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March 1998 £2.20



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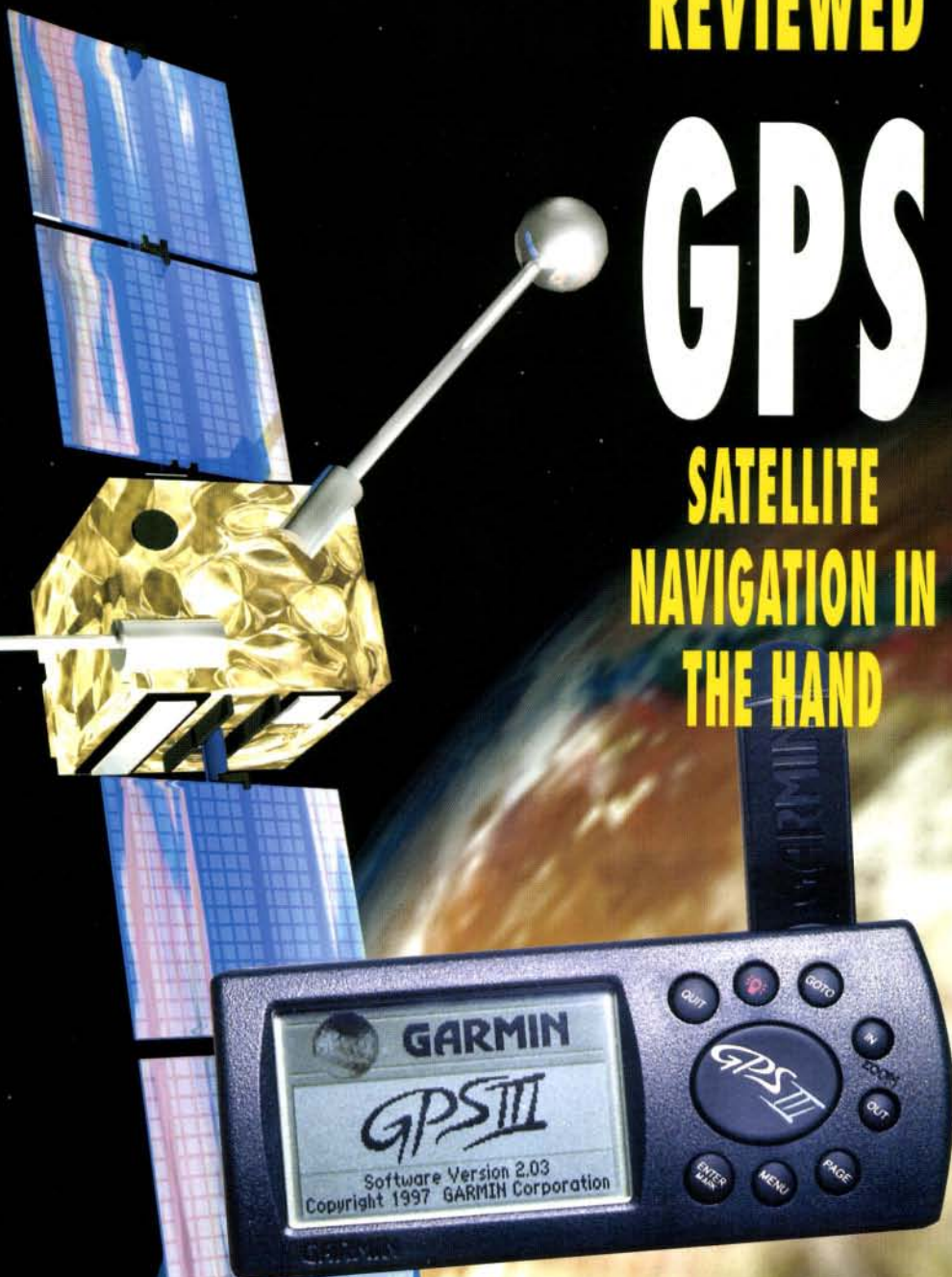
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VX-1R

THE SMALLEST HAND-HELD
IN THE WORLD

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NAVIGATION IN
THE HAND





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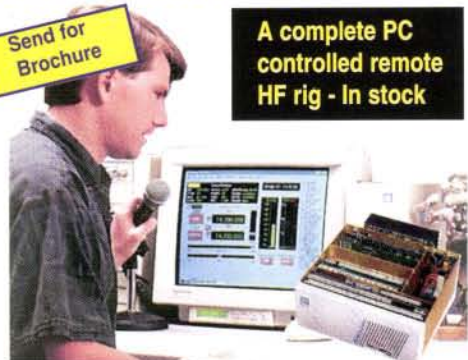
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Kachina 505DSP HF Transceiver

Send for Brochure

A complete PC controlled remote HF rig - In stock



Main Features

100W HF All bands + Receive 100kHz - 30MHz
Filters for SSB 3.5, 2.7, 2.4, 2, 1.7kHz
Filters for CW 1kHz, 500Hz, 200Hz, 100Hz
Band Scope, DSP filter, Memory keyer, log book, VSWR meter, Smith Chart, pre-amp, 20dB attenuator, plus many software controlled functions.

YAESU FT-8100 Dual Bander Mobile

£449



Yaesu's new dual band mobile makes the competition look old and out-dated. You get a detachable head, 300 memories, true dual same band rx, CTCSS encode and the best display in the business. This is proving to be one of the best sellers ever - particularly at Our Price!

SGC-230 Auto Wire ATU

£299



1.8 - 30MHz
Apply 12V and feed with any power up to 200 Watts for instant matching to any end fed wire - any length!! Build a true all-band long wire system to fit any garden

Alinco DX-70s TO CLEAR!!

£599



The last few of these rigs at a very special price. Where else could you get a 100 Watt hf rig at this price?

YAESU FT-50R 2m/70cms Handy

£269



- * Wideband Rx (AM Airband)
 - * FM Broadcast receive
 - * CTCSS & 1750Hz
 - * 112 Alphanumeric Memories
 - * Dual Watch - Military rated
 - * 5W from 12V DC input
 - * Ni-cads and AC Charger
- This is a very solid rig that is proving one of the most popular dual band handhels

KENWOOD TM-741E 70cms Mobile

Save £210!



£459

£249

A chance to purchase this top range 70cms mobile at a silly price! 35 Watts output, 41 memories and CTCSS encoder gives you all you need to enjoy mobile or base station operation. 12.5kHz/25kHz steps are featured together with a clear LCD.

ADI AR-146 2m 50W

FULL CTCSS



£249

- * 3 Power levels - Wideband receive
- * 40 Memories plus call channel
- * 7 Programmable steps
- * Channel or frequency display
- * The best sensitivity in the business
- * Keypad mic and mounting kit
- * CTCSS Encode and Decode!

ADI AT-600 Dual Bander



New Low Price £249

PW says: "an incredibly well priced radio - amazingly sensitive - audio - worked very well with 12.5kHz channel spacing - An Absolute Cracker"

- * CTCSS encode/decode
- * Full DTMF + 1750Hz tone
- * Alphanumeric memories
- * Full duplex
- * CTCSS tone reader
- * 29 programmable features
- * AM airband receiver
- * Rx up to 990MHz
- * Ni-cads and charger

ADI AT-201 2m FM Handy

£149



- * 40 Channels
- * 5W on 12V
- * Illuminated keypad
- * Full CTCSS
- * 1750Hz tone
- * DTMF
- * Channel Reasout or
- * Frequency Readout
- * Set to Set Cloning
- * Uses AA cells

NEW C-408



From HORA
70cms Handheld Full CTCSS

£89.95!

FREE Postage

SPECIAL OFFER PRICE

Full CTCSS; 20 memories; 1.6MHz repeater shift; Priority channel; Scanning; Dual watch; Dual mode squelch; PTT lock; 12.5/25kHz steps, 230mW output - all from just 2 x AA cells

SGC-2020 QRP HF Transceiver

£599



1.8 - 30MHz

0 - 20 Watts SSB and CW with full break-in. Can run from 12 volts or internal pack. Delivery expected at the end of February

1998 Catalogue



- * Largest in Europe
- * 176 Colour Pages
- * 1000 Photographs
- * 1400 Products
- * Technical Specifications
- * News Snippets

Now established as the foremost equipment guide this edition is completely new with every page in full colour and almost every item illustrated. For the cost of a magazine you can get the best guide ever.

£2.95 plus £1 postage

WATSON

Hunter

Frequency Counter

Features:

- 10 - 2.8GHz
- Ni-cad Pack
- AC Charger
- BNC Antenna
- Full Instructions

£59.95

Add £2.50 Post & Ins.



FREE frequency guide worth £12.95 on orders during Feb. & March

Check your base or handheld transceiver, or hunt out frequencies of nearby transmitters or handhels. The "hold" button lets you lock on and store the frequency.

UK's Top Dealer for YAESU, KENWOOD & ICOM

W&S

W&S**EXCLUSIVE 10 DAY APPROVAL - On All Mail Order Sales****YAESU FT-847 1.8-450MHz****Deposits being taken**

We promise you the lowest UK price! Just give us your address or phone number and we'll mail you the latest information pack as soon as it is available.

ICOM IC-746 1.8 - 144MHz Phone!

* 100W 1.8 - 54MHz * 50W 144MHz * SSB - CW - FM AM * Electronic keyer * Gen. cov receiver * Spectrum scope * DSP noise filter * Notch filter * IF pass band tuning. Delivery from stock.

ICOM IC-756 HF + 50MHz £1895

* 100W of pure Magic
* 160 - 6M
* SSB - CW - AM - FM
* Spectrum display
* Auto ATU
* Superb DSP built-in
* CW Memory keyer
* 100% duty cycle
* Keypad entry option
* DXers choice in the USA

KENWOOD TS-570 1.8 - 30MHz

Kenwoods new transceiver that is earning a reputation for offering one of the best receivers in the business. If you are looking for a hot little number that is not too expensive (Radio we mean!), send for brochure.

ICOM IC-207H 2m/70cm Mobile £329

* 2m & 70cm
* 50W / 30W
* Detachable head
* Packet 9600 bps ready
* 180 Memory channels
* CTCSS & 1750Hz tone

KENWOOD TM-V7E Dual Bander £499

* 144 & 430MHz 50/35W
* Dual Rx on same band!
* 280 Memories
* Detachable front head
* CTCSS & 1750Hz Tone
* Large clear display

WATSON W-MM1 Multimode Modem £69.95

* Packet, AMTOR,
* CW, SSTV, Fax, RTTY
* NAVTEX, SYNOP
* Transmit and receive
* Powered from RS-232 port

£1600

Approx.

* 1.8 - 430MHz * 100W 1.8 - 50MHz * 50W 2m/70cm
* SSB - CW - FM - AM * Gen. cov. receive * CTCSS
* Full duplex 42 Satellite tracking * Alphanumeric
* 01.Hz steps * Shuttle Jog * Keypad entry * Packet ready 1200 & 9600 * DSP filtering * Dual display
* squelch * IF shift * Notch filter * Power control
* Tx monitor * Electronic keyer * 12.5 / 25kHz switched FM filtering * Switchable pre-amp
* Size 260 x 86 x 270mm * weight 7kg
Above details are provisional

YAESU FT-920 1.8 - 54MHz**+ Free FM board & AM Filters**

* 1.8 - 54MHz 100W * DSP filter * MOSFET PA
* Internal ATU * Auto notch * Twin VFOs * Auto glow display * Shuttle jog * Digital voice memory
* Electronic keyer * RS-232C converter * Quick memory bank + lots more phone or e-mail for colour leaflet

YAESU FT-1000MPDC

* 1.8 - 30MHz 100W * SSB - CW - FM - AM * Rx 100kHz
* 30MHz * Message memory * Dual in-band rx * EDSP filter * RF processor * RF pre-amp * Electronic keyer
* IF shift width * Collins filters * Comprehensive menu system * RS-232 interface and more - send for details
TONNA Antennas - Perform!



Balun matched excellent gain and VSWR. The favourite of the contest groups. Mount horizontal or vertical.

March Offer:

20505 5 EI 50MHz
£86.95 £79 carr. £4

Just a small selection!

2 Metres	20921	21 EI. 18dB	£69.95
20804 4 EI. 8dB	£44.95	23 cms	
20809 9 EI. 13dB	£52.95	20623 23 EI. 18dB	£51.95
20811 11 EI. 14dB	£79.95	20635 35 EI. 20dB	£61.95
20817 17 EI. 15dB	£97.95	20655 55 EI. 21.5dB	£65.95
70cms		20696 4 x 23 EI. kit	£319.95
20909 9 EI. 8dB	£45.95	20666 4 x 55 EI. kit	£419.95
20919 19 EI. 16dB	£53.95	Full range of splitters etc. Phone	

**Radio Controlled 24 Hour Clock**

£19.95
NEW
24 hour digital readout
Day, week and month
50 years moon phase
Radio signal strength
Backlight and alarm
107 x 85 x 47mm

Rechargeable Alkaline Cells**Starter pack Now £13.99**

* Rechargeable Alkaline
* 1.5V cells
* No memory effects
* Charge mid cycle is OK
* 5 year charge shelf life
* 3 x capacity of ni-cads
* Very low cost

In stock now! * Note: you must use the special charger supplied with Starter Kit.

Starter Kit: Comprise 4 x AA cells and dedicated AC wall charger
£13.99 + £2 p&p

4 x AA cells (ready charged) £5.99 (£1.00 post)
8 x AA cells (ready charged) £10.99 (£1.50 post)
4 x AAA cells (uses standard charger) £5.99 (£1.00 post)

ICOM IC-706 Mk II 1.8 - 146MHz £995

We are pleased to endorse the performance and design of the IC-706 Mk II transceiver as the best compact hf mobile bar none. It out performs and out specifies any other model. The only choice left is which dealer you buy it from! We offer you an unbeatable price and an unbeatable back-up service plus optional extended 5 year warranty for an extra £98!

