3.5MHz is far from dead during the day!

Using GB2MC, the TR200 will operate from time-to-time on Wednesdays and Thursdays using either a.m. or c.w., when it's hoped to stimulate interest on-air in the Group's unique collection of vintage radios and other communications equipment.

The NNARG took up residence at the Muckleburgh Collection in 1990 and the main museum is open daily from Easter to the end of October, during which time the radio hut opens to visitors on Wednesdays, Thursdays and some Sunday afternoons.

For more information about the Radio Group: Tel: **Laurie Buttriss** on **(01263) 825651. www.muckleburgh.co.uk**

Donation made to AMSAT-DL

Following a meeting between representatives of the AMSAT groups from North America (AMSAT-NA), The United Kingdom (AMSAT-UK), and Germany (AMSAT-DL), a decision has been made by AMSAT-NA and AMSAT-UK to donate a total of 40,000 Euros to AMSAT-DL for the purpose of funding the continued operation of the 'Zentrales Entwicklungslabor for Electronik', (Central Development Lab for Electronics, other wise known as 'The ZEL').

The ZEL was established over 20 years ago at the University of Marburg by AMSAT-DL for the purpose of satellite construction. It is in this suite of workshops that several Amateur space frames have been constructed, integrated and tested, including the famous *OSCAR 13.*

The ZEL is staffed by approximately 10 engineers, technicians, administrators and so on, who are a mixture of University employees and AMSAT-DL volunteers. The major current project in the ZEL is the construction of the Phase 3E satellite (P3E). Although construction is centred at the ZEL many of the components come from other parts of the world, including the Integrated Housekeeping Unit (IHU-3), the CAN-Do buss interface modules, and the STAR camera from AMSAT-NA and the U/V SDX transponder module from AMSAT-UK.

The P3E is considered vital to the Amateur Radio space community for a variety of reasons. Currently, there is no high orbit satellite carrying analogue transponders allowing simultaneous multiple DX contacts. There are Amateur Radio satellites in low earth orbit but these, because of their low orbit, only support relatively short range contacts and are only visible for short periods of time (10 - 15 minutes). The proposed orbit of P3E will cause it to be visible from Amateur Radio stations on earth for several hours at a time, allowing increased periods of operation and experimentation.

The optimal years for launching a Mars bound spacecraft are 2009 or 2011 so, it is important that P3E is launched as soon as possible. This is currently planned to be at the end of 2008. The organisers realised that the next important step is to obtain an agreement with a suitable launch agency to undertake to fly the satellite.

For more information contact:

Jim Heck of AMSAT-UK, E-mail: g3wgm@amsat.org

Website: http://www.uk.amsat.org/

club news

Keep your club news coming to pwnews@pwpublishing.ltd.uk and please remember to include full details of your club, E-mail and telephone contact details and the postcode of your meeting venue - it helps potential visitors to find you!

MIDDLESEX

Echelford Amateur Radio Society (EARS)

Contact: John G4GSC
Tel: 01784 451898
Email: jho@dsl.pipex.com
Website: http://beam.to/ears

The EARS meets every 2nd and 4th Thursday in the month at 1900 for 2000 hours start at: The Lounge, St. Martin's Court, Kingston Crescent, Ashford, Middlesex TW15 3NB. They run radio Nets on: Sundays at 1000 local on 1.979MHz and 2100 local on 2m f.m. 145.500MHz and QSY. Meetings for March are: **March 8**: Software Defined Radio (talk and demo) by **Olof Lundberg G0CKV** and **22nd:** Annual General Meeting.

STAFFORD

Stafford & Districts ARS

Contact: Graeme Boull G4NVH
Tel: (01785) 604534.
E-mail: graeme.boull@ntlworld.com
Website: www.g3sbl.org.uk/

The Stafford & District Amateur Radio Society meet on Thursdays at 2000 hours. The shack is located in the AREVA T&D UK Ltd. Factory, St. Leonards Avenue, Stafford ST17 4LX. Forthcoming meetings include: **March 8**: The Restored Receiver Collection by **Mike G8BMP**; **15th:** Annual General Meeting; **22nd:** The National Grid by **Bill G6JNZ** and **29th:** Shack Night Fun. Why not go along and join in?

WEST YORKSHIRE

The Huddersfield Technical College Radio Club

Contact: Roger Higton G3XXR
Tel: (01484) 536975

The Huddersfield Technical College Radio Club has been resurrected, after many years, and was due to begin meetings again at the end of February. The original callsign, **G3KJO,** has been re-applied for and will be back on the air in due course. The club will be running courses for all licence levels and will take place on Monday evenings from 1830 to 2100hours. The club will be meeting every Monday from the end of February at Huddersfield Technical college, New North Road, Huddersfield, West Yorkshire HD1 5NN. All who are interested will be very welcome.

RadioActive Show to be opened by RSGB President

The RadioActive Show is the name that the **Mid-Cheshire Amateur Radio Society** (MIDCARS) has chosen for its enlarged and re-invented annual Spring Rally. Taking place on Sunday 29 April, the rally will be opened by **Angus Annan MM1CCR**, the President of the Radio Society of Great Britain (RSGB).

Concerned over falling attendances in recent years at their annual Winsford event, MIDCARS has taken the radical decision in changing to a larger and more accessible venue offering greater scope and better facilities. They have also changed the day and the date from the early May Bank Holiday Monday, as it was felt that that was more of a family day and to avoid both visitors and traders suffering from the Bank Holiday traffic problems.

Roger Reeves M0ROJ, MIDCARS' event organiser, said "Despite falling attendances at most Amateur Radio events, and a dearth of new entrants to our hobby, we feel that by providing more vibrant and extensive content at our RadioActive Show and by appealing to both the younger as well as the more mature enthusiast through focused marketing, we will not only attract new members for both our own and other clubs but we will also be bringing a refreshing change to Amateur Radio events."

Roger went on to say that, "The RadioActive Show will have over 80 stands of top traders and exhibitors but we are also planning to hold throughout the day a series of talks and demonstrations to suit all levels of interest, as well as presentations being made by specialist groups and clubs for the more experienced visitor. And, of course, we will be continuing with our ever popular Bring-and-Buy attraction. We are delighted with the RSGB President offering to open 'the Show' thereby confirming the importance and format of our event in promoting the Amateur Radio movement."

The new venue for the event is the recently modernised Civic Hall located in the historic market town centre of Nantwich in Cheshire, offering easy access, bright and airy space, and excellent catering and bar facilities. The town's bus station and extensive car parking are immediately adjacent to the venue, with the M6 Motorway (J16) being only 15 minutes away.

More information about MIDCARS and the RadioActive Show can be obtained by contacting **Roger Reeves M0ROJ** on (**07747) 618131** or by E-mailing: **info@RadioActiveShow.co.uk**

Technical for the Terrified!

This month, Tony Nailer G4CFY looks at *Q*, bandwidth and dynamic resistance. As usual in this column, Tony aims to remove the 'mysteries' and explain the maths in the topics discussed.

Looking back over the work covered by the previous articles, I realise it has come to that time of the year when we should flex our mathematical abilities again. After all, this column is Technical for the Terrified and it's important to address the issue!

The theme of this article is to extend the work done in August last year in respect of parallel resonance. And although we deal with formulae, which consider pure capacitors and inductors, real life is not quite like that! Inductors have resistance in the wire and capacitors have loss resistance in the dielectric.

Both the losses mentioned mean that the real world of tuned circuits contains loss resistance. In days past, with either air dielectric or mica dielectric, the loss of the capacitors was considered negligible. Any loss was therefore considered to be due to the inductor and it was usually drawn in series with the inductor in the tuned circuit, see **Fig. 1**.

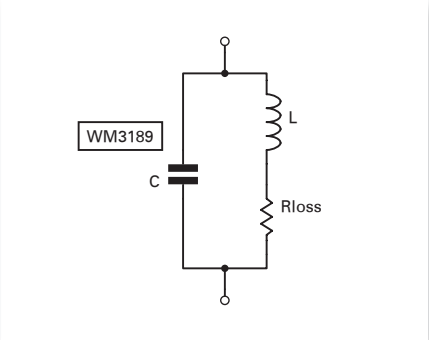


Fig. 1: In a parallel tuned circuit, the resistive losses (Rloss) may be considered in series with the inductor.

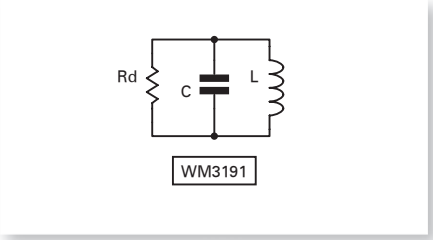


Fig. 3: Resistive losses may also be consdered as a parallel resistor Rd, with a value much higher than Rloss of Fig. 1.

Quality of Circuit

The loss resistance defined the quality of the circuit and affected the voltage swing across the inductor at resonance. It also affected how sharp the resonance peak was when observed on an oscilloscope.

The quality factor is given the notation *Q* and can be found as the ratio of the reactance of the coil at resonance divided by the resistance of the coil. In practice, *Q* can also be determined by observing the envelope voltage across the inductor using an oscilloscope.

The frequencies each side of resonance at which the amplitude has dropped to 0.707 of its peak value are determined. The *Q* is then the centre frequency divided by the difference between the two 0.707 peak frequencies.

Let's now consider parallel tuned circuit resonant on 7MHz consisting of a 5.5μH inductor and 94pF capacitor. A signal is applied from a signal generator to a low impedance winding on the coil and an oscilloscope is used to observe the voltage across the coil, see **Fig. 2**.

We'll start with the signal generator being set to 7MHz and adjusted to give (let's say 2.8V p-p on the screen). The

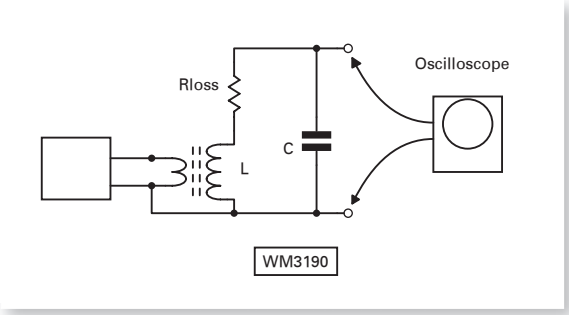


Fig. 2: Calculating Q from the voltage output bandwidth of the tuned circuit of Fig. 1. A signal source, around the resonant frequency, is fed to the circuit, via the input loop.

generator is then tuned up in frequency until the waveform has dropped to 2V p-p and the frequency noted. Likewise, the generator is tuned down from 7MHz until 2V p-p is achieved and the frequency noted again.

Let's now assume the two frequencies are 6.98 and 7.02MHz. The difference, or bandwidth, is 0.04MHz or 40kHz. The *Q* will then be 7.0/0.04 = 175.

The reactance of the inductor will be

$X = 2*\pi*f*L$.

$X = 2*\pi*7*10^6*5.5*10^{-6}$

Now the 10^6 and 10^{-6} cancel out,

so $X = 2*\pi*7*5.5 = 241.9\Omega$.

The *Q* factor of 175 tells us that the resistive losses of the circuit can be shown as a resistor in series with the inductor of 241.9/175 = 1.38Ω. Alternately the resistance can be shown as a parallel load resistor of $Q*X = 241.9*175 = 42332.5\Omega$. The parallel resistor is called the dynamic resistance Rd. (See **Fig. 3**).

Covering The 7MHz Band

In practice, we may want the tuned circuit to cover the whole of the 7 – 7.2MHz band without tuning. The bandwidth required is then 0.2MHz or 200kHz. The *Q* required is 7.0/0.2 = 35. This represents a parallel resistance of

241.9 * 35 = 8466.5Ω.

What's now required is the addition of an external parallel resistor to load the *Q* down to the value of about 8500Ω. (Let's try 10k□). The total resistance

Rt = R1*R2/(R1 + R2).

Rt = 42332*10000/42332+10000),

$Rt = 423.32*10^6/52.332*10^3$,

$Rt = 8.089*10^3 = 8089\Omega$. (Quite close, and probably good enough).

Let's just try 12kΩ as well.

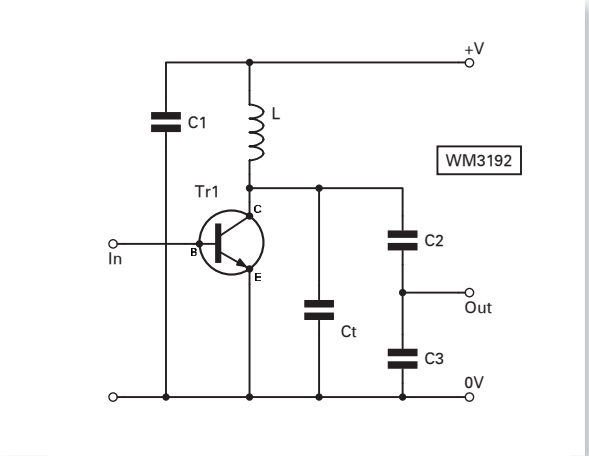
Rt = 42332*12000/(42332 + 12000),

$Rt = 507.98*10^6/54.332*10^3$,

$Rt = 9.349*10^3 = 9349\Omega$. (Clearly the first try was closest).

Loaded *Q*

We'll now consider **Fig. 4**, with a tuned circuit in the collector of a transmit amplifier. Note that C1 is a decoupling capacitor, which connects the supply rail to ground with respect to a.c. This means the equivalent circuit is as shown in **Fig. 5**. The term Ct refers to the capacitance of the transistor from collector to emitter, usually about 4pF for low power devices. The capacitors C2 and 3 provide an impedance step down to the following stage.



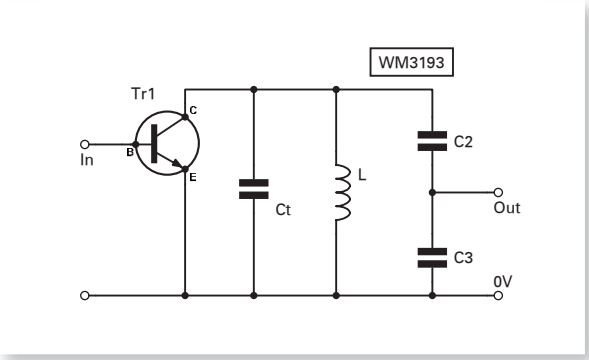


Fig. 5: The actual circuit of Fig. 4 may be considered in r.f. terms to be as shown here.

If the stage is to produce a power P = 100mW (0.1W) - at say 70MHz - the collector load required is RL = $Vs^2/2*P$. Using a 13.5V supply rail, the transistor collector voltage swing Vs might be from the rail down to 1.5V, so the swing is 12V.

RL = $12^2/2*0.1$ = 144/0.2 = 720Ω. The value of 720Ω can now be considered as a loading across the tuned circuit.

To achieve a loaded *Q* of 10 the inductive reactance has to be 720/10 = 72Ω.

Now inductive reactance XL = 2*π*f*L.

So L = XL/2*π*f.

L = 72/(2*π*70*10^6), now the 10^6 on the bottom becomes 10^{-6} on the top, so L = 72*10^{-6}/(2*π*70), also 10^{-6} on the top gives the final value in μH, then L = 72/2*π*70 μH, L = 0.163μH.

Fig. 4: A typical r.f. tuned and matched stage, Ct represents the transistor Tr1's collector-emitter capactitance.

Practical Value

The calculated results provides quite a practical value and can be wound using six turns of 20swg on a 6.5mm (0.25in) drill, then stretched and compressed. The resulting coil will be spaced evenly at about one wire diameter between turns.

The capacitance to resonate the coil at 70MHz can be found from

C = 1/(39.5*f^2*L).

C = 1/(39.5*70*10^6*70*10^6*0.163*10^{-6}).

(Don't panic!)

One of the 10^6 cancels with the 10^{-6} so the formula reduces to; C = 1/(39.5*70*10^6*70*0.163). Doing as we did before and taking the 10^6 on the bottom to become 10^{-6} on the top and then taking it out as μ, C = 1/(39.5*70*70*0.163) μF, C = 1/31548.65 μF, C = 0.0000316μF. C = 31.6pF.

Now, subtracting the 4pF of the transistor leaves 27.6pF to be made up with C2 and 3. For simplicity two 56pF capacitors in series will give 28pF total. That would be the starting point for a breadboard circuit. Then maybe reduce C2 and increase C3 until the match to the following stage is optimum.

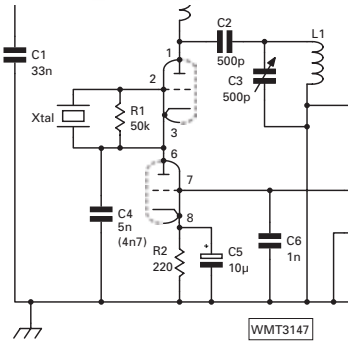
Useful & Helpful?

As usual, I hope this has been useful and helpful and enlightening and will encourage you to think about the technical side of the hobby, and even possibly experiment with circuits.

If you wish to correspond regarding this article or previous ones subscribe to the list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word subscribe in the subject box. When you receive confirmation from the server you can send an E-mail to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will then be answered by myself or the *PW* team. Cheerio for now. ●

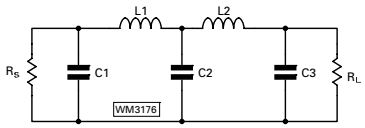
Tony Nailer G4CFY
To subscribe to my readers' list, send a blank e-mail to: **pw-g4cfy-on@pwpublishing.ltd.uk** with the word subscribe in the subject box. When you receive confirmation from the server you can then send e-mails to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by myself or the *PW* team.

Errors & Updates



PW Rother - *PW* January 2007

There was a missing capacitor in the circuit diagram of The Rother - a 1.8MHz amplitude modulated transmitter, published on page 52 of the January 2007 issue of *PW*. Capacitor C4, a 4.7 or 5nF r.f. decoupling capacitor, should have appeared across the lower half of the valve.



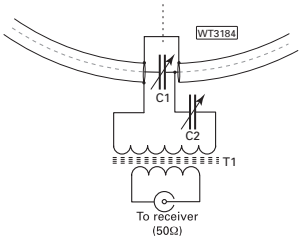
Doing it by Design - *PW* March 2007

On page 16 of Doing it by Design (*PW* March 2007) the filter circuit shown is of a single π-section, rather than the double-section (as shown here) that it should have been. The filter attenuation curve is the correct one.

Antenna Workshop - *PW* March 2007

On page 45 of the March 2007 issue of *PW*, the outer screen of the coaxial cable, used to make the loop antenna, was shown as being unconnected. In reality it should have been connected to the left-hand side of the coil as shown here. The left-hand side of C1 should, no longer be connected directly to the primary of transformer T1.

My apologies to all concerned for these errors. *Editor.*



BNC Screw type plug (Small entry) £1.25
BNC Solder type plug (Small entry) £1.25
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Di-pole centre *(for wire)* £4.95
Di-pole centre *(for aluminium rod)* £4.95
Di-pole centre *(for wire but with an PL259 socket)* £6.95
Dog bone insulator £1.00
Dog bone insulator heavy duty £1.50
Dog bone *(ceramic type)* £1.50
EGG-S *(small porcelain egg insulator)* £1.95
EGG-M *(medium porcelain egg insulator)* £2.50
EGG-XL *(extra large porcelain egg insulator)* £5.95
CAR PLATE *(drive on plate to suit 1.5 to 2" mast/pole)* £19.95

Cable & Coax Cable

RG58 best quality standard per mt 35p
RG58 best quality military spec per mt 60p
RGMini 8 best quality military spec per mt 70p
RG213 best quality military spec per mt £1.00
H100 best quality military coax cable per mt £1.25
3-core rotator cable per mt 45p
7-core rotator cable per mt £1.00
10 amp red/black cable 10 amp per mt 40p
20 amp red/black cable 20 amp per mt 75p
30 amp red/black cable 30 amp per mt £1.25

Please phone for special 100 metre discounted price

Baluns

MB-1 1:1 Balun 400 watts power £24.95
MB-4 4:1 Balun 400 watts power £24.95
MB-6 6:1 Balun 400 watts power £24.95
MB-1X 1:1 Balun 1000 watts power £29.95
MB-4X 4:1 Balun 1000 watts power £29.95
MB-6X 6:1 Balun 1000 watts power £29.95
MB-Y2 Yagi Balun 1.5 to 50MHz 1kW £24.95

Duplexers & Antenna Switches

DX-720D Duplexer *Port 1: HF + 6 + 2m (1.6-150MHz). *Port 2: 70cm (400-460MHz). *Connection: Fixed 2 x PL259 & 1 x PL259 ..... £19.95
MX-72 Duplexer *Same spec as DX-720D but with PL259 fly leads £29.95
MX2000 HF/VHF/UHF internal Tri-plexer (1.6-60MHz) (110-170MHz) (300-950MHz) £59.95
CS201 Two-way di-cast antenna switch. Freq: 0-1000MHz max 2,500 watts PL259 fittings £14.95
CS201-N Same spec as CS201 but with N-type fittings £19.95
CS401 Same spec as CS201 but4-way £39.95
CS401N Same spec as CS401 but with N-type fittings £59.95

Antennas Rotators

AR-300XL Light duty UHF\VHF £49.95
YS-130 Medium duty VHF £79.95
RC5-1 Heavy duty HF £329.95
RC5-3 Heavy Duty HF inc pre set control box £419.95
AR26 Alignment Bearing for the AR300XL £18.95
RC26 Alignment Bearing for RC5-1/3 ..... £49.95
RC5A-3 Serious heavey duty HF £579.95

Complete Mobile Mounts

All mounts come complete with 4m RG58 coax terminated in PL259 (different fittings available on request).
3.5" Pigmy magnetic 3/8 fitting £7.95
3.5" Pigmy magnetic PL259 fitting £9.95
5" Limpet magnetic 3/8 fitting £9.95
5" Limpet magnetic PL259 fitting £12.95
7" Turbo magnetic 3/8 fitting £12.95
7" Turbo magnetic PL259 fitting £14.95
Tri-Mag magnetic 3 x 5" 3/8 fitting £29.95
Tri-Mag magnetic 3 x 5" PL259 fitting £29.95
HKITHD-38 Heavy duty adjustable 3/8 hatch back mount £29.95
HKITHD-SO Heavy duty adjustable SO hatch back mount £29.95
RKIT-38 Aluminium 3/8 rail mount to suit 1" roof bar or pole £12.95
RKIT-SO Aluminium SO rail mount to suit 1" roof bar or pole £14.95
RKIT-PR Stainless PL259 rail kit to suit 1" roof bar or pole £24.95
PBKIT-SO Right angle PL259 pole kit with 10m cable/PL259 *(ideal for mounting mobile antennas to a 1.25" pole)* £19.95

Antenna Wire & Ribbon

Enamelled copper wire 16 gauge (50mtrs) £16.95
Hard Drawn copper wire 16 gauge (50mtrs) £19.95
Equipment wire Multi Stranded (50mtrs) £14.95
Flexweave high quality (50mtrs) £27.95
PVC Coated Flexweave high quality (50mtrs) £37.95
300Ω Ladder Ribbon heavy duty USA imported (20mtrs) £14.95
450Ω Ladder Ribbon heavy duty USA imported (20mtrs) £17.95

(Other lengths available, please phone for details)

Miscellaneous Items

CDX Lightening arrestor 500 watts £19.95
MDX Lightening arrestor 1000 watts £24.95
AKD TV1 filter £9.95
Amalgamating tape (10mtrs) £7.50
Desoldering pump £2.99
Alignment 5pc kit £1.99

Telescopic Masts (aluminium/fibreglass opt)

TMA-1 Aluminium mast ★ 4 sections 170cm each ★ 45mm to 30mm ★ Approx 20ft erect 6ft collapsed £99.95
TMA-2 Aluminium mast ★ 8 sections 170cm each ★ 65mm to 30mm ★ Approx 40ft erect 6ft collapsed £189.95
TMF-1 Fibreglass mast ★ 4 sections 160cm each ★ 50mm to 30mm ★ Approx 20ft erect 6ft collapsed £99.95
TMF-1.5 Fibreglass mast ★ 5 sections 200cm each ★ 60mm to 30mm ★ Approx 30ft erect 8ft collapsed £179.95
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ Approx 40ft erect 9ft collapsed £189.95

HF Yagi

HBV-2 2 BAND 2 ELEMENT TRAPPED BEAM FREQ:20-40 Mtrs GAIN:4dBd BOOM:5.00m LONGEST ELEMENT:13.00m POWER:1600 Watts £399.95

ADEX-3300 3 BAND 3 ELEMENT TRAPPED BEAM FREQ:10-15-20 Mtrs GAIN:8 dBd BOOM:4.42m LONGEST ELE:8.46m POWER:2000 Watts £329.95

ADEX-6400 6 BAND 4 ELEMENT TRAPPED BEAM FREQ:10-12-15-17-20-30 Mtrs GAIN:7.5 dBd BOOM:4.27m LONGEST ELE:10.00m POWER:2000 Watts £599.95
40 Mtr RADIAL KIT FOR ABOVE £99.00

Mini HF Dipoles (Length 11' approx)

MD020 20mt version approx only 11ft £39.95
MD040 40mt version approx only 11ft £44.95
MDO80 80mt version approx only 11ft £49.95
(slimline lightweight aluminium construction)

HF Verticals

VR3000 3 BAND VERTICAL FREQ: 10-15-20 Mtrs GAIN: 3.5dBi HEIGHT: 3.80m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £99.95
OPTIONAL 10-15-20mtr radial kit £39.95

EVX4000 4 BAND VERTICAL FREQ:10-15-20-40 Mtrs GAIN: 3.5dBi HEIGHT: 6.50m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £119.95
OPTIONAL 10-15-20mtr radial kit £39.95
OPTIONAL 40mtr radial kit £14.95

EVX5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 7.30m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £169.95
OPTIONAL 10-15-20mtr radial kit £39.95
OPTIONAL 40mtr radial kit £14.95
OPTIONAL 80mtr radial kit £16.95

EVX6000 6 BAND VERTICAL FREQ: 10-15-20-30-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 5.00m RADIAL LENGTH: 1.70m(included) POWER: 800 Watts £299.95

EVX8000 8 BAND VERTICAL FREQ:10-12-15-17-20-30-40 Mtrs (80m optional) GAIN: 3.5dBi HEIGHT: 4.90m RADIAL LENGTH: 1.80m (included) POWER: 2000 Watts £319.95
80 MTR RADIAL KIT FOR ABOVE £89.00

(All verticals require grounding if optional radials are not purchased to obtain a good VSWR)

Trapped Wire Di-Pole Antennas
(Hi grade heavy duty Commercial Antennas)

MDT-6 FREQ:40 & 160m LENGTH: 28m POWER:1000 Watts £59.95
MTD-1 (3 BAND) FREQ:10-15-20 Mtrs LENGTH:7.40 Mtrs POWER:1000 Watts £49.95
MTD-2 (2 BAND) FREQ:40-80 Mtrs LENGTH: 20Mtrs POWER:1000 Watts £59.95
MTD-3 (3 BAND) FREQ:40-80-160 Mtrs LENGTH: 32.5m POWER: 1000 Watts £99.95
MTD-4 (3 BAND) FREQ: 12-17-30 Mtrs LENGTH: 10.5m POWER: 1000 Watts £49.95
MTD-5 (5 BAND) FREQ: 10-15-20-40-80 Mtrs LENGTH: 20m POWER:1000 Watts £89.95

(MTD-5 is a crossed di-pole with 4 legs)

ALL PICTURES ARE FOR REFERENCE ONLY

Building the ABLO!

The ABLO is a very useful piece of bench equipment and forms the key component in a forthcoming all (traditional) band c.w. transceiver project (more on that in a later issue). The intention is to provide local oscillator signals for driving a direct conversion (DC) receiver and an associated c.w. transmitter. Hence, the emphasis is on frequency stability with a small tuning range.

In practice, the project can, of course, also be used as a low level signal source for aligning receiver r.f. filters. For work outside the traditional bands 1.8 to 28MHz (160, 80, 40, 20, 15 and 10m), you'll need a signal generator (this is also planned as another forthcoming project! As usual, kits for the project will be are available – see the end panel for further information.

The Concept

Using the ABLO as a local oscillator source on the highest band for transmission - c.w. or double sideband (d.s.b.) 'phone is the most challenging condition. The requirement is to avoid any fast transient changes in frequency that would cause c.w. chirp or 'FMing' and it must also have long-term stability to avoid the need for re-tuning every few seconds. Achieving this at 28MHz with a free running oscillator is almost impossible, so another solution is required.

Using the Direct Digital Synthesis technique is not an option because most builders won't be able to adapt the software if required. It's also complex, relatively expensive and the associated microprocessor is quite likely to generate wideband hash on the receiver! For our project mixing a low frequency variable frequency oscillator (v.f.o.) with suitable crystal derived frequencies is the obvious approach.

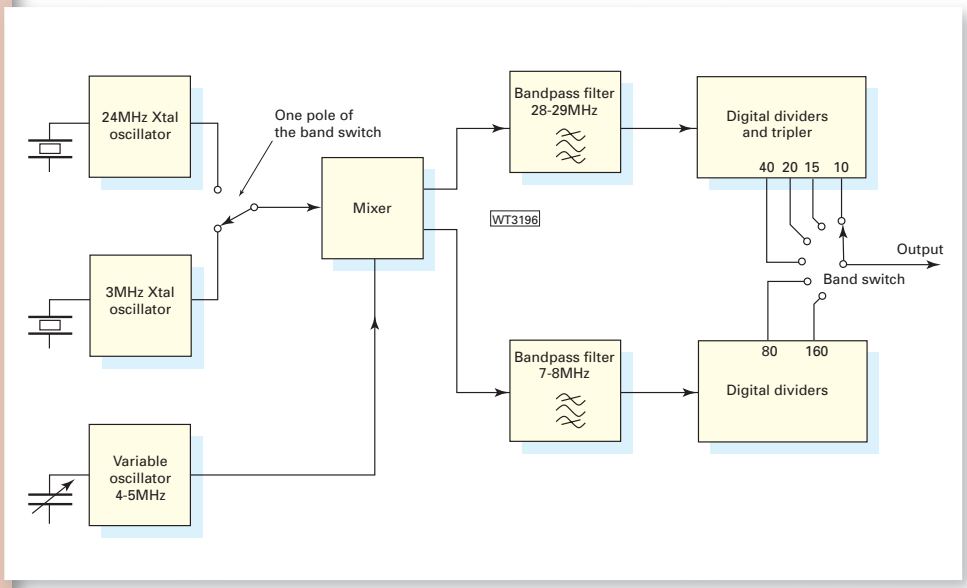

Fig. 1: Simplified block diagram of the ABLO.

However, even the mixing at low frequency approach has its problems! To avoid a crystal and output filter for each band, it's worth considering digital division down from the highest frequency band. Digital division and output is an option, as I will explain later!

The Amateur bands were originally made harmonically related because frequency doublers were often used to get up to the higher bands. We can now reverse that process, using up to eight stages of digital division by two. To cover all

Tim Walford G3PCJ says that, "The ABLO is not some scheme run by Government to make you operate your radio within the law but is the All Band Local Oscillator! It covers all the traditional harmonically related bands 1.8 - 28MHz and is certainly not a traditional v.f.o. - as implied at the end of my last article!"

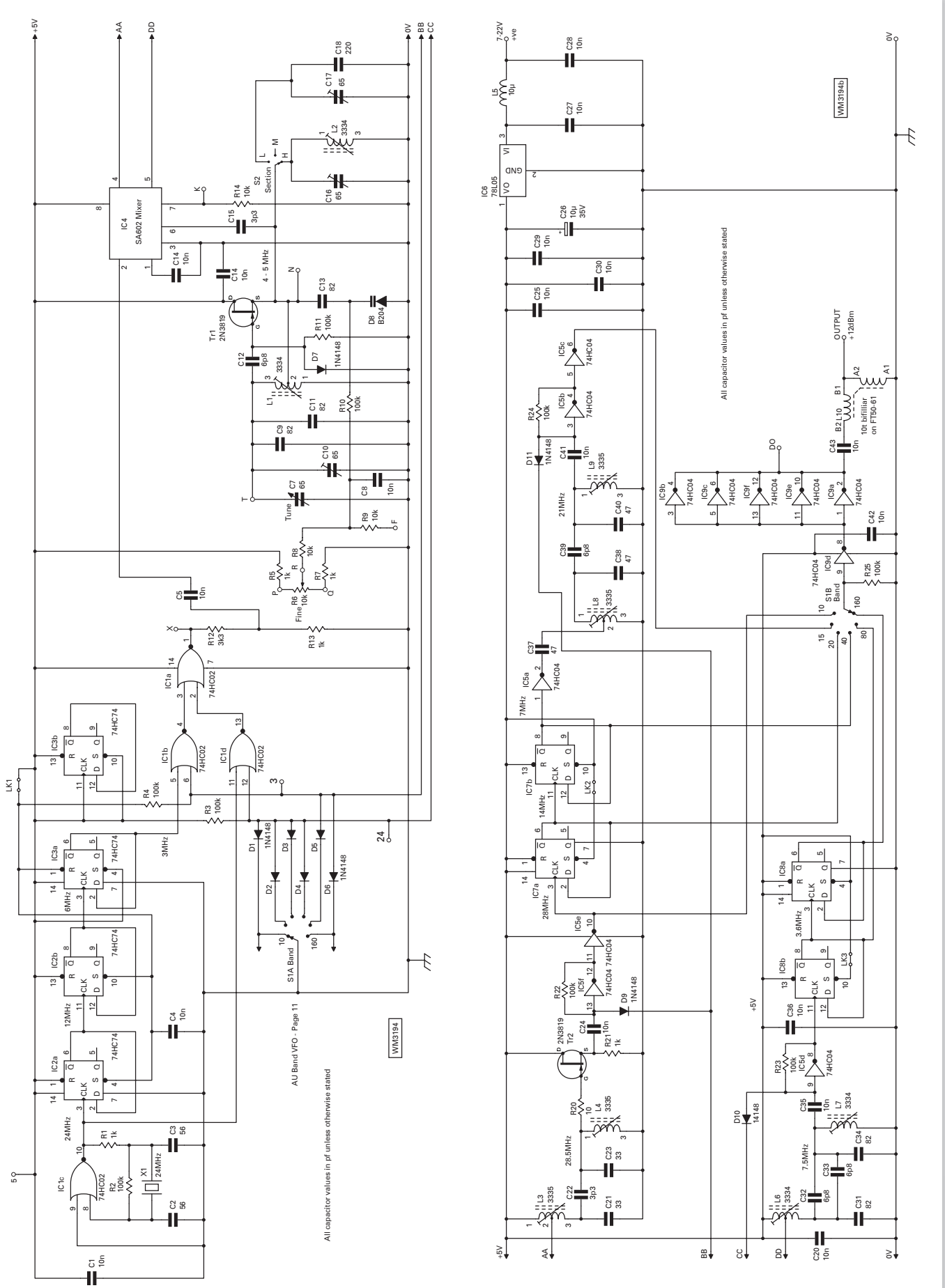

Fig. 2: Circuit of the ABLO.