YAESU VX-1R Dual band

The world's Smallest HT
From the UK's Biggest Dealer!

Our best selling dual bander and one we would be happy to own.



Bulk purchase means we can offer this at a price we dare not advertise! If you want the best deal, PHONE!!!

KENWOOD THG-71E Dual band**Special Price £249**

* Dual Band 2m/70cm
* 200 memories
* Alphanumeric Display
* Full CTCSS
* DTMF
* Up to 6W out
* Wideband Receive
* Illuminated Keypad
* PC Compatible
* Windows Programming
Send For Brochure

**ICOM IC-T8E Dual Band handy****6m 2m 70cms £349.95**

PRICE MATCH
PRICE MATCH

All in one small package.

* 5W output (13V)
* 25 / 12.5kHz ready
* Wideband Rx
* Nickel Hydride batt
* Wide FM broadcast
* AM for airband
* Rapid scanning
* Alphanumeric

**ICOM IC-T7E Dual Band handy****Special Price £219.95**

* 2m & 70cm Handy
* 70 Memories
* Full CTCSS
* Tone scan function
* Up to 4W out
* 8 tuning steps
* DTMF
* Auto power saver
* 600mAh 7.2v ni-cad
* AC charger and helical

**W&S**email: sales@wsplc.demon.co.uk**UK's largest Catalogue £3.95 inc. post**

MFJ

Ham Radio Accessories

Programmable DSP Filter



- Works with any rx. or tcvr.
- DSP filter, fully programmable
- 16 Factory pre-sets
- Plugs directly into audio out
- Drives speaker or headset
- Requires 12v at approx 500mA

1.8-30MHz 300W ATU



- 300 Watts PEP 150W CW
- 1.8 - 30MHz - with ease!
- Wire, coax or balanced line
- Balun included for best match
- 30 / 300W power meter - PEP / RMS
- Antenna selector, by-pass etc.

300W ATU + Dummy Load



- 160 to 10m 300W PEP 150W CW
- Wire, coax or balanced feed
- Built-in Dummy Load
- 30 / 300W power meter - PEP / RMS
- Antenna selector, by-pass etc.

1.8-30MHz 300W ATU



- 160m - 10m + VSWR metering
- Wire, coax, balanced feed
- 3-way antenna switch
- By-pass position
- 260 x 180 x 70mm

1.8 - 30MHz 3kW ATU



- 1.8 - 30MHz with roller coaster
- Cross needle VSWR & PEP
- "T" network with 4:1 balun
- Long wire, coax and balanced feed
- By-pass and Antenna select switch
- 270 x 375 x 115mm

Auto ATU matcher



Lets your Auto ATU match any coax aerial.

Auto-Tuner Extender

Connect between transceiver and antenna - no more problems with G5RVs and all those difficult antennas - 160 to 10 metres

WARNING Certain cheap MFJ items being offered may be dangerous or sub standard, have not been subject to UK Quality Control, and carry no MFJ UK Warranty - BEWARE !!

Mobile HF+6m ATU



- 1.8 - 52MHz atu 300W max
- Built-in VSWR Xneedle meter 30/300W
- Coax fed systems * Thru button
- 210 x 150 x 60mm

DSP Data Audio Filter



- CW 50, 100, 200, 500Hz filter
- Suits all data modes
- Full adjustable pass band & filter

2m FM Analyser



- This new analyser lets you check out your 2m FM signals and any other local ones as well!
- 143.5 - 148.5MHz
 - Deviation
 - Audio quality
 - Field strength in dBm
 - Scope socket
 - 3uV sensitivity
 - Runs from PP3

New QRN Noise Filter



- Phases out noise at the antenna socket
- Kills local QRN - lets signals through
- No more electrical interference!
- Rf sensed for transceiver use (150W)
- Up to 20dB noise reduction
- Recovers signals below the noise!
- Adjust to suit local problems
- Kill that thermostat problem

MFJ-250X 1kW Load



- Oil is not supplied
- 1kW Dummy Load
- Oil cooled design
- SO-239 socket
- Ideal for linears
- 1MHz to 400MHz

1.8-170MHz Ant. Analyser



- 1.8MHz - 170MHz
- Digital Readout
- Resonance
- VSWR
- Impedance
- AA batteries or 12v external

The World's Best Seller

Connect to aerial or coax and adjust it in seconds. Turns hours into minutes and ideas into antennas! Give your antenna system a complete check out. Over 500 sold so far! A great piece of kit.

IMPORTANT WARNING

If your MFJ item has no UK warranty card, phone FREEPHONE 0500 73 73 88 quoting receipt details - its your guarantee!

Ameritron 811 1kW



160 to 10M of DX-Getting Power Perfectly matches all 100W rigs

Electronic Keyer



- Self contained - ext 12 or internal batt.
- Semi auto and full auto modes
- Dot dash memory - self completing
- Weight, tone and Vol. controls
- Just plug in paddle and connect to rig
- Works with all modern rigs.

Magnetic Loop Antenna



The antenna for those with small gardens or no gardens at all! Just 3ft in diameter it performs as well as a full-sized dipole. Tuning control signals are sent up the coax cable. The only extra you need is a length of coax cable to go between the supplied control box and the loop. 2" mast mounting brackets included for loop.

- 10 - 30MHz Size <1m (36")
- 50 Ohm feed 150W
- Remote control head included
- Auto band select Fast/Slow tune
- Cross needle VSWR meter

LCD Data Reader



- Decodes CW, RTTY, ASCII, AMTOR FEC
- LCD 2 x 16 characters
- 8000 character RAM
- Key input for CW practice
- Epson compatible printer port
- Requires 12V at 300mA DC
- Connects to receiver phone socket

MFJ-901B HF ATU



- 1.8 - 30MHz 200W
- Long wire, balanced & coax

If you are looking for something that will match almost anything at a price that will please almost everybody - here it is!

- 1 kW linear 9dB Gain
- Like a 5 element Monobander!
- Uses low cost 811A tubes
- Built-in rugged AC Supply
- Instant by-pass switch
- PA V/A meter + Grid meter
- Over rated variable capacitors
- Fan cooled for long life
- Very efficient - 600W output
- Easy to tune and connect
- Size 16" x 13.75" x 8"

300W Dummy Load



- Dummy Load
- 50 Ohm
- 300W
- OK to 450MHz
- Air cooled
- SO-239
- Totally enclosed
- Essential item

MFJ-264 1kW Model 64.95

New CW Tutor



"It's an Amazing Idea!"

- Displays words, letters and numbers
- 3 to 35WPM with natural CW note
- Various modes including Farnsworth
- Enormous vocabulary of words
- Actually sends QSOs as well!
- Individual characters or groups
- Headphone socket; Power from PP3
- Sends text just like an actual test.
- A tutor that displays what it sends.

10W 6m SSB Transceiver



- 50 - 50.3MHz 10W SSB
- RF speech processing
- 10MHz xtal filter
- Super performance
- Ideal way to 6M DXing

200W Low Pass Filter



- 1.8 - 30MHz 200W PEP
- 50 Ohms impedance
- 50dB @ 50MHz 0.5dB at 30MHz
- SO-239 connectors

Long Wire 300W ATU



- Long Wire ATU
- 300W pep rating
- 160 - 10m
- Tunes any wire
- Use Home
- Use Portable
- SO-239 to tx.

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HANSEN

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All Change at Reg Ward in Axminster

We have moved Rodney, Bill and Mandy a few doors down the road into a new purpose built communications and home entertainment showroom

Whether its a New amateur rig, shortwave receiver, the latest CD player, or just a chat and a cup of coffee we'd love to see you.

New Look Open Plan Showroom

We aim to take the hassle out of choosing a new rig and with Rodney and Bill on hand to offer friendly advice, you can be sure there won't be any high pressure sales techniques!

Home Entertainment Systems

We have branched out into the world of home entertainment, and are now able to offer advice and demonstrations on the top of the range Hi-Fi's from Kenwood and Sony.

Pick and Play Radio Shack

Choose from any of the radios that Rodney has in stock, plug it in and try it out 'on the air'. There's no better way to decide which rig is best suited to you

NEW RADIOS ON DEMONSTRATION.

IC-746 HF, 2m & 6m Base Station	£1695	T8E 2m, 70cms & 6m Handheld	£339
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FT-1000MP HF Base Station	£2199	VX-1R 2m + 70cms Handheld	£269
FT-8100 2m + 70cms Mobile	£435	THG-71E 2m + 70cms Handheld	£269
TMV-7E 2m + 70cms Mobile	£495	TS-570D HF Base Station	£PHONE

We will match any price quoted by another authorised dealer

Unbeatable Opening Offers

Yaesu FT-920 HF + 6m Transceiver

£1399.00

FREE Two Year Parts and Labour Warranty.
Deposit £139.90 12 payments of £104.92

AR303 Light Duty Rotator

Special Offer £39.00

Manson EP920 Power Supply

18A continuous 20A Max. £59.95

TSB3303 Dual Band Colinear

144/430MHz 1.15M 120W. £30.00

TSB3608 Triband Colinear

50/144/430MHz 2.43M 200W. £60.00

Track Air Airband Receiver

88-140MHz AM/FM 20 Memories £49.95

Icom IC-746 HF + 6m Transceiver

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We are pleased to say that the full range of Siskin RF Data Products have now landed at Axminster.

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List Price £129.00 Our Price £99.00
Including computer cable and software.

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For Kenwood, Icom and Yaesu
Only £69.00 Complete with DOS and
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Model	Band	Elements	Gain	Boom	Price
CQ-DX 50/4Y	6m	4EL	10.6dB	3.8m	£89.95
CQ-DX 144/4Y	2m	4EL	10.6dB	1.5m	£54.95
CQ-DX 144/10Y	2m	10 EL	13.6dB	3.6m	£79.95
CQ-DX 144/10XY	2m	10 EL crossed	13.6dB	4.0m	£109.95
CQ-DX 430/10Y	70cm	10EL	13.6dB	1.5m	£59.95
CQ-DX 430/18Y	70cm	18EL	17.6dB	2.8m	£69.95
CQ-DX 430/18XY	70cm	18 EL crossed	17.6dB	3.2m	£79.95
CQ-DX 430/24Y	70cm	24EL	18.2dB	4.0m	£94.95

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AUTEK RF ANTENNA ANALYSERS

RF1 HF £169.95 P&P 7.95

RF5 VHF/UHF £289.95 P&P 10.00

Protective Case £14.95 P&P 2.75

The RF1 adjusts antennas, feedlines, and RF networks, from 1.2 to 35MHz in 5 bands. It measures RF values of true impedance (0-2000Ω), SWR (1 to 15.1), C (0-9999pF) and L (<0.04 to 300μH). It instantly reads out impedance and SWR. Feedline loss and phasing, Q, tuned-circuit resonance can be accurately measured and adjusted. L and C are measured at the RF frequency of interest, not at 1kHz or 100kHz as with other L/C meters. The RF5 is continuously adjustable from 35 to 75MHz, and 138 to 500MHz (typically 530MHz).

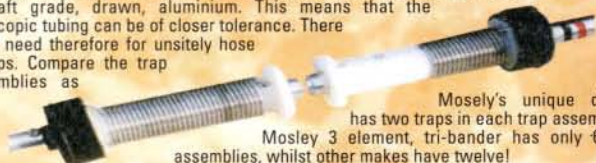
in 3 bands. It measures RF values of true impedance (0-600Ω), SWR (1 to 6:1), and its INSTANT SWR mode finds the frequency of minimum SWR (or Z) on command automatically. Both units fit into the pocket, and run on a standard 9V battery (or 7 - 12V).



RF1

Mosley H.F. Antennas

All Mosley Antennas have pre-drilled and colour coded element pieces which makes assembly quick and easy. All hardware is of stainless steel and tubing is aircraft grade, drawn, aluminium. This means that the telescopic tubing can be of closer tolerance. There is no need therefore for unsightly hose clamps. Compare the trap assemblies as



well. Mosely's unique design has two traps in each trap assembly. A Mosley 3 element, tri-bander has only 6 trap assemblies, whilst other makes have twelve! Consider the difference that makes to wind loading and structural stability.

VERTICALS	RV-4-C	10/15/20/40m	£269	Carr £10
	RV-6-C-WARC	10/12/15/17/20/40m	£359	£10
	RV-7-C-WARC	10/12/15/17/20/30/40m	£379	£10
STANDARD	TA-31-JR-N	10/15/20m	1 EL £199	£10
	TA-32-JR-N	10/15/20m	2 EL £299	£15
	TA-33-JR-N	10/15/20m	3 EL £349	£15
	TA-33-JR-N-WARC	10/12/15/17/20m	4 EL £499	£15
HEAVY DUTY	TA-31-M	10/15/20m	1 EL £229	£10
	TA-32-M	10/15/20m	2 EL £399	£15
	TA-33-M	10/15/20m	3 EL £509	£15
	TA-33-M-WARC	10/12/15/17/20m	4 EL £659	£15
HEAVY DUTY COMPACT	TA-53-M-WARC	10/12/15/17/20m	4 EL £769	£15
HEAVY DUTY CLASSIC	CL-33-M	10/15/20m	3 EL £679	£15
	CL-36-M	10/15/20m	6 EL £989	£20
WARC BANDS	TW-33	12/17/30m	3 EL £829	£15

Anti-Corrosion Compound for Aluminium Antennas: ACJ-2 Sachet £7.95 p&p £1.95



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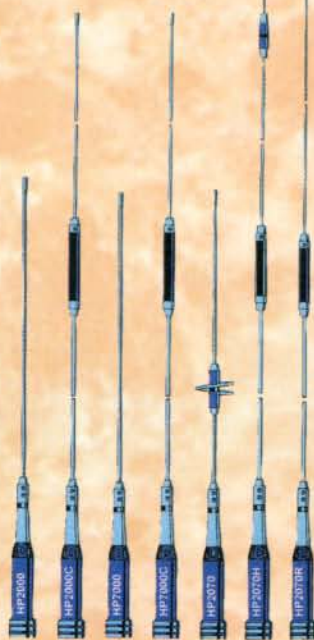
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	CN-144	140-170MHz	15/150/1500W	£79.95
	CN-V/UHF	140-170,410-450MHz	15/150/1500W	£89.95
PORTABLE				
	W450	140-170,400-470MHz	0-150W	£34.95



UHF/UHF ANTENNAS



DELUXE MOBILE ANTENNAS: P&P £4.95

These antennas are built to ensure maximum strength and performance. Flexible 17/7PH stainless steel whips, incorporate a 90° tilting system. The UHF male antenna connector has a gold plated centre pin, Teflon insulator and silicone rubber gasket for perfect waterproofing.

HP2000	5/8λ	75W	£33.95
142-148 MHz		5.35dB	1.23m
HP2000C	2x1/2λ	150W	£39.95
142-148MHz		7.15dB	1.97m
HP7000	5/8λ	100W	£29.95
430-440MHz		5.35dB	0.42m
HP7000C	2x5/8λ	100W	£36.95
430-440MHz		7.15dB	0.73m
HP2070	1/4+5/8λ	150W	£29.95
140-150,430-440MHz		2.15/5.35dB	0.45m
HP2070H	1/2+2x5/8λ	150W	£39.95
142-148,430-440MHz		5.15/8.15dB	1.05m
HP2070R	1/2+2x5/8λ	150W	£37.95
142-148,430-440MHz		5.15/8.15dB	0.98m

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MagH12PL	92mm Dia	£21.95
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Mag145PL	160mm Dia	£34.95
Mag160PL	Slim 160mm Dia	£34.95

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Panel MOUNT and Cable Assembly	£24.95

DELUXE BASE ANTENNAS P&P £9.95

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GP49-70	1/4λ, Ground Plane	500W	£69.95
49-70MHz tuneable		2.15dB	2.5m
SA22N	2x5/8λ	200W	£79.95
142-148MHz		7.15dB	2.7m
SA703N	3x5/8λ	200W	£59.95
430-440MHz		8.15dB	1.8m
SA705N	5x5/8λ	200W	£79.95
430-440MHz		10.15dB	2.8m
SA270SN	1/2λ, 2x5/8λ	200W	£59.95
142-148,430-440MHz		5.15/7.15dB	1.3m
SA270MN	6/8λ, 3x5/8λ	200W	£69.95
142-148,430-440MHz		6.15/8.15dB	1.8m
SA270LN	2x5/8λ, 5x5/8λ	200W	£89.95
144-148,430-440MHz		7.15/10.15dB	2.7m
SD1300N	Discone	2.15dB	200W
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Heavy Duty Deluxe G5RV's SO239 TERMINATION

Louis Varney designed the G5RV as a 1.5λ centre-fed doublet on 14.15MHz, hence the top length of 102ft. This gives a low feed point impedance, which can be matched to a 50Ω line using a line transformer, and a multimode radiation pattern.

G5RV	Full Size	80/40/20/15/10m	102' long	£39.95	4.95 p&p
G5RV	Half Size	40/20/15/10m	51' long	£24.95	4.95

Shortened Dipole Antennas* SO239 TERMINATION

SLS-40K	40m	38' long	£66.95	5.95 p&p
SLS-80K	80m	69' long	£77.95	5.95
SLS-160K	160m	100' long	£83.95	5.95

Receiving Dipole SO239 TERMINATION

SRD	46' long	£49.95	4.95 p&p
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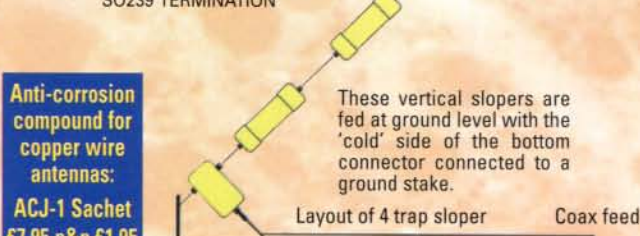
Trapped Dipole Antennas* SO239 TERMINATION

SD-32	20/15/10m	2 Trap	27' long	£83.95	p&p 5.95
SD-34	20/15/10m	4 Trap	24' long	£142.95	7.95
SD-42	40/20/15/10m	2 Trap	55' long	£89.95	5.95
SD-44	40/20/15/10m	4 Trap	47' long	£147.95	7.95
SD-52	80/40/20/15/10m	2 Trap	105' long	£103.95	7.95
SD-54	80/40/20/15/10m	4 Trap	97' long	£161.95	7.95
SD-56	80/40/20/15/10m	6 Trap	86' long	£219.95	9.00
SD-68	160/80/40/20/15/10m	8 Trap	154' long	£297.95	10.00
SD-610	160/80/40/20/15/10m	10 Trap	148' long	£349.95	10.00
SD-162	160/80m	2 Trap	208' long	£125.95	7.95
SDW-34W	30/17/12m	4 Trap	32' long	£139.95	7.95
SDW-46W	40/30/17/12m	6 Trap	46' long	£199.95	9.00
SDW-58W	80/40/30/17/12m	8 Trap	85' long	£274.95	9.00
SDW-610W	160/80/40/30/17/12m	10 Trap	152' long	£315.95	10.00

SVS-31	20/15/10m	1 Trap	14' long	£49.95	p&p 4.95
SVS-32	20/15/10m	2 Trap	13' long	£79.95	5.95
SVS-41	40/20/15/10m	1 Trap	28' long	£52.95	5.95
SVS-42	40/20/15/10m	2 Trap	24' long	£81.95	5.95
SVS-51	80/40/20/15/10m	1 Trap	53' long		
£59.95	5.95				
SVS-52	80/40/20/15/10m	2 Trap	49' long		
£88.95	5.95				
SVS-53	80/40/20/15/10m	3 Trap	44' long		
£118.95	7.95				
SVS-64	160/80/40/20/15/10m	4 Trap	77' long		
£156.95	7.95				
SVS-65	160/80/40/20/15/10m	5 Trap	73' long		
£189.95	7.95				
SVS-161	160/80m	1 Trap	105' long		
£70.95	5.95				

Trapped Slopers* SO239 TERMINATION

These vertical slopers are fed at ground level with the 'cold' side of the bottom connector connected to a ground stake.



Anti-corrosion compound for copper wire antennas:

ACJ-1 Sachet £7.95 p&p £1.95

All Band SA-10 450Ω TERMINATION

SA-10 operates on all bands 160m - 10m. It can be installed as a flat top, sloper, or inverted 'V'. The top is 135ft/41.15m of heavy duty stranded copper wire, with low loss end insulators. A centre insulator is fed with 100ft/30.48m of 450Ω heavy duty twin ribbon feeder. It will work well from the balanced line output of your antenna tuner.

		£59.95 p&p £10
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All Band Limited Space SAS-2 450Ω TERMINATION

SAS-2 will operate on all bands 160m - 10m. It can be installed as a flat top, sloper, or inverted 'V'. The top is of heavy duty stranded copper wire, and provides 135ft/41.15m electrical length, with a physical length of only 70ft/21.34m through the use of antenna shorteners. The centre insulator is fed with 100ft/30.48m of 450Ω heavy duty twin ribbon feeder. This antenna will work well from the balanced line output of your antenna tuner.

		£89.95 p&p £10
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Off Centre Fed Dipoles SO239 TERMINATION

OCF Full Size	80/40/20/17/12/10m	135' long	£65.95	5.95 p&p
OCF Half Size	40/20/10m	68' long	£50.95	5.95

Traps & Shorteners



These heavy duty deluxe 600W traps are housed in weatherproof enclosures. No soldering or jumper wires are required.

Use 2 traps for a dipole, or 1 trap for a Vertical sloper.

ST-10	28MHz trap	£29.95 each	p&p £4.95
ST-12	24MHz trap	£29.95 each	£4.95
ST-15	21MHz trap	£29.95 each	£4.95
ST-17	18MHz trap	£29.95 each	£4.95
ST-20	14MHz trap	£29.95 each	£4.95
ST-30	10MHz trap	£31.95 each	£4.95
ST-40	7MHz trap	£31.95 each	£4.95
ST-80	3.5MHz trap	£31.95 each	£4.95

Antenna 'Shorteners' are excellent where installation space is limited. Housed inside weatherproof, sealed enclosures, so no periodic cleaning is required.

Two are needed for a dipole, one for a vertical sloper.

SLC-40	Shorten a 40m Dipole to 38' overall	£19.95 each	p&p £2.75
SLC-80	Shorten a 80m Dipole to 69' overall	£21.95 each	£4.95
SLC-160	Shorten a 160m Dipole to 100' overall	£21.95 each	£4.95

Baluns & Centre Connectors

Lightweight, sealed, weatherproof, with Solid Brass rustproof terminals. Jumper wires not needed. Soldering of antenna wire not necessary. DC grounded for lightning protection. SO239 Connector. Stainless Support Hook (except SCE-1/S).

SPB-1 Pro-Balun 1:1 impedance ratio "voltage" Balun that matches 50-75 ohm coax to 50-75 ohm load. 3 - 35MHz, 1.5kW.

£29.95 p&p £4.95

SPB-1-C Pro-Balun 1:1 impedance ratio "current type" balun that matches 50-75 ohm coax to 50-75 ohm load. 1.5 - 60MHz, 3kW.

£32.95 p&p £4.95

SPB-4 Pro-Balun 4:1 impedance ratio "voltage" balun that matches 50-75 ohm coax to 200-300 ohm load. 3 - 35MHz, 1.5kW.

£32.95 p&p £4.95

SCE-1 1kW centre connector for a dipole antenna

£14.95 p&p £2.75

SCE-1/S 1kW connector for a vertical sloper antenna

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DR-430E 70cms, 35W mobile FM Tx £259.95
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DR-605E Dual band mobile Tx £399.95
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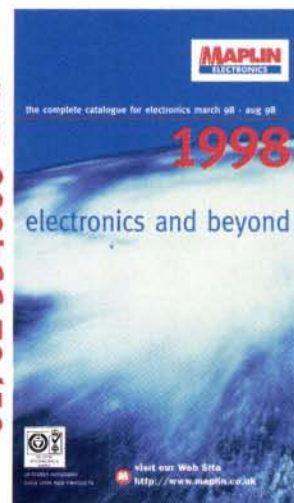
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MAPLIN
ELECTRONICS

Letters

COMPILED BY ROB MANNION G3XFD
& ZOE CRABB

STAR LETTER

Scott-Taggart Memories

Dear Sir

Reading through some of my back numbers of *PW* I came across an article by Charles Miller on 'Valve & Vintage', for his subject in January and April 1997 issues, he chose that entrepreneur of the 1920s John Scott Taggart. I found the articles very interesting on this gentleman's energy on valves and radio sets.

It was later in time that interested me, because I worked with John Scott Taggart when he was assigned to the Air Ministry as a civilian technician, where he worked on Radiolocation as it was then called. I was 18 years old and as an Aerial Erector in the RAF I was instructed to work with Mr Scott Taggart on various new installations.

I found him to be a gentleman who certainly knew what he was doing, though at the time I found him a little eccentric. He used to ride a motorcycle to and from work, and on one particular occasion at the Chain Home Station in Rye in Sussex, he instructed me to take a long coaxial cable 350ft to the top of one of the transmitting towers and to fix it to a special box, he told me it was an r.f. aerial, at that time I wasn't fully technical, just did as I was told.

At the time of this incident in 1941, there were no two-way radios and was instructed that when I was ready, to wave my arms, he watched through binoculars as I fitted the coaxial, when duly connected, as instructed, I waved my arms, he then disappeared into the block and I waited and waited. It was a very cold November afternoon and all I had for extra protection was a flying suit issued for our type of work, but at 350ft, wind blowing, the temperature dropping fast, I was becoming very cold indeed.

About one and a half hours later, now nearly dark, he emerged from the Block, promptly got on his motorcycle and disappeared up the lanes away from the station. He was to have waved his arms to indicate he'd completed the exercise and for me to come down, but he completely forgot me still sitting very uncomfortably 350ft in the air!

Naturally I came down as quickly as I could to find warmth in the Block, when I saw Mr Scott Taggart next, I reminded him of what had happened, he did apologise (with a smile I might add!). However, I worked with that gentleman many times on similar projects until I was promoted and posted to another unit, but I will never forget Mr John Scott Taggart.

I have taken *PW* for three years now and always look forward to the day it arrives. It is a very lively magazine and on a last note, I would like to say how much we enjoyed the visit from Rob G3XFD to Eastbourne and Southdown ARS in 1997.

Anthony Rayner MOAWQ
East Sussex

Editor's comment: Absolutely fascinating Anthony! Thanks for the memory, and I thoroughly enjoyed my visit to the Southdown ARS too. Any more Wartime radio/radar memories readers?

Shabby Treatment

Dear Sir

If possible, I would like to express my great disappointment, via your magazine, of the shabby treatment of people like myself who have in the last year or so been trying to pass their Amateur Radio Examination. Having already passed Part 1 and now trying for Part 2, I now find that the goalposts have been moved!

If I and obviously many others do not pass Part 2 at the December '97 sitting, we now have to sit the whole Examination again. How on earth can the City & Guilds make an award and then turn around and say it is no longer valid?

Are we now, at the very least, entitled to a full refund for the money spent on gaining Part 1? What I suggest should have happened is that anyone who already has Part 1 (or Part 2 for that matter) should have been entitled to resit for the other Part required without having to sit the whole examination again!

I would be very interested in reading your comments (and others) on this matter and especially the comments of the City & Guilds of London Institute.