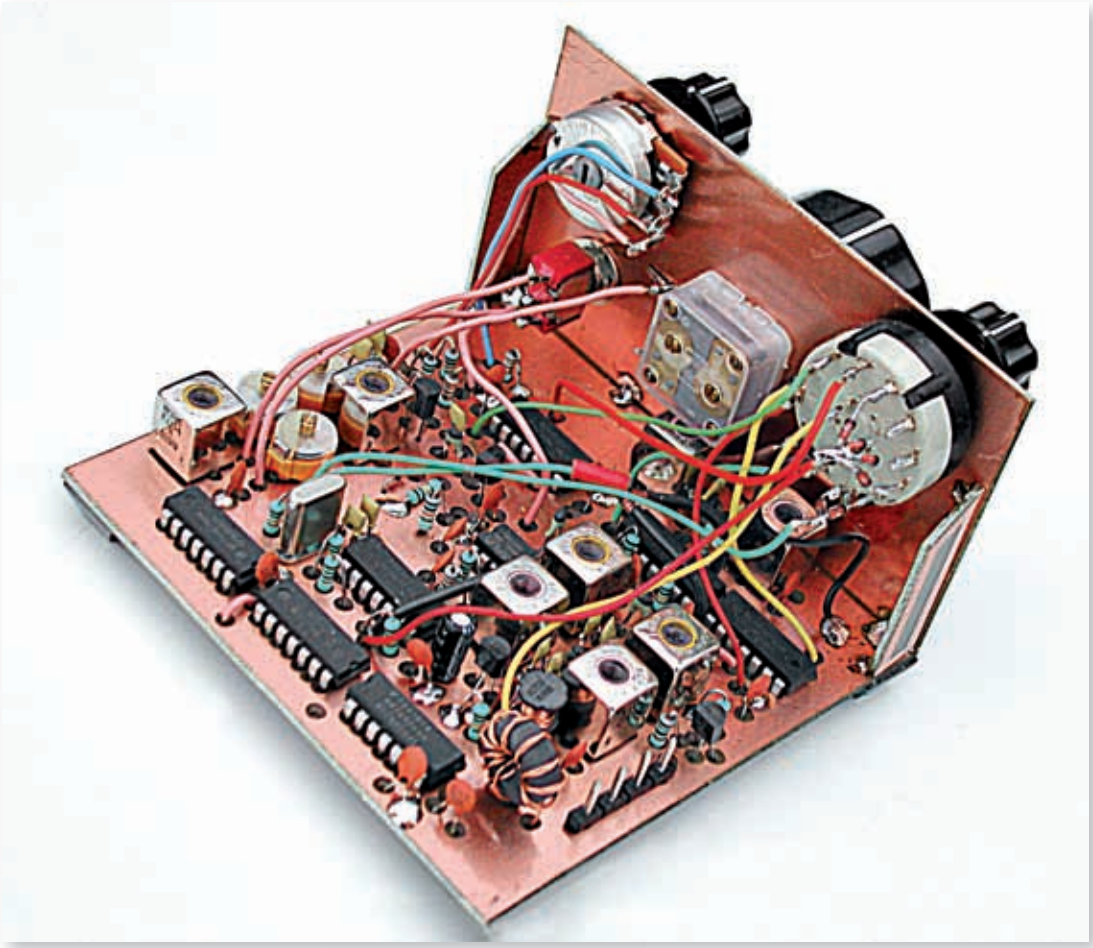

Fig. 3: Prototype rear view.

of 1.8MHz, the 10m band tuning range would have to be from 28.8 to 32MHz but, of course, for use on all the other bands, it has to run from 28MHz upwards. This 4MHz swing is just too large for a v.f.o. running below about 6MHz, which is necessary for good long term stability.

Furthermore, the tuning rate would change dramatically between bands (up to 16 times greater), so that on 28MHz it would be very fierce and impossible to use without some form of bandspread. The bands need to be split into at least two groups, and preferably with a reduced range on 10m. A 1MHz tuning range on 28MHz, implying a v.f.o. swing of 1MHz, will give you coverage of the whole of all the other bands.

Block Diagram

A simplified block diagram, **Fig. 1** (page 19), shows a scheme using a 4 – 5MHz v.f.o., mixed with 24MHz from a crystal, and then filtered to produce 28 – 29MHz for division down to the 7MHz band. Mixing the same v.f.o. with a 3 MHz crystal will also produce 7 – 8MHz, which divides nicely down for 80 and 160m.

By good fortune, 3MHz can be obtained from 24 by dividing by eight instead of using another actual oscillator! In both cases the unwanted mixer products will be well attenuated.

Complete Circuit

The diagram, **Fig. 2**, shows the complete circuit. All devices use the regulated 5V supply provided by IC6, which has extra filtering (L5) to separate these digital circuits from other analogue parts of an overall rig. All the digital logic uses 74HC series high-speed low power c.m.o.s. devices.

The doubly balanced SA602 mixer IC4 is at the heart of the design; its pin 2 input is arranged to take either 24MHz direct from the digital crystal oscillator IC1c via selection gate IC1d, or 3MHz via IC1b, after the 24MHz is divided by eight in the dividers IC2a/b and IC3a. (IC3b is not used.) The S1A pole of the band switch controls the choice of 3 or 24MHz input to IC4 by the diodes D1 to D6. It would be possible to omit these diodes but including them allows S1 to also control external relays that might be required for other aspects of a transceiver.

The other mixer input (pin 3 IC4) comes from the v.f.o., which uses a 2N3819 (Tr1) in the Hartley configuration. The point K (pin 7 of IC4) is a buffered version of the v.f.o. signal, which is useful when setting up. The v.f.o. main tuning control is a PolyVaricon C7 with a tuning range of about 450kHz, but there are three sub-ranges selected by S2 (centred on 4.25, 4.50 and 4.75MHz) so that the whole of 4 to 5MHz is covered.

The coverage is a bit coarse, so the potentiometer R6 is included to give a few kHz of **Fine** control either way – acting like bandspread. Any offset applied by the fine control R6 can be removed by shorting points P and Q during transmission, allowing its use as receiver incremental tuning (RIT) in a direct conversion (DC) c.w. transceiver.

The outputs of the mixer, IC4, each feed a bandpass filter, one for each of the ranges mentioned earlier. The inductors L6 and 7 form a double tuned filter for 7 to 8MHz used for the 80 and 160m bands (3MHz crystal plus 4 to 5MHz v.f.o.).

The filter output is applied directly to the inverter gate IC5d, which is biased into its linear region by R23 - implying its output is held halfway between the logical 0 and 1 levels (0 and 5V). The analogue filter output is thus 'squared' up by this gate ready for subsequent division by 2 twice in IC8 to give the outputs for 80 (3.5 – 4 MHz) and 160m(1.75 – 2.0 MHz). The diode, D10 forces the gate IC5d and following dividers to be inactive when not required on the other range.

The second mixer output (pin 4 of IC4) feeds the other double tuned filter for 28 - 29MHz, however, because of the need for lower tuning capacitance, a buffer stage Tr2 is used to isolate it from the squaring gate IC5f. The filter output might

also be slightly lower than in the other filter, so two gates are used to ensure a full 0 to 5 volt digital signal on 10m (28 – 29 MHz), and for driving the dividers IC7a and b giving 14 – 14.5MHz for 20m, and 7 - 7.25MHz for 40m. Again, D9 ensures this chain is inactive when not required.

You might wonder - just how is 21MHz for 15m obtained by digital division from 28MHz? The key is 'multiplication' by 3! Any squarewave is inherently rich in odd harmonics, starting with the third and declining fairly rapidly thereafter.

We already have a 7MHz squarewave signal (40m), so all we need to do is put it through a 21MHz filter to extract its third harmonic at 21MHz! The i.c., IC5, is a driver for the 21MHz filter comprising L8/9, with IC5b/c squaring up the lower level 15m output. Again, D11 prevents any activity when not required.

Output stage

At this point we have all the bands available as 0 to 5V digital squarewave signals. However, do they need to be filtered to remove their harmonics? The answer is no - for two reasons! First, the ABLO is most likely to be used for driving a DC receiver's product detector. This will usually be preceded by a radio frequency (r.f.) filter for each band so that the mixer is unlikely to be presented with any significant signals at the third (or higher) harmonics of the l.o.

In fact, many switching mixers are better driven (hard on/off) by a large digital signal than an analogue one. (The presence of harmonics is also unlikely to be a problem when the ABLO is used to align a filter).

The other concern is that the harmonics will generate 'digital noise' or wideband hash. However, there's no need to worry! The products are discrete signals, which, when listened to on a receiver sound just like any ordinary 'pure' sinewave signal - except that you can also find its harmonics (mainly odd and with decreasing strength) although these are immaterial as I've already explained. In between, the reception will be clean. Hence a digital output from the ABLO is fine!

It's desirable that the ABLO be capable of driving 50Ω loads, such as diode mixers and other r.f. gadgets that often use 50Ω in/out impedance. Unfortunately, the output impedance of the 74HC logic series is too high to do this directly but it's quite in order to parallel gates to increase their capability.

You can then drive a 4:1 impedance step-down broadband transformer with the nominal 5V signals, so achieving about 2.25V p-p and a power of +12dBm into 50Ω, which is suitable for directly driving most diode mixers. One pole of the rotary band switch S1B is used to select the desired band signal, which is then buffered digitally in IC9d for driving IC9a/b/c/e/f in parallel prior to the output transformer L10. If lower output levels are needed for aligning receiver input r.f. band filters, or other types of mixer, then use 50Ω attenuators as necessary.

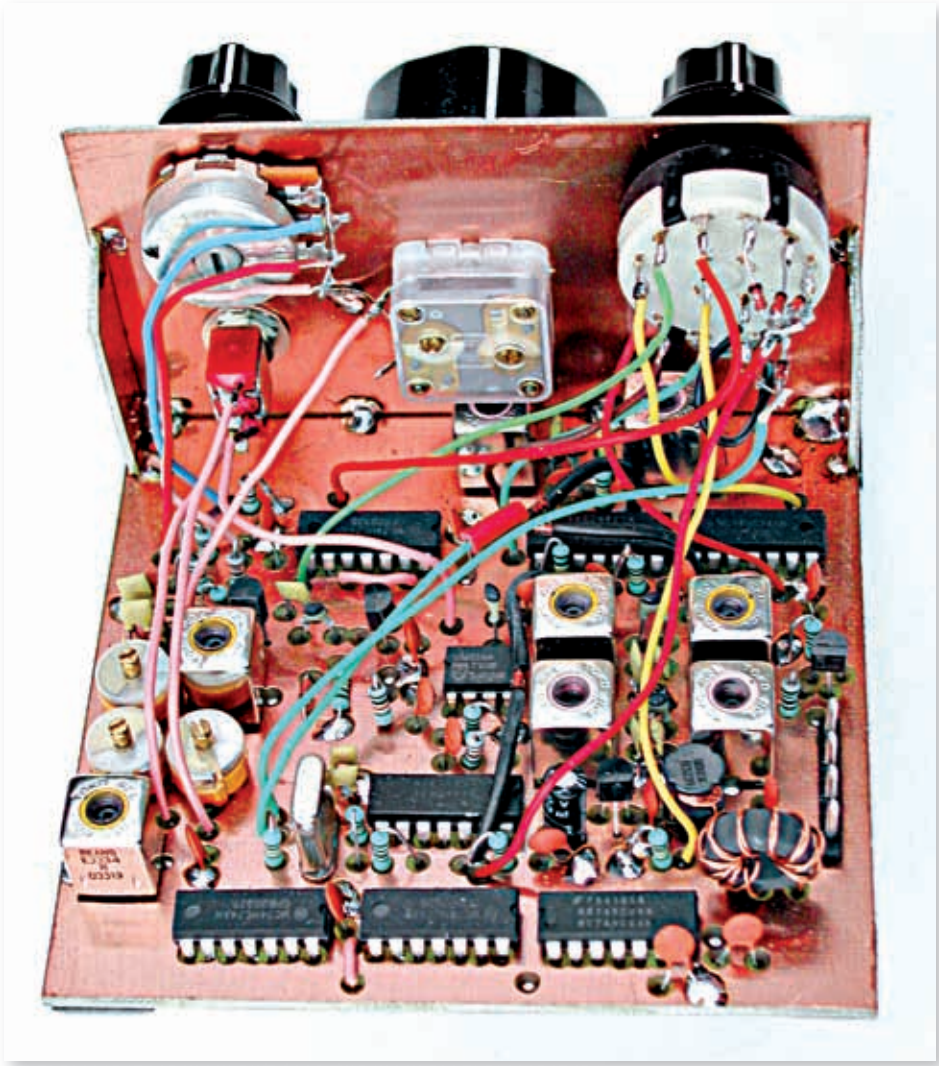

Fig. 4: Prototype of the ABLO showing a close up view of the rear. Please note this is the prototype, which is not exactly the same layout as final version.

Making it work

After checking the supply aspects, build the two oscillators. The 24MHz crystal oscillator and its dividers IC2/3 can be checked by observing their output with a d.c. voltmeter. All outputs (as they are 5V squarewaves) should have an average value of 2.5V. You can also check the gating of signals through ICa/b/d in the same manner when points 24 and 3 are grounded in turn.

The v.f.o. is best set with a counter connected to point K, after adding the mixer. (You can also listen for it on a general coverage receiver). With S2 set to M and with both tuning controls C7/R6 centred, C10 should then be adjusted for 4.5MHz. It doesn't matter what the exact tuning range is owing to the considerable overlap. Next, change S2 to L, set C7 for its low frequency end, and then adjust C17 for 4MHz. Then set S2 to H, set C7 for the high end and adjust C16 for 5MHz.

Next add the filter parts around L6/7, and IC5 and IC8. **Note:** Be careful to 'secure' any unconnected gate inputs to 0V at this stage!). Next, set the v.f.o. for 4.5MHz and pass 3MHz to the mixer by grounding point 3. Then, peak up the filter and you should be able to measure the average values of the 0 to 5V square wave 1.8 and 3.5MHz outputs. **Note:** It's quite possible that these signals will become unsteady at the band extremes, in which case the inductors L6/7 need be stagger-tuned at 7.2 and 7.75MHz respectively.

The filters L3/4 for the higher bands need their buffer stage, Tr2. Then you should enable the 24MHz input by grounding point 24. These resonators are unlikely to

need stagger tuning and can be peaked at 28.5MHz (if you have any means of assessing the signal level) on the source of Tr2. When correctly peaked, the divided 20 and 40m outputs from IC7 should be steady across the whole tuning range.

Next, fit the 15m filter L8/9, which is peaked at 21.2MHz (v.f.o. set at 4.27MHz) for a steady output from IC5c.The last task is to add the output stages in IC9 and the 2:1 transformer L10. **Note:** This is wound with 10 turns of twisted 27s.w.g. enamelled wires to form a centre tapped bifilliar winding on the ferrite toroid. (I am sure you will know how to do this from earlier *PW* projects!).

Using The ABLO

Using the ABLO is just like using an ordinary signal generator - the fact that the outputs are digital can normally be ignored! Just select the required band and set the tuning within your desired section of that band. If your particular application needs a lower signal level, then use external 50Ω attenuators. (The output level should be the same on all bands).

You may prefer to mount the main printed circuit board (p.c.b.) within a normal case, and possibly add an air tuned variable capacitor for C7 with a slow motion drive. It has also been suggested that the ABLO will be a good alternative l.o. source for elderly valved transmitters. Whatever the use, you'll find a digital readout of output frequency to be very useful.

Rather than calculate from the v.f.o. frequency, the actual output can be measured by connecting the counter to point **DO** on the circuit. Incidentally, a general bench counter is a most useful tool anyway and would be handy for the forthcoming signal generator. (Kits for attenuators and counters are available – see Kits & Bits panel).

Keen experimenters may be looking for a task for the normally unused divider IC3b! You could consider adding a second output channel driven by IC3b, using a clock input that's inverted compared to the clock driving the normal band output divider.

Finally, for this time - and although rather too complex a subject to explain here properly - it's possible to produce two l.o. signals for 1.8, 3.5, 7 and 14MHz that are 90° apart, such as are required for a phasing single sideband receiver. If there's room later, I'll explain this in connection with the forthcoming Pylle 'many band' c.w. transmitter. Meanwhile, I must write up the Wide Range Signal Generator! ●

Kits & Bits

Kits for the All Band LO are available from Walford Electronics. They include all parts, to build them 'open' style as in the accompanying photographs.
Prices are:-
ABLO kit £49
Switched 1 x 20dB attenuator kit £19
Five digit counter kit, (discounted when purchased with the ABLO) £45
(p&p is £3 per order).
Please send your orders - with a cheque - direct to **Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ.** Further information is available at **www.users.globalnet.co.uk/~walfor**

Taking a look at RAOTA

Editorial comment: The new In Focus feature will be available to help all Amateur Radio clubs and organisations to promote their activities. For further details please see Topical Ta k on page 81. **Rob G3XFD**

Ian G4EAN writes: Let me introduce you to RAOTA, the Radio Amateur Old Timers' Association. Everyone is welcome on this tour, as you'll see when we reach the Membership details. As a an established group, RAOTA aims to "maintain the traditions and spirit of Amateur Radio." The RAOTA motto is, "Honour the Past – Enjoy the Present – Ensure the Future."

The Radio Amateur Old Timers' Association is run to bring together those with an interest in the traditions and pioneer spirit of Amateur Radio. It aims to foster and maintain a spirit of friendship amongst all Radio Amateurs and to further the well being of Amateur Radio and the interests of its members.

Importantly, RAOTA also aims to offer the experience and expertise of its members to newcomers to Amateur Radio, particularly the young. A hard working and dedicated team of committee members and officers runs the association.

Let's start with the Membership details and this is where RAOTA is widely misunderstood. First, it's **definitely not true, as some potential members think,** that membership of RAOTA is only open solely to those licensed for 25 years or more, and that members have to hold an Amateur Radio licence. This is because RAOTA has both Full and Associate categories of membership and the following details summarise what the various categories offer.

Full Membership: This is open to anyone who has been actively involved in Amateur Radio for over 25 years.

Associate Membership: This is open to those who have been actively involved in Amateur Radio for a shorter period. It carries all the benefits of full membership but without the voting rights.

So what's the cost of RAOTA membership? Well, the current rate is £8 and all subs become due on 1 April every year. There is also a registration fee of £2 payable by all new members. In return they receive a distinctive RAOTA lapel badge and a membership certificate.

In Return For Membership?

Readers may ask - What do members get in return for their subs? Well, the most obvious benefit is RAOTA's quarterly magazine *Old Timers' News* (*OTN*). This was first published in 1985 and is now firmly established as an entertaining and informative magazine produced to a very high standard.

The magazine is well illustrated and carries a very wide range of articles, usually written by RAOTA members. Naturally, it covers a lot of radio history but there's also a wide range of articles covering radio theory and practice, DXpeditions, antennas, anecdotes and so on.

Published in A5 stitched format *OTN* is also available on tape (by request) for members who are visually impaired. A sample *OTN*, in a low-resolution form, can be downloaded from the RAOTA website.

RAOTA attend several rallies throughout the year. Here they are enjoying the 2006 Elvaston Castle Rally.

Book Range

Moving on to books, did you know that RAOTA publishes a range of books? For example, *The Early Years* is a collection of articles about the early years of radio and includes recollections from some RAOTA members who were eyewitnesses and participants of those early years.

Two books entitled, *Digest of Horizontal Wire Aerials* and *Proven Aerials and Related Subjects*, cover a wide and useful range of antennas and both books have shown themselves to be outstandingly popular. The association also publishes a logbook and this - rather helpfully - has complete pages blank for you to add your own notes and diagrams about your station.

On Air With RAOTA

You can find RAOTA on the air with its high frequency (h.f.) single sideband (s.s.b.) and c.w. (Morse) nets, which operate under the **G2OT** callsign. The RAOTA nets operate on the 1.8, 3.5 and 7MHz. Incidentally, RAOTA award a certificate and this is available to members who have communicated by radio with 50 other members of the Association.

New Get-togethers

A relatively new feature of RAOTA is its Get-togethers. These are social events organised by association members locally (not by the RAOTA committee). They started as informal events in the private room of a very nice Derby pub and micro-brewery but are developing into social events encompassing private visits to a selection of radio related museums.

Finally, I'll now provide a brief look at the history of RAOTA. Its ancestry goes back to the **British Old Timers' Club**, which was founded in the 1930s by the late **Gerald Marcuse G2NM**. It was re-established in 1948 with the help of the *Short Wave Magazine* Editor, **Austin Forsyth G6FO**. In 1959 it became the Radio Amateur Old Timers' Association and was re-established in its current form in 1985.

We've come to the end of our short tour of RAOTA and if you would like to apply for membership or find out more details then information is readily available. You can get it by post from **RAOTA, 65 Montgomery Street, Hove, East Sussex BN3 5BE**. On the Internet you can find us at **www.raota.org** where you can download an application form.

You can also pick up details and chat to us on the RAOTA stand at many rallies – look for the very distinctive cerise colour scheme on out stand. We look forward to meeting you!

Ian G4EAN

You may have seen a Radio Amateur Old Timers' Association (RAOTA) stand at a rally or come across their nets but how much do you know about RAOTA? Secretary and Publicity Officer Ian Brothwell G4EAN provides an introductory tour of the Association.

Radioworld.

kenwood

1 YEAR WARRANTY

TS-480SAT - HF&6m 100W.. £669.00.
TS-480HX - HF & 6m 200W.. £760.00.
TS-2000 - HF/6/2/70cm's... £1275.00.
TS-2000X-HF/6/2/70/23cm £1695.00.
TM-G707-Dual Band Mobile £265.00.
TM-V7E - 2m/70cm's..... £359.00.
TH-F7E - 2mtrs/70cm's..... £189.95.
THG-71E-Dual Band Handy £169.00.
TM-271E-2m/FM Mobile TX/RX £185.00.

ICOM IC-7800MK2 *"IN STOCK"*
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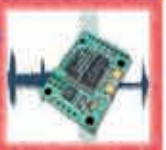

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Planning Permission For Your Ham Mobile Station?

It Could Be On The Way Soon!

Mounting a mobile antenna on your car in the future may mean the manufacturer might not accept the vehicle for scrapping. Without the manufacturer's 'planning permission' you may not even be able to sell it to a wary new owner before the end of its working life.

The European Union (EU) has been forced to take action regarding the huge mountain of scrap metal from vehicles at the end of their working lives. Since 1998, 14.5 million cars have been produced in the EU alone (see website **www.tms.org/pubs/journals/JOM/0308/Kanari-0308.html** for the background of the growing problem) and the possible piles of scrap vehicles could grow to unimaginable proportions. There's even a limit to the amount of scrap that India and Bangladesh can take due to the shortage of cargo vessels so, Europe could soon see huge piles of metal awaiting shipping to the Indian Sub-Continent.

Thinking on its feet, the EU has been looking into - and is about to introduce - a new scheme to make individual manufacturers fully responsible for the various models they produce. And from experience of life we all realise that wherever possible the large corporations, whether based in Japan, Korea or other countries but actually making vehicles within the EU, will try to find loopholes to successfully bypass the regulations introduced by EU regulation **293617602097834-01042007LOOFLIRPA57REAY (Vehicles**), which could cause problems for the Ham radio enthusiast.

Note: A similar regulation directed at the huge number of scrap bicycles lying in our streets (It's a real problem where I live in Amsterdam, the Netherlands). In Amsterdam, like many other European cities, you can find bicycle frames minus wheels - but still chained to fencing and guardrails – all littering the streets. This regulation - EU KIBE99678835566839LOOFLIRPA (Bicycles) has reached a temporary set back because the Chinese authorities (they produce 99% of the World's bicycles) refuse to co-operate or even provide a take-away service for their leftover products.

Extensive Research

Even though I live in the Netherlands I am a frequent visitor to the UK and other parts of the EU. Having learned English at school I'm often taken to be an American. Rather interestingly, Dutch people speaking English are often mistaken for Americans and I enjoy pointing out to our Transatlantic friends that in reality, Americans - especially those living in the New York area - are probably speaking English with a Dutch accent! Why should this be you may ask? New York was once called Nieuw Amsterdam and you may well remember a flamboyant character called **Peter Stuyvesant** - a Dutchman who left his mark on America and cigarette cartons!

Note: Peter Stuyvesant (circa 1600 – August 1672) served as the last Dutch Director-General of the colony of New Netherlands from 1647 until it was ceded provisionally to the English in 1664. He was a major figure in the early history of New York City. Stuyvesant's accomplishment as director-general included a great expansion for the settlement of New Amsterdam (later renamed New York) beyond the southern tip of Manhattan. Among the projects built by Stuyvesant's administration were the protective wall on Wall Street, the canal that became Broad Street and Broadway!

Because I am often mistaken for an American, car dealers seem prepared to freely talk and provide information in a relaxed manner. From Rome to Reading and from Cork to Cherbourg they have all told me how they imagine the new EU regulation 2233445576-097834-01042007LOOFLIRPA57REAY (Vehicles) will be handled by their companies and because I am a short wave radio enthusiast I have great concerns for the future.

Unwanted Vehicle Modifications

Meeting many motor dealers had led me to understand that their trade is rigid in its approach to buying and selling vehicles.

Planning permission for your Ham mobile station? Surely not you might ask? However, following newly introduced European Union regulations that will make manufacturers responsible for the disposal of their own models at the end of their useful lives - planning permission for minor vehicle alterations might soon be required. Specialist motoring journalist Edzell (Eddie) Karghford-van-Straate, based in Amsterdam, Holland - explains.

Even modifications inside the vehicle could lead to difficulties in scrapping your vehicle at the end of its useful life - so care has to be taken to ensure permission has been obtained from the manufacturer. In effect it's a form of 'planning permission'.

I also understand that they do not like anything unusual 'something out of spec' (specifications). For example, motor dealers are not keen on handling vehicles that have been 'customised' in any way at all. This includes the huge hi-fi systems and the strange blue lights (often mounted under the vehicles) and much favoured by drivers under the age of 30 years (or who like to think they are!).

Those car owners who have carried out modifications to their vehicles to allow the towing of caravans (it's a popular pastime here in Holland) could find themselves having problems. For example, extra 12V accumulators (difficult to dispose of without contamination) fitted to provide extra power for lighting and refrigeration - could work against the vehicle owner.

Toughened suspension units (with extra hydraulic oils and difficult to dissasemble) will similarly also work against the owner of any vehicles.

Unfortunately, for the ham radio enthusiast the fitting of extra antennas - and the complicated wiring and installations required - seems abhorrent to the motor trade. Their level of understanding does not seem to extend past hanging ornaments, SatNav units and air fresheners!

Antenna & Cables

Even though I do not live in England - I have no doubt that whenever a ham radio mobile-equipped car owner has driven on to a sales forecourt (perhaps to look at a new model) the salesman has approached the vehicle with a look of horror on his face. The look on the salesman's face will tell the unfortunate driver that a good deal will not result from the visit.

The forecourt focus will normally be to look out for fitted satellite navigation units, extra special gearboxes, enhanced engines and factory fitted extras. Any extra wiring - Amateur Radio antennas and so on immediately brings a sad look on their faces with the result that part-exchange prices will drop dramatically.

So, what can we do? Is it worthwhile taking precautions or even considering a form of 'planning permission' to avoid - as far as possible - the draconian results of new Vehicles LOOFLIPRA57REAY?

Negotiating With Dealers

Many ham radio operators own older cars and have so much equipment fitted that they often keep their vehicles for a longer period than other drivers. As this situation is likely to happen, it may be worth approaching the manufacturers of your car to negotiate the modifications they will accept to make it suitable for resale and eventual disposal (They may even issue a special exemption licence for this purpose). However, my advice is that Hams with older vehicles do not approach the dealer before 1 April 2007 because the dealers will not have the appropriate paperwork.

However, on 1 April (when the EU Directive comes into force) all motor dealers should have all the necessary documents. Please ask for the special form - (Vehicles LOOFLIPRA57REAY) the special short-hand style aimed at removing the cumbersome reference system ands to aid understanding. It helps everyone to understand the bureaucracy!

If you are a regular customer – I favour Peugeot cars myself – you may be able to negotiate a 'special deal' with your regular vehicle supplier. For example, if you have been buying cars from a dealer for a number of years they will be certain to want to keep your custom. Here in Holland, dealers have been known to run Christmas parties and 'come and see out new range of cars' weekends for their customers - often accompanied by a beer and barbecue!

Because you are likely to know your vehicle supplier very well – there will be a chance that you will be able to arrange a special facility to modify your car and stay within their disposal criteria. My own dealer – situated in a quieter suburb of Amsterdam - is aware that I always have heavy-duty batteries fitted to all my new cars. Because I am a regular customer there will be no problem in passing on my car when I part exchange it for a new model.

If, perhaps, you require a 12V d.c. power extension lead fitted in your own vehicle, you may be able to arrange for this to be considered so it will not affect the resale or disposal of the car. And, from the advice I have passed on to you - you will realise that good relations between the car dealer and yourself are essential! Consider placing them on your Christmas card list and perhaps share a beer with them occasionally - it is bound to help!

Planning Permission Forms

Individual vehicle manufacturers may well produce their own forms so that you can apply to them for exemption to the 'no modifications or no disposal rule', which the EU Directive is - in effect- introducing. Obviously, the various manufacturers will have different criteria. Some may allow you to have a 2m vertical antenna on the car (provided there are no holes to reduce the scrap value of the steel) whereas other may object to the same modifications.

In practice,- and after much research - I feel that the best way to approach the problem of ham radio equipment in our vehicles is to approach the dealer - on or after 1 April - asking for guidance to apply for the necessary 'planning permission'. I've prepared my notes ready for the day, although I am sure that the dealer will have all the necessary rules, limitations and instructions ready to help me.

It could be a worthwhile exercise to approach your dealer before April 1 - to ensure they are fully aware of the new directive. An early approach could help you find out exactly what's required - the Dealer is sure to put you 'on the right road' when you quote Vehicles LOOFLIPRA57REAY. It may even be a pleasant process as the dealer concerned may understand all the implications of the full directive EU regulation 2233445576-097834-01042007LOOFLIRPA57REAY (Vehicles) and you may even get a smile as they comprehend the problem involved with our hobby and they may be very keen to help you out of the predicament it could cause.

It may seem as the EU is being 'over authoratative' but we must understand that we must help reduce the pile of scrap metal from life-expired cars. Perhaps you may end up keeping your car for many years and also save a lot of money? ●

Magnetic Man

Editorial note: We pride ourselves in the office that we are a 'fun' hobby magazine, full of interest but lacking in pretentions of academia. However, for the purposes of Colin's article I think it's essiential for readers to know from just what an 'angle' he writes from. I'm sure that readers will learn much but (hopefully) not regard themselves as a major source of EMC after reading my good friend's article although most of will reconsider the uses of mobile 'phones against the ear! **Rob G3XFD.**

This article is a précis of a talk I presented to the **Medway Amateur Receiving and Transmitting Society MARTS** (founded in 1922) on 20 September 2002. It was supplemented by seven A1, 2 x 3ft posters I 'prepared earlier' so to speak!

The Magnetic Man article is an unusual outcome of our knowledge as 'radioists', helped by our knowledge of electricity and magnetism. It's also assisted by information derived in the last 20 years from our ability to measure minute quantities or traces. These quantities of weight, velocity, electricity, magnetism and so on are truly minute - not even 'micro', nor 'nano' but 'pico' (1/1000,000,000,000 = 10^{-12}), and even less.

Minute Measuring Capabilities

Such minute measuring capabilities means that it's no longer possible to put poison in Granny's porridge and get away with it! There's also the certainty that some man-made electromagnetism (mains, microwaves, motors) poses a serious pollutant threat in our lives.

Yet, on the contrary, we safely spend our lives - in Earth's natural magnetism - at about one thousandth the strength of a toy horseshoe magnet! Although we can't feel, taste, see or hear it, we are constantly swimming in the magnetism.