Ken Davies
Stirlingshire

Editor's comment: We sent a copy of Ken's letter to the City & Guilds and their reply follows:

I acknowledge the concern expressed by Mr Ken Davies with regard to the circumstances surrounding the introduction of the revised Radio Amateurs Examination in May 1998.

At the request of the Radio Society of Great Britain, City & Guilds agreed with the permission of the Radiocommunications Agency (Dept. of Trade & Industry) to introduce a revised RAE consisting of a single examination paper of 80

multiple-choice questions to reduce costs and facilitate access for potential candidates. A single examination paper also brings the RAE in line with other government licensing examinations, including the Driving and HGV theory tests.

After full consultation with both the Radiocommunications Agency (Department of Trade and Industry) and the Radio Society of Great Britain concerning the content and structure of the revised examination, it was agreed in January 1997 to introduce the revised RAE in May 1998 and discontinue the current examination after December 1997.

From February 1997 City & Guilds has given full publicity to all its centres concerning the introduction of the revised RAE

including the arrangement for the phasing out of the current syllabus. It was clearly stated that in the case of candidates who had passed only one of the two multiple-choice papers for the former RAE (7650-001 and 7650-002) there

Absolutely Appalled Of Lancashire

Dear Sir

I was absolutely appalled to learn that Watson-Gupthill Publications are about to discontinue the *Radio Amateur Callbook* and I understand that in future it will only be available on CD ROM.

This sounds suspiciously like a decision made by an accountant! I do most of my reading in bed - I rest my case.

Bernard Whitty G3HWX
Lancashire

Editor's reply: Let's hope they change their mind Bernard. They are certainly going to lose a lot of 'readers' - including me!

would be TWO further opportunities to take or re-sit the remaining paper in May and December 1997 only.

Because of the new structure of a single multiple-choice examination paper, it would be necessary for candidates holding a pass in only one of the former RAE papers to take the whole of the new examination from May 1998 onwards. In these circumstances it has not been considered appropriate to refund fees for any candidates having achieved one paper only in the past.

Full publicity to this effect has also been given to the Radio Society of Great Britain and by *RadCom*, *PW* and other radio publications.

It should be noted that no major changes have been made to the content of the current

syllabus with the exception of EMC where new topics have been introduced including, for example, the use of transceivers in cars. Information sheets on these new EMC topics are available from the Radio Society of Great Britain.

The newly revised RAE will reflect a more modern approach while maintaining present high standards. A revised syllabus pamphlet and sample paper are available from the City & Guilds, Sales Department at £10.50. I hope Mr Davies will have passed the December 1997 RAE Paper 2 and enjoy the benefits of becoming a licensed Radio Amateur.

Roger Bone
Assessment Services (Vocational)
City & Guilds of London Institute
London

Morse & Band Plans

Dear Sir

Having been a bit of a c.w. fanatic in my time, I do not lean either way on a compulsory Morse test. Some people are born into a fortunate time scale, while others just have to put up with it.

To me, a more important aspect of the forthcoming connection is the implementation of a compulsory band plan, with non adherence leading to confiscation of equipment. If a station is operated correctly and in accordance with the rules of the game, then everyone will benefit and life will take on a more intelligent and tolerant outlook.

J. G. Openshaw G2AYG
Lancashire

Carrying On The Practical Way

Dear Sir

I am writing with reference to the Rev. George Dobbs G3RJV's excellent series entitled 'Carrying On The Practical Way'. I always find this article very interesting, being of a practical mind myself, always eager to try building something new.

Hooray for some great ideas! I have built some very good direct conversion receivers based on your designs. But what about v.h.f.? Every week I read through the magazine and find h.f. pre-amps, h.f. receivers and h.f. this and that, but never v.h.f. Will I ever see a 144MHz pre-amplifier or a receiver project?

Something cheap and easy, like all (or almost all) the h.f. projects?

A 144MHz pre-amplifier would be a great start, and something I'm sure many operators (and v.h.f. listeners) would find very useful. I know I would. Keep up the good work and maybe we'll see something in 1998?

N. Ginn
Norfolk

Editor's reply: A very good point! George G3RJV is kept busy with h.f. matters but I'll look into the possibilities.

Varactors & Varicap

Dear Sir

I would like to thank John G4BYV for his letter which appeared in the February 1998 issue of *PW* regarding my article 'What is a Varactor Diode?' (published in the December 1997 issue). The situation with regard to varactor and varicap diodes may seem confusing.

Some years ago the term varicap was kept for diodes used in low power applications such as oscillators and other small tuning applications. Varactors as John rightly states tended to be used in multipliers where much higher powers were often encountered as demonstrated by the fact that they had to be mounted on a heatsink.

However, both diodes are exactly the same. Now, the term varactor is used for variable reactance (i.e. variable capacitance) diodes for all applications and the term varicap is used much less, although it is still seen occasionally.

As a result of the current usage I used the term varactor to describe the diode, hoping that it would reduce the confusion.

I hope this explains the situation.
Ian Poole G3YWX
Middlesex

Batteryless Calculators

Dear Sir

The article by Ray Fautley G3ASG on 'Batteryless Calculators' in the February edition of *PW* brought back nostalgic memories of school days. I too bought the Woolworths 6d (two and a half new pence!) wooden slide rule complete with pink cardboard case.

I still have it and it is in full

MARCONI OR TESLA

Dear Sir

All my life I have always understood that 'wireless' was invented by Marconi, but on a recent trip to the Rocky Mountains I found out that the Americans now give credit for this to Tesla. However, they do admit that the first wireless patent was British, taken out by Marconi in 1896, pointing out that before that date, in the early 1890s, Tesla had freely given some of his radio related inventions to the world before even thinking of patenting them, and he registered over 700 patents during his life (1856-1943).

To commemorate his numerous inventions there is a Nikola Tesla museum of Science and Industry in Colorado Springs, at 2220 E. Bijou St., which is well worth a visit by any collector or amateur. Open throughout the week from 10am to 4pm, there is a laboratory tour every afternoon.

So, the Americans say it was Tesla, the Russians give the credit to Popov, the Germans to Hertz and the English of course to Marconi! Who might I ask, did actually invent radio?

If by that we mean communication by means of wireless waves, then surely the credit must go to Marconi, who, one hundred years ago, was sending messages in Morse code across the Solent from the Isle of Wight to Bournemouth. Only a few years later, he crossed the Atlantic, that really was communicating!

What do other readers think about who should get the credit?

Douglas Byrne G3KPO
Isle of Wight

working order. One of the good points about it is that it allows direct reading of cube roots which I found very useful. I also still have several others, including a Simphon also one made in ivory with leather case, one called Unique and the Faber Castell.

The Unique is a 'cheap and cheerful one', whereas the Faber Castell is much superior. Of some, the cursor can be worked on either side and the slider turned over to reveal more scales. The slide rules were known as 'guessing sticks' at school and some chaps used to hide 'cribs' behind the slider!

I still have the circular model. These have the advantage that the scales are continuous. The only snag was that the cursor tended to move around during operations causing confusion and wrong answers.

I hope that the high standard of the magazine will be maintained - and thanks for the interesting look back at the 'old days'.

Martin Lindars
Somerset

Letters Received Via The 'Internet'

Many letters intended for 'Receiving You' now arrive via the 'Internet'.

And although there's no problem in general with E-Mail, 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 don't forget to include your full postal address and call sign along with your E-Mail hieroglyphics! Editor

NEWS

COMPILED BY DONNA VINCENT G7TZR

HEADLINE NEWS

Mr AMSAT UK!

Over the course of the last two years, the committee of AMSAT UK have been preparing for the retirement of **Ron Broadbent MBE G3AAJ** from his position as Secretary, Treasurer and Editor, which he has carried out so energetically for more than 20 years. During this time, Ron's hard work, knowledge and enthusiasm has helped to build AMSAT UK into an organisation with an international reputation as a reliable and timely source of information.



Professor Martin Sweeting OBE G3YJO says that it's always difficult to replace someone who has played such a formative and central role in building up a Society and who has, indeed, become 'Mr AMSAT UK'. However, the Committee has a responsibility to the membership to ensure a smooth and efficient succession, and also owes it to Ron to ensure that he can enjoy his retirement safe in

the knowledge that all his hard work will not disappear.

Even now he's officially retired Ron will remain active in the Committee of AMSAT UK, relieved of the burdens of day-to-day administration, he will have a responsibility for representing AMSAT UK on and to various bodies, such as the RSGB, IARU, etc., as well as having time to enjoy Amateur Radio! This of course will mean that the AMSAT organisation will continue to benefit from Ron's great experience and wide network of friends and contacts.

The PW team wish Ron all the best in his retirement and hope that he will enjoy being able to put the 'hobby' back into his Amateur Radio activities! In view of Ron's retirement all correspondence to AMSAT UK should now be addressed to: **AMSAT UK, 40 Downsview, Small Dole, West Sussex BN5 9YB UK, Tel: (01273) 495733, FAX: (01273) 492927.**

NEWS FROM AMERICA

Ed Taylor N0ED, our American correspondent, reports on an issue which is a concern on both sides of the Atlantic.

Safety And RF Fields

Administrations world-wide are introducing standards for safe levels of exposure to radio frequency (r.f.) energy. This subject has become particularly important recently, because of the huge growth in the use of mobile 'phones in many countries. Users of devices which radiate r.f. close to the human body want to be sure that their equipment is safe.

Radio Amateurs have been exempt from many of the regulations which affect commercial interests. The feeling has been that enthusiasts who have learnt about (and passed examinations relating to) safe usage of their own equipment will have enough knowledge to observe sensible precautions. However, a step towards regulation (rather than recommendation) for Radio Amateurs in the USA came into effect on January 1st of this year.

While the new system is not currently enforceable by law, it's envisaged that there will actually be a legal requirement to comply in two to three years time. From the beginning of this year, amateurs in the USA should observe a series of basic guidelines relating to r.f. exposure.

The American national society (ARRL) have been working closely with the regulatory body to develop the new guidelines. Members of the ARRL and advisors were involved in reviewing preliminary drafts. One result of their deliberations is that a series of tables has now been published, showing various frequencies, power levels and antenna configurations, so that 'hams' can determine whether their stations comply with the rules.

So far, everyone in America who's involved seems to be taking the issue seriously. However, there is not a com-

plete consensus on the extent to which r.f. fields have adverse effects, or even on the level which is considered harmful.

However, there is no doubt that human bodies ought not to be exposed to large electromagnetic fields and rules need to be followed in order to avoid possible long-term problems. In fact, amateur stations can sometimes create much

stronger fields than their commercial colleagues. For example a kilowatt amplifier feeding a high-gain u.h.f. antenna can be very hazardous to anyone standing close by and in the direction of maximum radiation.

There has generally been praise from American amateurs for the way the new rules have been introduced. The majority consider that they are not a major burden, and it looks as if most 'hams' will already be in compliance.

To reinforce the message about r.f. environmental safety practices, questions have been added to the licensing exams to cover the scope of these regulations. Let's hope we'll see more situations where the national societies and government agencies co-operate to produce rules which are fair, sensible, and achieve a worthwhile goal.

Ed Taylor N0ED



Communication Centre

Bob Burrows G6DUN of the **The Shortwave Shop Radio Communications Centre, 18 Fairmile Road Christchurch, Dorset** and his 'team' are pleased to announce that they are now on the Internet and have their very own Web site. If you want to drop them an E-mail the address is sales@shortwave.co.uk and to take a look at their web-site you need to point your browser at <http://www.shortwave.co.uk>

In addition to this the Short Wave Shop changed its opening hours with effect from **2 January 1998**. The opening hours are now:

First UK Digital Radio Station

As the race for Digital Audio Broadcasting (DAB) or Digital Radio gathers pace across Europe, **WRN1**, the 24 hour-a-day English-language channel of London-based **World Radio Network**, has become the first British radio station to take part in an Eastern European pilot DAB service. **Polish Radio** is undertaking trials in Warsaw using a transmitter at the Palace of Culture, the Polish capital's tallest building.

Polish Radio's national channels - Radio One, a general spoken word channel; Radio 2, a classical music, arts and education channel; Radio 3, for the under-25 listener and Radio BIS, an educational service are carried on this new DAB pilot service. As from Thursday 15 January, WRN1 has been carried 24 hours-a-day on the Warsaw DAB Digital Radio service

Simon Spanswick, World Radio Network's Director of Corporate Affairs says "We are delighted to be contributing to this important project in Poland. Poland has been running DAB Digital Radio trials for sometime, and now we are able to bring a high-quality

English-language service to complement Polish Radio's popular national channels".

The World Radio Network has been actively involved in DAB Digital Radio for some years, and WRN1 has been broadcast via this new transmission technology in London and Birmingham in the UK as part of the GWR DAB multiplex since 1996. World Radio Network is also heard overnight in Norway on the NRK's Alltid Nyheter DAB Digital Radio programme.

"DAB Digital Radio represents the future of the radio medium", says Simon Spanswick. "It offers superb sound quality, without any of the hiss and interference that can affect f.m. or the distortion and fading of a.m. broadcasts. And besides that, it offers the opportunity for listeners to have access to a wide range of new services, as well as a whole host of added-value multi-media services.

"World Radio Network is planning to expand its coverage via DAB Digital Radio across Europe and in other parts of the world as this exciting new technology captures the imagination of listeners. We are also demonstrating that DAB Digital Radio offers innovative broadcasters the opportunity to reach new audiences in new markets".

The first consumer DAB Digital Radio receivers are expected to be in the shops from the Spring of this year. So far more than 20 manufacturers have unveiled prototype receivers including in-car radios and home hi-fi tuners and midi-systems. Watch this space!