We are conceived, born, live our lives and end up in our coffins bathed in magnetism! However, trouble arises for us if the situation is interfered with and when this natural field is (**a**) varied, (**b**) disturbed, or (**c**) removed! Some experimental data follow with references given at the end of the article.

In the animal kingdom, Magnetite ($Fe_3O_{4)}$ is found in the brain cells of bees and hornets and helps in their homing and the building of their hexagonal cells in their combs. A Helmholst coil round the hive completely disorganises them!

Pigeons have magnetite in the left side of their skulls, helping homing. Snail's antennae are magnetic positioning devices. Bacteria follow magnetic fields, as do potatoes, cress and butterflies! In humans? Yes, we are magnetic!

Magnetic Aura

In 1927, Moscow, the Kirlians, using 20kV at a frequency 2MHz were able to demonstrate a magnetic outline (aura) of the body. They also showed that the original aura of a maple leaf persisted - even if one of its lobes was cut off.

In 1967, Dr R Becker, New York (a retired orthopaedic surgeon) mapped out the electromagnetic fields of the body and found that they corresponded precisely with the acupuncture points widely used in ancient Chinese medecine .

In 1957, the same doctor published a study of 28,000 mental patients, from eight hospitals over four years and 67 magnetic storms (including aurorae and eclipses) and showed the schizophrenic (widely known by the over simplified, perhaps misleading term of 'split-personality') patients deteriorated at such times. He also confirmed a lunar cycle in their behaviour due to the effect, which the moon has on the Earth's magnetic field.

In 1990, Rutger Weaver of the Max Planck Institute, isolated a woman volunteer in a Mu-metal screened room (without clock or calendar) in constant air pressure and temperature with a supply of food. After two months, she was completely disoriented and the menstrual cycle had stopped.

In 1990 Prof. Robin Baker at Manchester University discovered we have a magnetic compass in our heads, giving an intuitive directional sense. He also discovered this could be temporarily removed by 10 minutes of a magnet held to the head (from the magnets in headphones) but it was restored after its removal (see below, Vitamin B12).

Extra Low Frequency

Extra low frequency (ELF) ranging from d.c. to 20Hz, is known to affect animals and humans. This can be 'pure ELF or ELF

Keen *PW* supporter and friend, the late Dr Colin Sumner (MRCS, LRCP, MRCGP, DRCOG) G0POS was both a modest man, an active Radio Amateur and dedicated physician. In this article - originally a talk for his local club - Colin sets out to show the link between the human body and magnetism.

modulating any other frequency, for example: In 1961 Dr W Ross Adey, of Linda, California, found that ELF implants in monkey's brains delayed their reaction times, by 1977 he found that 147MHz applied to cats had no effect till modulated by ELF.

In 1979, Carl Blackman found that 50MHz - modulated by 15Hz - altered the microscopic structure of chick's brain tissue.

By 1980 several scientists had established that ELF causes harm: (Wertheimer, Millan, Becker, Adey and others). Of interest, at the same time, Svante Arrhenius in Sweden, found that Earth's field needed to be excluded from any experiments by screening.

Colin Sumner G0POS – An appreciation by the Editor: Sadly, Colin Sumner G0POS died in 2005, just after submitting the article for publication a month after his 80th birthday. I'm proud to say that Colin was a friend and a staunch supporter of *PW*. Although long retired from his General Practitioner and specialist medical work, he had a lively mind accompanied by wonderful sense of humour. I always enjoyed meeting him at the Pickett's Lock show and reading his letters, which always carried a miniature illustration of an RAF Lancaster aircraft – a poignant reminder of his earlier career. Thank you Colin – you were a great friend and a wonderful Radio Amateur. Rest in peace.
Rob G3XFD

Human's Natural Magnet

In humans, the natural magnet is sited in what used to be thought of as a vestige of a 'third eye' (beloved of characters in space thrillers and in myths such as Cyclops). This Pineal body (Pineal - like a pine cone) is protected and situated deep in the brain about 60mm behind the bridge of the nose. It's only about 15mm in size, yet it controls all our bodily and some mental functions (see the list below).

The Pineal's magnetic function is due to **Vitamin B12** (cyanacobalamini), which is realised to be magnetic due to the cobalt in its structure. The concentration of B12 in this gland is the highest in the body, the other high concentration site being the liver. All the Pineal's functions can be disordered by man-made electromagnetism (see above: R Becker & Schizophrenic patients).

Brain's Electrical Frequencies

Since the discovery, by Hans Berger in 1929, that the brain develops four basic electrical frequencies it has been known that they are at ELF! Recent scientific results from *Explorer* spacecraft have established that the ionosphere, in addition to its other known variations (solar, lunar and 11 year cycles) also resonates at ELF!

Modern (2002) researches by Dr Gordon McDonald at Dartmouth, demonstrate that the ELF of the ionosphere can reduce human performance. Also, 17 August 2002 the European Space Agency released studies of massive earthquakes ('starquakes') at the centre of the sun. These are inaudible to us due to the vacuum of intervening space but – guess what? - they're rumbling away at an ELF frequency!

Is it a coincidence the sun, the ionosphere and the brain all pulsate at the same inaudible Extra Low Frequencies? What does it all mean? Perhaps one day we'll know more!

REFERENCES:

'Third Eye' (Pituitary or pineal gland) functions:
Hormone systems Growth generally and particularly our skeletons, Sex maturity, including the onset of menstrual cycle, Length of a pregnancy and the Date of onset of Birth and Lactation, urine, eye focus.

Automatic systems: Nerve control of breathing, heart rate and blood pressure, digestive system, kidneys, eye focus.
'Sunquakes', Sun Mag, August 2002. Neil Clark G0CAS.

Butterflies: Prof. O Taylor 1999, migrate thousands of miles.
Hornets; Prof. J Ishay 2001, Tel Aviv University.

Stop-press: Article by Laurence L Hawes, KA4QZQ on the Russian 'Woodpecker', RADIAL Mag. Winter 20002 – 'Mind control' by its ELF broadcasts controlling sleeplessness, neurosis, blood-pressure, etc. Original article was by Prof. I R A Einhorn and Dr R Adey, California 1984.

Velleman K8048 PIC Microcontroller Programmer Kit

Most radio and electronics enthusiasts have come across PIC Microcontrollers, made by Microchip Technology Inc. of Arizona, USA. Although PICs have been around for quite a while, it's only since Microchip began to use Flash memory technology in some devices that they've become so remarkably popular with Amateur Radio and construction enthusiasts.

In case anyone isn't quite sure what a microcontroller is, it is simply a (usually quite small) microprocessor, which has on the same piece of silicon: a clock generator, program memory, data memory and various peripheral devices. These peripherals can include: comparators, timers, counters, serial communication interfaces, l.c.d. drivers, analogue to digital converters and even USB and Ethernet ports.

Flash Memory

Flash memory is an electrically erasable and programmable, non-volatile memory (that means it remembers even when the power is switched off). Storing the microcontroller's program in Flash memory means that the same PIC can be programmed and **reprogrammed** several hundred times or more. In addition, these Flash PICs often have a simple, two wire serial programming interface, making them very easy and cheap to physically program.

The devices themselves are relatively inexpensive and Microchip provides - at no cost - a comprehensive and powerful development environment, which runs on the Windows operating system. So, it's possible to write programs for PIC Microcontrollers and to physically program them, all for a very modest outlay. Assuming you have a PC lying around, of course!

Where To Begin?

All very good so far perhaps but knowing where to begin with PICs can be a little daunting even for experienced programmers! Because of this many companies - including Microchip themselves - sell development kits to help people familiarise themselves with PIC hardware and with writing PIC programs.

One such example is the K8048 Microcontroller Programmer Kit, produced by Velleman. I purchased mine at a local Maplin store and it's one of the least expensive kits available at the moment, currently priced at under £22.

The Vellman PIC programmer kit before Phil G4JCP got to work on it along side a completed board!

The kit is supplied in a clear plastic case and includes a high quality double-sided p.c.b., all essential components and an 80mm CD. There's also a manual, which gives clear assembly instructions, a circuit diagram, and a component overlay.

In common with all Velleman kits, the p.c.b. has all component outlines marked and if the assembly instructions are closely followed and anyone with a little soldering experience will find no difficulty in making up the board.

To actually use the kit, two additional items are required: a power supply and a serial lead. Oh, you'll also need a PC with a serial port, of course!

The serial lead is just a standard 9-way 'D' type serial lead (male-to-female) with all cores connected. As for the power supply, the manual calls for an unregulated 12 or 15V, 300mA supply. However, this is somewhat misleading and inadvertently using an unsuitable supply can cause problems.

What's really required is a power supply whose output voltage is at least 16V, as the circuit shows a 12V, three terminal regulator with two diodes in its common lead (so it gives approximately 13.5V output). There's also a protection diode in series with the supply input. The minimum acceptable

Phil Cadman G4JCP will soon be undertaking a Programmable Integrated Circuit project (see note above regarding trademark/copyright protection). The project will be the PIC version of the PW International Beacon Project electronic 'clock'. As part of his preparatory work Phil came across the Velleman kit reviewed in this article, considering it to be a useful item for anyone attempting a PIC project, such as the IBP 'Clock' themselves.

input voltage is, therefore, 12V plus three diode drops, plus the dropout voltage of the regulator. I'd recommend 16V minimum.

The Circuit

The circuit is effectively in two parts. First, there's the programming circuitry, which converts the voltages on the computer's serial interface to the 5 and 13.5V signals required to physically program the PIC. Then, there's a separate experimenters' area consisting of six l.e.d.s and four switches. There are also four i.c. sockets to accommodate 8, 14, 18 and 28-pin PICs (but only one socket can be used at a time).

The supplied 4MHz crystal can be connected (via jumpers) to either the 14, 18 or 28-pin sockets. **Note:** 8-pin PICs (yes, there are such things) generally use their own internal 4MHz clock and so don't need a crystal. The kit includes an 18-pin PIC16F627 device, which can be used for running the supplied demonstration programs, or for your own programs.

The kit can also program some 40-pin PICs but you will need to mount a 40-pin i.c. socket on a piece of strip board and make five connections. With a little consideration at the design stage, it's also possible to program PICs without removing them from the target system. This facility - known as 'in circuit' programming - can be immensely useful.

On The CD

On the CD you'll find data sheets on several common PIC devices (including the 16F627), a help file to guide you through the business of actually transferring a program from a computer to the PIC, an assembler and a program to transfer the assembler's output into the PIC's program memory.

The assembler program is *MPASMWIN.EXE*. This is Microchip's own assembler, which runs on Windows 95/98(SE)/ME/NT/2000/XP. What's an assembler? Well, an assembler simply takes a list of PIC instructions (written in a kind of English) and converts them into the binary digital patterns that a PIC chip understands.

The assembler output is usually not pure binary but binary in hexadecimal form. This is easier to handle than pure binary and the format - Intel Hex for those who understand such things - has the advantage of being readable by humans. (Just about!)

The program that transfers the Hex file into the PIC in binary format is called *PROGPIC2.EXE*. Curiously, this is a shareware program, which is available off the Internet and not written by Velleman.

A trawl around the Internet will also reveal the wailings of people who have had great trouble in programming PICs with this kit. Yet I've built two of them and programmed many PICs without difficulty! I think any problems that may occur are often related to the power supply (which I've already mentioned) or to the attached computer.

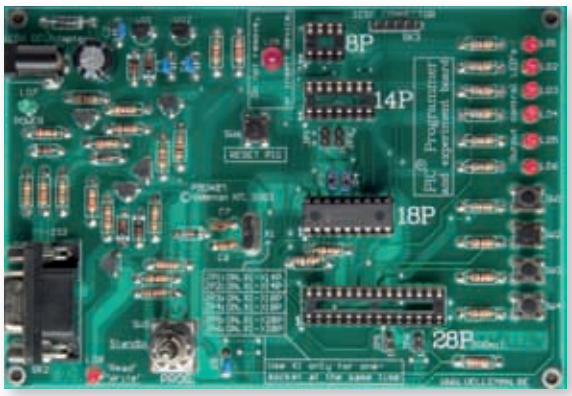

Fig. 1: The completed kit, which G4JCP says is, "Very easy to use."

Proper RS232 Required

Most important, is the requirement that the computer must have a real hardware serial port with proper RS232 voltage levels. A USB-to-serial converter will not work and the documentation clearly warns of this. Non-standard serial ports may also cause problems, as *PROGPIC2* directly accesses the serial port's modem control lines and uses them to generate the programming waveforms for the PIC.

Fast PCs can also be problematic! The *PROGPIC2* was originally written for much slower machines than are commonly available today, and when run on a fast machine, there can be timing issues. Allied to this is the version of Windows in use. I've only ever run the program on Windows 95 and 98/98SE because later versions of Windows can get very upset when applications attempt to directly access the serial port and other motherboard hardware.

Using an old Pentium class machine is ideal and makes good use of what might otherwise be a redundant PC. That said, Microchip's *MPASMWIN* does run perfectly well on later versions of Windows.

It's only *PROGPIC2*, which requires consideration. In fact, most d.i.y. programmers using either the PC's serial or parallel port, have much the same requirements. If you only have a fast Windows XP machine (or don't wish to use anything else), then the K8048 may not be suitable and you'd be advised to try a programmer that communicates with the PC through a USB connection.

Very Easy To Use

So, just how easy is it to use the completed K8048 (**Fig. 1**) kit? The answer is simple - very easy! Both *MPASMWIN* and *PROGPIC2* need only a few mouse clicks to 'do their stuff'. And it's possible to go from assembler file to programmed PIC in little more than a minute. If that's all you ever want to do, and *PROGPIC2* supports your chosen PIC, then the K8048 kit is all you'll ever need. However, if you want to write your own PIC programs - that's a different matter!

Let me make it very plain - no development kit will turn you into a 'hotshot' PIC hacker. If you've never written a program for a microprocessor or microcontroller before, then be prepared for a big shock and lots of work.

In addition to a kit like the K8048, you'll need a book - maybe several books - about the PIC and how to program them. And be prepared for disappointments; no program ever works first time in my experience*!

Whilst PIC hardware design is often straightforward, even trivial, people without software experience can find writing assembler code very difficult. It's a statement that may even apply to experienced programmers who have only ever used high-level languages like C and Visual BASIC; the PIC assembler language is a culture shock!

For example, the 16F627 included in the kit has room for only 1024 instructions (that's less than **2 kilobytes** of program memory) and has a mere **224 bytes** of data memory. But for most applications, that's more than sufficient. (Let's say that PICs encourage brevity!).

Some people never take to writing in assembler, or even programming in general. If you turn out to be one of those people, then at least buying an inexpensive kit like the K8048 isn't much of a gamble. On the other hand, it just may be the start of a new interest that can complement and enhance an existing interest in radio and communications.

***Editorial note:** Phil G4JCP – never one to blow his own trumpet - has a PhD in Data Communications involving much research work with microprocessors and digital electronics.*

Editor

Filters Behaving Badly

Most of us first meet filters in a book or as part of the Radio Amateur Examination (RAE) course, either as a component in isolation or in a simplified system. It's easy to see if a filter is high, low or band-pass. So, all you need is a few simple formulae or tables – easy (perhaps)!

The introduction above is deceptive if you're not told **how a filter works** in a real system. If it's just treated as a 'magic box' then, when there's a problem with a filter not working properly, you don't know where to start to solve the problem!

The vital point is that any network combination of inductor and capacitor (LC), works by modifying the match between source and load. Simple theory assumes that the match is perfect so that the network must introduce mismatch – or loss – at some frequencies, reflecting power back to the source. In fact, a match is not essential – a network can give a 'gain' at some frequencies by improving the match, as well as loss at others, so predictable results depend on knowing the state of mismatch beforehand.

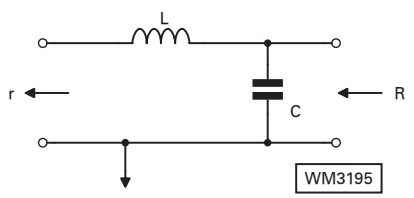

Fig. 1: A simple low-pass LC network.

An Example

As an example, consider a case where a 10Ω resistive load is to be matched to a transmitter needing an optimum load is 50Ω. The simplest device to do this is a low-pass L-network (**Fig. 1**). Let's reduce the arithmetic by dealing with reactances expressed in ohms. If L has a reactance of 20Ω at the working frequency then the series combination of L and R is equivalent to a parallel combination of 50Ω resistive and 25Ω inductive. Capacitor C adds 25Ω capacitive in parallel to tune out the inductance so the net impedance seen at the input is 50Ω resistive. (Full formulae are shown in the appendix)

The circuit, **Fig. 1**, is clearly a matching device, since the load has been transformed from 10 to 50Ω but harmonics will also be attenuated so it's a filter too! Because the loaded *Q* is set to two for matching, and there are only two components, attenuation of the second harmonic is poor. But at the tenth harmonic the load is transformed to 4010Ω resistive with about 2.5Ω capacitive in parallel, diverting most of that harmonic away from the load.

More Control

With more Ls and Cs in the network the designer has more control over the loss with frequency, but the action is still one of modifying the (mis)match. I have used this L-network to match coaxial cable to the base of a 6m high vertical antenna on 1.8 and 3.5MHz so the transmitter can feed the cable directly. However, extra inductance is needed at the antenna to tune out its capacitance, so the whole system is not as wideband as the network alone.

Since an antenna is reactive, except at its resonant frequencies, there may be problems when a filter, designed for a wideband matched load, is used on an antenna that is matched (more or less) at the operating frequency but has an unknown load impedance elsewhere - including the frequencies supposed to be attenuated.

The important point is that a filter (plus any feeder cable runs) can transform a worst possible load to a match at its input. When it's all matched, attenuation disappears as the filter is matching the load. In the filter's stop-band, this worst possible impedance is liable be far away from a nominal match but this is the sort of impedance that may appear with antennas operating off-frequency. Like a 16th century map, this region of a Smith impedance chart should be labelled 'Beware, here be dragons'. Beware indeed, these dragons can bite when you don't expect it!

The filtering out of harmonic and spurious signals from a transmitter's output is one case where a reduction in filter attenuation can cause problems. In at least one case of TVI that I'm aware of, when measurements were made the harmonic radiation was less without the filter. The effect probably happens more often but isn't measured.

Interference filters on a power supplies also have an unknown terminating impedance on the supply side, so the same thing can happen. However in this case it's possible to make a filter with load independent dissipative loss (say by winding coils on lossy ferrite) without any loss at d.c. or 50Hz so, reducing dependence on mismatch loss.

Specific Illustrations

Looking at a specific illustration, a transmitter feeds a simple dipole with 50Ω coaxial cable via a 3-pole Butterworth low-pass filter. At the second harmonic, the filter has an attenuation of about 10dB when correctly terminated. The antenna itself will have a radiation resistance of 500 to 1000Ω, giving a 10 to 20:1 standing wave ratio (s.w.r.) on 50Ω i.e. (A reflection loss of 4.7 to 7.3dB).

You might, therefore, expect a total attenuation about 15 to 17dB. However, computer analysis (see below) shows that this is only true on average; the actual loss depends on the exact phase of the load impedance seen by the filter, i.e. The length of coaxial cable between antenna's feed-point and the filter (**Fig. 2**). Lengths are indicated in degrees at the harmonic frequency rather than wavelengths ($\lambda/2 = 180°$) because it is more convenient to talk of 10° rather than 0.0278λ.

At around 108° there is almost zero loss (the spike) because the filter matches the antenna. Nearby (in phase terms) the attenuation is reduced, although further away it is increased. At microwaves this problem can be avoided with a ferrite isolator, so the filter sees a perfect match but at lower frequencies there

Barry Priestley G3JGO sets out to explain how filters work in a real system

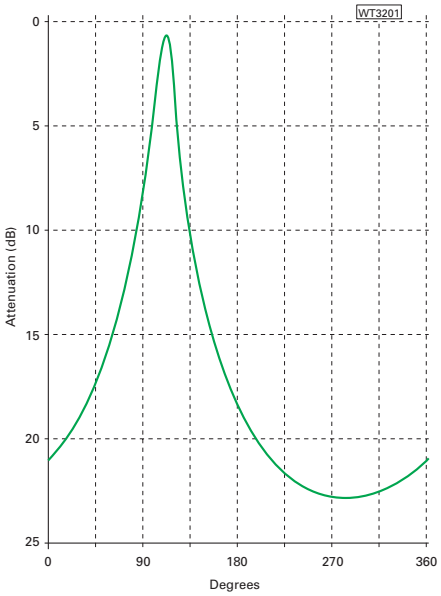

Fig. 2: Computer analysis of the relationship between the load phase angle and the filter's attenuation.

is no such way to eliminate the problem. However, there are several ways to avoid it.

First, it's a good idea to have a notch filter set at, rather than just near the frequency that causes the spike and its reduction of unwanted signals. This will improve the filter's ability to reduce spurious emissions and incoming signals.

Second, a change of feeder length can phase shift the transformed antenna load at the filter away from the problem value. If the antenna and filter parameters are known, or can be measured, then a computer aided design (CAD) program can be used to calculate the worst filter load and the length of feeder to transform the actual antenna impedance to it, at relevant frequencies. Without CAD, it's a case of 'guesstimate in, guesstimate out' but cut-and-try should show the length to avoid.

Thirdly, the type of antenna feed can modify the harmonic s.w.r. So, that a quarter-wave balun will change the second harmonic feed impedance of a dipole from high to very low. Incidentally, this should also slightly improve the bandwidth at the fundamental!

Frequency Diplexer

Another technique that has been advocated, is a frequency diplexer following the filter, with a resistive load on the high-pass arm and the antenna on the low-pass arm. This places a matched load across the filter output in its stop-band, restricting the range of possible filter load impedances. As the antenna still places it's impedance in parallel, the problem is reduced but not eliminated. Also, this technique will only work properly outside the diplexer crossover frequency range for example. (But not for spurii closer to the operating frequency than about the second harmonic).

The important thing is to realise that this is real life, where problems avoided in the RAE do happen and there isn't a one-size-fits-all answer at the back of the book - but that doesn't mean there is no solution! ●

Appendix The L-network

In its simplest form this acts as a transformer to convert a low value resistance r to a larger value resistance R (or vice versa) at a frequency f. Both low and high-pass versions are possible.

The network loaded Q is given by $Q = \mathrm{Sqrt}(R/(r-1))$

The series reactance $Xs = Q*r$ so for the low-pass version $Ls = Qr/(2\pi f)$ or for high pass $Cs = 1/(2\pi f Q r)$

The parallel reactance $Xp = R/Q$ so $Cp = Q/(2\pi R)$ or $Lp = R/(2*\pi f Q)$

Wider bandwidth matching networks, with more LC sections are possible, say for matching wideband transistor transmitters to 50Ω.

Project

The Backpacking Packing Case!

I first gained my licence as **G6TTL** in 1983 and lived in Kent for many years. In 2000 I retired from my broadcasting work, moving to Lincolnshire where I can be occasionally heard from JO03, mainly on 50 and 144MHz.

In the early years of the RSGB 'Backpackers' contests I was operational from several sites in Kent as well as Devon and Wales. From 1998 to 2004 I served as the **Radio Society of Great Britain** (RSGB) VHF Awards Manager.

The Back Pack project was conceived as an accessory to aid my participation in the 'Backpacking' series of RSGB contests. (Yes I know I haven't made an entry for several years but I do try to 'give points away', both in that and the *PW* QRP Contest whenever possible!).

Grovelling Around

I developed the Back Pack because - usually on the Saturday before the contest I was hoping to enter - I could often be found grovelling around the shack or garage! I was trying to find 'this link' or 'that cable' and asking, 'where was the FT-290?' Does that seem a familiar story?

I was really fed up having to sort out or find all the items needed for each and every contest, admittedly there weren't as many as were required for the larger events but there were enough! The solution had to be one that was as far as possible self-contained so that at arrival 'on-site' all that's required is to open the case, connect the antenna and battery to become operational.

As well as 'backpacking' I intended that my system could be used for other portable activities such as '**Summits on the Air**' (SOTA) and '**RayNet**'. It had to be versatile.

Although my pack is designed for a Yaesu FT-290 I see no reason why the idea could not be used for a number of other suitable transceivers, although in this instance advantage is taken of the FT-290's carrying strap fixing points. And, to be frank, this article is not so much a blow-by-blow account of how to construct the pack but more of an idea, which can be adapted to your own needs.

Fig. 1: Ready to go on the air! Tony Jarvis G6TTL describes his portable packing unit to help keep everything together for 'outdoor' contests.

Instrument Case

My pack is housed in an instrument case (460 x 350 x 150mm), **Fig. 1**, which originated from the 'Argos' catalogue store but they are also available from photographers and sometimes at radio rallies. When purchased new they usually contain a re-usable expanded foam liner. This not only gives provides a means of keeping the kit in one place but also provideds a considerable degree of protection to valuable equipment.

If you are intending to use different equipment then the case size may well need to be changed. Most of the other materials came from the junk box, or was scrounged from neighbours, although the aluminium angle came from the B&Q stores. (I've provided a 'components list' at the end of the article).

Little or no metal working skills are required for the project. If you can use a hacksaw, drill and file this job is not beyond you. After all if I can knock it together - so can you! It all revolves around a 'sub-chassis', which I will call a 'tray', that carries all the major components and simply hinges forward to the operating position.

My idea was also to allow sufficient space to fit a speech compressor and a "CQ caller". (They're in the blue boxes in the photographs and are 'stand-alones'). In my view, these accessories are important when the rig doesn't have those functions. But do make sure that they still work adequately when the battery voltage starts to drop! During the 2003/4 series of contests, on a number of occasions, I heard stations radiating severely distorted CQ calls from digital storage devices due to battery problems.

Decision Time

To start, you have to first decide on the layout within the case and I arranged the 'CQ' caller and speech compressor items as shown in **Fig. 2** (the dimensions for the tray are shown). If you don't want to add these, the space could be used to house a small linear amplifier but do remember to switch it off for the 3W category contest!

When closed, the case also provides space for microphone, power lead and antenna link. The lid can hold all the necessary paperwork, logbook, clipboards, scrap paper, etc.

When placed in the open position on a chair or small picnic table (you shouldn't forget the creature comforts that make portable operation so enjoyable), the transceiver is presented at a convenient angle for operation.

The framework of the 'tray' is made from 25 x 25mm aluminium angle and 1 - 2mm (or 16swg) sheet material, either bolted or screwed together with self-tapping screws as appropriate. **Note:** I used countersunk heads on the inside of the housing.

Tony Jarvis G6TTL describes how he enjoys 'oudoor' Amateur Radio. Now retired, Tony is determined to enjoy the hobby to the utmost when 'out and about' and encourages readers to try this aspect of the hobby for themselves!

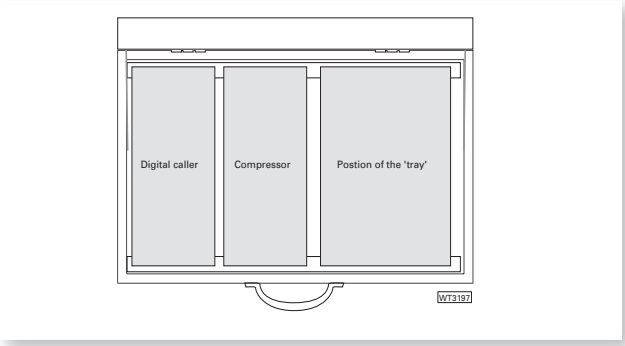

Fig. 2: The suggested layout for the pack, as used by G6TTL.

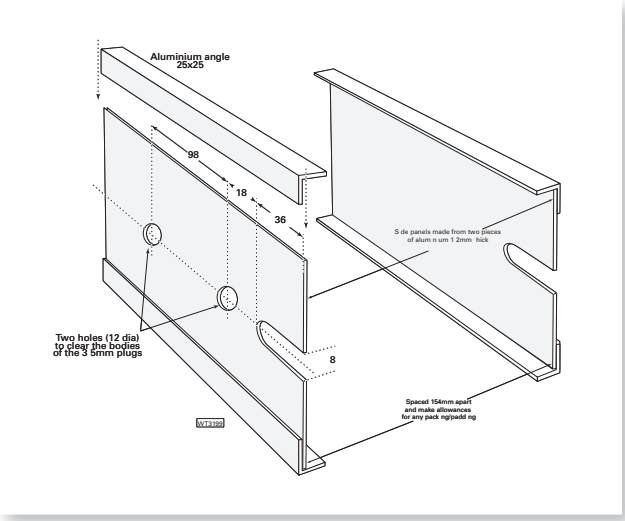

Fig. 2a: Dimensions for making the special tray for the Yaesu FT-990 (all dimensions in millimetres).

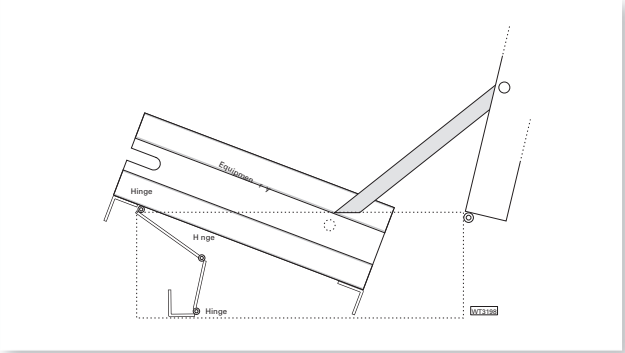

Fig. 3: Side view of the equipment tray.

Cut the items to the dimensions, shown in Fig. 2 for an FT-290 (which will also function for the FT-690 and '790), or adjust to suit. If you wish to use pieces of baize cloth or fabric to protect the equipment case then make allowances in your marking out. Although I didn't try them, I suspect that mobile mounts (where available) would also be suitable and that would reduce the amount of metalworking needed.

The diagram, **Fig. 3**, shows the arrangement for mounting the tray within the case. Again, I suggest that you adjust the sizes to suit your equipment. I used 4BA nuts and bolts to fit the sub-assemblies together. The hinges I used were two pair of small (25mm) cabinet hinges separated by 70mm 'flaps' of aluminium. Again these were scrap off-cuts. The photograph, **Fig. 4**, shows the case with the two ancillary units fitted (drawn forward ready for operation), and the rack ready to accept my FT-290. The photograph, **Fig. 5**, shows all the equipment recessed into the case ready for transport.

Components List

Instrument case - Argos, photographic shops, radio rallies?
25 x 25mm aluminium angle - B&Q or similar d.i.y. stores
scrap sheet aluminium - approx 1mm. I used some scrap 14 and 16swg) this came from my junk box, but try as for the angle. Two pairs of hinges approximately 25mm - again local d.i.y. store or junk box. Self-tapping screws/nuts bolts (4, 6 and 8BA as appropriate) scrap lengths of feeder, station standard plugs and sockets, if you use PL259s please make sure that you use silver-plated versions! Length of suitable power cable, scrap piece of baize cloth (the material used on card table tops) or thin foam rubber - really anything that can provide protection for the rig's case.

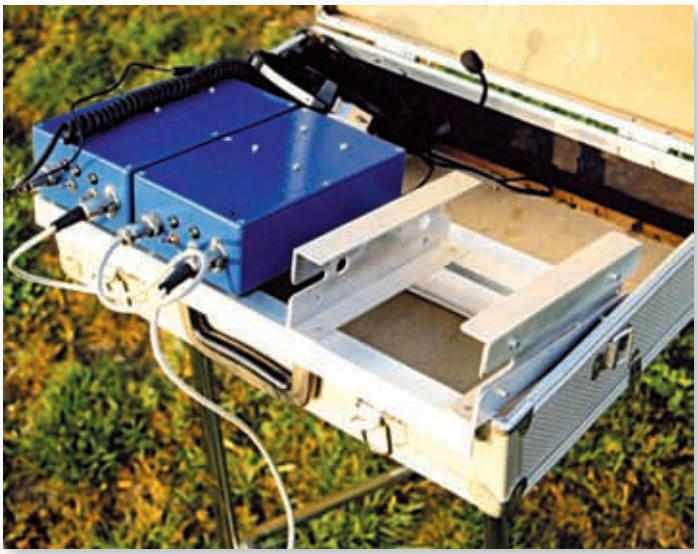

Fig. 4: Showing the equipment "CQ" caller and speech processor) drawn forward ready to operate. The tray for the FT-990 is shown ready to receive the rig.

Fig. 5: All secure and ready to transport!

A Simple Project!

So, there you have it, a simple project to keep everything tidy and in its place and ready to encourage you to get out /P in the coming months. Also (hopefully) it will encourage domestic harmony as it can be sneaked into the car for those Sunday picnics without the usual, "You're not taking all that lot are you?" (After all it's just a camera case! Isn't it?).

However, you'll have to explain the mast and antenna but that's not my problem! ●

In the Shop with Harry Leeming G3LLL

Harry G3LLL looks at problems with an FT-1000 and intermittent connections and, as always, offers advice on solving these often elusive nuisances.

A good customer, 'Tony' sent me an E-mail regarding his FT-1000, asking if he could bring it round. I sold very few of these when I had the shop and so I'm not that familiar with them. They are rather complex and extremely heavy so I was not that keen but I had nothing much on! So after first checking that I had a service manual, I said I would have a go but held out no promises.

The first thing I did was to give the rig a full test and note the effects of all the controls. The transceiver would transmit but was dead on receive and all that could be heard in the speaker was a very slight background noise. This changed in level as the squelch control was rotated but there was no other sound. I went round trying the various controls and to my surprise a loud hiss came from the speaker and the receiver seemed to come to life - if the speech processor was switched on. There was still no sign of any stations, however, which seemed rather odd.