Badger Boards

Badger Boards, the supplier of p.c.b.s for *Practical Wireless* and *Short Wave Magazine* projects has moved to **12 Hazelhurst Road, Castle Bromwich, Birmingham B36 0BH.**

Tel: 0121-681 4168. There is also a new catalogue available, containing a range of components, projects and p.c.b.s, which is available free to anyone sending **Roy or Sue Martin** an s.s.a.e.

FOUR DAYS IN MAY QRP CONFERENCE

The **QRP Amateur Radio Club, International (QRP-ARCI)** have notified us that the third annual 'Four Days In May' QRP Conference will be taking place this year from Thursday May 14 1998 and will as usual coincide with the Dayton HamVention in Ohio, USA.

During the four days there will be plenty to see and do. For example the Thursday sees Amateur Radio QRP presentations, workshops and demonstrations taking place as part of the QRP Symposium to be held at QRP-ARCI headquarters at the Days Inn, Dayton South. Last year, this event proved so popular it sold-out with 125 enthusiastic pre-registered attendees making for a 'standing room only' crowd.

Those attending the QRP Symposium will start their day with a wake-up coffee social and then will be treated to a full day of multi-media QRP presentations by renowned QRP authors and designers. Topics will include: Antenna Feeders, PCB Alternatives, G3RJV Six-Pack, Coherent CW, Transistor Modelling, Beyond the NE-602, QRP PIC Designs, and much more.

The Four Days in May QRP extravaganza will continue on Friday 15th with the annual QRP-ARCI Awards Banquet at which QRP dignitaries are honoured for their services to the Amateur Radio community. Events on the Saturday will include an evening social for QRPers to meet the many regional North American and International QRP Club members culminating in the annual QRP building contest sponsored by the NorCal QRP club.

For more information and registration details please contact **Bob Gobrick NOEB, FDIM 98** Publicity Chairperson. E-mail: rgobrick@world-net.att.net and rgob@tengizchevrol.com

A Dip In The Lake

Lake Electronics manufacturer of kits like the one shown here have recently launched a new catalogue. The *1998 Lake Electronics Catalogue* contains details of the DTR series of h.f. c.w. transceivers together with a range of ancillary items such as filters, a.t.u.s and antenna coupling transformers.

Also included for the first time is a section devoted entirely to vintage radio containing details on obsolete components and out-of-print books, one of Alan Lake's specialities. So, why don't you 'take a dip' into the new Lake Catalogue, which is available free on receipt on an A5 s.s.a.e. or two IRCs, by contacting **Alan at 7 Middleton Close, Nuthall, Nottingham NG16 1BX. Tel: 0115-938 2509** or E-mail: 100775.730@compuserve.com You never know you mind just find what you've been looking for!



Tuesday-Friday: 10.30am-6.00pm
Saturdays: 10.00am-5.30pm
Closed Sunday and Monday

Finally, there is a new hotline number that you can call and this is: **07000 CQDXCQ (273927)**. The old telephone/FAX number is still in use and this is **(01202) 490099**.

Club spotlight

Compiled by Zoë Crabb

New Radio Group

Martin Hallard MOAJN, Divisional Sergeant of the Bloxwich Quad Division, has recently written into 'Club Spotlight' with information of a station recently set-up and news of a new radio group within the St John Ambulance.

The station **GB6SJ** ran from 1200 on the 29th November to 1500 on the 30th November 1997. The first h.f. antenna was a half size **G5RV** and the second h.f. antenna was a vertical. A single band antenna was used for the v.h.f. radio and a dual-band antenna was used for u.h.f. radio. For v.h.f. a small beam (**HB9CV**) was used, which was rotated by hand.

The furthest station contacted on h.f. was **R97V** which was a special event station in Murum, Russia, this was on a frequency of 21.2648MHz using 100W via the vertical antenna. On v.h.f., the furthest station worked was **G7HUD**, who was located in Birkenhead, this was done on a frequency of 144.260MHz using 10W via the **HB9CV**.

All radio equipment used was loaned to the group by various people who Martin would like to thank. He says that without the help of these people, the station would not have been able to run.

Operation of the station was overseen by Martin **MOAJN**, **David G0WWA**, **Kevin G6KOY**, **Philip G6UKV**, **Ian G1GZM**, **Stuart G7TBS**, **Mark G0WCI** and **Gareth G1VLS**. So, thanks to all who helped out with the running of the station and those who raised sponsorship. The money raised from the sponsorship was in the region of £150.

The date for the next station is hoped to be over the weekend of the 17 and 18th October 1998 and it is hoped to link every county within the country. Due to the growing interest within the St John Ambulance, it has been decided to start up a radio group.

The main aim of the group is to promote the use of radio within the St John Ambulance and it is also hoped to run one special event station each year to raise money for them. It has been suggested that other areas/counties (if they are willing) start their own radio group (this will make the goal of linking counties a lot easier). Help in setting up a group in other areas is available by contacting Martin **MOAJN** during the daytime on (01426) 119704 (pager) or in the evenings on (0961) 808807 (mobile).

Bangor's Talk

The **Bangor & District Amateur Radio Society** meet on the 1st Wednesday of the month in the **Clandeboyne Lodge Hotel, Bangor** at 8pm. A talk on Packet Radio will be given, with live demos, by **Hugh G13TLT** on March 4th.

In addition, the annual Constructors Contest will be held that evening. Visitors and new members are most welcome. More information from **Roy G10WVN** on (01247) 460716.

Cockenzie's Background

The Cockenzie & Port Seton Amateur Radio Club

(winners of the 1997 Club Spotlight Club Magazine Competition) was formed back in 1984 with the sole aim to help each other with any Amateur Radio problems in a relaxed atmosphere and also that there would be no official hierarchy, Chairman, Secretary, Treasurer, etc. to keep the club totally informal. From this humble beginning, the club has just grown from strength-to-strength, averaging now 33 people at each club night.

Since those early days, the club has moved on in the sense that they are now a very active group, running Novice classes, Morse tuition, Contesting, running Special event Stations, Talks, etc., but still managing to keep the totally informal system. The only difference in the 'informal structure' is that the club have now adopted the **British Heart Foundation** as their charity and have managed to raise over £3660 for them since 1994!

You may be wondering why the Cockenzie club adopted the British Heart Foundation as their charity, well, it started at the very beginning of 1994, after the very sudden death of one of the club members, **Bunny Anderson** (s.w.l.). Bunny was staying with his daughter and her husband at Blyth for the 1993 Christmas, when he suddenly collapsed and was rushed to Warbreck Hospital, Ashington, but unfortunately died suddenly two days later.

A wreath was purchased by the club to put on Bunny's grave at the funeral, but as mentioned before, the club has no funds at all, so at their January Club Night, they had a 'whip' round, which more than covered the cost of the wreath. The question was, what were they going to do with the excess money?

Well, that was simply answered, why not donate it to the British Heart Foundation as Bunny had died from the result of a burst Aortic Artery. At that time, the club were also in the progress



An amount of £1190 was raised by the Cockenzie Club over the past year. (R) Colin Smith G0OCLN, Bob Glasgow G4UYZ, Wallace Moodie M0QAMV, Ron Brown G4IHU.

of organising their first Junk Night, and it was suggested that any money that was left over, would once again be donated to the British Heart Foundation, in fact, it was then decided that the Foundation would be the Cockenzie's charity, in Bunny's memory.

Special Event Radio Station

Club Spotlight has recently heard from **Dennis K. Egan G4XKE**, Secretary/Treasurer of the **Prudential Amateur Radio Society (PARS)**, who has news of a Special Event Station to celebrate Prudential's 150th Anniversary. Here he tells us about it in his own words.

"The last time a Special Event Amateur Radio Station was put on the air world-wide with the callsign **GB3PRU** was from Chief Office on the 6th August 1978 and reported in 'Prunews' No. 48 in September/October of that year on the front page. It was only from 1982/1984 that the Prudential Amateur Radio Society came into being from a small nucleus of licensed Prudential staff and the callsigns **G8PRU**, **G0PRU** and **G0PPS** being issued by the **Radiocommunications Agency**. The first callsign **G8PRU** being the oldest, issued on the 1st November 1978, which is the Class B licence for v.h.f. use only, which at the time was for shorter distance

Club Reminders

Members of the **Wigtownshire Amateur Radio Club (GM4RIV)** meet at the **Aird Unit, Stranraer Academy, Cairnport Road, Stranraer**. Meetings are held on Thursday evenings at 1930 until 2200hrs local. RAE and c.w. classes are available.

Any visitors will be made most welcome and a cup of tea is always available! Contact **Gerry Maxwell GM4BAE** on (01775) 702876 for further details.

Meetings are held each Friday night at the **ECC Social Club, Highweek, Newton Abbot** for the **Torbay Amateur Radio Society**, starting at 7.30pm. February 20 - AGM.

For further details of activities, contact **Peter G4VTO** on (01803) 864528.

The **Echelford Amateur Radio Society** meet on the 2nd and 4th Thursdays of each month at **The Hall, St Martin's Court, Kingstone Crescent, Ashford, Middlesex** at 7.30 for an 8pm start. More information about the Society is available from **Robin Hewes, QTHR**, on (01784) 456513.

Members of the **Hoddesdon Radio Club** meet on alternate Thursdays at 8pm at the **Conservative Club, Rye Road, Hoddesdon**. More details from **Don G3JNJ** on 0181-292 3678.

Meetings are held every Wednesday at 8pm at **Cotebrook Village Hall on the A49, north of Tarporley, Cheshire** for the **Mid-Cheshire Amateur Radio Society**. Tea, coffee and biscuits are available and visitors and new members are always made welcome.

Regular RAE and c.w. classes are also available. Find out more from **Ted Bannister** on (01606) 592207.

The **Rugby Amateur Transmitting Society** meet every Tuesday evening at the **Cricket Pavillion, Rugby Radio Station, A5 Watling Street, Near Rugby, Warwickshire** at 7.30pm. If you wish to join the Society or just make some enquiries, please get in touch with **Arthur Gallichan M0ASD** on (01788) 550778.

Members of the **South Normanton & District Amateur Radio Club** meet every Monday (except Bank Holidays) at **New Street Community Centre, South Normanton** at 7.30pm. All visitors are made very welcome.

If you want to know more or join, contact **Russell Bradley G0OKD** on (01773) 863892.

Meetings are held at the **Lovedean Village Hall, 160 Lovedean Lane, Lovedean, Hants** at 7.30pm for the **Horndean & District Amateur Radio Club**. Some of the up and coming events are: February 24 - Annual Bring & Buy sale, March 3 - Club social evening.

More information about the Club from **Stuart Swain G0FYX** on (01705) 472846.

The **Mid-Warwickshire Amateur Radio Society** meet on the 2nd and 4th Tuesdays in the month at 8pm at **Club HQ, 61 Emscote Road, Warwick**. All members and visitors are most welcome.

Contact **G8XDL** on (01926) 498115 for more details.

Members of the **Liverpool Amateur Radio Society** meet at 8.30pm (courses begin at 7.30pm) every Tuesday evening at the **Churchill Club, Church Road, Wavertree, Liverpool**. More details can be obtained from **Ian Mant G4WWX** on 0151-722 1178.

The **Dundee Amateur Radio Club** meet on Tuesdays at 7pm in the **Dundee College, Graham Street, Dundee**. Morse code is taught every Tuesday evening. The club radio and technical library are available to club members.

More details from **Allan Martin GM7ONJ** on (01382) 739179.

The **Horsham Amateur Radio Club** meet at the Guide Hall, Denne Road, Horsham, West Sussex. Further information from **Miss M. J. Dixon G7EYL**, 70 Shelley Drive, Broadbridge Heath, Nr Horsham, West Sussex RH12 4NT, Tel: 0181-686 5701 daytime or (01403) 275525 evenings.

Members of the **Loughborough & District Amateur Radio Club** meet from 1930 on a Monday evening for construction, computers, operating and general chat, etc. and on a Tuesday evening for a program of events. Meetings are held in the **Science Lab., Hind Leys Community College, Forest Street, Shepshed**. New members are always most welcome.

Further information and details of activities from **Ian G8SNF** on (01509) 218259.

The **Trowbridge & District Amateur Radio Society** meet at 8pm the **Southwick Village Hall, Southwick**, which is on the A361 Trowbridge/Frome. There is a car park on site and good access for disabled people.

Visitors are welcome, but a small charge of 50p per head is made. There is no obligation to join the club, so just go along and further your enjoyment of the hobby! More info. from **Ian Carter G0GRI**, QTHR, or telephone on (01225) 864698 evenings and weekends.

Members of the **Lincoln Short Wave Club** meet at **The Railway Sports & Social Club, Ropewalk, Lincoln** every Wednesday from 7.45pm. On February 25th there is a talk on **BONSAI** by Bob Peach and on March 11th there is an illustrated talk on **Lincoln At War**, by Dave Willey G1WV0.

More information about events, etc., can be obtained from **Cliff G3EBH** on (01522) 750637.

communications.

With the 150th Anniversary of the Prudential in 1998 (end of May), it was thought that we could celebrate this birthday with a very, very special callsign, **GB150PRU**, so to this end we contacted **Jenny Campbell**, our Group Archivist, in the middle of 1997. After some correspondence, we had our support for our application to the Agency.

Special Event Station Licences are issued by **The Radio Society of Great Britain** on behalf of the Radiocommunications Agency, however, very special callsigns, such as **GB150PRU**, must have documentary evidence in support of its issue and has to have direct approval from the RA before the RSGB are allowed to issue the licence.

Our application was forwarded to the RSGB in early November and a direct reply received from the Radiocommunications Agency in late December to say that this very special call could be issued by the RSGB and that authorisation would be sent to the Special Event Department in due course.

The venue for the Special Event Station will be the **'IBIS' Sports & Social Club, Scours Lane, Tilehurst, Nr. Reading, Berkshire RG1 3ES**, through the kind permission of **Tony King**, the Manager. This licence has been granted for a period not exceeding 28 days from the 25th May 1998, which will cover the period required for the anniversary.