My first approach to any odd faults in microprocessor controlled equipment is to do a complete reset, so I switched off the back-up battery and switched the rig on and off a few times with the power lead disconnected. (Doing this will often cure the most strange and illogical faults but this time it didn't!).

The fact that the speech processor had an effect when in the receive mode pointed to a fault in the transmit/receive switching and so my next move was to check the voltages on the 9V transmit and receive switching lines. The receive line checked out correctly, being slightly negative when the rig was in the transmit mode, and +9V when switched to receive. But the transmit rail was still live to the extent of +3V when the rig was set at receive. The FT-1000, like most modern rigs, is full of switching diodes so, I wondered if one was leaking?

Next Step

The next step was to try pulling out the plugs that connected the switching rails to the various circuit boards and when the one on the r.f. board was removed, the 3V disappeared from the transmit switching line. A screwdriver 'tickled' on the input terminal of the i.f. stage showed that from this point on the receiver was now live. Further investigation lead me to D1006 on the r.f. board, which was short circuit and which I duly replaced with, believe it or not, a 1N4007 1A 1000V rectifier.

Switching diodes are the modern replacement for the multi-wafer wave change switches that were used in older equipment but they can cause problems and simply replacing them is not always a final solution. I have had quite a few rigs returned within a few months of repair with the complaint, 'same fault as before', after I have fitted the 'correct' diodes during repair. In these cases they are obviously being subject to excessive voltages but the exact cause, whether caused by static charges, nearby lightening or an adjacent transmitter, can be anyone's guess.

Many of the switching diodes used are only rated at around 100V. Some years ago, I read in the Technical Topics column of *RadCom* a comment about the 1N4007 1000V/1A silicon rectifier diode. The author **Pat Hawker G3VA** had tested these on the h.f. bands and had found them to be indistinguishable in performance to normal switching diodes but very much more robust. In the last few years, I have used the 1N4007 diodes many times as replacements for switching diodes at the front-end of h.f. transceivers and have never had one fail. So, I felt confident when I let Tony have his rig back.

I had tested the unit out and waved it 'goodbye' sure that all was well. The next day, however, I got a 'phone call from its owner. The auto a.t.u. (a.a.t.u.) would not work and the built in s.w.r. meter gave a permanent high reading. What on earth was going on? Tune-in to this column in two months time to find out!

The FT Club

If you want help with or to find manuals on older Yaesu equipment, try the FT club at **www.foxtango.org** It is quite a site and Carol should be congratulated for all the work she has put into it. Why not join? It's free.

Intermittent Connections

Whatever kind of electronic repairs you work with, the bane of life is an intermittent fault. Typically, the equipment will stop working correctly, only to have all functions restored when the slightest attempt is made to trace the fault.

Often, intermittent faults will be found to clear if a certain area of a circuit board is gently poked with an insulated tool. But even in these cases, the fault may well be at the opposite end of the board and great patience is needed if you are to track down the cause of the problem.

With an intermittent fault it's well worth

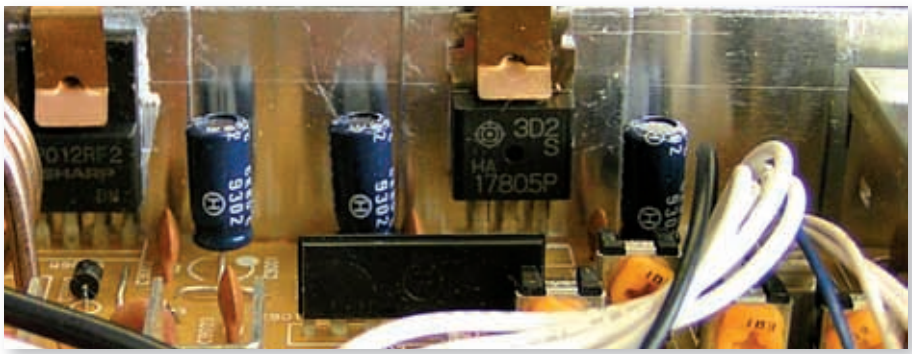

Fig. 1: The fault in this FT-990 was traced to the regulator board.

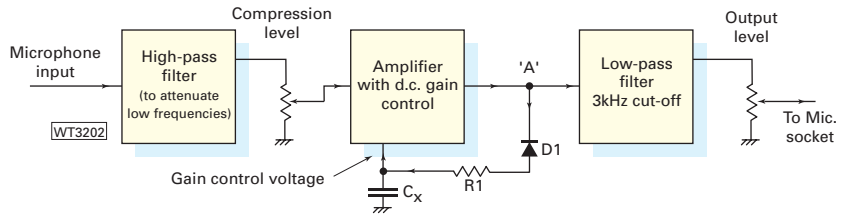

Fig. 2: Sophisticated compressors can be fitted externally to most rigs.

looking first at three of the most common causes of intermittent faults. These are:

Crimped leads in plugs. These tend to become unreliable after about 10 to 15 years, especially if a smoker has used the equipment. In these cases a little gentle movement of the leads will usually provoke a reaction and once the offending plug has been found, it should be removed and the previously crimped connections soldered. (For some odd reason this is a common fault with the FT-707).

Relays. It's surprising as to how a relay at one end of a board can be affected by movement at the opposite one; the only sure test is to remove the relay's cover and then to gently prod at the contacts with an insulated tool. Once you have found the relay that's the source of the trouble, apply cleaning fluid and operate it rapidly whilst still wet. **Remember, that you must not use a cleaning fluid that contains a lubricant on any relay or you will do more harm than good.** Try something like Aero-Klene 50 obtainable from Maplin but even then double check that it will not harm the plastic first. (If the relay can be removed, a better cleaning job will result if you draw a suitable thickness of feeler gauge through the wet contacts.)

Transistors and regulators with heat sinks (those types that are clamped to the chassis). After years of operation, and the action of expansion and contraction together with vibration, the joints on these devices are very prone to fail.

An Intermittent FT-990

'Joe' turned up with an FT-990, that I had sold him 12 years previously and, which now occasionally would not switch on. The slightest tap on the top would cure it and from then on nothing he could do would make it fail, until it was left switched off for some considerable time, when the process would repeat itself!

Now, unlike the FT-1000 I sold quite a lot of FT-990s but even so I have never had much experience at servicing them, as they were just too reliable! In business the cost of repairing a batch of faulty equipment can be expensive and as many people have found to their cost, you can't say that you have made a profit selling something until the guarantee runs out! With the FT-990, however, there were no such worries as they were a 'sell and forget rig' and are still one of my long-term favourite rigs.

In the case of Joe's rig, after checking out all the possible intermittent faults, I eventually traced the fault to the regulator board, a picture of this, (as fitted to the FT-990DC), which did not contain an internal PSU, is shown in **Fig. 1**. As you will see the two regulator transistors use the metal chassis as a heat sink and while the connections looked okay, one was sometimes not quite 'making' and was presumably oxidised.

Tapping the rig on top had caused just enough movement to clean the connection and so restore operation for a few hours. To be on the safe side, I resoldered all the connections on the two regulator transistors and the rig was then as good as new.

Speech Processing

The built in automatic level control system, (a.l.c.), used in most rigs acts as a speech compressor but rather more sophisticated compressors can be fitted externally as shown in the simplified block diagram in **Fig. 2**. If the output at point 'A' becomes too high it's rectified by D1. This charges Cx via R1 and the resulting negative voltage then turns down the gain of the voltage controlled amplifier. How effective this compressor will be depends to some extent on the value of Cx.

If it's too large a high voice peak will turn down the audio gain and all sounds following this will then be low in volume for several seconds while Cx holds its charge. If it's too small, the gain (and any background noise) will go up and down constantly and the audio will sound very 'chopped'.

For Amateur Radio use a well-designed clipper is preferred to a compressor, and the layout of one of these is shown in

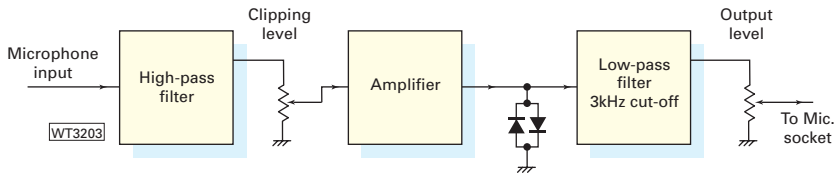

Fig. 3: Layout diagram of a clipper.

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Harry's waiting to hear from You!
As I am now retired, I like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs. If you want a direct reply please remember to send me your E-mail address or enclose a stamped addressed envelope. Send your letters to: **Harry Leeming G3LLL, 'The Cedars' 3A Wilson Grove, Heysham, Morecambe LA3 2PQ. Tel: (07901) 932763. Email: G3LLL@talktalk.net**

Remember the mains supply is potentially lethal. Unless you really know what you are doing, always pull the mains plug out, do not just switch off at the wall socket, when working on equipment.

Fig. 3. This device 'chops off' the voice peaks when they exceed the voltage at which the clipping diodes conduct. The whole audio level can then be lifted without over modulating, resulting in a louder and (hopefully) clearer-to-read signal. This is not, however, as simple as it seems as it seems because two problems arise.

The first problem is, if a wave is clipped many harmonics at multiples of the original frequency are created. For example clipping a 500Hz wave will result in extra frequencies every 500Hz (1000, 1500, 2000, 2500 and so on) up to many kHz. These will be heard as distortion and, if it was not for the 3KHz cut off filter or some other restriction of the signal bandwidth, they would also broaden the transmission and cause interference to other stations.

The second problem is that with excessive clipping, loud sounds will be turned into square waves. Squarewaves tend to tilt and overshoot when passed through an amplifier and in doing so can produce new peaks that are as high as the ones that have been removed.

Fortunately, the loudest voice sounds tend to be those at the lowest frequencies and by attenuating these using a low frequency filter, it's possible to limit their amplitude prior to the clipping diodes. By careful juggling with the characteristics of the filters, coupled with intelligent use, such as not shouting into the microphone, it's possible to get quite a boost in readability with an audio clipper, however, as I will explain in the June issue there are better ways of speech processing. ●

The RadioUser ISWL Any 15 Hours Contest

If you enjoy taking part in contests why not try your hand at this one? Being run by the International Short Wave League and our sister publication *RadioUser* this contest is open to all! Go on – join in!

We have designed the contest so that it will allow the majority of readers to be able to take part, whatever their abilities or personal preferences. A lot of contests take place over a weekend and are inflexible in their timings, which makes it difficult for many to enter. We hope that the way this contest has been structured will please everybody.

And now for the rules!

A. The contest is entitled "The RadioUser – ISWL Any 15 Hours Contest"

B. The contest will start at 00.01GMT on Saturday 19th May 2007 and end at 23.59GMT on Friday 25th May 2007.

C. The objective of the contest is to log or work up to 5 stations per country in as many countries as possible using any of the recognised amateur or broadcast bands during a time period of 15 hours of your choice.

D. The 15 hours can be split into any time periods during the week of the contest – the only proviso is that the minimum time spent in any one session must be 1 hour or more. For example, it would be acceptable to operate for one stretch of 15 hours or perhaps for five 3 hours periods or 15 one-hour periods – the choice is yours!

E. To calculate your score – 1 point is awarded per QSO or listening log for a station in your own continent and 2 points for all other QSOs or listening logs. The final score is then calculated by multiplying the total points by the number of countries worked or logged. Countries will only count once as a multiplier.

F. Countries are defined as per the DXCC list.
In the case of Broadcast Band stations, the transmitter site counts as the country of origin. For example BBC World Service via transmitters in Kranji, Singapore counts as Singapore.

G. No mixed modes are allowed, although individuals may enter for more than one category – i.e. CW Worked, Broadcast Band or SSB Listening and so on.

H. No CQ Calls permitted or pirate operations.

I. All SSB logs to show:
Date, Time, Frequency, Country, Callsign Heard, Callsign Worked, RS.

All CW and Data Modes logs to show:
Date, Time, Frequency, Country, Callsign Heard, Callsign Worked, RST.

All Broadcast Logs to show:
Date, Time, Frequency, Country, Station Name, SINPO.

J. All logs to be accompanied by a front summary sheet that shows
Time and date of the 15 hours operated.
Total Number of points claimed
Total Number of Countries claimed
Grand Total of points claimed

Name, Callsign and Address of participant.

Signed declaration:
"I declare that this station was operated strictly in accordance with the rules and spirit of the contest. My report is correct and true to the best of my knowledge. I agree that the decision of the contest organisers will be final in all cases of dispute"

K. All contest entries to be received by Friday 15th June.

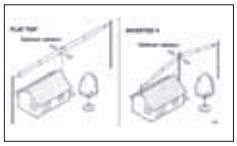
L. Entries to be sent to:
Dick King G14167/M5DIK
ISWL Contest Manager
10 Bucks Avenue
Oxhey
WATFORD
HERTS WD19 4AS

M. Prizes and Certificates will be awarded to:
The Best Broadcast Band Score
The Best SSB Listening Score
The Best SSB Transmitting Score
The Best CW Listening Score
The Best CW Transmitting Score
The Best Data Mode Listening Score
The Best Data Mode Transmitting Score
Good Luck! ●

***RadioUser* and The International Shortwave League (ISWL) have combined forces to run a radio contest during the month of May 2007. The aim of the contest is to promote interest in the radio hobby as well as providing an opportunity to have some fun!**

accessories at ml&s

New! Yaesu YA-30 Broadband Antenna



The Yaesu YA-30 pre-assembled multi-band, commercial-grade folded dipole is designed to get HF operators owners on the air fast. No ATU required. Covering all amateur bands from 1.9 to 30 MHz [VSWR < 2:1 1.9-18 MHz, VSWR <2.5:1 18-30 MHz]. It is 80.3 feet (24m) long and can handle up to 150 watts. The YA-30 can be installed as a Flat Top or an Inverted-V. This antenna is identical to the Icom IC-AH710. **£199.95** (RRP: £319)

MyDEL ML-S Hands Free Mic

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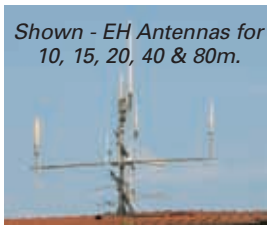

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Fred and the Mark IV

Many readers will have heard Fred - and I don't wish to make any bones about revealing his identity - because everybody knows of him, even if they're not among the fairly select few who have managed to work him!

This brings me to an idea I have been fostering for years, which was to run a special contest to see how many times a single operator could work Fred in a year. Never mind what mode or band it would be really challenging and would give everybody a chance.

The brilliant contest operator could bring to bear their linear and cubical quad antennas and those with home-brew hand-helds would stand an equal chance. This is because Fred always gives the people he's working the idea that they're living on the knife-edge of uncertainty with him and both weak and almighty powerful signals leave him unimpressed.

Fred & The Sked

It may interest readers to know that I've had a sked with Fred for over 35 years (Saturday, 3.60MHz 1300 clock time). During that time, only once have we made it - and that was an 'eyeball contact'!

Occasionally, I still take a listen around that frequency and know who it is making all the agonising swoops across the band, finally stopping for a few whistles that are barely audible over the top of a huge mains humming. After 10 minutes or so he starts to mumble his callsign and then S-meters for at least three miles around begin to fluctuate between S5 and S9+ as he desperately tries to find the right positions for C1 and C2 on the commercial matcher unit.

Little does Fred know the matcher contains very little but an input and an output socket. Still, it looks well on his side table where he operates under the full blast of a huge colour TV, which spellbinds his long-suffering wife.

Sliding Up The Band

Suddenly, Fred's massive carrier (rapidly sliding up the band) is switched off with a loud rasp. This could signify that the dog has backed on to the mains lead, or the antenna plug eased out a few microns or indeed any of a dozen things.

I wait (as always) with bated breath, as I know Fred is by now calling me through a dead rig and will continue to do so until a glance at the TV with no TVI present will signal to him that nothing is going out. (The picture is nearly perfect).

He will then start a frantic search for the trouble and the whole tuning process will re-commence. By then, I have usually gone to lunch. Well, after a time, I mean years, you do become rather blasé.

Please don't think I want you to get the idea that I've never called Fred or tried to force a QSO by sheer persistence. In truth, on many a Saturday afternoon I've gone to the local match and been unable to give voice, due to having flogged it to shreds calling my friend.

Anyway, due to fact that his brother-in-law keeps ferrets and was run in for having a defective rear light and someone else's rabbits in the car, Fred had a chance of a lifetime. Credit must be given where it's due because he grabbed it with (both) soldering iron burnt hands.

I won't go into the mechanics of how he connected with the opportunity because any of his multitudinous relatives might spot a discrepancy in my reportage and resort to fisticuffs. To keep the tale short, he was loaned a Yackimashu Mark IV! I can hear the gasps of incredulity from where as you read this. Your gasps overcame the evening Top Band static!

How Fred came to have in his possession something that normally graces the presence of a crowned head or a super rich rhombic owner, would normally merit a story of its own. You can imagine it's difficult for me leak the information to you without causing GBH to my person so, I'll push the risk aside and try to concentrate on the goings-on after the Mark IV was duly installed by the usual method, matchsticks in the mains plug and crocodile clip antenna lead.

Three Nights With Manual

Fred spent three nights sorting out the manual and - positively agog with delight - eventually started to twiddle like a man possessed. Incidentally, I've briefly forgotten to mention that he had the companion automatic antenna-tuning unit (a.a.t.u.) and I have no certain knowledge of how it coped with Fred's antenna and manic manipulations.

I do know he has yet to make a QSO, although three friends have told me they heard him calling desperately on various bands. I called in to see him briefly recently but couldn't stop as I was parked on a double yellow line.

Fred was squatting on his haunches in front of the magnificent thing and was holding the microphone nervously as if it were a hand grenade. The banks of light emitting diodes (l.e.d.s) were blinking like an aerial shot of a large bombing raid.

It was obvious to me that Fred had got the memory banks in a mess and was also using the transceiver's scan quite wrongly. The a.a.t.u. was motor-boating as it stuttered to try and get a match and the nearby colour TV was showing teletext without an adaptor!

Impulsively, I went over to Fred and grabbed his shoulder. His head turned and I never want to see such a look of utter despair again. I stumbled out into the street into the arms of a black-and-yellow hatted maiden, caring little that there was a plastic envelope dangling from my windscreen wiper. However, even though I don't think you'll want to hear much more about my troubles - if you have, or happen to know of anyone with an AT5 for sale, please contact Fred via G3COI. ●

Although he's well into - and enjoying his 80th decade - John Worthington G3COI's humour is fizzing with youth but has a wit, which clearly shows he know's 'what's what'!

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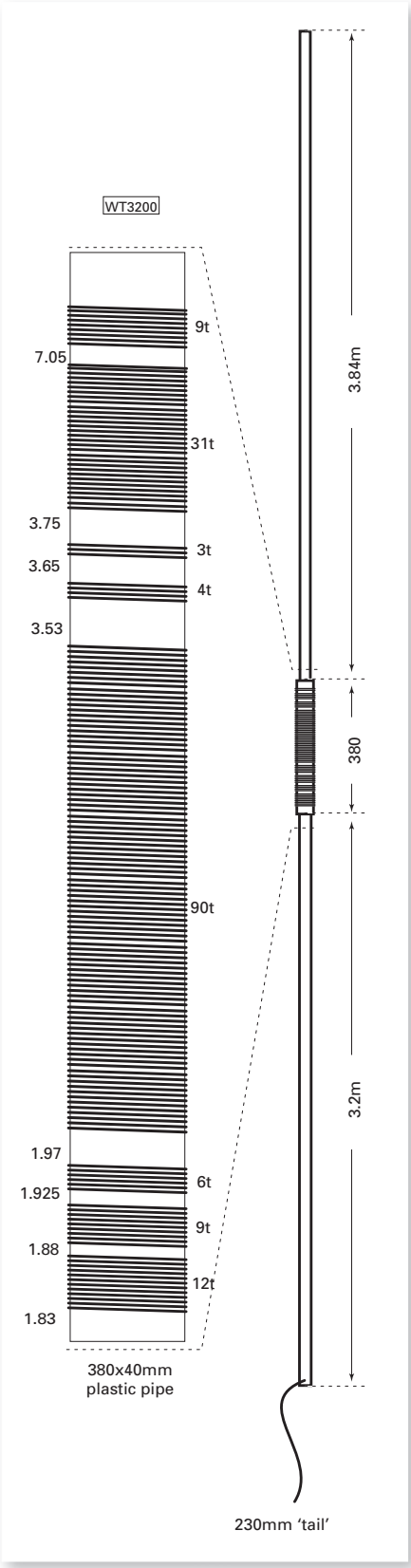
Antenna Workshop

Stephen Cole G3YOL gets the most out of a small space for Top-Band h.f. operations.



A suitable antenna was required for use on 1.8-7MHz at temporary locations, often with limited space. I decided that a ground mounted quarter-wave loaded vertical would best meet the space limitations, fed with coaxial cable against earth. The ability to erect the antenna single-handed was also important!

My previous experience of building 'Top-Band' (1.8MHz) mobile antennas suggested that best radiation occurred with a resonant antenna and a long centre mounted loading coil. The higher the loading coil the greater the length of the section carrying maximum current, which increases radiation, although also increasing the size of the coil needed.

The higher and larger the coil, the more difficult it becomes to erect, so that centre loading is an arbitrary compromise (but seems effective).

Increase Radiation

Making the coil appreciably longer than the diameter seems to increase radiation from the coil when compared to a coil proportioned for minimum loss. However, with a coil tapped for multiple band operation, the coil proportions are better at the higher frequencies where the r.f. wire resistance per unit length is greater due to increased 'skin' effect.

Consideration of coil losses is probably academic since they are likely to be negligible compared to the various ground losses, which usually have to be accepted with this type of antenna. This does assume that a reasonable size of wire is used for the coil, not smaller than, say, 18s.w.g. (1.2mm)

Antenna Construction

While this description for the antenna construction is fairly detailed, the methods used should be modified to suit the materials available and the ideas of the constructor. The materials used to construct my antenna were mostly those that I already had to hand.

The aluminium tube was some old one inch and three quarter inch electrical conduit; this was used for the lower and upper sections respectively. Incidentally, the lengths I had meant that my coil was mounted below centre.

The sections were joined by a length of fibreglass tube with an external diameter that would fit inside the larger aluminium tube (with a little filing) and over the small diameter tube. This was used to carry the coil and to join the two lengths of aluminium tube as well as at the base of the antenna. The coil was wound with 18s.w.g. enamelled copper wire on a fibreglass tube about 40mm diameter.

A length of steel pipe was found (old three quarter inch electrical conduit) over which the bottom fibreglass tube was a good (but free) fit. This was used for the antenna ground post and fitted with a spring clip at a suitable level to support the antenna base tube above ground. (The ground post must be protected when driven to avoid belling of the top if this mounting system is used).

Note: The antenna was often used as it's been shown here, being carried to the site in two sections on a car luggage rack. When I changed to a car without a rack, I had to divide the antenna into four sections so that it would then fit inside the car. The new divisions were joined with carefully shaped hardwood dowels. A carrying container was made from rainwater down-pipe for the earth rods (described later) and the ground post, a good idea as these are usually dirty after use.

Fig. 1: The overall layout of the radiating element of the three low-band vertical antenna.

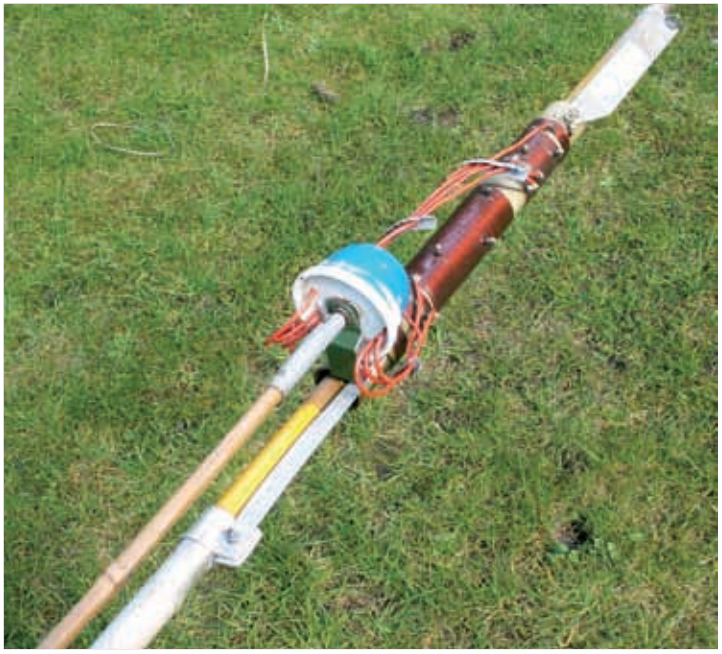


Fig. 3: The mid-antenna mounted band-change switch.

Fig. 2: The base, showing the ground connecting leads. They connect to the screen of the coaxial cable feeder.

The Coil

I didn't know how many turns would be required on the coil so, the antenna was first constructed with a long coil with multiple taps and mounted to one side of the smaller diameter central fibreglass tube. After erecting the antenna the resonant frequency was checked for each tapping - using an accurately calibrated gate dip oscillator (g.d.o.) coupled to a two turn coil plugged into the SO239 socket at the base.

Using a g.d.o. is the only reliable way to check for resonance – don't adjust for lowest standing wave ratio (s.w.r.). The unused part of the coil was shorted by a lead permanently connected at the bottom, which could be securely clipped onto the selected tap position.

I secured the taps by inserting brass screws into the former tube by drilling and tapping. The thread under the screw heads was first filed away to leave a smooth surface, this was then tinned. After inserting the screws the heads were cut off.

The wire's insulation was stripped at the screw, before wrapping it around the screw and soldering it. Care had to be taken to control the wire of the coil while soldering because the heat softened the resin but this set again after cooling. The screws were left long enough to accept a crocodile clip.

The resonance figures were used to make the first adjustments to the coil taps. The coil was found to be much longer than necessary so the former was shortened to 335mm before being mounted coaxially over the centre fibreglass tube.

The centre tube must be long enough to ensure that the aluminium tubes do not reach inside the coil. The coil former was secured to the inner tube by forcing in some (firm) plastic foam a little way at each end and then pouring in some resin.

Coil turns were subject to adjustment at various stages. Care must be taken not to remove too many turns at a time. It's easier to take turns off than put them back! If starting again with the information that I now have, I would wind and adjust the top part of the coil, then the next one down, and so on.

My antenna uses four taps for 1.8MHz, three taps for 3.5MHz and one tap for 7MHz. It might be considered an advantage to increase the number of taps or slightly change the selected resonant frequencies.

Band Switching

It's very inconvenient having to lower the antenna to change taps! This problem was overcome by fitting a rotary ceramic switch adjacent to the coil to change taps (the switch was mounted inside a plastic food container).

A removable bamboo rod set into a calibrated horizontal indicator plate about 1.2m above the ground remotely operates the switch. A hole was then drilled through the shaft of the switch and tapped to accept a steel screw secured tightly without the need for a lock nut. The screw extended out of the shaft only on one side. I then cut the head of the screw off.

A coupling at the top of the bamboo shaft was made from some plastic tubing with a slot on one side to engage with the screw on the switch shaft. **Note**: To be able to install and remove the bamboo with the antenna erected it's necessary to mould the plastic adapter into a bell mouth.

The size of the bell mouth depends mainly on how adept you are at handling a snooker cue! I always remove the bamboo and keep it at the operating location to be sure that nobody can operate the switch during transmission.

A good quality ceramic switch is essential, and even then care must be taken to avoid the risk of burning non-ceramic insulation. After some use the original switch had to be replaced because of burning of the Bakelite rear support of the switch spindle. Part of the replacement support was first filed away to give greater clearance. RF voltage around the coil and switch is very searching.

Earthing Rods

Three earth rods, each about 1.2m long are interconnected with the ground post by clearly visible leads and heavy crocodile clips and to the earth terminal near the SO239 socket. The rods also serve as pickets for the light plastic guys, the top ends of which are tied to a Perspex ring resting onto a clip above the loading coil.

The earthing system should be considered the minimum acceptable and in dry soil will need to be kept well watered during operation. The antenna has been used in dry sand dunes, where quarter-wave radials were used lying on the dry sand and morning contacts to South

America were made on 7MHz.

Radials are very inconvenient to use where the general public have access. If there were room for radials there would be room for a better antenna, such as a dipole, doublet, or G5RV.

I recommend the use of copper clad steel earth rods if they can be obtained. I have had a few of these for many years and they have withstood being driven and removed many times. The expensive but flimsy copper rods offered today would not have stood up to such use. Another alternative is to use galvanised steel rods Finally, here's a health and safety warning! Muscle power and a lump hammer usually give no problem for driving in the earth rods. However, withdrawing them again is a different matter! I always grasp the rod with self-locking grippers and pull while twisting each rod. But remember - try to keep your back straight and use your legs to pull!

For permanent earth installations I have sometimes used 15mm copper pipe after driving a hole with a steel fencing spike. If you find any of the old half-inch copper water pipe this would be even better – it is heavier gauge!

Whichever type of rod or pipe is used remember to space them at least the length of the rod apart. Burying an old hot water tank helped one very successful installation. Watch out for these because the old ones (without factory fitted foam insulation) are becoming quite rare.

Feeding & SWR

The antenna is fed using 50Ω coaxial cable (UR67) and, if necessary for the transmitter, a matching unit (a.t.u.) at the transceiver. Over the whole bands the s.w.r. on 1.8MHz is between 1.5:1 and 4:1; on 3.5MHz between 1.5:1 and 3:1; and on 7MHz between 1.4:1 and 1.7:1. This is no problem for the feeder and almost any a.t.u. should be able to deal with it.

The antenna has been used with 400W input, before fitting the switch. Restricting the power to 100W would be safer. Fitting the switch only marginally altered the resonance frequencies

A quarter-wave antenna physically shortened by means of a loading coil will have a low feed-point impedance, but the best radiation will be achieved by operating it at resonance because this ensures maximum current in the unloaded part of the antenna. However, this may not give the lowest s.w.r.

The antenna did, in fact, show minimum s.w.r. at slightly above its resonant frequency. This can be explained by realising that under those conditions maximum current occurs in the loading coil, thus increasing losses and raising the feed-point impedance.

Material Difficulties

It may be difficult to obtain the same materials as those used for the prototype. Smaller and tapered sizes of aluminium tube should be satisfactory for the upper section. The upper section of my antenna is reinforced at the bottom with a short length of smaller aluminium tube inside to counteract the lighter gauge of the long tube.

For the smaller size fibreglass tube a reinforcing layer of fibreglass and resin could be applied to a plastic tube. After some experience with the antenna, I found that similar reinforcement was necessary for the bottom fibreglass tube I used.

If the antenna is to be erected permanently any exposed resin should be protected from sunlight by painting. A good thick layer of exterior varnish should be built up over the coil to because of u.v. light from the sun.

Two additional top sections were made. One reaching 1030mm above the top of the coil former gave resonance at 14.160MHz, and one 1550mm for 10.120MHz operation - both with the switch set for the 7MHz band.

Capacity Hat

Consideration could be given to top loading by means of a capacity hat. This would allow shortening of the antenna, or, alternatively, reducing the size of the loading coil, or perhaps a combination of both. Reducing the size of the coil would improve efficiency, but maintaining the same length with the addition of a capacity hat would obviously make erection more difficult unless stronger tube is used.

If the number of turns were reduced the coil turns could possibly be spaced, which could reduce coil losses. Also if operation on the 1.8MHz band isn't needed the coil could be appreciably smaller than the one described here.

Fig. 4: The calibrated band-indicator plate with the bamboo stick used to operate the band-switch.

Operational Experience

The bandwidth for an s.w.r. of less than 2:1 is 25kHz on 1.8MHz and 75kHz on 3.5MHz. Better than this cannot be expected for an antenna that is so short in terms of wavelength. Nevertheless, remember that it will be most efficient at resonance, not at the lowest s.w.r.. If an s.w.r. of 1:1 is most important replace the antenna with a dummy load. The s.w.r. will be perfect but you won't make many contacts!

The s.w.r. is less than 1.7:1 over the whole of the 7MHz band. With 7MHz selected it also shows an s.w.r. of less than1.5:1 over the 21MHz band but I am very doubtful that good low angle radiation would result.

This cheap home-constructed antenna has met the original aims well. It has proved itself over the last 15 years at a number of /P locations. It has also been used for many special event stations, sometimes with very unusual mounting arrangements. The use of 'home-brew' equipment is very satisfying. ●

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There's an amazing variety of 'all band' portable radios available nowadays – every 'budget price' shop seems to have them. This month the Rev. George Dobbs G3RJV describes how we can use the receivers to advantage on the Amateur Radio bands.

"You can't make a Silk Purse out of a Sow's Ear."
Jonathan Swift (1667 - 1745)

Etymologists would tell you that that the 'sow's ear' of Mr Swift's (the famous Irish humorist, essayist and novelist is, of course, also very well known as the author of *Gulliver's Travels*) saying is an English corruption of a French word. At one time French peasants would keep their money in a purse called a 'Sousier' (from the old French coin the Sou).

The rich had their fine si k purses but the poor would have a rough cloth Sousier. Be that as it may, the saying holds true in most things - even Amateur Radio!

Simple Circuit Extras

Sometimes, radio constructors believe that by taking a simple circuit and adding enough 'extras', it will evolve into something far beyond what the original was designed to do. This month I'm suggesting following that advice, by trying to get very cheap shortwave broadcast radios to resolve Amateur band c.w. and s.s.b. signals!

Far Eastern Wonders

In recent years, many very inexpensive multi-band radios have appeared on the market and these Far Eastern wonders can have up to 10 bands, covering the whole h.f. short wave spectrum.

Some months ago, the national chain Superdrug had a multi-band radio selling for only £2.99. This radio offered the usual v.h.f. Band II and medium wave a.m. coverage with eight shortwave bands, from 5.95 to 22.54MHz. It also had a four-digit liquid crystal display (l.c.d.) frequency indicator.

The radio became a topic of great interest on the G-QRP Club Internet reflector and members undertook some serious 'shopping' to buy them up! They then attempted to get them usable as Amateur band receivers.

Hans Summers G0UPL collected most of the ideas on his website (**www.hanssummers.com**). Obviously, there's no shortage of sources for these inexpensive broadcast type radios. But what can be done with them?

Lacking Morse & SSB

None of the really cheap radios are equipped to receive c.w. and s.s.b. signals, as they lack a beat frequency oscillator (b.f.o.). Morse code c.w. signals are the simplest form of radio communication in that the transmitted signal is merely switched on and off in the coded sequence.

Receivers designed for amplitude modulated (a.m.) signals don't (satisfactorily) resolve c.w. signals and the signals appear as a series of hisses or a quieting of the background noise. To overcome this problem a b.f.o. can be added. This is an oscillator adjusted so that it 'beats' against the incoming c.w. signal to produce an audio frequency signal. The b.f.o. is usually applied at the fixed intermediate frequency (i.f.) of the receiver.

This month, the Rev. George Dobbs G3RJV sets out to achieve the Amateur Radio version of creating a 'Silk Purse' by adding a b.f.o. to an inexpensive broadcast receiver.

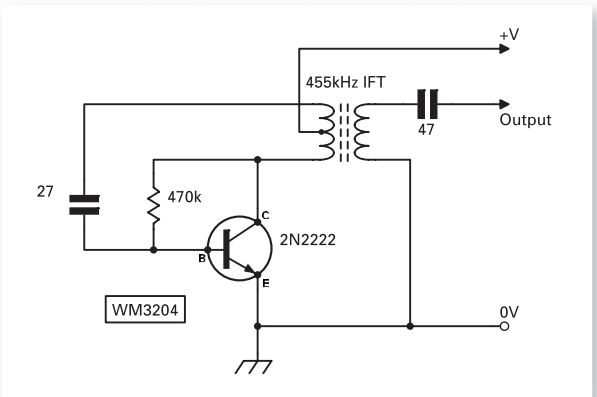
In broadcast shortwave a.m. radios, the intermediate frequency is almost always at 455kHz. An add-on b.f.o. will usually be at this frequency.

Single sideband (s.s.b.) signals should really be called 'single sideband, suppressed carrier signals' as they only contain one sideband of the signal and the carrier is suppressed (a very energy efficient way to carry the signal). With this form of specialised amplitude modulation, a b.f.o. will reinsert the required carrier signal to resolve the signal. This is why the b.f.o. is sometimes called the carrier insertion oscillator (c.i.o.).

Simple BFO Circuits

The diagram, **Fig. 1**, shows two simple circuits for a b.f.o. Both of these were submitted by **Jim Chick G4NWJ**, to the **G0UPL** website. They follow the usual configuration for an inductive b.f.o. and a b.f.o. using a ceramic resonator.

One circuit uses an i.f. transformer to tune the oscillator. This is in the collector of the transistor and *npn* transistors like the 2N2222 or the 2N3906 can be used in this circuit.



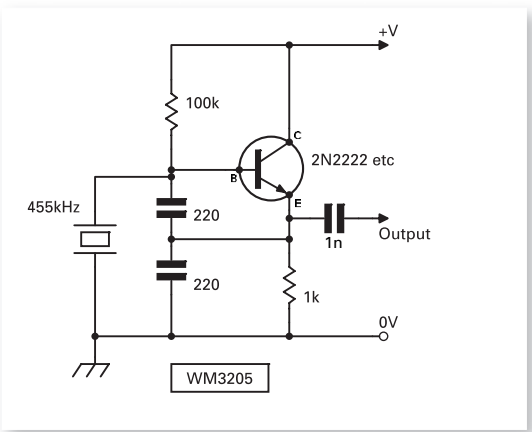


Fig. 1: Jim Chick G4NWJ produced these circuits and published them on the G0UPL website. They follow the usual configuration for an inductive b.f.o. and a b.f.o. using a ceramic resonator.

Feedback to maintain oscillation is provided by the 27pF capacitor. If the circuit fails to oscillate, this value can be increased.

The output is taken from the un-tuned link winding on the i.f. transformer. Almost any 455kHz i.f. transformer should work in this circuit. On such transformers the tuned winding will have three pins, the centre one being the tapping point used to supply the operating voltage. That voltage can be drawn from the receiver battery. The b.f.o. frequency is adjusted using the core of the coil until it's heard in the receiver.

The other circuit of Fig.1, shows a b.f.o. using a ceramic resonator at 455kHz. The circuit is the familiar Colpitts oscillator with capacitive feedback. Should this circuit fail to oscillator the values of the 220pF capacitors in the feedback circuit could be increased or the ratio varied. This circuit has no frequency adjustment and is fixed at the frequency of the resonator.

Either circuit should provide the necessary carrier for c.w. or s.s.b. signals. Direct connection to the receiver is not required. Taking a short wire from the output and placing it close to the receiver should inject enough carrier signal. Too much signal will probably activate the receiver's automatic gain control (a.g.c.) and de-sensitise the receiver.

Preferred VFO

I've played about with add-on b.f.o. circuits over the years and much prefer a variable frequency oscillator (v.f.o.). Using a v.f.o. has several advantages and perhaps the most important is that it can be used for fine-tuning the signals.

There are many such circuits but about the simplest is shown in **Fig. 2**. Here the oscillator once again uses a ceramic resonator (I used a Murata CSB-455E). The resonator forms the feedback path between the drain and gate of a field effect transistor (f.e.t.) device. A moulded 1mH choke provides a drain load to pick off the signal.

The Fig. 2 circuit is essentially a variable crystal oscillator (VXO) circuit using a ceramic resonator in place of a quartz crystal. The frequency can be shifted by the capacitor and inductor in the gate circuit.

In my prototype the 60pF variable capacitor was one section of a Polyvaricon tuning capacitor. The capacitance shifts the frequency upwards so a 1mH inductor was added to pull the frequency downwards. This allows the circuit to tune through the nominal 455kHz frequency. Just using this circuit alone with one of the £2.99 radios produced surprisingly good results.

I attached a clip lead, about half a metre long to the output and placed it alongside the radio tuned to just over 7MHz. By adjusting the proximity of the lead to the radio and tuning the oscillator c.w. signals appeared as if out of nowhere!

As the oscillator signal was varied, fine-tuning of the signals was easily achieved and little oscillator alone had turned the cheap a.m. radio into a usable c.w. receiver. Results were equally encouraging with s.s.b. signals, as I adjusting the oscillator frequency to fine-tune the audio signal.

Note: Some experimentation with the proximity of the lead to the radio is required. Slight 'quieting' by the a.g.c. system (because of the relatively strong local signal caused by the b.f.o.) has some advantage and Amateur signals were resolved using the short whip antenna on the radio under difficult evening conditions on the 7MHz band.

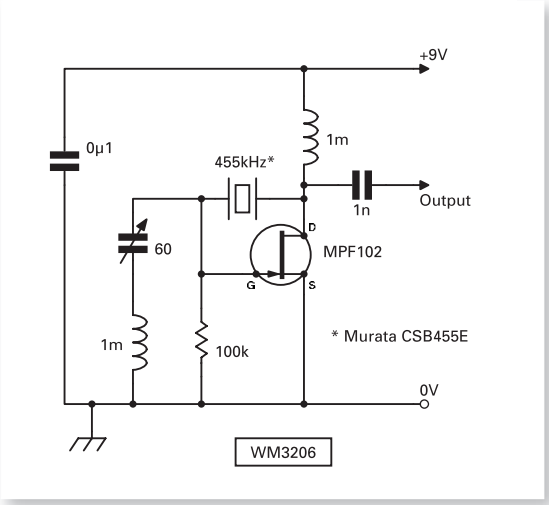


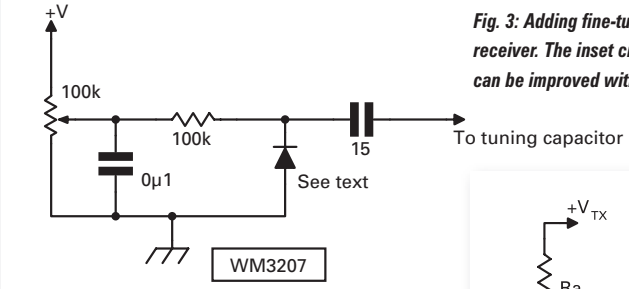
Fig. 2: The simplest b.f.o., where the oscillator uses a ceramic resonator. The resonator forms the feedback path between the drain and gate of an f.e.t.

Double Bonus!

The b.f.o. provides a double bonus because it not only adds the required carrier signal but also acts as a fine-tuning control for the signals. It's also possible to add receiver fine-tuning to the radio and a suitable circuit is shown in **Fig. 3**.

The fine-tuning is achieved by adding varicap diode tuning to the main radio tuning capacitor. A high value linear potentiometer (50 or 100kΩ) acts as a potential divider to voltage taken from the radio battery supply and this is applied via the 100kΩ resistor to a tuning diode.

A conventional varicap diode could be used but following the advice of G4NWJ, I used a 33V zener diode. Large silicon diodes like the 1N4005 would also work well in the circuit and other constructors have used light emitting diodes (l.e.d.). My advice is that you simply try what you have to hand!



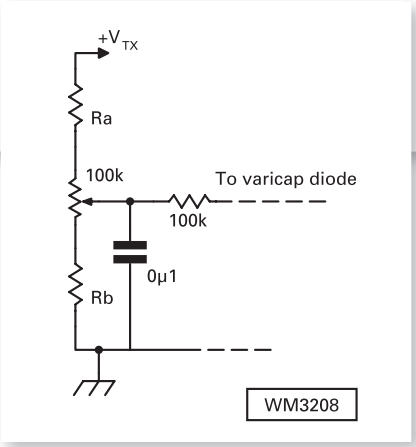


Fig. 3: Adding fine-tuning to a 'bargain buy' short wave receiver. The inset circuits show how the coarse tuning can be improved with the use of suitable resistors.

No Connection Problems

Not knowing which connection to use on the radio's tuning capacitor is not much of a problem. One method to identify them is to touch the capacitor connections and see which seems to shift the frequency. There's no harm building the circuit and connecting it to each capacitor terminal in turn to see which one works!

Because the whole of the supply voltage can be varied across the potentiometer, the tuning range is non-linear and probably too great and too coarse. Those who want to experiment further can add limiting resistors either side of the potentiometer. The inset in Fig. 3 shows these as Ra and Rb (the values of which are determined by experimentation until a useful range is achieved).

I added the fine-tuning externally using leads between the circuit mounted on the back of the potentiometer and the radio. Readers may find a potentiometer small enough to be mounted inside the radio's case.

This project may not quite end up being the 'silk purse' of Amateur Radio receivers but I was pleasantly surprised with what I achieved by just adding the tuneable b.f.o. to a very inexpensive radio. The circuits could be applied almost any such bargain. ●

VHF DXer

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This month, David G4ASR has reports of recent propagation openings and also takes a look back at notable achievements during the 1970s.

A mixed bag of ionospheric propagation was noted during January with Sporadic-E (Sp-E), Auroral backscatter (Au) and Auroral-E (Au-Es) events occurring on the 50MHz band. The Quadrantids shower around January 3-4, enabled meteor scatter (m.s.) contacts to be made on the 50, 70 and 144MHz bands.

Occasional lifts in tropospheric (tropo) propagation were reported on the 144 and 430MHz bands and during periods of heavy rain some microwave operators made extended contacts via rain-scatter on the 5.7 and 10GHz bands. Activity via the Earth-Moon-Earth (e.m.e.) path has increased dramatically with contacts being reported on most bands between 50MHz to 10GHz. The only downside to all this activity was the gale force winds that occurred during much of January seriously incapacitating many stations with large antenna arrays or dishes.

Sporadic-E openings were reported on January 1, 2, 3, 13, 25 and 26. All of these were noted on the 50MHz band with none reaching the 70MHz band. This is pretty much as expected as the Winter Sp-E season in the northern hemisphere is considerably more spasmodic compared to the Summer 50MHz season that lasts for around four months (May-August) and is very intense.

In my opinion, the best opening of the month was reported on January 1 between 1130-1300UTC to Croatia (9A), Germany (DL), Italy (I), Poland (SP), Slovakia (OM) and Slovenia (S5). Between 1300-1700UTC there were isolated reports of stations being heard from Estonia (ES), Lithuania (LY), Italy and Poland but signals were very sporadic. Between 1915-2200UTC the 50MHz band opened up again with s.s.b. contacts being made with stations in Denmark (OZ), Hungary (HG), Serbia (YU), Italy, Lithuania, Poland, Slovakia and Slovenia.

Some of the stations worked from the UK included DL1DSN, ES2RJ, HA5FV, IZ7EUH, LY2BAW, OM3CM, SP9HWY, S51DI, YT1AU and 9A6R. Towards the end of the opening a few G-operators heard the station of OH2KTL (Finland KP02) and the Finnish beacon OH9SIX (50.067MHz)

Fig. 1: The Colchester Contest Group G0VHF operating from Walton-on-the-Naze during a v.h.f. field day.

via Au-Es propagation. From 2300UTC the station of MM0DQP (Caithness IO88) reported hearing the Norwegian beacon LA7SIX (50.051MHz) and OH9SIX peaking up to 599 via Au-Es on the direct great-circle path.

Signals propagated via Aurora however are never heard on a direct path. They are always reflected back from the ionised 'sheets' hence the term 'backscatter'. Both stations aim their antennas towards the area of ionisation rather than at each other to make a contact. This concept is quite common in Amateur Radio communication. For example, in e.m.e. tests (by pointing at the Moon), microwave rain scatter (by pointing at the rain cloud) or scatter from objects such as mountains or metal structures.

Auroral backscatter openings were reported on January 2, 3, 15, 16, 28, 29, 30 and 31. All were relatively weak only reaching the 50MHz band and generally restricted to stations in Scotland and northern England. Stations known to be active in these events included G4IGO (IO80), GM3WOJ (IO77), MM0AMW (IO75), MM0DQP (IO88), DL5XJ (JO54), LA8NK (JO48) and SM3GSK (JP82). Also heard were the beacons on Jan Mayen Island JX7SIX (50.079MHz), Faroe Islands OY6BEC (50.034MHz) and Shetland Islands GB3LER (50.064MHz).

Sporadic-E

Graham Rogers VK6RO (Perth, Australia OF77) passes on the news that the recent 50MHz Sp-E season at his QTH was the best that he has experienced in over 28-years. He reports having openings, beacons or video indicators during 24-days in December. Day after day, Graham received television signals from New Zealand (ZL) on 45MHz (video) and 50MHz (audio) with many two-way contacts being made. Overall, it was an outstanding Sp-E season 'down-under.'

Not quite 'down-under' but still a considerable distance away is **Gary Geoffery 9W6RAY** (Malaysia). He writes that he is a keen follower of this column and that he would like to share his limited DX experiences with us. In 2006, he received his Malaysian B licence that allows access to the 28, 50, 144 and 430MHz bands.

A few months ago, during the Sp-E season Gary got ready to make his first unsupervised CQ call since getting his license. He hooked-up his Yaesu FT-897D transceiver into the feed-line of a newly installed Diamond CP6 multiband (3.5-50MHz) vertical antenna and took a listen to the beacons on the 28MHz band.

Nothing was heard so he moved up to the 50MHz band to check out any propagation beacons. Again, nothing was heard so Gary proceeded to call CQ on **50.120MHz**. To his surprise he had a pile-up of stations calling him from Japan over 3000km away. As he was not expecting the band to be open he had to rush and get a pen and paper to jot down all the call signs. A total of 32 s.s.b. QSOs were completed before he suffered a power failure!

Unfortunately, when the power came back on the multi-hop Sp-E opening had disappeared. Welcome to the 'Magic Band' Gary. Stick with it, put up a directional Yagi and in a few years time you will be literally working all around the World.

Tropo Reports

Ross Wilkinson G6GVI mentions that on Sunday January 14 he operated in the 70MHz cumulative contest from his favourite high spot on Winter Hill (Lancashire IO83). The weather was deceptively calm at 400m a.s.l. when he arrived so a 2-element Yagi was put up on the mast at 6m a.g.l. These cumulative

contests last only two hours (1000 to 1200 hours) and are designed to enable stations to be active for a short time during the morning.

Ross, using a G3WPO design transverter running 25W output, started off at about 0950 hours chatting with a couple of locals on f.m. telephony before changing to the s.s.b. mode a half-hour later. As usual, he operated in the contest on a casual basis tuning up and down the band answering calls and sitting on a frequency chatting with whoever wanted to call in. He ended up with 24 contacts in the two hours (including stations in Scotland and Dorset) and as befits the 'Friendly Band' he was on first-name terms with all of them!

Angus Young M0IKB (Scarborough IO94) mentions that because of trouble getting planning permission for outside antennas at his new QTH he has had to resort to indoor Yagis for the 144 and 430MHz bands. Having only 5W of transmit power has not helped this situation either. Angus is using a Yaesu FT-817 transceiver running into a home-made 9-element Yagi for 144MHz and 2 x 14-element Yagis for the 430MHz band. These antennas are mounted in the loft of the house and seem to work quite well.

On December 23, Angus heard the German repeater DB0FT coming in very strongly so he quickly became active and had some fun working over 100 stations through the repeater before his XYL and family stopped play! On Christmas Day, he slipped away to play radio for a few hours and using the indoor 14-element Yagis he managed to contact 33 German and Dutch stations on the 430MHz band whilst his wife was busy in the kitchen.

It wasn't until December 27 that Angus was allowed on the radio again! By then the tropo opening had moved further inland and Angus was able to work over 50 stations including those of DL7QY (JN59), DF4UE (JN48), DF6IY (JN48) and OE5XBL (JN68). Under normal conditions he likes to work on the 430MHz band into the Netherlands via local sea ducting. Failing that, he can often be heard making meteor scatter contacts with the indoor 144MHz Yagi. Angus reports that he has now worked over 70 locator squares on 144MHz during various propagation events. On the 430MHz band the count is slightly lower at 56 squares all worked using c.w. and s.s.b. via tropo propagation.

Deadlines

That's it for this month. If you have any news, reports or anything of interest regarding the 75 years anniversary of *Practical Wireless* please send me the information to the address given at the head of the column before the last Saturday of each month. **73, David G4ASR**

75 Years Celebration - The 1970s

Every month during 2007 I'm celebrating the 75 years of *Practical Wireless* by looking at recollections or notable achievements and this time around I'm looking at the period between 1970-1979.

10GHz DX

During the mid-1970s, the Gunn Diode appeared on the Amateur market and revolutionised the 10GHz band. Up to that time microwave operators were using the 723A/B klystron with associated bulky power supply. Since the diodes were very small, a few millimetres long, 10GHz equipment became highly portable and the UK saw what many Old Timers still regard as the 'Golden Age' of 3cm. The first England (G) to Netherlands (PA) 10GHz contact was made on **August 3 1975** by the stations of **G8APP/P** and **PA0KKZ**. The former used a 20mW klystron while the latter ran just 3 mW to cover the 240km path. This contact had immediately followed a one-way attempt by G4ALN who used 10mW to a dustbin lid as an antenna! The station of G8APP/P was located at Walton-on-the-Naze, a site that has become famous in the annals of 10GHz in the UK and one that is still used by the Colchester Contest Group G0VHF as seen **Fig. 1** (opposite on page 54).
It is arguably the finest portable location in the UK for working into the European Continent.

On **August 4 1976,** a world DX record was set on the 10GHz band between Pendeen Sands Cornwall and Portpatrick in South West Scotland, a distance of 521km. For this remarkable contact the stations of **G4BRS/P** (Barry Radio Society) and **GM3OXX/P** used simple 10mW Gunn transceivers to small 75cm parabolic dishes. The signals were exchanged directly on the 10GHz band without recourse to prior talkback on the 144MHz band. A super-refractive sea duct was the means by which the two stations were able to work well beyond line-of-sight with such low power and wide bandwidth receivers.

Tuning Low to High

Godfrey Manning G4GLM (Sky High columnist in *RadioUser* magazine) mentions that he started on the 144MHz band over 30 years ago. Using the callsign G8JBH his equipment consisted of a converted private mobile radio (p.m.r.) transmitter with a QQV03-10 valve in the final stage. The high tension (h.t.) was converted from 12V d.c. by a transistorised inverter that sang merrily away while transmitting.

Godfrey recalls that you could tell the output valve load current when tuning up by listening to the inverter note. The crystal controlled transmitter used amplitude modulation (a.m.) and the receiver was modified with varicap-tuning. The "CQ" calls were long and followed by the announcement 'tuning the band low to high.' He recalls the joy of a mid-summer tropo lift, low power and restricted suburban antennas suddenly reaching the Netherlands and Germany with clarity better than making a telephone call.

OSCAR-7

On **November 15 1974** the seventh OSCAR (Orbiting Satellite Carrying Amateur Radio) satellite was launched and put into a 1450km low-earth orbit. **AO-7** as it was termed carried two working linear transponders, one in Mode A (145.850-950MHz uplink; 29.400-500MHz downlink) and another in Mode B (432.180-120MHz uplink; 145.920-980MHz downlink).

In mid-1981, AO-7 ceased operation due to battery failure. It was thought at the time that the batteries had permanently shorted out. However, on June 21 2002 the station of **Pat Gowen G3IOR** reported hearing the 145.973MHz beacon on-board the AO-7 satellite.

Surprisingly, AO-7 still continues to operate and is going strong more than 30 years later! The satellite becomes operational when its solar panels are illuminated by the Sun and closes down again when it enters the shade. In spite of this, it is still possible to make c.w. and s.s.b. contacts through AO-7. For example, on February 2 2007, the station of **Terry Bromley G1WPR** made contacts through AO-7 with EA8BWY (Canary Islands), EB3JT (Spain), G0VHS (England), IW0DTK (Italy), K3SZH (USA), LA2QAA (Norway), PE1BVQ (Netherlands) and UA9CS (Russia). Quite remarkable!

Share your news, views and reports with fellow readers. Reports to Carl by the 15th of each month please.

HF Highlights

Carl GW0VSW says although the bands have taken a dive there's still plenty to report. So remember a quiet band is not necessarily a dead one!

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Special Events

A number of special events for 2007 have begun and the first for this month is from members of the **Amateur Radio Club Koprivnica** (9A8K Croatia) who will be active with the special anniversary callsign **9A60K** to celebrate the 60th anniversary of the ARC Koprivnica. This special callsign will be in use until 31 December 2007.

To celebrate this 60th event, radio club members will issue the Koprivnica City Award' for contacts with Radio Amateurs from that City. The QSL and award Manager for this activity **is Kresimir Juratovic 9A7K, PO Box 88, HR - 48001 Koprivnica, Croatia** and more detailed information about this special event can be found at **www.9a7k.com**

Also look out for the **Balkan Contest Club** (LZ1KZA) who are using the special callsign **LZ170VL** from now until 31 December on most h.f. bands to celebrate the 170th anniversary of the Bulgarian national hero, **Vasil Levski** who was born on 18 July 1837, in Karlovo.

Vasil was a **Bulgarian** revolutionary, ideologist and strategist of the Bulgarian National Revolution and leader of the struggle for liberation from Ottoman rule. He is hailed as a national hero and often referred to as 'The Apostle of Freedom' by the Bulgarian people.

A QSO with LZ170VL counts for 10 points towards the St. Teodosii Tyrnovski Award. For more details on the award you can visit **www.balkanclub.org** and to learn more about Vasil Leviski try **http://levski.magde.info**

Finally, **HL22** is a very special callsign issued to **Kim Kyu-Dong DS5SWL** to support Pyeong Chang as the candidate city in South Korea, which will help organise the XXII Olympic Winter Games to be held there in 2014. The HL22 callsign will be aired on 3.5-28MHz using both s.s.b. and c.w. until June 30. All QSLs should go through the bureau or direct to **Kim Kyu-Dong, PO Box 21, Sokcho, Kangwon 217-600, Korea.**

Prefix Change

In Mexico the **Federacion Mexicana de Radioexperimentadores** (FMRE), which was formerly known as Liga Mexicana de Radioexperimentadores will celebrate its 75th anniversary and Amateur Radio stations there have been allowed to replace their ordinary prefixes with the following, 6H1for XE1, 6I2 for XE2, 6J3 for XE3 and 6E4 for XF4 (Revillagigedo).

In addition to this, **6G1LM** (FMRE club station) and **6F75A** (FMRE contest station) will also be active throughout the year on most h.f. bands. In 2008, Mexico is likely to establish ten call areas from XE1 to XE0 replacing the four areas currently in existence.

Another new QSL card from Keith Winward 2E0JKD.

DX News

On to some DX news now and to Cambodia in Southeast Asia where **Yoko JA3DFM**, **Yoshi JA3EGZ** and **Tada JA3PPH** will be active **as XU7DFM, XU7EGZ** and **XU7PPH** respectively from Shihanoukville City until 19 March. Activity will be on all h.f. bands using all modes and you can QSL to their home calls via **QRZ.com**

In the Bahamas, **Foster Nye W1CGT** will be active as C6AWN NA-001 from the 19 to 26th March. During his stay, Foster will be active from the islands of South Andros and New Providence. His activity will be mainly on 7 and 14MHz and possibly others as time and conditions permit. Try looking for him during mid-afternoons on 14260 or 14300kHz.

International HF Contest

Some news now from *PW* reader **Alexander Korda OM6SA** who has sent in some details of an annual contest organised by the **Slovak Amateur Radio Association** (SARA). The Low Power Spring Sprint will be held on Easter Monday 9 April between 1400 and 200UTC and is for c.w. only in five power categories: A 1, B 5, C 25, D 50 and E 100W output and three band categories, Single, Two/Three bands and **all** bands 1.8, 3.5, 7, 14, 21 and 28MHz only.

The format of the contest is very simple with the exchange being RST, IARU locator and power category. For example, 579 JN98 C. Alex says "I regard this as very suitable for operators of any standard and especially those new to contesting." Further details can be found at **www.hornucopia.com/contestcal/lowpowerspringsprint2006.pdf**

Your Reports

I begin your reports with the log of **Ted Trowell G2HKU** on the Isle of Sheppy in Kent who has spent a fair amount of time on 1.8MHz this month. Ted say's "Top band has been very interesting at times though QRN has made listening rather difficult. When the band did go quiet I heard several Japanese stations calling - only to be smothered by some really awful operating from Europeans."

Among Ted's contacts around 2100UTC were K1GUN John in Woolwich , Maine, 5A7A (Libya) and VY2ZM (Canada) a contest station established in 2001 and located in Eastern Kings County, Prince Edward Island. All contacts were made using a Ten Tec Omni V and 70W to a Butternut HF6 vertical.

Leighton Smart GW0LBI in Trelewis, Mid-Glamorgan is also very active on the band and using his Yaesu FT-100 with 100W c.w. to a 67m (220ft) long wire antenna. Between 2000 and 0100UTC W4ZV (USA) William in New London, North Carolina, UA4HBW (European Russia), HB0/DL2OBO (Lichtenstein), EA8AX (Canary Islands) AF-004, SP7GGV (Poland), UX3HX (Ukraine), CT4L/QRP (Portugal) and DL1RWN (Germany) all made the log.

In Worcester Park, Surrey **Eric Masters G0KRT** fired up his Kenwood TS-570DG and with 100W to a W3EDP found DQ4M (Germany) 2219, OH0M (Aland Island) EU-002 at 2222, SN2B (Poland) 2233, F5IG (France) 2208 and PA0ILM (Netherlands) at 2218UTC using c.w.

THE 3.5MHz BAND

Moving to 3.5MHz (and again using his key) Eric switched his transceiver to a Yaesu FT-817 and with 5W worked DR5E

(Germany) 1630, I1BAY (Italy) 1854 and F6AUS (France) at 2050UTC.

On to Northern Ireland now and welcome to new reporter, retired senior ambulance officer **John Crawford-Baker GI0HWO,** who has been using PSK31 for his h.f. activities. John's station includes an Icom IC-756 ProIII and a 60m (200ft) doublet at 16m (55ft) running East/West from his QTH on a small peninsula called Islandmagee at the head of Belfast Lough, Larne, County Antrim. Contacts on the band included PA3DTR (Netherlands) 2002, RV3HA (European Russia) 2009, SM3HFD (Sweden) 2018, HB9MCZ (Switzerland) 2035, OE9MHV (Austria) 2041, F6DEO (France) 2115, DL1RWG (Germany) 2124 and SP1DTG (Poland) at 2148UTC.

Back in Wales, Leighton GW0LBI decided to try listening for a change between 2200 and 0100UTC using a Trio R-600 receiver and a random wire for the antenna. Stations heard included 9M2PV (West Malaysia), NP4A (Puerto Rico) NA-099, KJ2S (USA) Richard in New York, YV4TAU (Venezuela), VE1PEI (Canada), 9L3KN/MM off the coast of Liberia and 1A4A (Sovereign Military Order of Malta) QSL direct only to **Massimo Cortesi IZ4DPV, PO Box 24, 47100 Forli' Centro (FC), Italy.**

The 7 & 14MHz Bands

In Oxford another new reporter, **Paul Goodhall M3JFM**,enjoyed a spell of RTTY on 7MHz. Between 1700 and 1730, Paul lists amongst his contacts OH2LU (Finland), HA8EK (Hungary), UT1IA (Ukraine), ER5DX (Moldovia), 4L1FP (Georgia) and ZC4LI (UK Sovereign Bases on Cyprus) AS-004. His equipment was a Kenwood TS-570DGE running 10W to a Hustler 6-BTV Vertical antenna. S58MU (Slovenia) 1856 and F5OEL (France) were worked by Eric G0KRT on c.w. and just 5W while on s.s.b. and using 100W EA8OB (Canary Islands) made the log at 1948UTC.

On 14MHz, **Owen Williams G0PHY** in Biggleswade, Bedfordshire worked s.s.b. calls RK0UT (Asiatic Russia) 0904, UN7MMM (Kazakhstan) 1031 and TF4/RRC (Iceland) EU-021 at 1150 using a Yaesu FT-747 and 100W to a dipole antenna.

Also on the band was **Martin Addison 2E0MCA** in East Finchley, North London who used a Yaesu FT-840 and 10W s.s.b. to a folded half-size G5RV antenna working s.s.b. stations LZ2007EU (Bulgaria) and a special call commemorating the Bulgarian admission to the European Union at 0847, GD4PTV (Isle of Man) Brian in Bride, EU-116 at 0925, R7C/TF (Iceland) 1028, II1XMAS a special call for Christmas! At 1128, EA8EQ (Canary Islands) AF-004 at 1154, HA503FIN (Hungary) 1331, RK3XWO (European Russia) 1418, A61AU (Dubai) 1426, SQ9ITA (Poland) 1430 and SV9CVY (Crete) EU-015 at 1500UTC.

Eric used his '817 once again and had several 'two way' QRP contacts with OM7DX (Slovak Republic) 0836, OH3RF (Finland) 0857, 5A7JP (Libya) 0911 and EA4CJI (Spain) at 1030UTC.

Back in Oxford Paul M3JFM used RTTY again at 10W but this time with a Windom antenna to work AA3B (USA) Joseph in Boyertown, Pennsylvania, S54E (Slovenia), IQ3UD (Italy) Associazione Radioamatori Italiani - Sezione di Udine QSL via IV3DSH and 9A5CW (Croatia) between 1600 and 1700UTC.

The PSK of John GI0HWO reached RV9OK (Asiatic Russia) 0855, ZL2CV (New Zealand) OC-036 at 0914, HB9DRV (Switzerland) 0924 and RK6JKN (European Russia) at 0959UTC.

Finally for 14MHz, **Keith Winward 2E0JKD** in Middlesbrough used c.w. to find SP5EPP (Poland) 1336 and RV6FQK (European Russia) at 1341 before switching to PSK31 and logging F4EZD (France) 1420, SV1GGA (Greece) 1530, RX3DQ (European Russia) 1530, UR8GM (Ukraine) 1541, IW0HOS (Italy) 1543 and EA5CVS (Spain) at 1904UTC using a Yaesu FT-920 and around 30W to a Cobwebb antenna.

The 18 & 21MHz Bands

The 18MHz band was open occasionally and allowed a few contacts for our reporters. Ted G2HKU managed HK7AAG (Columbia) and 6Y3R (Jamaica) NA-097 on the key around 1500UTC, while John GI0HWO had a PSK31 QSO with UA3IFH (European Russia) at 0951UTC. Owen G0PHY worked XT2C (Burkina Faso) at 1559, while Martin found CN2DX (Morocco) at 1526 both s.s.b.contacts on voice.

Also on the band was **Jim Pedley GM7TUD** in Dumfries who had QSOs with C91VB/6 (Mozambique) AF-088 at 1125, VU7LD/VU2VKU (India) on Lakshadweep Island AS-011 at 1145, 5H3VMB/5 (Tanzania) AF-074 at 1208 and XT2C (Burkina Faso) at 1518UTC using s.s.b. from a Kenwood TS-450S transceiver and Cushcraft MA5B antenna.