It is hoped that the Station

will be in operation during some of the period of the Prutour cycle race through the UK with the help of members and friends of PARS. Special commemorative QSL cards will be issued world-wide to those stations with whom we are in contact.

Certain special conditions apply to stations run by the licence holder in that non-licensed persons can speak 'over the air' which under normal terms of a licence, they

could not, provided that all radio controls are operated by a licensed operator for a short period to pass greetings, etc. Visitors to the station will be very welcome and we would like them to also sign our visitors book".

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The Garmin EXPERIENCE!

The Satellite Global Positioning System - What Is It ?, How Does It Work and How Is It Used?

David Butler G4ASR
has been roaming
with the Garmin GPS
III Personal
Navigator. But
before he did he
took a look at
exactly what GPS is,
and after reading
his article we think
you'll agree it's a
fascinating subject
and you'll appreciate
just how useful a
'personal navigator'
can be.

Since prehistoric times people have been trying to figure out a reliable way to tell them where they are, to help guide them to where they are going and to get them back home again. Cavemen probably used stones to mark a trail when they set out hunting for food.

When navigators first sailed into the open ocean they discovered they could chart their course by following the stars. The next major navigational developments were the magnetic compass and the sextant.

The compass could show you in what direction you were travelling and the sextant could determine your latitude. However, mariners were still unable to determine their longitude until the development of the chronometer which could accurately measure time.

For over 200 years the compass, sextant and chronometer were used to provide bearing, latitude, longitude and time information. Prior to, and during the Second World War, several radio-based navigation systems were developed for use by ships and aeroplanes.

Some of the original ground-based radio-navigation systems, such as LORAN, are still in use today.

One drawback of using radio waves is that you must choose between a system that is very accurate (very high frequencies (v.h.f.), ultra high frequencies (u.h.f.) or super high frequencies (s.h.f.) but doesn't cover a wide area or one that covers a wide area (medium frequencies (m.f.) or high frequencies (h.f.) but is not very accurate.

Engineers therefore decided that the only way to cover the entire world's surface and to obtain the required positional accuracy was to place microwave radio transmitters on satellites out in space. This is one of the main principles behind the satellite Global Positioning System (GPS).

What GPS provides is an extremely accurate passive system allowing three dimensional positioning, velocity and time determination. It also calculates a common world-wide grid easily converted to other local datum's, providing real-time and continuous information in all weather conditions.

Who Owns & Operates The GPS?

Currently there are two operational satellite constellations, GLONASS and NAVSTAR. The GLONASS is the Soviet equivalent of GPS, although manufacturers of GPS receivers seem less than keen to rely on it in these changing times.

The NAVSTAR is the GPS constellation developed, funded and controlled by the United States Department of Defence (DoD). It was formally announced as being in full operational capability in 1995 (nearly 20 years after the first GPS satellite was launched!) and will be the DoD's primary radio-navigation system well into the next millennium.

Three Part System

The entire navigation system actually consists of three parts; the space segment, ground control and the user. Now I'll take a look at each of the areas in turn.

The space segment consists of a constellation of 24 operational NAVSTAR satellites plus a number of in-orbit 'spares'. They are arranged in six circular orbital planes (four satellites in each) with an inclination angle of 55°.

The satellites are located 20,200km above the earth's surface and take 12 hours to complete one orbit. Therefore the satellites do not remain fixed in the same point of the sky like a geostationary satellite would, but move slowly from horizon to horizon.

However, the constellation is arranged so that at any time a minimum of 6 satellites will be in view to users anywhere in the world. The orbital paths of these satellites take them approximately 60° North and 60° South latitudes. What this means is that you can receive satellite signals anywhere in the world, at any time. If you move closer to the poles you will still pick up the GPS satellites but they won't be directly overhead anymore.

First Launched

The first GPS satellite was launched in February 1978 and in the following 20 years a number of different types or 'blocks' have been placed in orbit.



"I just can't understi

To the civilian or commercial user however, they all carry out the same function.

Each satellite weighs almost a tonne and measures about 5.5 metres across with the solar panels extended. The satellites have a lifetime of about 10 years, similar to that of commercial geostationary satellites.

The satellites are generally allowed to 'float' in their orbits and aren't rigidly held in position. However, the attitude of the satellites is controlled to keep them pointing at the earth. This is achieved by momentum wheels, magnetic coils and attitude control thrusters.

Attitude control is normally maintained by the momentum wheels and by torquing against the earth's magnetic field. The thrusters are only used when the on-board computer senses unusually high momentum continuing for over two hours. The on-board transmitter has a power output of 50W and this feeds a specially shaped antenna system designed to supply even power across the face of the earth.

Frequency Bands

The United States positioning system has been allocated down-link frequencies in two bands; Link 1 (L1) between 1559-1610MHz and Link 2 (L2) between 1215-1240MHz. These frequencies lie in the region designated as L-Band (that's between 1000-2000MHz or 1-2GHz).

The L-band is ideally suited for satellite to earth transmissions such as GPS. At frequencies below L-band (v.h.f. and h.f.) natural conditions and spectrum crowding preclude implementation of an precise positioning signal. Ionospheric delay, galactic background noise and antenna size as well as the existence of many high-power interference sources are obstacles to the GPS.

At the other end of the scale, frequencies in the s.h.f. region have high attenuation due to the atmosphere and rain. Also spreading loss and beam pointing requirements make a GPS ranging signal impractical.

The most practical frequencies therefore lie between 900MHz and 8GHz, with the best link margins occurring at L-band. Each NAVSTAR satellite actually transmits two L-band radio frequency (r.f.) signals, L1 on 1575.42MHz and L2 on 1227.60MHz. Civilian and commercial operators use the L1 frequency for standard positioning and the military use the L2 frequency for precise positioning and other uses.

Ground Control

The ground control segment consists of a master control station located at Falcon Air Force Base, Colorado Springs. Remote stations at Hawaii and Kwajalein in the Pacific Ocean, Diego Garcia in the Indian Ocean, Ascension Island in the Atlantic Ocean and Colorado Springs, Colorado carry out a monitoring function.

Three of the locations in the Atlantic, Indian and Pacific Ocean regions (Ascension Island, Diego Garcia, Kwajalein) are provided with up-link facilities. The monitor stations track all GPS satellites in view and collect ranging information from the satellite broadcasts.

The monitor stations then send the

information they collect from each of the satellites back to the master control station, which computes extremely precise satellite orbits. The information is then formatted into updated navigation messages and transmitted to each satellite via the ground station antennas.

Transmitted Information

So, what information does the NAVSTAR satellite transmit? In fact it transmits the GPS signal, which contains a pseudo-random code, ephemeris data and almanac data. The pseudo-random code identifies which satellite is transmitting, in other words it's simply an identification code.

The GPS receiver indicates which satellites you are receiving with a number from 1 through 32. But, why 32 when there's only 24 satellites? That's simply because there are a number of in-orbit spares and it simplifies the maintenance of the GPS constellation. A replacement satellite can be placed into the correct orbit, turned on and used before the satellite it was intended to replace actually fails! The master control station then allocates a different identification number (from 1 through 32) to identify the new satellite.

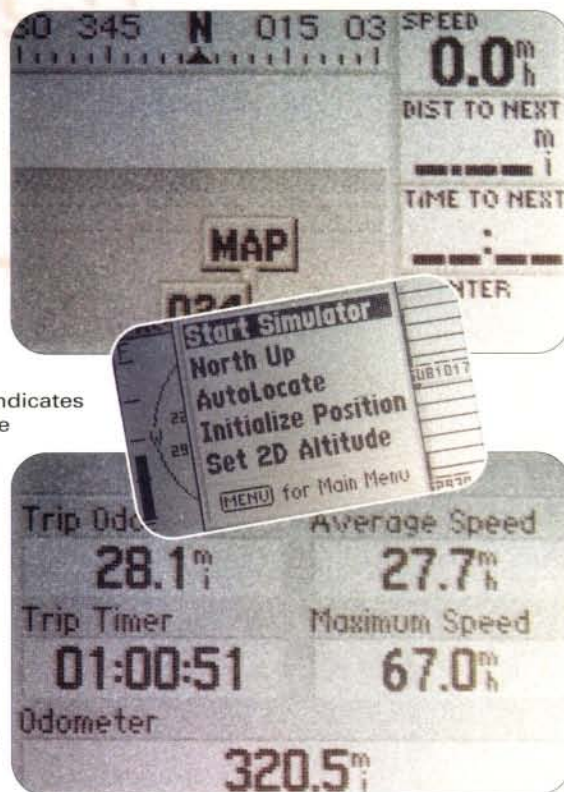
Ephemeris data is constantly transmitted by each satellite and contains 'housekeeping' information such as healthy or unhealthy status of the satellite, the current date and time. Without this part of the message your GPS receiver would have no idea what the current time and date is. This part of the signal is essential to determining your position.

The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

The signals are transmitted using spread spectrum (s.s.) techniques. An s.s. system is one in which the transmitted signal is spread over a wide frequency band, much wider than the minimum bandwidth required to normally transmit the information being sent.

One advantage of using the s.s. modulation system is that it resists intentional and non-intentional interference. It can also share the same frequency band with other users as a spread-spectrum GPS receiver doesn't 'see' other narrow-band signals. This is because it's listening to a much wider bandwidth for signals with a specific pseudo-random code sequence.

There is also one unique property that arises



and how Garmin can cram the whole world in a little box!"

as a result of the selective addressing technique. By assigning a unique code to each separate satellite in the NAVSTAR constellation all satellites can transmit at the same time on the same frequency without causing interference to each other. So, if you see the specification for a civilian GPS as having a 12 parallel channel receiver what it actually means is that it can receive 12 satellites on one frequency (1575.42MHz) at the same time!

At last I've come to the final part of the positioning system: the 'user segment'. This consists of the antenna, passive receiver and processor that allows land, sea or airborne operators to receive the GPS satellite broadcasts and compute their precise



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All these are available from Waters & Stanton PLC.

position, velocity and time. The GPS receivers can be hand carried or installed on cars, lorries, aircraft and ships. In fact virtually anywhere that can 'see' the satellites overhead.

How GPS Works

Finally it's time to pull everything together to show you how the GPS works. And to start with each satellite is equipped with an accurate clock and it transmits signals coupled with a precise time message. The clocks keep time to within three nanoseconds, that's 0.000000003 or three billionths of a second!

Each satellite transmits a message which essentially says, 'I'm satellite X, my position is currently Y and this message was sent at time Z'. Your GPS receiver reads the message and saves the ephemeris and almanac data for further use and accurately sets the internal clock. This precision timing is important because the GPS receiver must know exactly how long it takes for the signal to get from the satellite.

Then to determine your position, the GPS receiver compares the time a signal was transmitted from a satellite with the time it was received by the GPS receiver. The time difference tells the GPS receiver how far away that particular satellite is.

If distance measurements from a few more satellites are added then it can triangulate your position. This is exactly what a GPS receiver does.

By using a minimum of three satellites the GPS receiver can determine a latitude and longitude position (a 2D position fix). With four or more satellites, a GPS receiver can determine a 3D position fix which includes latitude, longitude, and altitude. By continuously updating your position, a GPS receiver can also accurately provide speed and direction of travel (referred to as 'ground speed' and 'ground track').

How Accurate?

The GPS provides two levels of service, the Standard Positioning Service (SPS) and the Precise Positioning Service (PPS). The Standard Positioning Service is a positioning

and timing service which is available to all GPS users on a continuous, world-wide basis with no direct charge. The SPS provides a predictable positioning accuracy of 100m (95%) horizontally and 156m (95%) vertically and time transfer accuracy to UTC within 340 nanoseconds (95%).

The Precise Positioning Service (PPS) is a highly accurate military positioning, velocity and timing service which is available on a continuous, world-wide basis only to users authorised by the US military and is denied to unauthorised users by the use of cryptography. The PPS provides a predictable positioning accuracy of at least 22m (95%) horizontally and 27.7m vertically and time transfer accuracy to UTC within 200 nanoseconds (95%).

There are several factors which can add error to your GPS accuracy. The first of these and the largest source of positional error is called Selective Availability (SA).

The SA is an intentionally imposed degradation in the accuracy of civilian GPS by the United States Department of Defence. Under SA, GPS accuracy can be degraded to a maximum of 100m but normally the DoD do not degrade GPS accuracy to that level.

However, the DoD have set a goal of reducing the SA to zero by 2006 (and tasked the military to use electronic warfare techniques to selectively deny the civil link to enemy forces.) Nevertheless errors of 30m or more are not unusual with a commercial GPS.

Another factor that affects the accuracy of the GPS is the number and location of satellites it can 'see' at any particular time. For example, you could be in a screened location where a GPS receiver can only lock onto four satellites.

If all four of these satellites are in the sky to the north and west of the receiver, satellite geometry is rather poor. That's because all the distance measurements are from the same general direction. This means triangulation is poor and the common area where these distance measurements intersect is fairly large.

However, if you are in a clear location and those same four satellites were spread out in all directions, north, south, east and west, the positional accuracy improves dramatically. The common area where all four distance measurements intersect is much smaller and even with SA the accuracy may be within 30m or better.

Therefore satellite geometry becomes an issue when using a GPS receiver in a vehicle, near tall buildings, in thickly wooded or mountainous areas. When the GPS signals are blocked from several satellites, the relative position of the remaining satellites will determine how accurate the GPS position will be.

A good GPS receiver indicates not only which satellites are available for use but where they are in the sky (azimuth and elevation) so that you may determine if the signal of a given satellite is being obstructed.

Other sources of error include multipath effects, propagation delays due to atmospheric effects and internal clock errors. In most cases the GPS receiver is designed to compensate for these effects and will do so quite efficiently. But very small errors due to these items can still occur.