The 24 & 28MHz Bands

The 24MHz band provided Jim with 5H3VMB/5 once again at 1007 followed by 1A4A (Sovereign Military Order of Malta) at 1245UTC. Ted G2HKU lists 3V6T (Tunisia) and V51AS (Namibia) on 28MHz, which was open for a short time around 1150 while Jim GM7TUD worked 1A4A again at 1159UTC.

Signing Off

Well that's about it for another month and I hope that I have managed to fit all your reports in this time? There is just enough room for me to thank all our reporters for their logs and **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for all the DX information. I wish you all good DX filled month.

73, Carl GW0VSW

75 Years Celebrations

History of h.f. operating during the 1970s

QRP

The long-distance low power record was set by **KL7YU** and **W7BVV** using one microwatt over a 2655km (1,650 miles) 28MHz path between Alaska and Oregon in 1970. This was the equivalent of 1.6 billion miles per watt!

WARC Bands Introduced

In 1979, due to the efforts of the **International Amateur Radio Union** (IARU), the union that represents Amateur associations at World Administrative Radio Conference's (WARC), Radio Amateurs got three new h.f. bands allocated to them. These were 10, 18 and 24MHz.

Amateurs had to adapt their antennas and find ways to allow their equipment to transmit on the new frequencies. The 10MHz band was very narrow and only c.w. and RTTY were initially allowed, though some operators did (and still do) use s.s.b. on the band today. Because of the relatively small bandwidth on each of the bands there is a kind of gentleman's agreement that they should not be used for contests of any kind.

A couple of interesting QSL cards received by Martin Addison 2E0MCA.

In Vision

Graham G8EMX rounds up the latest ATV news.

Graham Hankins G8EMX
E-mail: g8emx@tiscali.co.uk

Brian Kelly, the new editor of the **British Amateur Television Club**'s magazine *CQ-TV*, lives in a fairly remote location in Wales. And although extremely computer literate, his E-mails have shown the software and power problems he had while setting up his PC to handle the BATC's magazine software.

Brian had a new computer that would not activate Windows XP because Microsoft considered the number had already been used; so following a busy telephone helpline; eventually getting to speak to someone, then the phone line dropped out; Brian tried again, obtained a new activation code, keyed them in and then suffered a power cut!

After all this, Brian found that the BATC membership database was not compatible with other operating systems and there was yet another power cut, this time prolonged. Thankfully, despite all this, *CQ-TV 217* was eventually sent to the printers! I am sure things can only get better…

Satellite TV

I am presently selling my home in Acocks Green, Birmingham and I'm temporarily 'house sitting' for a friend in nearby Erdington. The first thing I noticed was that the house was only equipped with a dish and Sky receiver – it had no terrestrial antenna at all. I had never played with satellite TV before and couldn't find an instruction manual but getting going was obvious enough.

I don't know what Sky package the house has but the number of channels is bewildering. Picture quality appears to be quite stable and no different – neither better nor worse – than the terrestrial Freeview Service.

The Sky Electronic Programme Guide (EPG) can take several seconds to load but there is much more to be loaded, of course. It also always reverts to the top of the long list when the 'back-up' button is pressed - my preference would have been for it to go back to where you were in the list.

I do have one other criticism of the EPG – there is no individual programme detail for the radio channels, just broad statements of the station types. The Freeview service separates each title, which is very useful for Radio 4. The hard disc receiver my friend has will record an audio broadcast in the same way as the TV channels.

New Zealand News

It's always good to hear from the readers of In Vision, either in person at rallies or by E-mail from far and wide. I received the following from **Vince ZL1VL** (ex **G3TKN**), in New Zealand:

"Dear Graham, I read with interest your section titled 'The First TV Service' (In Vision, August 2006) and subsequently went on to look at the British TV Heritage site. I was particularly taken up with the Heritage's project to transmit black and white TV pictures on the original Ch1 (system A 3.5MHz sound/vision separation) from Alexandra Palace."

"I thought it might interest your readers to know that out here in New Zealand the main TVNZ channels are still being transmitted on both Band 1, 3, 4 and also 5. The u.h.f. band is used only for Maori TV, Prime and some local TV broadcasting. I believe there is still a lot of merit in using these lower frequencies for TV transmissions; there are many hilly areas outside of Auckland for instance that would not receive TV at all if it was transmitted on u.h.f. I helped a friend who lives in a very hilly area erect a 9-element log periodic array (made by Alkan in NZ and designed for Bands 1 and 3). Despite the terrain, we had nearly perfect pictures on TV1, (Band 1) and TV2 and Channel 3 (Band3) and yet u.h.f. transmissions are not readable at all in this particular area where my friend lives."

Vince continues: "If we go back to the early days of black and white TV broadcasting in the UK, it's interesting to remember that relatively few main stations operating in Band 1 covered a very large percentage of the UK population; names such as Crystal Palace, Sutton Coldfield, Holm Moss, Rowridge, North Hessary Tor, Wenvoe, Kirk O'Shotts come to mind. Having been brought up in this era, I was very pleased to see the British Television Heritage group wanting to resurrect Band 1 (even only for a limited time) as I feel these range of frequencies have served us so well, and are doing so to this day here in New Zealand." 73s Vince ZL1VL/G3TKN

Thanks for that Vince – fascinating stuff!

Graham G8EMX

75 Years Celebration

Looking Back - the 1970s

The 1970s was a relatively quiet decade for television development. The BBC1, BBC2 and ITV services were well established and with the major breakthrough of compatible, stable colour transmissions having been introduced in 1968, it seemed that little else was required of the television services. There was no obvious demand for TV stereo sound, which was 10 years away anyway (sound had always been the 'poor relation' of TV) so the viewing public seemed content. There was a hint of the digital changes to come when, in 1973, observant viewers began to notice the 'twinkling dots' above some underscanned pictures; these were the digits of the Teletext system, putting out text information and rudimentary graphics to viewers who bought the set-top boxes.

However, even if development of the television system was relatively static, there would be a lot more of it. Early morning channel close-down times disappeared in 1972, as the government removed the restrictions on broadcasting hours, releasing a huge increase in television time that had to be filled. This would prove to be relatively insignificant - all our thinking on television viewing and organisation of our television lives was about to be twisted and shaped in a far more dramatic way.

The high street window-shopper was quite familiar with the television screens on show in the retailers. In 1974, another display appeared by the 'For Sale' sign in the shop window. The new display proudly proclaimed: THIS IS A RECORDING. The video cassette recorder (v.c.r.) had arrived!

The video recorder - a masterpiece of domestic electro-mechanical design and production, was available for everyone, not just the broadcasters. There was no longer a need to actually be at home for *Coronation Street* anymore! The rest, as they say, is history.

The v.c.r. became the fastest selling consumer product of all time, the JVC Video Home System (VHS) competed with and eventually won against Sony Betamax (there was even a Philips system but relatively few were sold), colour sets outsold black and white sets by 1976 and in 1978 the BBC ended its 'junking' policy and opened its film and video archive to provide repeats for us to record and enjoy again and again and again!

Introduction

As usual, selecting the articles to appear in this 'spotlight' view of notable items published in *PW* is a fascinating job, as Rob Mannion G3XFD explains!

The PW Treasure Tracer
Selecting the articles for this special 16-page section of the magazine is a truly enjoyable job and many memories come flooding back when I'm researching. I had first started reading my own copy of *PW* in 1954. Previous to that time, I sneaked a preview from my Grandfather's copy. This meant getting into his office/study cum shack – where the 'young Robert' (I was always called Robert by my grandparents) was not welcome. In fact **2FD** (He held a pre-war 'Artificial Aerial' callsign licence) never encouraged me into his 'den'. At the time I thought this was unfair but many years later I realised it was his escape from Grandma who wasn't sympathetic to anything that was technical, associated with books or journalism!

My grandfather **Fred Durnford** (by an amazing coincidence his initials - FD – appear in my callsign) was a busy journalist and inveterate experimenter, enjoying working with anything technical so he could learn how it worked. As soon as he saw the *PW* Treasure Tracer (TT) in *PW* he started scrounging the bits and pieces from me to build his version. For some very odd reason he never asked directly, instead he would suggest he'd be interested if I came across anything or ask via my mother!

Once the TT had been built 'Grandpop', as he was known, very soon found all the sections of shrapnel pieces to be found in his garden! Located not far from the original Spitfire factory in nearby Woolston, Southampton (where my mother worked before joining the Army) he told me it was a reminder that an anti-aircraft battery had been located close by during the Second World War. Unfortunately, the largest historical item Grandpop found in the garden was a rusty charcoal filter unit from a wartime gas mask!

Denco Oscillator Coil
Very quickly, constructors who wanted to build the TT found that the Denco long wave oscillator coil was very difficult to find. We were both fortunate that the local radio shop – run by **Leo Worboys G3AFD** - had some in stock. However, Leo – as canny as ever - made sure he charged 'top prices' for the coils, as they were so difficult to find!

Leo became a very great friend of mine although his 'tight purse' reputation was legendary! We always joked together that he would use teabags three times over before they went into the bin! Many years later, I 'pulled his leg' over the air on 70MHz suggesting that he had purchased as many Denco long wave oscillator coils as possible to 'corner the market' and create an even bigger demand. My friend never denied the suggestion but for many years there was always a Denco coil on offer to me from G3AFD's collection, whenever I wanted to build a project!

As it as such a fascinating project, I'll be most interested to hear from readers who built their own TT unit. Perhaps your experiences - and how you managed to get the oscillator coil – would make an interesting letter? Finally, whatever difficulties we might have had - I think it's a fair comment to say that the *PW* 'Treasure Tracer' certainly provided a great deal of fun and helped to start a new 'treasure hunting' hobby for many keen users.

Tele-Tennis
Another pioneering project to appear in *PW* was the Tele-Tennis project. This month, I have only selected the first part of the series to be republished. However, even though I found that electronic video game to be addictive, it was (for the period) innovative and was 'state of the art' in the style of presentation.

The period of *PW*'s history in which the Tele-Tennis and Treasure tracer projects appeared was the last decade of the magazines' 'general radio ' and 'hobby electronics' coverage. The coming 1980s saw a radical change where the magazine would be re-dedicated to devote itself to Amateur Radio - to stride confidently into the future.

Rob Mannion G3XFD

1970 – 1979

Become a Treasure Hunter - The *PW* Treasure Tracer
August 1971
Fancy becoming a treasure hunter? Well, start here. We make no wild claims; just give you honest, proven results. Complete and detailed building instructions make this a suitable project for all levels. **Halvor Moorshead** gets you going.

Looking Back
1970-1979
Snippets from the *Practical Wireless* archives.

Tele-Tennis - Played on the Television Screen Part 1
July 1974
The popular new electronic game by **M.J. Hughes, MA.**

Coming Next Month
Join the *PW* team as we take a trip back to the 1960s.

Practically Yours

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- March Issue: 1980 - 1989
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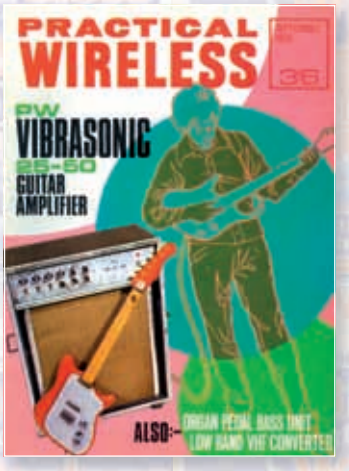
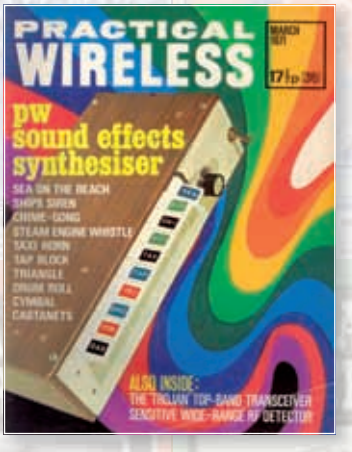
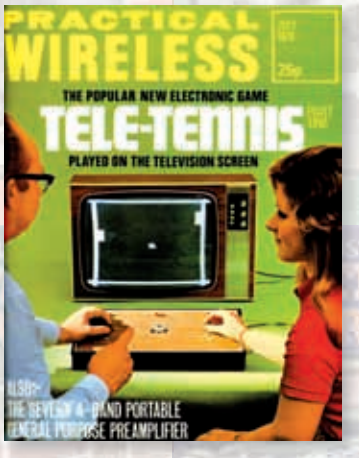
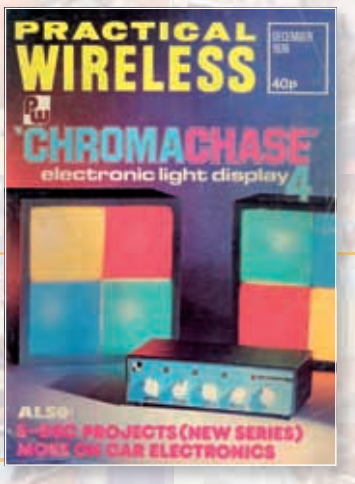
- May Issue: 1960 - 1969
- June Issue: 1950 - 1959
- July Issue: 1940 - 1949
- August Issue: 1930 - 1939
- September Issue: *PW* Launch in1932
- October Issue: Pre-*PW* Radio Days
- November Issue: Pre-*PW* Radio Days
- December Issue: Pre-*PW* Radio Days









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Aug 1971

The PW Treasure Tracer

Aug 1971

Halvor Moorshead

Rob Mannion G3XFD comments: *This truly iconic article spawned many new 'treasure seekers' and introduced many of us to a completely new hobby. The publishing of the article also led to a dire shortage of Denco long wave oscillator coils! Indeed, some people took advantage of the paucity of the Denco inductors and asked outrageous prices for them! I've checked and as far as I can tell - a licence is no longer required for this device. However, I suggest that anyone building such a project would be advised to check with Ofcom.*

The August 1971 text:

We thought very carefully before calling this article the *PW* Treasure Tracer. Certainly this sounds better than 'metal locator' but could we justify the title? We think we can, especially after our test. We found nothing of great value but judging by the results we could have, that is, if there had been any there.

Even if valuables are not found, certainly a whole lot of extremely interesting items will be and the history of an area of ground will yield up its secrets. However, your chances of finding coins are very good – about 150,000,000 coins are lost **every year** and a high proportion of these must be lost in areas where they can be found using a device of this type.

Not many months ago (in 1971) a hoard of Anglo-Saxon coins was found, using a metal locator, these were later auctioned for £9,000. It shows what can be done!

Variety Of Principles

Metal locators work on a variety of principles and the author has experimented with a number of different circuits. Nearly all rely on the fact that metal objects distort magnetic fields.

Complex designs have appeared from time to time making use of various effects – each claiming to be an improvement over others – but the author's experience has not borne out these claims. The principal used here – the beat frequency type – is possibly the oldest and certainly the simplest.

The design needs only one wound coil, unlike many other circuits and the sensitivity and results are excellent. We are deliberately not over-stating our claims and the only figures for range, etc. are those proved by our tests.

Two Oscillators

The Treasure Tracer comprises two low power r.f. oscillators working at about 130kHz. One of the oscillators is screened inside the chassis and the frequency can be altered over a fairly wide range to match it close to the other. The second oscillator uses a frequency determined by the inductance of a winding, which is used as the search coil.

In the absence of any material to affect the inductance of this search coil, the oscillator is at one frequency. However, when this coil is moved near some metal object, the inductance is altered slightly and the frequency of oscillation is changed. If the oscillators are set closely together an audio beat note is produced (equal to the difference in frequency), which may be amplified to feed a loudspeaker.

Let's assume that the search oscillator is working at 130kHz. The reference oscillator is adjusted to (let's say) 130.2kHz. The two signals are mixed together producing notes of 130.2-130.0 = 200Hz. **Note:** There's also another frequency produced, the sum of the two, 260.2kHz, but this can be ignored.

The presence of a metal object near the search coil will increase the inductance causing the frequency of the search coil oscillator to fall to say 129.8kHz. The beat note will now be 130.2-129.8 = 400Hz, so the raising of frequency of the beat note will then indicate the presence of a metal object near the coil.

From the theory outlined the Treasure Tracer was built, using a frequency below 150kHz to conform to regulations. Initial tests in the *PW* laboratory showed that the prototype was working reasonably well and that a definite beat note was obtained – but how would it work in practice?

The Tests

The first test was arranged at the *PW* offices*. A couple of dozen telephone directories were piled two high (making a thickness of at least two inches) and coins ranging form 1/2p to 50p were hidden under certain piles. All coins were found immediately but there was an extra reading – this turned out to be the wiring under the floor!

***Note:** The PW offices were still in London in 1971. **Editor**.*

Fancy becoming a treasure hunter? Well, start here. We make no wild claims; just give you honest, proven results. Complete and detailed building instructions make this a suitable project for all levels.

The tests were interesting and we were slightly encouraged but how would the metal locator (for we were still calling it that at this stage) fare in the field test? Only one way to find out – arrange one.

One Monday in late May 1971 **Eric Dowdeswell** (*PW* Editorial), **Peter Metalli** (Art Editor), **Jack Wood** (Photographer) and the author set out for Canvey Island in South Essex to put it to the test.

The weather was fantastic and the beach was far from empty and under the puzzled eyes of day trippers we began our search, panning up and down the beach, just above the water line.

Our hearts fell. For several minutes the whistle remained unaltered. Up and down we panned and gradually we began to think that the journey was wasted. Then suddenly the note changed frequency – a very definite, strong reading. As we dug Jack Wood photographed us and the picture is that used on this month's cover cover. A quick dig produced a rusty hinge about three inches under the sand. We must have been unlucky to start with for after our first 'find' as we then obtained readings every few yards. The items we found on this short stretch of beach and at other locations tried on the test are shown on page 67.

Silver Foil Curse

One thing cursed the search – aluminium 'silver' foil wrapping. We found it everywhere and it accounted for over 75% of all readings. We couldn't ignore these of course, for until we dug we didn't know what was causing the note to change frequency. The foil was from ice cream wrapping, cigarettes and sweets and even pieces - so small that they were only found after extensive sifting - gave strong readings.

We altered our technique because of the sensitivity of the Treasure Tracer to small objects. As soon as we obtained a reading we carefully located the **exact** position before we began to dig – this could be done within an inch or two. As we dug we put the sand in two piles and checked at intervals with the Treasure Tracer that there was still a reading in the original position.

If we had found nothing and the reading had disappeared we checked the two piles of sand. Invariably the metal was found in one of these. Even quite careful digging didn't stop us missing several items the first time around.

Our deepest find was at 9in. The strength of the reading confused us at first – it was too strong and over a fairly wide area. The 'treasure' turned out to be an aerosol paint can for retouching cars and a beer can of similar size was found at 4in with less trouble. The reading at 9in. was strong and it would be fair to assume that if the can had been deeper it would still have been found.

Sea Wall Success

We were very successful near the sea wall where people were sunning themselves but due to the numbers already there we could only try a few yards of this but it was here that we found our only coin which turned out to be a 1966 penny, badly corroded.

We had expected to find more money and because of our failure to do so, we arranged a test. One person buried coins of various sizes in a marked off area and we tried to locate them. These tests were successful and convinced us that we could unfailingly find all coins at depths up to four or five inches and larger coins at even more. As we progressed experience enabled us to locate more accurately and our ears became more and more sensitive to changes in the note.

Note: Just one word of caution! The beach will provide finds of all types but be careful near the water's edge. The spray landing on the search coil sent it haywire and searching became almost impossible.

Later tests carried out in the light rain proved fruitless for the same reason. Not only does the impact of the spray or raindrop change the note but water trapped in the turns alters the inductance of the coil. As the water evaporates the pitch of the note changes – the effect lasts several minutes during which searching is impossible.

The second part of the test was made on the outskirts of a nearby castle. Not unreasonably the custodians would not let us search in the grounds but recommended trying outside, pointing the way to the original approach roads. A number of items were found, though none were of any great age.

Garden Test

The final test was conducted in the author's garden in north-east London. Surprisingly, most of the items were found at the same depth under the lawn. When a reading was obtained a circle of turf about 6in in diameter was cut out, the item was found and the earth replaced. Laying the turf back in position in this way ensures no damage was done to the lawn.

The house was built in 1913 and the lawn is probably original. The objects found were probably from the building process, spread out before turfing – though the file we found was probably lost by some workman long ago.

Some pieces of shrapnel were found. This is not really surprising for at the height of the London Blitz the fire from the anti-aircraft guns was so heavy that shrapnel apparently came down almost like 'hail stones', according to a neighbour. Most of the shrapnel was cleared up but quite a lot would have buried itself in the ground.

Grass Guard

A grass guard was developed from experience; this can be seen in the photographs. It is a piece of Perspex, 6 x 6in. Fixed to the bottom of the search coil framework to stop blades of grass from touching the coil and so cause the beat note to change.

A total of four hours test searching was carried out to produce the finds shown. In that short period we became very much better at identifying signals and in the end knew exactly where to dig and even how deep we could expect to find the metal object.

Building The Tracer

The circuit of the Treasure Tracer comprises three distinct sections: the search coil oscillator, the reference oscillator and the audio amplifier.

The search coil oscillator is made around L1, which is wound on a wooden framework shown in **Fig. 1**. This is made up from two 6in lengths of hardwood batten with a section of 1.75in, though this section is not critical. These should be made into a cross by half-lapping as shown and small V shaped grooves cut into the ends. This framework must be rigid and if poor joints are made, theses should be firmly glued.

The handle is made up from wood of the same cross section as the coil framework and about 4ft. In length, though this will depend upon the height of the user. The base of this should be cut at 45° and screwed firmly to the coil former. A normal type screw can be used although it will alter the inductance of the coil, but as it's a constant it doesn't affect operation.

A small three-way stand off tag strip should be mounted a few inches from the bottom to provide a firm anchorage for the coil wires. A thin enamelled copper wire should be used; the gauge is not too critical and 32 to 38 s.w.g. will do if the wire has to be specially purchased, 36 s.w.g. (as used in the prototype)

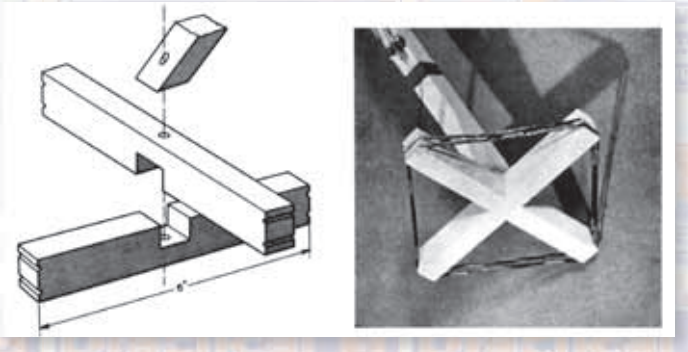


Fig.1: The construction of the search coil wooden framework. The search coil. Note the terminal tag at the top left and the taping of the wires.

would be a good choice. The start of the wire should be soldered to one of the outside terminal tags and 48 turns should be wound in the upper grooves, ending by fixing to the centre terminal tag.

The second part of L1 is wound in the lower grooves, again 48 turns, anchoring at the centre and other outer terminal. Both coils should be wound in the same direction and the centre terminal used only as a convenient centre tap, which is needed for the circuit.

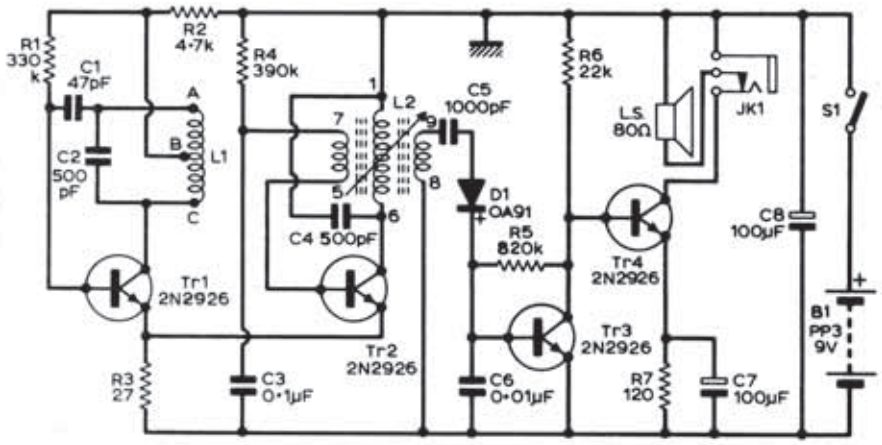
All windings should be tight, including the lead ups to the terminal tag. Once completed the windings should be taped together at several points to hold them firmly.

Important Note: It should be emphasised that the successful operation of the Treasure Tracer depends largely on the care taken in the construction of this search coil and loose windings will make operation very difficult and unreliable.

The inductor L1 is connected into the collector circuit of Tr1 as shown in the circuit diagram in **Fig. 2**. The capacitor C2, shown as a 500pF value, is connected across the coil and this combination will resonate at about 130kHz. The value of C2 and C4 (in the reference oscillator circuit) should be of the same type and reasonably close in value; miniature 5% polystyrene types are very good here and inexpensive. It doesn't matter too much what their values are as long as they are the same, but to stay within the regulation frequency band they should be over 390pF.

The components in the search coil oscillator are connected to form a Hartley oscillator, working at the frequency mentioned. The resistor R1 provides the base bias for Tr1 and C1 provides the feedback signal to maintain oscillation.

A low value resistor, R3, is connected in the emitter and Tr2, which forms the reference oscillator, shares this.



★ components list

Resistors

R1	330kΩ	R5	820kΩ
R2	4·7kΩ	R6	22kΩ
R3	27Ω	R7	120Ω
R4	390kΩ	All ¼W, 5% types.	

Capacitors

C1	47pF	C5	1000pF
C2	500pF†	C6	0·01µF
C3	0·1µF	C7	100µF 6V
C4	500pF†	C8	100µF 25V

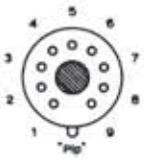
† see text

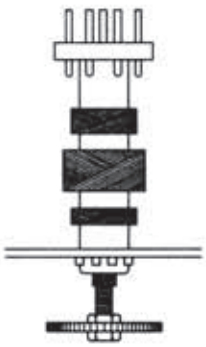
Semiconductors

Tr1	2N2926	Tr4	2N2926
Tr2	2N2926	D1	OA91
Tr3	2N2926		

Miscellaneous

L1—see text and drawings
L2 Denco LW aerial coil, Type 1T
LS 75-80Ω miniature loudspeaker
JK1 3·5mm jack socket with cut-out switch
SW1 On-Off slide switch
B1 PP3, 9V battery
Chassis 6¾ x 2¾ x 1¾in., (H. L. Smith Ltd. 287/9 Edgware Road, London W.2.) 60p inc. postage.





The inductor, L2, is a standard Denco LW aerial coil, which is fitted with the three windings necessary. The main one (between points 1 and 6) is tuned by C4. Another of the windings is arranged to feed back to the base forming a blocking oscillator; this also carries the base bias to Tr2.

The shared emitter resistor R3 means that there is a mixing action in Tr2 and a degree of the search coil oscillator signal is mixed with that of the reference oscillator to make the beat note.

It's necessary to tune one of the oscillators to bring it close to that of the other and here the reference oscillator can be tuned over a wide range by altering the position of the ferrite dust core. The coil should be mounted as shown in **Fig. 3,** with a small knob fixed to the brass thread attached to the dust core.

The take-off point of the coil comes from the third winding of L2 (between pins 8 and 9). The is d.c. blocked by C5, detected by D1, smoothed by C6 and applied to the base of Tr3.The signal here will be the beat note or an audio frequency represented by the difference in frequency of the two signals.

The base bias for Tr3 is provided by R5 with R6 acting as the collector load.

Tr4 further amplifies this audio signal and applies it to the 80Ω loudspeaker in the collector. R7 and C7 are included to raise the emitter voltage of Tr4 and to limit the quiescent current. The impedance of the loudspeaker can lie between 35 and 80Ω and various miniature types with impedances in this range are available. If difficulty is experienced in obtaining one of these, the loudspeaker can be replaced by a transistor output transformer (such as the Eagle LT-700) feeding a lower impedance loudspeaker.

There is a tendency for the two r.f. signals to lock together if they are within a few Hertz of each other. This is not too serious but the inclusion of R2, which drops the supply to Tr1, reduces this tendency. Theoretically the junction of R1 and R2 should be decoupled to the negative line using a 0.1μF capacitor; this however made no difference in the prototype but may be included if Tr1 fails to oscillate.

Note that the chassis is connected to the positive rail rather than the more conventional negative line. This enables simple fitting of the jack socket, JK1, one connection of which has to touch the chassis.

Assembling Project

The majority of the components are mounted on a small piece of 0.15in. matrix Veroboard, 16 holes by 13 holes and this is shown in **Fig. 4**.

The chassis used in the prototype, and highly recommended, is available from H. L. Smith Ltd. (see components list) and the bottom of this is drilled as shown in **Fig. 5**. The three holes in a triangle are fitted with 1in., 4BA screws and the component board is mounted on these, spaced off by means of nuts.

The loudspeaker can be glued in place and the wiring between the Veroboard and the other components is shown in **Fig. 6**.

The recommended chassis comes with a lipped lid, which is screwed, to the wooden handle as shown in **Fig. 7**. A hole 0.25in in diameter is fitted with a rubber grommet to take the wires leading to the search coil L1. Stiff wire should be used to run between the chassis and the terminal tag and this should be firmly taped to the handle as shown in the photographs. A small loop is left before entering the chassis to enable it to be opened.

Checking & Testing

Once all wiring is done a visual check should be made to ensure all is well and this being so, the Treasure Tracer can be switched on.

If all is correct the tuning of L2 will produce two positions where a strong beat note can be heard. A number of weak signals may be heard at other settings. These are probably caused by radio signals on those frequencies but they are very low compared to the main signals.

The beat note should be set at the lowest stable audio note – probably between 50Hz and 200Hz. When a metal object is brought near L1 the note will either go up or down, depending on whether the search coil oscillator is working higher or lower than the reference oscillator.

By experience it was found that it was better to arrange for the note to go **down** in frequency when a metal object was approached but this is up to the user as a rising note may be preferred.

Certain objects – especially brass – go against the general trend and operate in reverse – causing the note to rise when iron and aluminium cause it to fall.

No volume control is fitted as the output

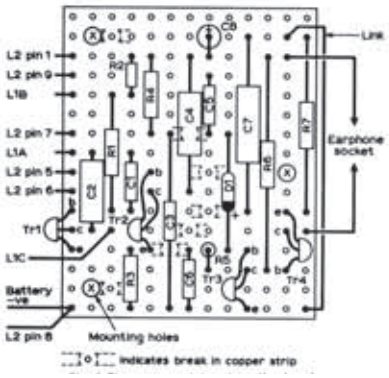


Fig. 4: The component layout on Veroboard.

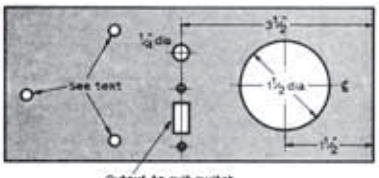


Fig.5: The drilling of the bottom of the chassis.

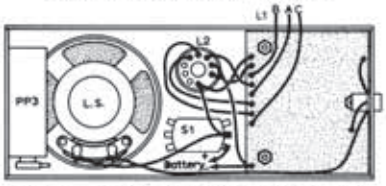
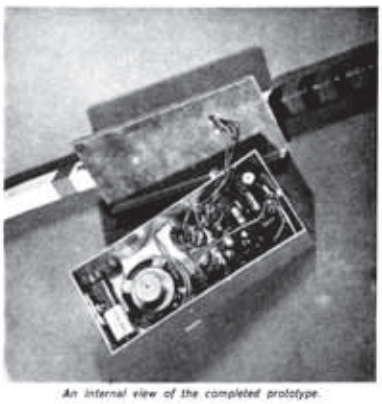


Fig. 6: The wiring between the component board and the other components.



An internal view of the completed prototype.

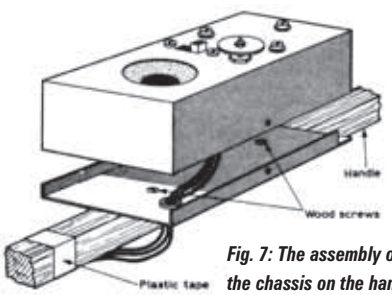


Fig. 7: The assembly of the chassis on the handle.

from the loudspeaker is fairly low – about 75mW, though this proved sufficient and was not found too low even by the sea shore. Headphones or earpieces with impedances between 50 and 4000Ω all work when plugged into the socket – this automatically cuts the loudspeaker out if wired as shown.

The current consumption is not too high – it should certainly be under 20mA and several hours of searching are possible using the PP3 battery specified.

Before carrying out your first search, eliminate as much movement of the lead up wires as possible by taping them, as even a mild breeze will cause a change in note otherwise.

In testing it will be found that nearly all large objects cause some change in frequency – even laying the coil on the ground – but these changes will be minute compared to that caused by even a small piece of metal.

Don't expect to become an expert in a few minutes. The use of a device of this type needs a degree of skill and it took all of us several hours before we became reasonable at it. Now, after the test, we have used the detector to find a whole mass of new material, including more coins, but this was outside the testing period and the finds were not witnessed so we are not including later items in the list.

Well, where do you search? **Please note that there are very heavy penalties for using such a device in areas scheduled as being of historical interest and there have been prosecutions of this.** However, there is no need to search in such places - paths or roads that have been in use for centuries are a good place to start and river banks will also prove fruitful.

An excellent small book *A Fortune Under Your Feet* by **E. Fletcher** elaborates on this and is recommended reading for those encouraged by early results.

If you find something of interest, let us know. We are offering £2 for the most interesting letter we receive dealing with objects found. It doesn't have to be valuable, just as long as it is interesting.

WHAT WE FOUND

1 Cart fitting (?). Found on the old farm road at 2'' down
2 Boiler clinker (?). Gave strong reading 1'' down
3 Sheet metal handle, badly rusted. Found in author's garden at 2.5''
4 Iron hinge. Our first find, 3'' under the sand
5 Nail found under the beach 0.5'' down
6 Copper gasket ring (?). Found under the beach at 6''
7 Shrapnel. Author's garden at 2''
8 Sharp metal spike. On the beach at 3''
9 Screw eye (from cloths line?). Author's garden, 2'' down
10 Small piece of torn metal. Beach at 3''
11 Copper tube (squashed). Author's garden, 2'' down
12 Piece of unidentified iron. Beach at 1.5''
13 File badly rusted. Garden at 2.5''
14 Plant label (?). Zinc, garden at 4''
15 Shrapnel. Garden at 1''
16 Copper clip. Beach, found at 3''
17 Shrapnel, gun metal, beach at 4''
18 Screw-on bottle top, beach, 1'' down
19 Shrapnel. Author's garden at 3''
20 1966 penny, Beach at 3''
21 Encrusted iron fitting. Under the beach at 1.5''
22 Thin copper tube (squashed). Beach at 2''
23 Copper tube (squashed). Author's garden at 2''
24 Piece of cast iron. Beach at 3''
25 Nail with small piece of wood attached. Beach at 1''
26 Cart fitting. Old farm road at 4''
27 Galvanised washer. Author's garden at 3.5''. Looked just like a coin until cleaned up
28 and 29 (not shown). Aerosol can and beer can. At 9'' and 4''

The one that got away! The tide came in so fast that before we had time to dig out the 'find' the water put an end to it.

Finding a small copper clip (Item 16). The grass guard made from Perspex can be seen fitted under the coil framework.

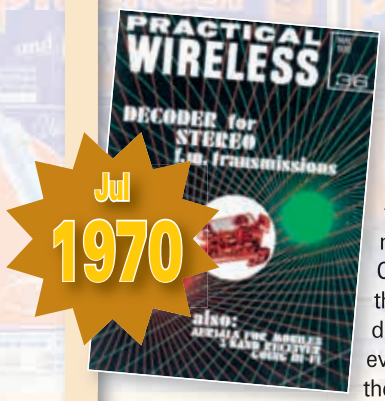
Searching along an old track. All we found here were cart fittings (Items 1 and 26) but such places should generally be more fruitful.

Money! Right against the sea wall we found our only coin – a 1966 penny, badly corroded.

To conform with the Wireless Telegraphy Act (1949) a licence is required to use the Treasure Tracer described here. Under Section 1(1) (Pipe Finder Licence) the band 16 to 150kHz can be used for equipment of this type. A licence for five years costs 75p and can be applied for on a form obtainable from the Ministry of Posts and Telecommunications, Waterloo Bridge House, Waterloo Road, London SW1.

Feature

News, Views and Memories from 1970-1979



Jul 1970

Audio Transducer

A new device, which reproduces music through a variety of ordinary household materials from an apparently invisible source, is now available. Called the Sound Scan Capsule, the unit may be concealed in the ceiling, under floorboards or behind doors to envelop the whole room in an even volume of music no matter where the listener may be standing or sitting.

This effect is achieved by linking the unit to the output socket of any record player (mono or stereo), tape recorder or amplifier. The capsule will work on almost any flat surface such as a table, picture or window and will diffuse sound over large areas – up to 2000 square feet in ideal circumstances. It is weather protected, will play under water and comes with a five-year warranty.

Measuring about four inches in diameter and less than three inches in depth, the Sound Scan Capsule is technically known as an audio transducer. It was invented in the USA, where it has been successfully marketed by Photo-Scan International of Los Angeles, manufacturers of electronic systems to combat shoplifting and pilferage.

Costing £10, the capsule will be available throughout the country from radio and electrical shops.

Further details from: Mr Colin Stewart, Sound Scan Ltd., Oakwood House, 63 Pound Lane, Marlow, Bucks. Tel: Marlow 6655.

April 1971

1971 RSGB President

At a reception held at the Bonnington Hotel, London on 15 January, **Fred Ward G2CVV**, Secretary of Derby and District Amateur Radio Society, was installed as a president of the Radio Society of Great Britain. Over 150 guests attended the function, including J. Sinnerton G2YS, J Graham G3TR, V Desmond G5VM, W A Scarr G2WS, A O Milne G2MI, P Hawker G3VA, W Corsham G2UV, A Forsyth G6FO, T Hughes G3GVV and L Newnham G6NZ. Also present were representatives of the Ministry of Posts and Telecommunications and 20 visitors from Derby including Mr A G G Melville, president of Derby and District Amateur Radio Society and his wife.

The Mayor of Derby, Alderman Miss M E Grimwood-Taylor (whose father was a founder member of the Derby society) sent Mr Ward her congratulations and best wishes.

Mr Ward is employed by the Post Office Engineering Department, and at present is in the Radio Investigation Service. He is keenly interested in the history of Amateur Radio and mainly through his efforts, Derby and District Amateur Radio Society (the oldest such society in the country) has a comprehensive collection of documents and equipment from the early days of Amateur Radio.

In his speech at the reception, the new president expressed the hope that all members of the RSGB would endeavour to enrol at least one new member, the aim being to double the existing membership by the end of his year of office.

Mr Ward's callsign G2CVV was issued to him in 1937. He is active on all bands from 160m down to 2m and he says, would be interested in the higher frequencies if there were more hours in the day!

Will Badman G2ZG

Britain's oldest active Radio Amateur, **Will Badman G2ZG** died in February. He was operating on the 160m and 80m bands right up to his death.

Will was an early pioneer of radio at the age of 18, while working in his father's electrical business at Weston-super-Mare, he charged the batteries used by Marconi in 1897 when the successful Bristol Channel spark test transmissions were carried out.

The call G2ZG was issued to him in 1922 for fixed station operations and G2KQ as a portable call for experimental broadcasts. On April 11 1922 he transmitted a service from Sunnyside Church, Weston-super-Mare, on 160m and one month later, using the frequency of 1000m he transmitted a programme from the local town hall.

Jul 1971

A selection of what was happening between 1970-1979 in the Amateur Radio hobby – how much do you remember?

Trio Technology

Aug 1979

The new Trio TS-180S makes its debut – and what a beauty it is too. Covering the h.f. bands 180-10m this transceiver uses digital frequency control, designed around a dual-circuit phase-locked loop, comprising a 4-bit microcomputer and four memories, usable in transmit or receive modes.

Arrangements allow any of the memory frequencies to be tuned in 20Hz increments up or down, either step-by-step or by scanning, the original stored frequency being retained for instant recall. Its like having four v.f.o.s in addition to the 'conventional' analogue v.f.o. with digital read-out. The memories permit split-frequency operation and three of the four provided can be retained by the use of battery back-up.

An innovative single-conversion p.l.l. system improves the spurious characteristics during transmission and reception, making i.f. shift and mono-dial indication possible in any mode. The dual i.f. filter, when inserted, improves receiver S/N ratio and selectivity significantly increasing speech processor efficiency in the transmit (s.s.b.) mode.

Gas Igniter

Oct 1972

No, it's not a device for 'doing-in' Editors – it's a piezo electric gas igniter! It's guaranteed for ten years, does not need any batteries or flints, you don't have to plug it in the mains or hold it under a hot tap! While you pause for breath, we'll explain:

The device, made in Germany by Junkers, operates on the principle that if a sudden force is applied to the interfaces of various crystals, an electric charge results. In practice, when the trigger is on this igniter is pressed it releases a 'firing' pin, which deforms the piezo crystal and causes a discharge voltage in the region of 20kV to appear at the end of the pistol 'barrel'.

The end of the barrel is designed like a car sparking plug so that the spark (of 50μS duration) jumps from the centre electrode to the barrel wall thus igniting the gas it is held near.

In the sketch (a) is the crystal mounting area and housing unit (b) and (c) are the points that the spark jumps from and (d) is the plastic housing of the complete unit.

The Junkers Piezo Eletric Gas Igniter is priced at £2.25 plus 15p postage and packing and may be obtained from Servitronix Limited, 572 Kingston Road, Raynes Park, London SW20.

Avo 1972

April 1972

Avo (Thorn Group) announce a completely new Avometer, the Model 72. It is the company's first pocket-sized multimeter with a sensitivity of 20,000Ω V d.c., an accuracy of ±2% on all d.c. voltage, a.c. voltage and d.c. current ranges, a frequency response up to 30kHz and the ability to measure up to 20MΩ.

A single scale calibrated 0-100 and 0-250 covers all voltage and current readings. A further scale covers resistance measurements. Only two input sockets are required for all measurements, which cover the d.c. voltage from 150mV to 1000V f.s.d., a.c. voltage from 10V to 1000V f.s.d., d.c. current from 50μA to 1A f.s.d. and resistance from 1Ω to 20MΩ.

The Avometer Model 72 is supplied complete with moulded test leads, interchangeable prods and clips and a comprehensive instruction book. Avo Limited, Avocet House, Dover, Kent.

Disc Car Aerial

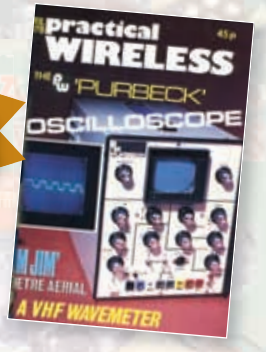
Dec 1972

A new car radio aerial is being introduced by Valan Electricals to complement their wide range of conventional aerials. Named the Valan Disc Aerial, it combines the function of an aerial with that of the road tax licence holder or club card holder and is fitted on the windscreen.

It can be fitted in minutes by anyone. The fitting instructions are simple and are on the reverse of the pack. It works equally well in all makes of car and commercial vehicles.

The recommended retail price is £1.20. The Valan Disc Aerial is available from Halfords and leading garage and accessory shops. Valan Electricals, 1034 Yardley Wood Road, Birmingham B14 4BW.

April 1978



Sounds Good

The American Federal Communications Commission (FCC) is to reconsider the feasibility of stereophonic sound channels for US television. First examined in 1964, the idea was abandoned some three years later on the grounds of lack of interest.

The Public Broadcasting Systems (PBS), means the question has been reviewed and the FCC is to hold an inquiry investigating the present feelings of manufacturers, broadcasters and the American public. At the same time, as in the UK, soundings are being taken to determine the interest in a.m. stereo and f.m. Quadraphonic transmissions.

July
1974

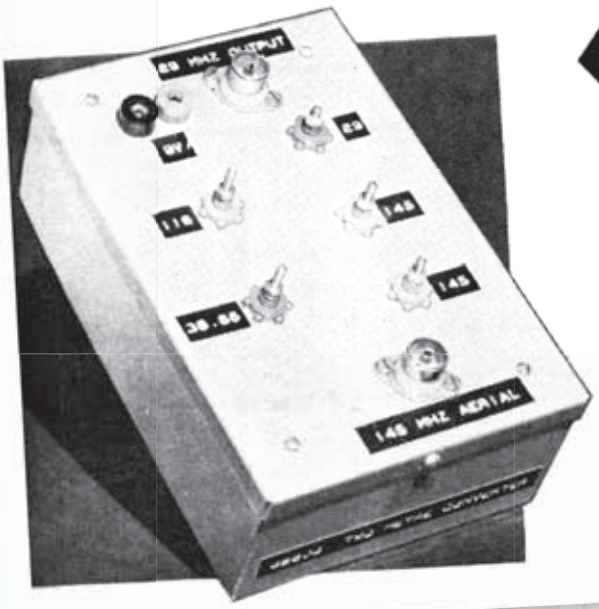
IN NEXT MONTH'S PRACTICAL WIRELESS

PLUG-IN TO PERSONAL LISTENING

STEREO HEADPHONE AMPLIFIER

PW DERBY

Do you run your expensive, high-power stereo Hi-Fi outfit just to listen on your headphones?? Of course you do!! Then why not build the 'Derby' which incorporates only the necessary stereo/mono preamplifier stages, plus full-range tone controls, to drive your headphones? Lightweight, mains operated, it can be fed from your radio or record deck.



TWO-METRE CONVERTER

Tune round the exciting 2 metre VHF amateur radio band on your own short wave receiver! Converts the incoming signals to the 10 metre band. No special coils or components required and simple alignment virtually guarantees first-time operation. A small 9V battery will operate the four transistor circuit.

MANY OTHER CONSTRUCTIONAL ARTICLES, SPECIAL FEATURES AND REGULAR COLUMNS AUGUST ISSUE ON SALE IN JULY

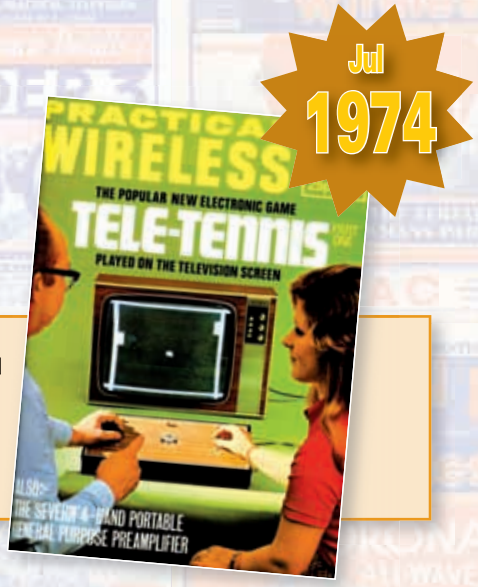
The above details are subject to the national industrial situation at the time of going to press.

The popular new electronic game

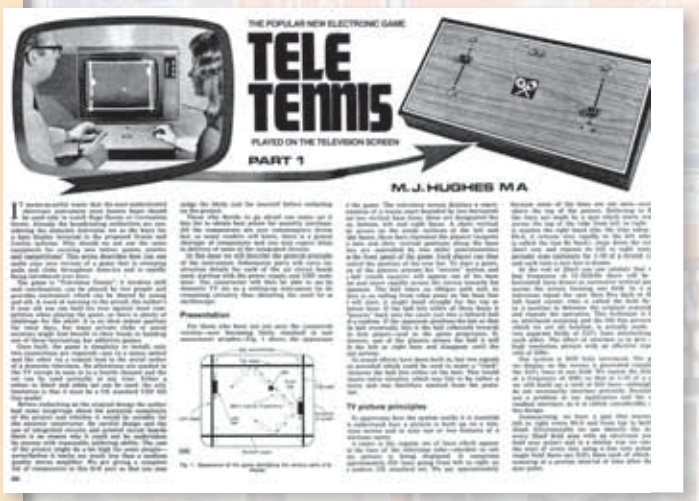
Tele-Tennis
played on the television screen

Part 1

By M.J. Hughes, MA



Editorial comment: Although I never built a Tele-Tennis system myself I did use one that was built by a friend. A truly pioneering electronic game, Tele-Tennis first published in the July 1974 issue, was hypnotic in effect and could eventually become annoying because players often developed into complete addicts! Several friends suggested it could be relaxing to play but I found my personal stress levels approaching the John McEnroe Wimbledon levels! **Rob G3XFD**



The 1974 text:

It seems an awful waste the most sophisticated electronic instrument most houses boast should be used only to watch Bugs Bunny or Coronation Street! Already the broadcasting authorities are considering the domestic television set as the basis for a data display terminal in the proposed Oracle and Ceefax systems.

Why should we not use the same equipment for exciting new indoor games, puzzles and competitions? This series describes how you can make your own version of a game that is sweeping pubs and clubs throughout America and is rapidly being introduced over here.

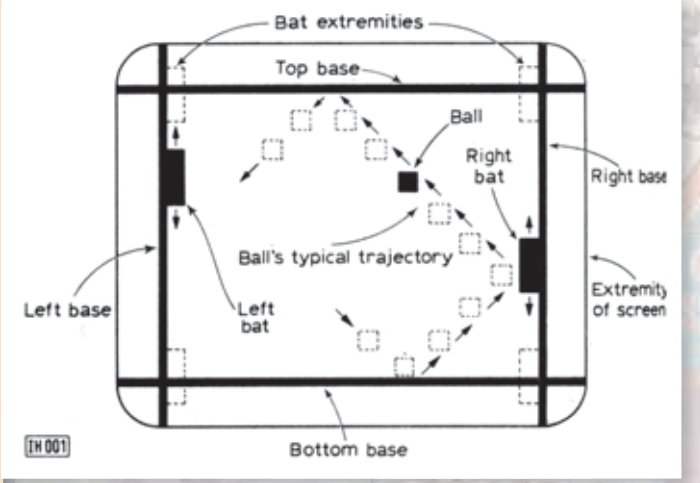


Fig. 1: Appearance of the game identifying the various parts of the display.

The game is 'Tele-Tennis', which involves skill and co-ordination, can be played by two people and provides excitement, which can be shared by young and old. However, a word of warning to the proud; the author's six year-old son can hold his own against most competition when playing the game, so there's plenty of challenge for the adult! T-T is an ideal indoor pastime for rainy days but many private clubs or social societies might find benefit to their funds in building one of these fascinating, but addictive games.

Simplicity To Install

Once built, the game is simplicity to install; only two connections are required – one to a mains socket and the other via a coaxial lead to the aerial socket of a domestic television. No alterations are needed to the TV except to tune in to a fourth channel and the set can be used normally at any time. Either a colour or black and white set can be used; the only limitation is that it must be a UK standard u.h.f. 625 line model.

Before embarking on the original design the author had some misgivings about the potential complexity of the project and whether it would be suitable for the amateur constructor. But by careful design and the use of integrated circuits (i.c.s) and printed circuit boards there is no reason why it could not be undertaken by anyone with reasonable soldering ability. The cost of the project might be a bit high for some people – nevertheless, it works out much less than a medium quality stereo amplifier. We are giving a complete list of components in this first part so that you my judge the likely cost for yourself before embarking on the project.

Those who decide to go ahead can make use of this list to obtain best prices for quantity purchases. All the components are now commonplace devices but, as many readers will know, there is a general shortage of components and you may expect delays in delivery of some of the integrated circuits.

In this issue we will describe the general principles of the instrument. Subsequent parts will carry construction details for each of the six circuit boards used, starting with the power supply and u.h.f. modulator. The constructor will then be able to use his domestic TV set as a setting-up instrument for the remaining circuitry thus obviating the need for an oscilloscope.

The Presentation

For those who have not yet seen the commercial version – now becoming fairly standard in most amusement arcades **Fig. 1** shows the appearance of the *PW* game. The television screen displays a representation of a tennis court bounded by two horizontal and two vertical base lines; these are designated the

top, bottom, left and right bases.

A short vertical bar occurs on the inside surfaces of the left and right bases; these bars represent the players' racquets or bats and their vertical positions along the base lines are controlled by two slider potentiometers on the front panel of the game. Each player can thus control the position of their own bat.

To start a game, one of the players presses their 'service' button and a ball (small square) will appear out of their base line and move rapidly across the screen towards their opponent. The ball takes an oblique path and as there's no telling from what point on the base line it will start, it might head straight for the top for bottom base. If the ball hits either of these bases it 'bounces' back into the court just like a billiard ball off a cushion.

If the opponent positions their bat so that the ball eventually hits it the ball rebounds towards the first player – and so the game progresses. If, however, one of the players misses the ball it will hit the left or right base and disappear until the next service.

No sound effects have been built in but two signals are provided, which could be used to make a 'clack' whenever the ball hits either of the bats. This would require extra circuitry, which was felt to be rather a luxury and was therefore omitted from the prototype.

Television Raster

To appreciate how the system works it is essential to understand how a picture is built up on a television screen and to note one or two features of a television raster. A raster is the regular set of lines, which appear on the face of the television tube – whether or not any picture is being displayed.

It comprises approximately 625 lines going from left to right on a modern UK standard set. We say approximately because some of the lines are not seen as they are occurring above the top of the picture. Referring to **Fig. 2**, the lines are made by a spot, which start scanning across the top of the tube from left to right. When it reaches the right hand side, the time taken being 64μS, it returns very rapidly to the left side (this is called the line fly back), steps down the screen a short way and repeats its left to right scan. This periodic scan continues for 1/50 of a second (20mS) and each time a new line is drawn.

At the end of 20mS you can calculate that with a line frequency of 15.625kHz there will be 312·5 horizontal lines drawn at successive vertical positions across the screen forming one field. In a normal television signal the spot then flies back to the top left hand corner (this is called the field fly-back) to a position in between the original scanned lines and repeats the operation. This technique is known as interlace scanning and the 625 line picture, with which we are all familiar, is actually made up of two separate fields of 312.5 lines

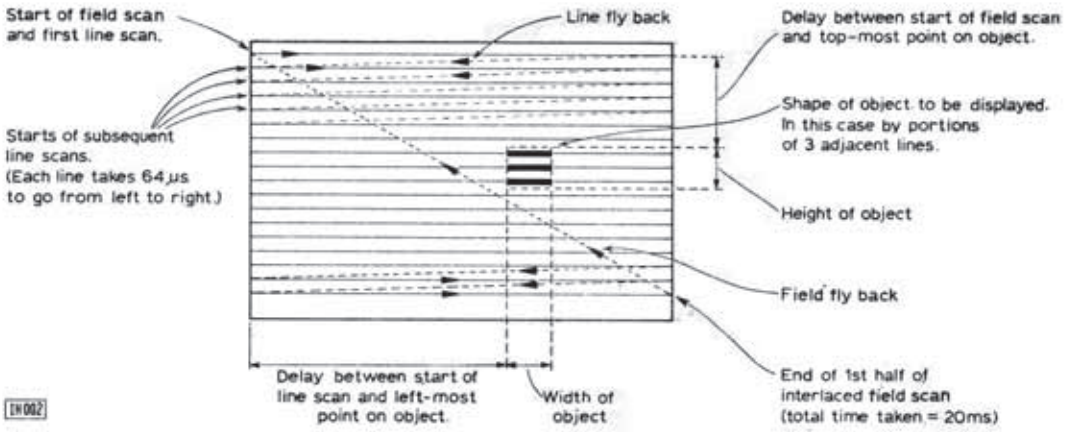


Fig. 2: Elements of a TV raster showing how an object's position can be represented by times within the field and line scans.

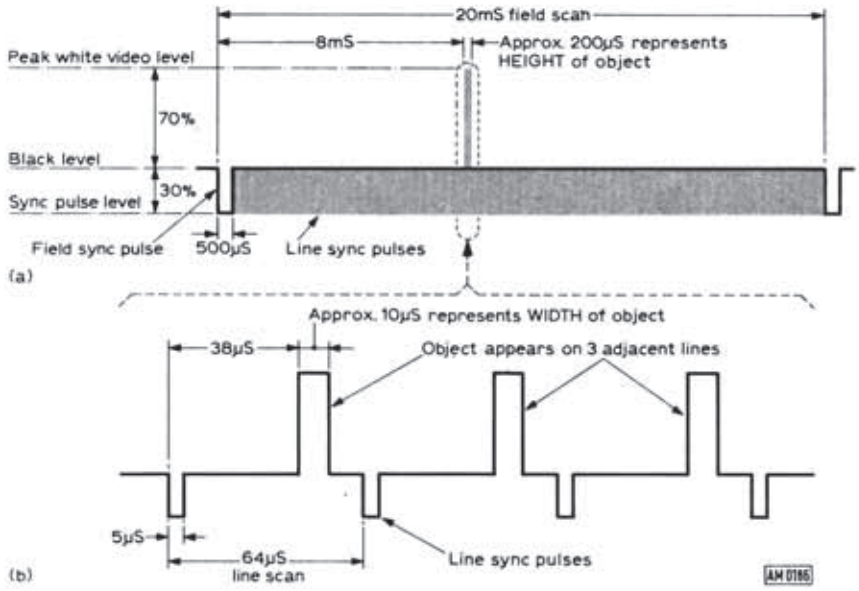


Fig. 3: The periodic waveform required to produce the object shown in Fig. 2.

interlocking with each other. The effect of interlace is to give a very high-resolution picture with an effective repetition rate of 25Hz.

Please note that the Tele-Tennis system is **not** fully interlaced. The picture we display on the screen is generated complete on the 312.5 lines of one field. We repeat the field scan at a frequency of 50Hz so that in 1/25 of a second we still build up a total of 625 lines – although they do not necessarily interlace precisely. Resolution is not a problem in our application and the use of random interlace (as it's called), considerably simplifies design.

Summarising, we have a spot that moves from left to right every 64μS and from top to bottom in 20mS. Electronically we can identify the start of every 20mS field scan with an electronic pulse (a field synchronisation or 'sync' pulse) and in a similar way we can 'tag' the start of every line using a line sync pulse. In a single field there are lines each of which starts scanning at a precise interval of time after the field sync pulse.

Picture Generation

Suppose, for example, with picture generation we want to delineate a square block on the screen at a certain position as shown in Fig. 2. We can do this by specifying on which of the horizontal lines the block is to occur and how far along those lines the block should extend. This can be done by co-ordinating the block in terms of time from the start of the field (this specifies on which line the block starts to be delineated) and time from the start of the line in question.

The width of the block is determined by the length of time we allow the spot to 'Bright-Up' along the line and the height of it, by the number of successive lines we allow to bright-up. This number of lines is equally determined by time.

The waveforms in **Fig.3**, show the signals, which would delineate the block shown in Fig.2. We take +300mV as an arbitrary zero signal level (called black level) any signals going from -300mV in a negative direction are the sync pulses – mentioned earlier.

For simplicity of circuitry we generate a single field sync pulse rather than the train of pulses normally used in broadcast TV practice. In our case we make the field sync pulse 500μS long (Fig. 3**a**) and between it and the next we generate approximately 312 line sync pulses – each 5μS long (Fig.3**b**).

Positive going signals above +300mV are video levels - these control the brightness of the spot on the television tube. A standard of 700mV above black level is taken as peak white.

To produce the block of Fig.2 we want to make use of three lines occurring about 8mS down the field. It takes 64 x 3 = 192μS for three adjacent lines to scan across the screen, so we can say that the height of the block is contained within a window of about 200μS occurring 8mS after the field sync.

The horizontal position of the block is just to the right of screen centre, say 38μS after line sync. To give the required width the duration of the video signal on each of the three lines would, in this case, be 10μS. Thus you can see that the video signal we want occurs over a very small portion of the field waveform and equally over a very small portion of the three lines.

Delay Elements

To generate the signal in the correct time position we need a number of time delay elements, controlled by the synchronisation pulses. One sets the vertical position while another sets the height relative to the field sync. A third sets the horizontal position and a fourth the width.

We take the field and line video waveforms so produced and combine them in an AND gate to give the video signal in its correctly coordinated time position. It's a little difficult to grasp this at first because we are dealing in times as opposed to normal vertical and horizontal dimensions. Nevertheless, after a bit of thought, I think anyone would quickly get used to thinking of vertical and horizontal times as being equivalent to dimensions across the face of the screen.

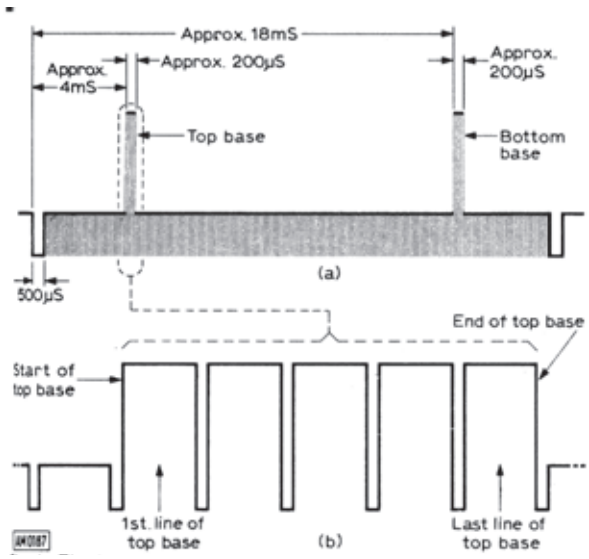


Fig. 4: The top and bottom baselines each occupy the whole of five line scans.

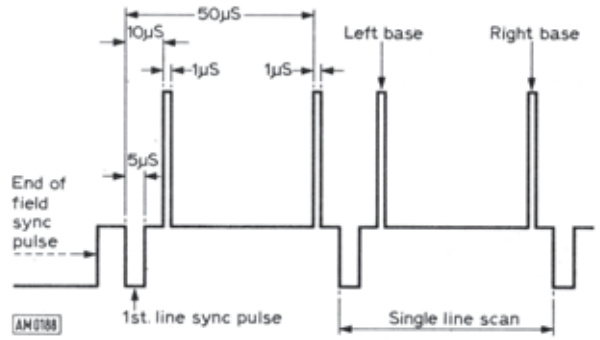


Fig. 5: The left and right base lines occur on every line of the field.

What's just been described is the technique for producing the video signal for the ball in our game. The position of the ball on the screen and its apparent movements are set by the time delays after the field and line sync pulses. These delays are generated by voltage controlled timing units.

The top and bottom base lines are somewhat simpler to produce because they extend the full width of the screen. We need only define the respective vertical positions and heights (number of lines to be brightened up). These waveforms are shown in **Fig. 4**. Similarly the left and right bases occur on every line so we need only define their co-ordinates in terms of time across the screen, **Fig.5**.

In practice we have to prevent video information appearing in our composite waveform during field and line sync pulses, which, for reasons of simplicity, are made the same length as the sync pulses. In other words the front and back porches normally present on line sync pulses are missing. We use conventional TTL logic levels of +5V and OV to generate and define all video and sync information and only in the last stage do we convert to normal television signal voltages.

In the descriptions that follow a logical '1' or +5V denotes that a video signal is in the state that would bright-up the spot on your screen. To simplify descriptions we have adopted a crude form of Boolean Algebra terminology to describe

our waveforms. For example if we use the term 'BALL' we mean the waveform that, if fed to the screen, would display the ball – $\overline{\text{BALL}}$ is therefore the inverted waveform for the ball. Other terms that we use include LEFT BASE, $\overline{\text{LEFT BASE}}$, RIGHT BASE, $\overline{\text{RIGHT BASE}}$, LEFT BAT, $\overline{\text{LEFT BAT}}$ etc. We shall define other terms later.

Block Diagram

A simplified block diagram of the complete system is given in **Fig. 6**. Note that we show basic AND and OR functions in this diagram; in practice NAND gates are used and the logic connections are rather more involved. These will be dealt with in detail in subsequent parts. It's more important at this stage to try to understand the overall system.

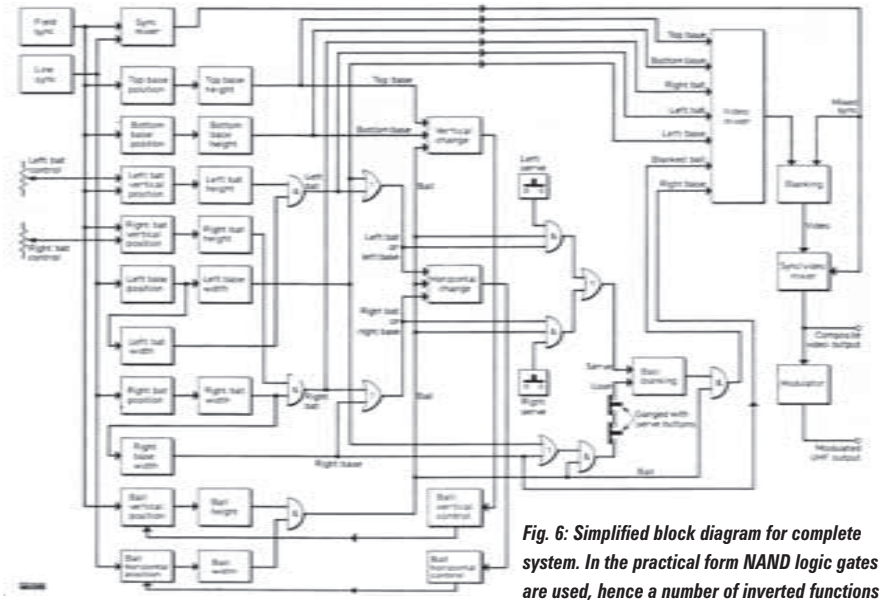


Fig. 6: Simplified block diagram for complete system. In the practical form NAND logic gates are used, hence a number of inverted functions appear which are not shown here.

All operations are linked to the field and line sync generators. These feed all the delay units which generate the functions of base lines, bats, bat positions, ball and ball position. Notice, immediately, that the left and right bat vertical positions are set by voltages from potentiometers feeding voltage controlled delay units. Similarly the ball's horizontal and vertical positions are set by the Ball Horizontal and Vertical Control units – each of which is triggered by a Horizontal and Vertical Change signal. All the other delay parameters are preset.

The AND gates just to the right of the delay units provide horizontal and vertical coordination for the left and right bats and ball. The seven waveforms emanating from the delay units are: TOP BASE, BOTTOM BASE, LEFT BAT, RIGHT BAT, LEFT BASE, RIGHT BASE and BALL.

Ball control

Generating these waveforms utilises most of the systems circuitry; the remainder performs fairly simple logic operations on these signals. Although the ball is only seen on the screen during a game it is there all the time, bouncing around between top and bottom or left and right base lines or the bats! Between games it is blanked by the logic circuitry.

Now to deal with that circuitry and first of all we'll look at the Vertical Change unit which detects when the ball 'hits' the top or bottom base lines. A 'hit', in reality, is coincidence of signal between the BALL and one of the base line waveforms. If we get BALL and one of the base line waveforms.