So in reality a typical civilian GPS receiver may have an accuracy of between 20 to 100m, depending on the current status of selective availability, the number of satellites available and the geometry of those satellites. However, this can be reduced to 5m or better (in some cases under 1m) through a process known as Differential GPS (DGPS). The DGPS system employs a second receiver (such as the Garmin **GBR-21** beacon receiver) to compute

corrections to the GPS satellite measurements.

The Garmin GPS III Personal Navigator

So, with the background information under your belts here is my review of the Garmin GPS III Personal Navigator.

The new Garmin GPS-III is a global positioning system with a difference. It's loaded with an electronic map covering millions of miles of motorways, normal roads, railways, rivers, towns, villages and shorelines.

So, the GPS-III not only calculates your speed, time and distance to destination, it also displays your position on a real-time moving map. There's also a handy trip odometer, compass bearing, average and maximum speed readings and a memory capacity sufficient to memorise 20 reversible routes with up to 500 'waypoints'.

The GPS-III Navigator is very compact, fitting easily in the palm of the hand. It measures approximately 60 high x 130 wide x 40mm deep. It weighs only 255g (9 ounces) and that's including the four AA-size batteries required to power it! There's also an internal lithium battery backup which lasts for 10 years.

A socket is provided for external d.c. power (if required) and it also provides an RS-232 compatible output allowing an easy interface to a wide range of external devices. These can include a computer, differential beacon receiver (DGPS), a second GPS receiver or a marine auto-pilot unit. The small flip-up antenna is detachable and connects with a standard BNC connector allowing remote-mounted antennas to be easily attached.

The Garmin GPS III Personal Navigator comes with a user's manual, a quick reference chart, wrist strap and Velcro mount as standard. Optional accessories include a vehicle dash bracket, bicycle handlebar bracket, cigarette lighter adapter, p.c. kit (with data cable), power/data cable, carrying case, remote antenna (GA26) and a differential beacon receiver (GBR-21).

Navigator Capabilities

The GPS III features six main pages, which are shown on the l.c.d. screen. These display the satellite status, position, map, compass, highway and active route pages.

You can scroll through the pages in either direction using panel mounted buttons. The satellite status page features a sky view of all available satellites, corresponding signal strength bars and the status of your current fix (poor coverage, 2D or 3D fix). It also indicates the accuracy of the position fix, using dilution of precision (DOP) and estimated position error (EPE) figures.

The DOP measures the number of satellites received and where they are relative to each other. The EPE uses this DOP figures and other factors to calculate a horizontal position error, in feet or metres. A bar graph also tells you how much battery power is available.

Position & Map Pages

The position page displays a graphic compass showing your direction of travel (track), current position co-ordinates, date and time. The current position read-out can be displayed in latitude/longitude (in degrees, minutes, seconds or decimal degrees), Universal Transverse Mercator (UTM) or Universal Polar Stereographic (UPS) grids, six other grids including the British Grid system (to show

your WAB square, e.g. SO34) and Maidenhead locator (e.g. IO81MX).

There are six user-selectable data fields which also display your current speed, average speed, trip odometer, trip timer and sunrise/sunset times at your current location. All the user-selectable fields can be changed to display other information if required.

The map page shows your real-time track log (an electronic 'bread crumb' trail that appears directly on the map as you move) and your present position as a pointer icon in the centre of the map. But it can do much more than just plot your course and route.

The map also displays background details such as town names, road names, rivers, lakes, coastlines and countries. An on-screen cursor lets you pan ahead to nearby locations (waypoints) to determine the distance and bearing to any new map position while you navigate.

There are 24 selectable map scales ranging from 800km (500 miles) down to 30m (120ft). The map can be oriented with the top of the page always pointing north, oriented along your desired course or it can automatically rotate to keep your current direction of travel (track) at the top of the screen.

Compass & Highway Pages

The GPS III features two different navigation pages, compass and highway. The Compass page provides graphic steering guidance to a destination waypoint with an emphasis on the bearing to your destination and current direction of travel. The middle of the screen features a rotating 'compass ring' that shows your course over ground and a bearing pointer that indicates the direction of the destination.

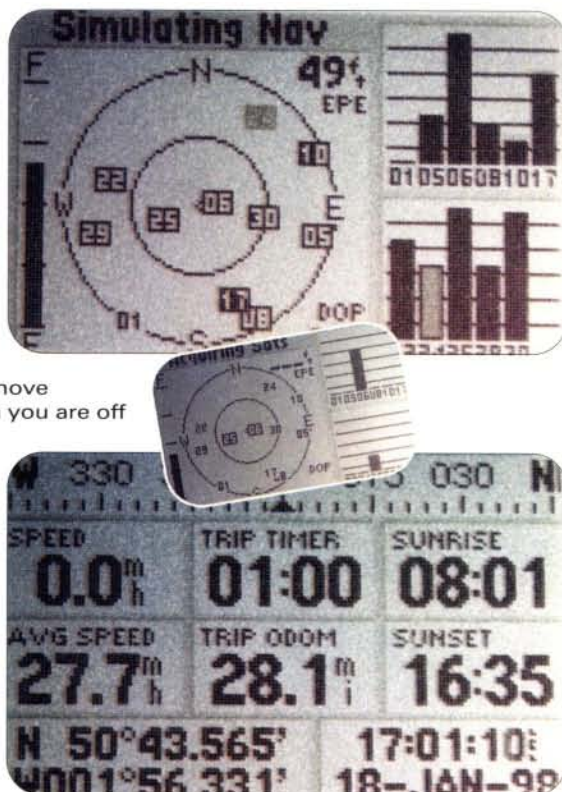
The Highway page places greater emphasis on the straight-line desired course and the distance and direction you are off course. The middle of the screen provides visual guidance to your destination on a moving graphic 'highway'. A line down the middle of the highway represents your desired course. As you move towards your destination the highway will actually move indicating the direction you are off course.

Active Route Page

Before you can use the GPS III to guide you somewhere you have to mark a position as a waypoint. The Garmin III Personal Navigator can store up to 500 such waypoints in its memory, assigning each a name and icon.

Once you've stored a waypoint in memory you can use the GPS III to guide you to it by using the GOTO feature. This function is displayed in the last of the six main screens within the Active Route page.

In addition to the six main screens you can also access the Main Menu which gives you many additional pages (sub-menus). These are



Did you Know?

Useful GPS Facts

The first GPS Satellite was launched in 1978.

There are currently two operational satellite constellations - GLONASS and NAVSTAR.

The NAVSTAR satellite constellation came into full operation in 1995.

GPS satellites are situated some 20200km above the earth's surface.

Each NAVSTAR satellite transmits two r.f. signals on 1575.42 and 1227.60MHz.

The GPS satellite signals are transmitted using spread spectrum techniques.

The Garmin GPS Web site can be found at:
www.garmin.com

used to create or edit waypoints, create routes, list nearby waypoints, review trip information and times, alter interface formats and to make changes to the GPS III system settings. You can set limits that bring up an alarm if you stray off course and you can even use it as a conventional alarm clock!

Personal & Compact

When I first took the Garmin GPS III Personal Navigator out of its box I was surprised how compact it actually was. The case is fully-gasketed, waterproof to IPX7 standards and made of high-impact plastic.

A lot of thought has obviously gone into the design of the GPS-III and I was pleased with the way it felt, the size of the display screen and the layout of the user buttons. It really is ideal for carrying in your pocket, in your hand or for discretely mounting within a car.

Unlike other equipment reviews I've carried out I really did need to read the manual first but at 90-pages this can be rather time consuming. However, Garmin have thought of this and have provided a training mode accessible from the main menu page. The simulator is excellent and I was able to pick-up the basic features very quickly.

The first time you turn on the GPS III you need to initialise it. This basically means you have to tell the unit, by scrolling the map to your approximate location (within 350km or so), and then wait for the satellites to lock in.

The auto-locate mode normally takes up to five minutes but when I first turned it on it came up with a location centred on Poole, Dorset. (Obviously someone in the PW offices had been playing with it before sending it to me!). As it didn't need the initial (once only) set-up, it only took about 30 seconds for the unit to acquire the requisite number of satellites.

The unit then automatically 'jumped' to the correct map location, my home QTH in Herefordshire. It's amazing! It really did it!

As I had the review model over the Christmas period I was able to test out the automatic acquisition and map function whilst carrying out the annual 'Christmas present run' around the country. My first journey was from Herefordshire to London and in the interests of safety I located the Personal Navigator in the back seat with my children, Ben and William.

Before leaving I had detached the flip-up antenna and connected a remote mounted antenna on the rear of the car. On switch-on the unit acquired the satellites and

automatically jumped to the map page, again within 30 seconds.

Throughout the three hour

journey to London Ben and William were able to correctly tell me every A-road and Motorway we were travelling on. The 'bread crumb' trail accurately followed all the roads of our route on the map.

The next leg of the journey was from London to Ingatestone, Essex. The previous evening I had spent considerable time putting in numerous waypoints (it gets easier with practice) to enable Ben and William to navigate us to a location they had never been to before. A teenager and his 12 year old brother navigating! This was risky stuff!

Using a combination of the active route page and map page they got me to within 3.2km of my destination. As the last part of the

journey was on an unclassified road, Ingatestone wasn't shown on the map (most smaller villages aren't) and as I didn't have a precise grid reference of my brother-in-law's house I wasn't really surprised.

Even so we were all very pleased with how this little box of tricks could navigate us around the country. The only thing that worried me was that my kids could tell me how fast I was driving along the motorway!

The next trip was to my parents' house in Ferndown, Dorset. This time I left the GPS switched off as I wanted to see how quickly the unit could switch to a new map location when I arrived on the south coast.

On arrival I parked in a slightly screened area, with many tall (and wet) pine trees above me. Even so, it only took 42 seconds for the unit to acquire the satellites and for the correct map location to automatically 'pop-up' on the screen.

The review model comes with a moving map of the UK and Europe. But exactly what detail does this show? Well it shows all major towns, cities, A-roads, Motorways and other fixed features.

In the UK for example the map shows Lerwick in the Shetland Islands, Merthyr Tydfil in South Wales and the A5025 on the island of Anglesey. Features such as the railway track at Ryde on the Isle of Wight, the River Wye through Hereford and Grafham Water (a lake near Huntingdon are also accurately shown).

The unit doesn't identify country lanes and some very recent roads but it's still very accurate. Surprisingly though, it didn't show the M50 and that's been around for nearly 20 years or so! Nevertheless I was very impressed.

On switch-on the unit displays the message 'International Land Data, Version 1.01, 1996'. I just wondered whether the GPS III could be upgraded at a later date with a new ROM map? This level of detail is carried throughout all of western Europe.

In Germany for example it shows all major roads and even the town of Weinheim, the location for Europe's largest v.h.f. convention. As you move into eastern Europe the level of detail decreases but even so all the cities and major road routes are still shown.

As you scroll around to the other side of the world, say Australia or South America, the map shows coastlines, individual countries and major cities, only losing the road detail. I just can't understand how Garmin can cram the whole world in a little box!

Magnetic Antenna

Outdoor performance of the GPS III using the built-in antenna is very impressive. However, you do need to keep the unit a reasonable distance away from your body to reduce shielding effects and to increase the overall accuracy.

With the information being updated once every second, it's really amazing to see how fast you are walking and quickly showing that you've changed direction. I found the 'personal navigator' always picked up about six satellites or more, even when in a fairly screened location.

For use in a vehicle though I recommend that you use an optional antenna. As well as the GPS III, I was also loaned the **Watson GPS-150** remote antenna. This is an active antenna for GPS receivers, with a magnetic mount and 5m of coaxial cable terminated in a BNC plug.

Proving that size is not everything, the GPS-150 antenna measures only 40mm square by 10mm high. It really is unobtrusive and doesn't advertise the fact there may be a GPS unit in the car.

"It's amazing! It really did it!"

When I used it in my car I located the antenna on the rear boot lid of my car. The coaxial cable is very thin and easily slipped in the gap at the rear of the boot without any problem. The magnetic mount makes fitting extremely easy and the 5m length of cable is long enough to reach from one end of the car to the other.

The performance of the Watson GPS-150 antenna is impressive and was considerably better than the flip-up antenna mounted on the GPS III. It consistently picked up more satellites, normally a minimum of nine and the signal strengths were also much stronger. The increased performance is probably due to having the antenna located in the clear with an excellent ground plane beneath it.

The high contrast, back-lit liquid crystal display, measuring 60 x 40mm, is very sharp and easily viewed. There are three levels of back-light intensity so, it's even possible to view the GPS in total darkness.

The contrast and the back-lighting shut-down periods are adjustable from the main menu to allow optimum viewing in all lighting conditions. All display pages can be orientated to horizontal (landscape) or vertical (portrait) format to suit it's use either in a vehicle or as a hand-held on hiking trips.

The only down side to all this constant GPS activity is that the batteries don't last all that long. Garmin claim eight hours but I reckon it's less than this, especially if you leave the unit running for many hours at a time. Certainly in a car or other vehicle it would make sense to use the optional power cable. If using it for hiking I would only turn it on when necessary and I would definitely take a spare set (or two) of batteries with me.

Software Kit

If you've got a personal computer (PC) and want to fully maximise and complement all features of the GPS III it might be worthwhile considering the Garmin PCX5 software kit. It's designed for use with Garmin GPS units which do not contain a Jeppesen aviation database, i.e. the Garmin GPS III, 40, 45, 75, etc.

The PCX5 kit consists of a PC interface cable, a 3.5in disc containing the software program and a 38-page owner's manual. The interface cable is terminated in a four pin plug which connects into a socket on the GPS unit. The other end is terminated in a 9-pin D-type connector which connects to the p.c. serial port.