If we get BALL TOP BASE (coincidence between the ball AND top base) the vertical change system detects this with an AND gate. This sets a flip flop, the output signal of which causes a ramp generator to start a voltage sweep that increases the delay in the Ball Vertical position unit. Eventually, of course, there will be coincidence provided by BALL, BOTTOM BASE; this is detected by Vertical Change and the direction of the control ramp is reversed by the Vertical Change flip flop changing state.

To control the ball horizontally we need it to "bounce off" either the left or right base lines or the bats. Because the bats are inside the court, when they are in the correct vertical position we shall get coincidence with their signals before the respective base lines.

Nevertheless, it is necessary to get Horizontal Change signals from either BALL. (LEFT BAT + LEFT BASE) or BALL. (RIGHT BAT + RIGHT BASE). These signals are detected and processed by the Horizontal Change unit in exactly the same way as for the vertical operation.

Provided both these systems work the ball will stay within the court, bouncing about as already stated. There is only one problem – the ball must be inside the court to start with, otherwise it can never get in. This is a switch-on ambiguity and is overcome by means of a push button on the front panel, which, for want of a better name, we call the 'Ball Boy'. This centralises the output voltages of the two ramp generators. (It's not shown on this simple diagram).

Brightening Up Ball

To complete the system all we need is a method of brightening up the ball at the start of a service and ensuring that it stays bright until one of the players misses it. A miss is detected by coincidence between the ball and either the right or left base lines. In ideal play the ball never hits these because it would have hit a bat first, BALL is ANDED with RIGHT BASE + LEFT BASE and the LOSE signal is then fed via the push button contacts S2b and S3b to the Ball Blanking circuit.

If either of these coincidences occurs, the flip flop in Ball Blanking prevents the ball waveform passing through the following AND gate. The ball will then stay blanked until the next service.

Each player has a push button, which generates either a RIGHT SERVE or a LEFT SERVE signal. We arrange that if the LEFT SERVE signal is present and the BALL is coincident with either LEFT BASE or LEFT BAT it will bright-up. This logic is effected by the AND gate shown immediately below the representation of the Left Service button.

A similar signal is produced if the RIGHT SERVE signal is present when the ball hits the right hand base line or the right bat. Both right and left serve control signals are fed via an OR gate into the other side of the Ball Blanking flip flop.

The switches on the input to the LOSE side of this flip flop prevent coincident signals on both inputs. This could have been done by logic but it was felt more economic to use the spare contacts of the service push buttons. We have now modified our original BALL waveform to BLANKED BALL.

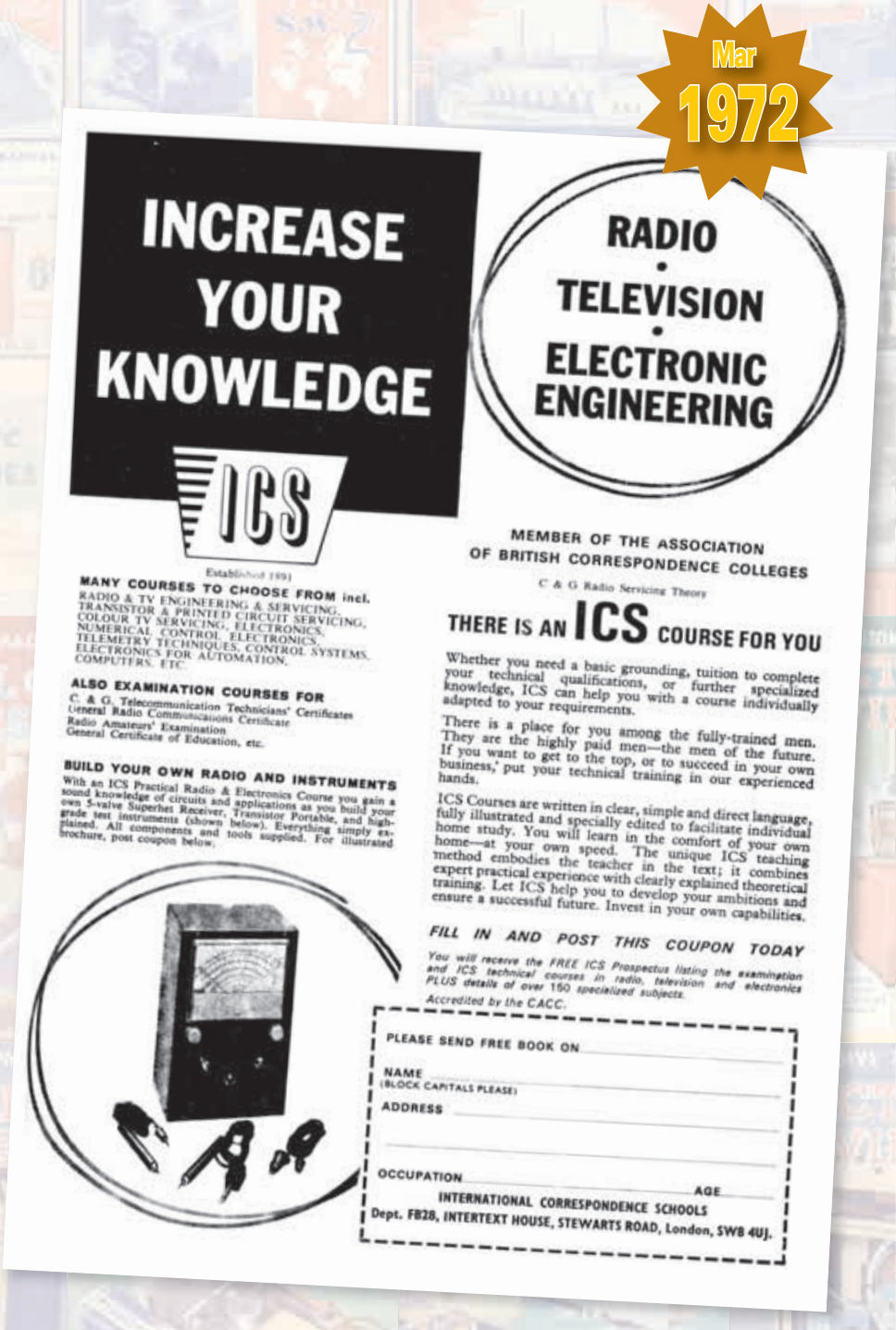
Video Mixer

All the waveforms are now combined in the Video Mixer which is a simple diode OR gate. They are then blanked to prevent their occurrence during field and line sync pulses and fed to the Sync-video Mixer. This circuit algebraically adds the correct proportions of video and sync to produce the composite video output signal.

The source impedance is a few hundred ohms, as opposed to the normal 75Ω. But the signal level is greater than the standard 1V peak to peak so when loaded with 75Ω this drops to a normal amplitude.

It's assumed that not many people will want to use a video monitor and so this signal is used to modulate an uhf carrier for injection into the aerial socket of a conventional television set. The modulator used was designed by the British Amateur Television Club and is offered in kit form by Crofton Electronics.

The design will only operate satisfactorily on UK 625 line standard. The same principles can be adopted for other TV systems but some of the timing components will need different values, and radio frequencies and modulation polarities will be at variance. ●



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● ***THE SAGA OF MARCONI OSRAM VALVE.*** *B. Vyse & G. Jessop*	346	£25.00
Valves		
● ***OUT OF PRINT HOW TO MAKE A NEUTRODYNE RECEIVER.*** *Webb*	63	£5.95
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To advertise on this page see the booking form below.

DISCLAIMER Some of the products offered for sale in advertisements in this magazine may have been obtained from abroad or from unauthorised sources. *Practical Wireless* advises readers contemplating mail order to enquire whether the products are suitable for use in the UK and have full after-sales back-up available. The publishers of *Practical Wireless* wish to point out that it is the responsibility of readers to ascertain the legality or otherwise of items offered for sale by advertisers in this magazine.

Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check both prices and availability of goods with the advertiser before ordering from non-current issues of the magazine.

Valves

VALVES:- OVER 50000 STOCKED Ham, Vintage, Military, Audio. SAE for FREE list to: Wilson Valves, (Jim Fish G4MH), 28 Banks Ave., Golcar, Huddersfield, West Yorks HD7 4LZ. Tel: 01484 654650/649380/650725. Mobile:- 07733 283084. Fax: 01484 655699. E-mail: wilsonv@zoo.co.uk Visa etc. Fast & personal service.

VALVES AND ALLIED COMPONENTS IN STOCK Ring for free list. Valves/ books/ magazines wanted. Geoff Davies (Radio). Tel: 01788 574774.

TOP PRICES PAID

for all your valves, tubes, semi-conductors and ICs.

Langrex Supplies Ltd.
Unit 4, Daux Road, Billingshurst, W. Sussex RH14 9SJ
TEL: 01403 785600. FAX: 01403 785656.

Repairs

REPAIRS TO ALL AMATEUR AND VINTAGE Rx/Tx Cost effective service. Phone or call in for details. Medway Aerials, Rear of 14 Luton Road, Chatham, Kent ME4 5AA. Tel: 01634 845073.

Aerials

GAREX ELECTRONICS VHF/UHF accessories and aerials, PMR equipment and spares. www.garex.co.uk

Tel: 0771 4198 374 PO Box 52, Exeter EX4 5FD.

For sale

Qtz x-tals 455kHz to 150MHz Std 10.106, 10.245, 10.7, 11.155MHz £1.00/unit. Callg 3.56, 7.030, 21.06, 28.06 £1.00/unit. 1.4MHz fltrs £14.00. 10.7MHz 10kHz fltrs £3.25 P&P £1.00 + VAT. IQ Electo 0208 391 0545. vincent@jakomin.fsnet.co.uk

Wanted

OLD HALF INCH FERRITE RODS Must be half inch in diameter and be six inches long or more. Tel: Peter Tankard 0114 2316321.

BABANI BP276 SW superhet receiver construction. No reasonable price refused. Tel: 01935 432845.

QSL Cards

FULL COLOUR QSL CARDS for all your QSL needs. Shirts and caps with callsigns and also ham cartoons by GW3COI. For free samples contact Chris M0DOL. E-mail: qslers@aol.com P.O. Box 184 Northampton NN3 9JH.

Classified Advertisment Dept.
PW Publishing Ltd.,
Arrowsmith Court,
Station Approach,
Broadstone,
Dorset BH18 8PW

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The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 70p extra. Semi-display setting £13.90 per single column centimetre (minimum 3cm). Please add 17.5% VAT to the total. All cheques, postal orders, etc., to be made payable to PW Publishing Ltd. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW. Tel: 0870 224 7820, Fax: 0870 224 7850.

Please insert this advertisement in the ..... **issue of *Practical Wireless*** (if you do not specify an issue we will insert it in the next available issue of *PW*) for ..... insertion/s. I enclose Cheque/P.O. for £.....(42p per word, 12 minimum, please add 17.5% VAT to total).

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Bargain Basement

SEND YOUR ADVERT TO:-
***PRACTICAL WIRELESS*, BARGAIN BASEMENT, ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW**

For your advert in Bargain Basement please remember to include your dated, coloured corner flash from this page along with your entry.

YOUR ATTENTION PLEASE!

Bargain Basement rules - £4 per advert

Please write your advert **clearly** in **BLOCK CAPITALS** up to a maximum of **30 words**, plus **12 words f**or your contact details on the form provided and send -it together with the dated corner flash and your **payment of £4** (**subscribers** can place their advert **free of charge** as long as they provide their **subs number and corner flash**), cheques should be made payable to **PW Publishing Ltd.**, credit card payments also accepted.

Send your advert to **Bargain Basement, Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW** or E-mail your advert to **peter@pwpublishing.ltd.uk** (If you don't want to include your credit card details on your E-mail, just 'phone us on **0870 224 7820**.

Please help us to help you by preparing your advert carefully. Any advert which contains **??** marks indicates that the advertiseing dept. could not read/interpret the wording. **Please avoid FAXing your advert - it could delay publication.**

Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. **No responsibility will be taken for errors and no correspondence will be entered into on any decision taken by the Editor on any of these conditions.**

You should state clearly in your advert whether equipment is professionally built, home-brewed or modified.

The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

FOR SALE

1949 MURPHY battery receiver. Was working last time I tried it 30 years ago, £1 you collect. Tel: Edwards 01671 402376 (SW Scotland).

AMATEUR GIVING UP Daiwa 30A PSU, Yaesu FT-840 transceiver, MFJ-949E tuner, MFJ-784 DSP, Yaesu DSP-6 speaker. All very good condition. Offers for the lot around £300. Prefer not to split. Tel: Derek M0DJR 02476 443485 (Coventry).

EDDYSTONE Rx 840 Excellent condition. Working, £40. Tel: 01778 570234 (Bourne, Lincolnshire).

ELECTRONIC MORSE KEYER KIT as published in Practical Wireless, 4-35wpm practice or transmit with auto switch-off. Excellent keyer yet simplicity itself to make. Full details provided, only £16. E-mail:- chick@chickene.freeserve.co.uk

ICOM IC-E7 plus soft case (LC-161) still in box, £150 o.n.o. Tel: 07753 40154 (London).

KENWOOD TS-950SD digital transceiver. Extended transmit for 5MHz. Exceptional condition. Boxed, manuals, as new, genuine reason for sale, £865. Tel: John 07767 301030 (St. Austell, Cornwall).

KENWOOD TS-870S HF transceiver in mint condition, £850. MFJ-989C ATU 3kW Roller coaster. Mint condition, £190. Also, Icom IC-275H 2 mete multimode, 10-100 Watts transceiver, good working condition, £350. Buyer collects or pays postage (Non smoker). Tel: Derek GW0CSR 01286 674455 (Caernarfon).

KENWOOD TS-5700D £475. MFJ-949E, £90. 25 Amp PSU, £75. All as new, boxed. Hustler 4BTV, £95 RTTY. Modem, £20. Tonituna, £25. Yaesu desk mic, £15 or £725 the lot plus carriage. Tel: 01745 570538. (Flintshire, North Wales).

KENWOOD/TRIO R-2000 communications receiver. 0-30MHz, good working order. Original box, manual, immaculate. Only £160 includes carriage. Also, desktop scanner PRO-2022 UHF/VHF direct entry 200 channel AM/FM. 60-950MHz only £80. Tel: 01608 663745 (Warwickshire).

SILENT KEY TA-33 Junior 3-element, 3-band beam, 20/15/10m. Jaybeam LR1/sm colinear base station, 2m vertical 4.3dBd, offers. Tel: G3YOL 01934 843144 (North Somerset).

W1191 WAVEMETER with calib. charts, spare valves, circuit and data. Selena Vega S.W. radio with mains PSU and circuit. Sinclair ZX-81 computer, boxed complete. Sensible offer please. E-mail: percibryka@hotmail.com (Stockport).

YAESU FT-1000MP MkV mint condition. Buyer collects. Bargain at £1100. No offers, cash only. Tel: Mr Cochran 01373 858165 (Westbury, Wiltshire).

WANTED

CIRCUIT DIAGRAM for AVO all-wave oscillator. Also, complete instrument (working or not working). Tel: 01591 620747 (Powys).

INSTRUCTIONAL MANUAL for Realistic scanner, 1000 channel PRO-2035. Will pay cost and postage. Tel: Ken M0WTD 0151 3481233 (Chester).

OLD HALF INCH FERRITE RODS must be half inch in diameter and be six inches long or more. Will pay very good money for the rods. Tel: Peter Tankard 0114 2316321 between 9am and 10pm (Sheffield).

SPY/CLANDESTINE RADIO SETS from any period or Oregon wanted by collector. Incomplete units for spares also wanted. Can collect or pay postage. Cash waiting. Tel: Bill 0208 505 0838 anytime.

CIRCUIT DIAGRAM for Kingshill model 50V2. Dual power supply, post copying costs paid. Please ring before 9.30pm, many thanks. Tel: 01430 828346 (York).

EDDYSTONE 6-pin coils. Tel: Peter 01205 871410 (Boston).

YAESU FRG-770 working. Tel: 0208 82921042. (London).

bargain basement order form

Please insert this advertisement in the next available issue of *Practical Wireless*.

❑ **For Sale** ❑ **Wanted** ❑ **Exchange**

PLEASE NOTE: as a security measure, you must include your house number and postcode.

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Address .....

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..... Post code .....

Telephone Number .....

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Signature..... Security number
last three digits on the back of the card

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CONTACT DETAILS FOR ADVERT.

Please only write in the contact details you wish to be published with your advert, ie. do you want your name & address, or just your telephone number?

Your advert, you decide! PLEASE - No FAXed Ads!

			(12)

B.B. Apr '07

TRADER'S TABLE

The equipment for sale on this page is secondhand or ex-demonstration

Disclaimer

Advertisements from traders for equipment that is illegal to possess, use or which cannot be licensed in the U.K, will not be accepted. While the publishers will give whatever assistance they can to readers or buyers having complaints, under no circumstance will the magazine accept liability for non-receipt of goods ordered, late delivery or faults in manufacture.

SHORTWAVE SHOP LTD

01202 490099

TRANCEIVERS

ICOM IC736 HF/6.....£550
ICOM IC703.....£375
ICOM IC703.....£350
YAESU FT2800.....£129
YAESU FT817.....£365
YAESU FT897.....£495
ICOM E 90 + 4M HANDY.....£195
YAESU 747 HF.....£295
NAVICO AMR1000 145MHZ.....£50
TRIO TW4000A DUAL BAND.....£85
AKD 2001.....£60
KENWOOD TR751E MULTIMODE.....£235
KENWOOD TS870 + ATU.....£949
ICOM IC208 2/70.....£155
YAESU FT290R.....£125
YAESU FT690R.....£125
KENWOOD TS690S.....£599
KENWOOD TS120S.....£195
YAESU VX5R.....£125
ICOM IC718.....£350

RECEIVERS

BEARCAT 278 BASE.....£95
COMMTEL.....£60
KENWOOD R5000.....£395
SONY SW11.....£20
BEARCAT 278 BASE EX DEM.....£139
BEARCAT 278 BASE S/H.....£99
SANGEAN AT818.....£85
ROBERTS 9914.....£60
AOR 5000.....£890
SONY SW07.....£25
ICOM 8500.....£695
AOR EM8200 MEMORY.....£35
GRE PSR282.....£65
NRD/JRC 535.....£420
REALISTIC DX395.....£125
AOR 8600.....£150
YAESU VR5000.....£400

ACCESSORIES

NISSIE BASE MIC YAESU/KENWOOD.....£55
ICOM SM6 BASE MIC.....£49
TOKYO HL50B AMP.....£180
ERA MULTIREADER.....£45
DIAWA 144MHZ AMP.....£30
DIAWA CAN 1001 HF AUTO ATU.....£125
MFJ 948 ATU.....£55
GLOBAL AT200 ATU.....£49
GLOBAL AT1000 ATU.....£60
RN ELECTRONICS TRANSVERTER.....£55
KENWOOD R2000 REMOTE CONTROL.....£145
TONO MR1300E.....£60
MFJ 722 OPTIMIZER UNIT.....£25
KPC-2 TNC.....£85
PACCOMM TINY-2.....£85
MIRAGE 2M AMP 160W.....£159
FRV 7700.....£20

For latest list please see www.shortwave.co.uk

NEVADA

023-9231 3090

Alinco DJC7 Handy Transceiver c/w Soft Case/Earphone/ERW4C Interface Lead.....£149
Yaesu FT736R 2/6/70cms Base Transceiver.....£599
Alinco DJX3 All Mode Scanning Receiver.....£75
Bearcat 220XLT 200 Channel Handheld Scanning Receiver...£79
Bearcat UBC120XLT 100m Handheld Scanning Receiver.....£79
Bearcat UBC860XLT Scanner.....£99
Icom R10 All Mode Scanning Receiver.....£179
Uniden UBC180XLT Handheld Scanning Receiver.....£109
AOR 7030+ Receiver c/w NB, Filter Board & Remote Control.....£699
Grundig Satellit 800 HF & Airband Portable Radio.....£299
Roberts R861 Portable All Mode Worldband Radio.....£129.95
Sony SW100E Compact Worldband Receiver.....£99.95
Yaesu VR5000 Wideband Receiver.....£399
Eton E1 Shortwave Receiver.....£325
Icom 7000 HF/VHF/UHF Mobile with DSP/new display.....£825
Icom 7400 100w HF/2/6m Base Transceiver with DSP/ATU...£999
Kenwood TS850S 100w HF Base Transceiver.....£699
Yaesu FT920 100w HF & 6M Transceiver including filters.....£795
Commtel Base 40 Channel Base CB Transceiver.....£89
Midland 98+ Mobile CB Transceiver.....£69
Zetagi M27 Antenna Matcher.....£20
Icom AT180 Auto Tuner to suit Icom 706/7000.....£225
Kenwood PS30m 20amp Power Supply.....£110
MFJ 784 DSP Filter.....£1290
MFJ 784B Digital Noise Filter.....£149.95
MFJ 9406 6m SSB Transceiver c/w microphone & manual...£139
MMT144/28 10watt Transverter.....£89
Pakratt 232 Data Terminal & Leads.....£99.95
Ten Tec ATU 2KW High Power Antenna Tuner Coaster.....£169
Timewave 59+ Digital Noise Filter.....£159
VCI PM30 2Kw Power Meter.....£69.95

Check our web site for latest items available. E&OE. Prices quoted are in pounds sterling and exclude carriage

WATERS & STANTON

01702 206835

Icom IC-821H 2m, 70cm All Mode Base Transceiver 45/40W 12V.....£549
AOR AR-3000 100kHz-2036MHz All Mode Receiver 400ch. 12V + psu.....£449
Alinco DJ-190T 2m FM H/held Transceiver + CTCSS.....£99
ADI AT-400 70cm FM H/Held with Battery box 420-465MHz RX.....£89
Kantronics KAM plus Multimode Dual Port Data Controller + Pactor.....£149
GRE PSR-282 66-512MHz (with gaps) AM,FM Hand Held Receiver 200ch.....£69
Kantronics KAM Multimode Data TNC.....£99
Ameritron ALS-600XCE 10-160m Solid State 600W Amplifier with 80W in.....£849
Yaesu FT-5200 2m,70cm FM Mobile Transceiver 50W,35W.....£149
AKD 2001 2m FM Mobile Transceiver Channelised 25W.....£89
Optoelectronics..... Model 40 "Scout" 10MHz-1.4GHz Frequency Counter + Reactive Tune & 400ch.....£199
CDX SWR-7RM 7MHz HF PWR/SWR meter 60W with Antenna Matcher.....£39
Palstar KH-6 6m FM H/Held with CTCSS, NiCd, Charger, DC lead.....£75
Sharman PS-205 13.8V 20A Regulated PSU 25A Surge No Meters.....£59
Sony ICF-SW07 Mini Receiver + FM stereo, SSB & "One Touch" tuning.....£169
Icom PS-85 13.8V 20A (max) Matching PSU.....£179
SEC 1212 13.8V Switch Mode Regulated 12A (max) PSU.....£45
Alinco DJ-496E 70cm FM H/Held Tx with CTCSS, DTMF keypad, NiMH & charger..£99
Alinco DJ-496E 70cm FM H/Held Tx with CTCSS, DTMF keypad, NiMH & charger..£99
Kantronics KAM-98 Multimode Digital Data Controller with Pactor, GTOR, AMTEXT & NMEA-0183 GPS.....£279
Icom IC-706 HF,6m,2m All Mode Mobile/Base Transceiver with Gen.Cov.100/100/10 Watts.....£449
Icom IC-T3H 2m FM transceiver with CTCSS and DTMF keypad.....£89
Sony ICFSW07 Mini Receiver + FM stereo, SSB & "One Touch" tuning.....£169
Tokyo HX-240 HF Transverter 3.5-28MHz with 2m IF 40W.....£139
Icom IC-2100H 2m FM Mobile Transceiver 55W 113ch. + CTCSS.....£149
Uniden UBC-3300XLT 25-1300MHz (with gaps) AM, FM, WFM 1000Ch. Alpha-tag + TrunkTrackerIII, CTCSS.....£129
SGC PortaPak Portable QRP Transceiver SSB,CW 25W 10 x D cells or 12V.....£599
MFJ MFJ-461 Pager size Morse Code Reader + LCD Display.....£59
Alinco DJ-X7 100kHz-1300MHz AM, FM, WFM Hand Held Receiver 1000Ch + 8.33kHz step.....£79
Alinco DJ-491T 70cm FM H/Held Transceiver 40ch. + DTMF keypad & CTCSS.....£115
Maycom AR-108 108-180MHz AM,FM 99Ch. Mini Receiver 2 x AA or 3V DC.....£49
Uniden UBC-68XLT 66-512MHz (with gaps) FM Receiver 80Ch. 4 x AA or 12V DC.....£59
Uniden UBC-105XLT 25-960MHz (with gaps) AM,FM Receiver + 8.33Mhz step 100Ch. 4 x AA or 9V DC.....£49
MFJ MFJ-484C Grandmaster CW Memory Keyer + 4 Random Access Memories...£89
Yaesu VX-150 2m FM Mil. Spec. 5W Hand Held Transceiver + Full CTCSS & DTMF keypad.....£79
Icom IC-R2 0.495-1309MHz AM,FM & WFM Hand Held Receiver 450Ch.....£79
SSE PSU-101 Desk Stand with 2 x 12V DC outputs 240V AC.....£29
Icom IC-706 MkII HF,6m,2m All Mode Mobile/Base Tx with Gen.Cov. 12V.....£449
Icom AT-180 HF + 6m Automatic ATU, 50ohm.....£249
Icom IC-R2 0.495-1309MHz AM,FM & WFM Hand Held Receiver 450Ch.....£79
M. Modules MML144/30-LS 2m 1-3W in, 30W out Linear with Preamp.....£69
M. Modules MML144/30-LS 2m 1-3W in, 30W out Linear with Preamp.....£69
Matsui MR-4099 Portable World Band Receiver with FM stereo and SSB.....£59
Uniden UBC-3300XLT 25-1300MHz (with gaps) AM, FM, WFM 1000Ch. Alpha-tag + TrunkTrackerIII, CTCSS.....£129
Kenwood TR-751E 2m All Mode Mobile/Base Transceiver 25W.....£199
Midland Alan 42 Multi 40ch 4w CEPT CB Han Held Transceiver with Battery Box, AC Charger & DC Power Lead.....£69
Uniden UBC-278CLT 25-174,406-512,806-956MHz AM,FM,WFM + MW Desk/Mobile Receiver 100Ch. 10V + psu.....£99
Icom IC-R7000 25MHz-2GHz All Mode Base Comms Receiver 99Ch. mains.....£349
Radio Shack Pro-97 25-1300MHz (with gaps) AM,FM Hand Held Receiver + "SignalStalker" 1000Ch.Alpha & PC input.....£75
Yupiteru MVT-7000 200kHz-1300MHz AM,FM,WFM Hand Held Receiver 200Ch.....£99
Yaesu FT-290R II 2m All Mode Portable Transceiver 2.5W 12V or 9 x C cells.....£199
Alinco DX-70TH HF,6m All Mode Mobile/Base Transceiver with Gen.Cov. 12V.....£399
Realistic Pro-43 68-999MHz (with gaps) AM,FM Hand Held Receiver 200Ch.....£69
Icom IC-703 HF& 6m All Mode QRP Mobile Tx + Auto ATU, Gen.Cov. 10W 12V.....£339
AOR SDU-5600 Colour Spectrum Display Unit for Receivers + PC control.....£649
Yaesu FT-920 AF HF,6m All Mode Base Transceiver + Auto ATU, Gen.Cov. FM option & AM Filter 100W 12V.....£799
Optoelectronics..... Digital Scout 60MHz-2.6GHz Digital Frequency Counter + Field Strength, Reactive Tuning & 1000 Memories.....£259
AOR AR-5000A +3 10kHz-3GHz All Mode Communications Receiver with TXCO, Sync AM, AFC & NB 2000Ch. 12V + psu.....£1,199
AOR AS-5000 3 Way Antenna selector for AR-5000 Receivers.....£65
Uniden UBC-3300XLT 25-1300MHz (with gaps) AM, FM, WFM 1000Ch. Alpha-tag + TrunkTrackerIII, CTCSS.....£129
Steepletone MBR-2000 Portable FM Stereo,MW & SW Radio 20ch.....£14
Yaesu FT-290R 2m All Mode Portable Transceiver 2.5W 12V or 9 x C cells.....£159
Icom IC-756 HF,6m All Mode Base Transceiver + ATU, DSP & Gen.Cov. 12V.....£749
MFJ MFJ-945E 1.8-30MHz Mobile ATU + meter 300W.....£65
Watson W-65XM 12V Variable 65A Switch Mode PSU with Meters.....£119
Icom IC-R3 0.5-2450MHz AM,FM,WFM Hand Held Receiver 450Ch. + 2" TFT colour TV & Fast Charger.....£199
Sky Scan Desktop 25-2000MHz Desktop Receiveing Discone Antenna with 4m cable & BNC.....£29
SGC SG-230 1.8-30MHz Microprocessor controled ATU 150W.....£229
Manson EP-925 12V variable 25A (30A max) Regulated PSU with meters.....£69
Watson W-25XM 12V Variable 25A Switch Mode PSU with Meters.....£69
Yaesu FT-736R 2m,70cm and 6m All Mode Base Transceiver mains or 12V with FTS-8 CTCSS.....£499
Yaesu VR-500 100kHz-1300MHz All Mode Hand Held Receiver 1000Ch.Alpha.....£145
Kenwood TH-F7E 2m,70cm FM Palm Held Transceiver + 0.1-1300MHz All Mode RX.....£149
Realistic DX-394 150kHz-30MHz AM,CW,SSB Receiver 160Ch. Mains/12V.....£99
Realistic Pro-2042 25-520,760-1300MHz AM,FM,WFM Base Scanner 1000Ch. Mains 12V DC.....£119
Realistic Pro-43 68-999MHz (with gaps) AM,FM Hand Held Receiver 200Ch.....£69

Rob's chance to air his views!

Put your club or society 'In Focus'

Topical Talk

This month, Rob G3XFD discusses the newly introduced In Focus article idea that came from Ian Brothwell G4EAN (letters this issue) and the continuing feedback room other letters and articles published in *PW*.

As regular readers will realise from my previous published comments- **Ian Brothwell G4EAN** is a truly dedicated Amateur Radio enthusiast. Closely connected to both the **Radio Amateur Old Timers' Association** (RAOTA) and the **British Amateur Radio Teledata Group** (BARTG) Ian is active in many aspects of our hobby.

We often chat to each other by E-mail and Ian often has suggestions regarding new initiatives for *PW*. In recent months, while we were discussing other promotional ideas for our hobby, Ian came up with the idea (letters this month) of a special page or pages to be published in the magazine to promote individual clubs and organisations directly associated with our hobby.

I thought Ian's idea was a good one – with my only concern being that we would only be able to run the In Focus feature when we had space in the magazine and when it would complement the editorial 'balance'. We then discussed the idea further and I put Ian on the spot - literally - by asking him to write the first article for the In Focus pages. Undaunted, Ian got busy and prepared the feature that appears on page 25 in this issue.

Your Club In Focus

The idea behind the In Focus page/or pages is to allow your club or organisation to provide a feature to help promote it effectively and perhaps attract new members. The service will be completely free and there will be no payment made for the promotional article.

The In Focus features will be researched, prepared and written directly by the clubs/organisations themselves. However, to help, I'm preparing a special In Focus Guide to help with the preparation. (I promise you - it will be enjoyable – so don't be put off!).

To start the process of promoting your own club via the In Focus feature, it will be essential to contact the editor at the *PW* offices to request the In Focus Guide. When you contact me, either by telephone or E-mail, I'll ask a number of questions and help you on your way with some preparation advice. The guide will then be sent off to you (see request below). With its guidance, you'll be able to help us to work with you provide the most informative and helpful promotional pages possible.

In practice, providing we have enough support from everyone involved, I envisage publishing In Focus as often as possible – when we have the space in the magazine! The length of the feature will depend on what's required. If, for example, a club wishes to provide some background history and details of what's gone on over the years - a two-page feature can be produced for In Focus.

However, if your organisation just wishes to publicise a new clubroom or an initiative, a single page article will do the job effectively. The new In Focus guide will be available shortly and I ask that you send a 50p s.a.e. (A5 sized envelope please) for its return (different arrangement for clubs outside the UK – please ask for details). I'm sure that by working together in this fashion, your club or organisation will benefit from the publicity.

Terms & Individuals

It's been my privilege to edit *PW* for almost two decades and in that time I have met an enormous number of fellow Radio Amateurs. During that time, I've also met many differing opinions and some of these have been put to me in (occasional) a rather forthright manner!

It seems to me that whenever humans get passionately involved in a particular pastime - strong opinions can develop. A number of my Radio Amateur friends are also deeply involved with model engineering and it seems that passions can run high among boilers and safety valves just as much as it does inside a radio club!

Recently, I was chatting to a friend from the north of England who has just finished building a beautiful 5in gauge steam engine (it took him 10 years!). Amused at the recent correspondence in *PW* regarding 'Aerials & Antennas', my friend said that the same form of discussion often develops in model engineering circles regarding engineering terms – with just as much passion.

We both laughed when he remembered Jonathan Swift's (*Gulliver's Travels*) story about a war that developed over which end of the boiled egg to break! And our laughing reminded me that's an important message to bear in mind - provided we can laugh at ourselves occasionally, despite the difference of opinions we'll never lose sight of reality. After all, our hobby is supposed to be fun. Vive la difference perhaps?

Rob Mannion G3XFD/EI5IW

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