The minimum p.c. requirements for the PCX5 are an IBM-compatible computer (AT, 386, 486 or Pentium), 640Kb memory, 3.5in (1.44Mb) floppy disk drive, a hard disk drive and an EGA or VGA graphics adapter. Once running on a suitable PC the software can be used to either download (from your GPS unit) or upload (to your GPS unit) route, waypoint, proximity waypoint, almanac and track data for editing, plotting, processing and analysis.

You can display the digital map in real time for mapping and navigation guidance or you can print files to your system printer for track analysis. Data files can be manipulated, zoomed and panned. Great Circle range (distance) and bearing calculations can also be made. All this and more can be achieved by use of the PCX5 software kit.

In use the software was found to be a little

dated insofar that it runs from DOS, rather than in a proper WIN95 environment. It can be used with a keyboard but a mouse is essential for 'zooming' and 'panning'. These functions would be even easier if they could be carried out using 'Windows' scroll bars instead of clicking and dragging with the mouse.

To print you need to first use DOS 'GRAPHICS.COM' to set up the printer before launching the program and there's no on-line help. Perhaps the next software version will take these points into account?

On the positive side, though the software is simple to install, it runs very well and without any crashes. Up-loading and down-loading is very easy and the manual is well written. It simply does everything you would need it to do.

Other Uses

Okay, so you've already got a road map covering all of Europe in the car and you don't like hiking. So, what amateur radio uses can you use the GPS III for?

Well, how about connecting it to a packet radio terminal node controller (t.n.c.) and 144MHz transceiver? This can form the basis of an Automatic Position Reporting System (APRS), a mapping program that tracks mobile

stations via Amateur Radio.

Some of the applications could include keeping track of Raynet resources as they move about, fox hunting (using packet radio!) or direction finding. Mobile Worked All Britain (WAB) enthusiasts could find the GPS III indispensable when trying to locate a particular WAB square. Similarly it could be very useful when you fancy a bit of portable v.h.f. operating and don't know what locator square you're in.

Another use could be to use the precise timing function of the GPS to calculate radio propagation delays and hence path length. And this is exactly what a few operators have been doing on the 50MHz band with the use of timed pulse signals.

Powerful System

The Garmin GPS III Personal Navigator is a powerful navigation system providing detailed mapping information in a convenient compact package. As well as all the standard navigation features it has those little extras that make it very useful for Amateur Radio use. And of course it's got that map!

Truly amazing! So, if you really want to know where you are, where you've been and where you're going I would thoroughly recommend the Garmin GPS III. Do I really have to give it back?

My thanks go to **Waters & Stanton PLC of 22 Main Road, Hockley, Essex SS5 4QS. Tel: Free-Phone Order Line (0500) 73 73 88 or Enquiries (01702) 206835** for the loan of the Garmin GPS III Personal Navigator, which is available from them for **£349.95**. Thanks also to a colleague of mine, Mike Preedy, who comprehensively tested out the PCX5 software.

PW

"What GPS provides is an extremely accurate passive system allowing three dimensional positioning, velocity and time determination".

Prize Competition

To win the Garmin GPS III as reviewed by David Butler G4ASR see next month's PW for our special competition! Make sure you keep this copy of PW to hand as the questions will be based on the fascinating subject of GPS.

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Rob Mannion G3XFD was taken by surprise by the interest shown by readers in the simple diode receiver project published in January 1998. So, this month he takes the opportunity to further discuss the project and techniques to help you build your version.

Although I realise that people are continually picking up *PW* from the newsagent's shelves and getting going in the radio hobby - I was rather taken aback by the amount of interest and requests for the diodes and earphones on offer in the January issue (I was also delighted by the response!). But by now everyone who wrote asking for earphones, etc., should have received them.

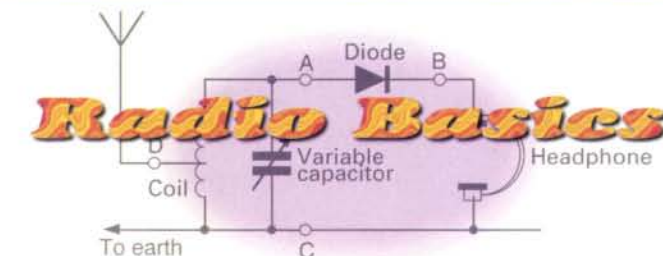
I apologise for the delay in getting the diodes and notes out - but I caused an extra delay by individually testing each diode and earphone on a test receiver set-up at home. And I can tell you - after testing well over 100 diodes and earpieces I was rather weary of listening to Radio France International (the short wave station I was tuned into). Weary not because of the programme content - but because I was only hearing it 'snatches' as I tested the components!

Asked & Answered

The most frequently asked questions from the considerable postbag, E-mail messages, telephone calls and letters (to the office and my home) involved coil winding, type of wire, reception, antennas and earphone types. So, without further ado I'll reply and answer them in order.

With regard to the coil winding details I've got to admit that it really is a case of 'pot luck' with such a simple receiver circuit. This is because as it's so 'unselective' (it cannot 'select' the transmission you want from the many others on nearby frequencies).

With the coil details provided in the January *PW* for the circuit in Fig. 1., (repeated above, from January to help you), you should be able to receive several short wave broadcasters. And 40 turns on a convenient 'for-



mer' (which could be anything from an empty, used plastic pen case or piece of plastic tube to a cotton-reel or even a 'loo roll' centre) with the wire being of anything between 22s.w.g. (standard wire gauge) (Maplin order code BL72E is suitable) and 28s.w.g. also being suitable.

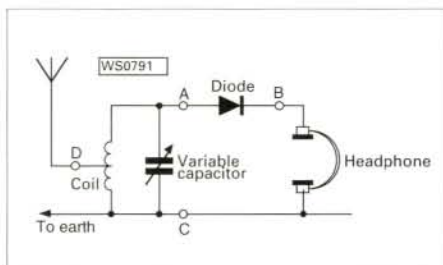


Fig. 1: The diode detector circuit. (See text for further advice on the circuit and how to get best results).

The coil tapping will provide some help in 'selecting' the wanted short wave station and may also (depending on your antenna length and height) assist in receiving a variety of stations. However, I've got to warn you that with this really simple receiver - **the actual length of the antenna** is the main deciding factor on what band of frequencies are received at the best volume. And of course, a good 'earth' is helpful (it's best to bury an 'earth' rod directly in the ground - and keep the area damp if possible).

For reception with this receiver a length of wire being used for the antenna could perhaps be (as it was in my case) approximately 49 metres long. And although half wavelength antennas are very often considered the optimum for use on particu-

lar frequencies - the 'full wavelength' wire certainly produced excellent results on the 6MHz (49 Metre Band) at my home.

The major problem with the input circuit described in Fig. 1, and the 'coupling' arrangement adopted is that virtually any transmission on the 49 metre band will dominate - even if you wind a coil for the medium wave band - the short wave stations will often be there in the background! But as a first radio project it's great fun and free as no batteries are required!

Tuning & Earphones

Another source of puzzlement for beginners, judging from the letters I've received, concerns the variable tuning capacitor and earphone/earpiece. However, both problems are easy to overcome.

Undoubtedly, the most suitable type of variable tuning capacitor is the tradition-

al 'moving vane' version which is still used in modern radio equipment - although it's slowly being superseded by other tuning techniques. If you go to a radio rally you can often find them for sale for around the £1.50 mark - but bought new they can cost more than a 'ready made' receiver! However, they can be recovered from scrap radio receivers, as shown in Fig. 2.

There are other alternatives for tuning, and a popular method involves the 'solid dielectric' variable capacitor, also shown in Fig. 2. Unfortunately however, this form of variable capacitor does not provide the same results as the traditional 'open type' as there are some 'losses' - an important factor when you remember that the diode receiver is providing minute signal levels.

Unfortunately, finding a pair of suitable headphones can be a problem! Unless you're fortunate to own an old fashioned pair of sensitive 'high impedance' headphones or you have a sensitive (telephone type) earpiece - the only easy-to-obtain choice nowadays are 'Walkman' low-impedance style, which aren't sensitive enough for good results.

So, in this column next time I'm planning to provide you with a very simple amplifier circuit. This will

'boost' the signal and enable cheap, readily available headphones to be used.

In the meantime I'm preparing a free 'information sheet' (please send an A5 stamped addressed

envelope and request Basics Information Sheet 1) to help you further. Cheerio for now - and keep writing. In return I'll do my best to help and advise **you** how to discover the basics.

PW

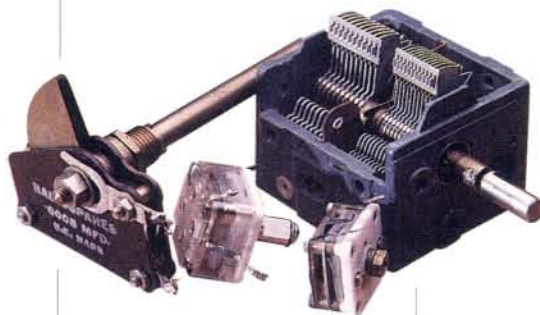


Fig. 2: Photograph showing common types of variable capacitor. Solid dielectric type, often available as surplus (left), modern Polyvaricon types (centre) and traditional double ganged 'air spaced' from a broadcast receiver.

To order any of the titles mentioned on these pages please use the order

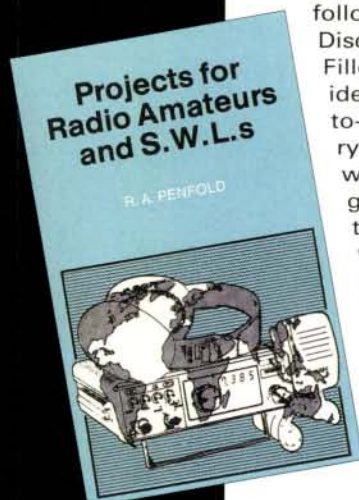
It's the time of the year when you've got every excuse to stay indoors and switch the soldering iron on! So, to help you get organised on the 'home-brewing' - particularly if you're enjoying our 'Radio - Discover The Basics' series, the PW team have selected some interesting books. Read on - and switch on!

Book PROFILES

Radio Receiver Projects You Can Build Homer Davidson

Although originally aimed at the American reader, this book is a winner - it's full of good, well thought out projects (33 in total) presented in a thoroughly good practical way. It also includes a valved receiver and despite the fact that some of the projects use the ZN414 and ZN416 integrated circuits which are becoming difficult to purchase in the UK - this book will prove abso-

lutely ideal for anyone starting in the hobby, and especially anyone following 'Radio - Discover The Basics'. Filled with good ideas, projects, easy-to-understand theory and backed up with plenty of diagrams, photographs and illustrations it will prove to be very helpful. **Very Highly Recommended at £18.95.**



Projects For Radio Amateurs & SWLs R. Penfold

This little Babani book will prove helpful to anyone progressing into the hobby as it offers interesting (and instructive) working projects ranging from 'add on' beat frequency oscillators, crystal calibrators, various filters and an 'active antenna' circuit. The author is well known for his straightforward approach and the book will provide hours of home-brewing ideas, construction and instruction all at the same time. **Helpful, practical and affordable at only £3.95.**

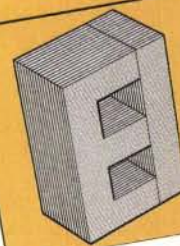
Coil Design & Construction Manual B. B. Babani

This little paper back book has become a little 'classic' over the years. Essentially unchanged from the time it was first published in 1960, it has proved extremely useful to any home construction enthusiast who is particularly keen on working with valved equipment. Some of us still have their original 1960 copies on the workbench!

So, if you're 'into valved equipment' this book will help you design wound components ranging from radio frequency tuning coils to interstage

audio coupling and output transformers. Additionally, if you are one of the ever increasing band of valved 'hi-fi' enthusiasts - it could help you in the never ending quest for good quality reproduction. **A helpful reference source for valved equipment.** The *Coil Design & Construction Manual* costs just **£3.95.**

Coil Design and Construction Manual B.B. BABANI



Power Supply Projects R. A. Penfold

Power supplies probably cause the inexperienced constructor more problems than any other project - but quite unnecessarily in many cases. Added to the fear of the 'unknown' there often seems to be some trepidation when it comes to the dealing with the 'mains' power.

To help - this little book, from the busy word-processor of R. A. Penfold - seeks to provide simple and straightforward ideas backed up with informal instruction. Dealing with everything from transformation, rectification, fixed and variable voltage regulation and associated techniques, it provides in 'one package' self-tutoring and projects you can build in a week-end. Power Supply Projects is a **Very useful and well prepared** book costing **£3.99.**



er form in this issue or telephone Michael or Shelagh on (01202) 659930.

Packet Selection

For all you Packet and Data mode enthusiasts here's a selection of books that you should think worthy of a place on your bookshelf.

Packet Radio Primer

Dave Coomber & Martyn Croft

There aren't many British written and published books on packet radio - but **Dave Coomber G8UYZ** and **Martyn Croft G8NZU** have done well to produce this informal but informative introductory guide. They've aimed at producing the book in the 'American Style' - complete with the occasional cartoon, lots of information and good illustrations.

With a short introductory section on data communication the authors take the reader through how packet works, the packet station, setting parameters, PMS mailboxes and servers, writing messages and getting files. And if you're interested in using packet radio via Amateur Radio satellite links - that's also included. Altogether this book provides a very well produced 'primer' and reference source for both the beginner and active packet radio enthusiast. **Recommended at £8.95.**

Your Packet Companion

Steve Ford WB8IMY

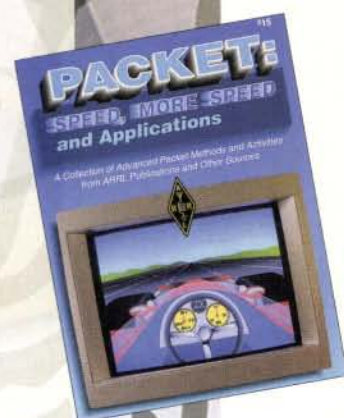
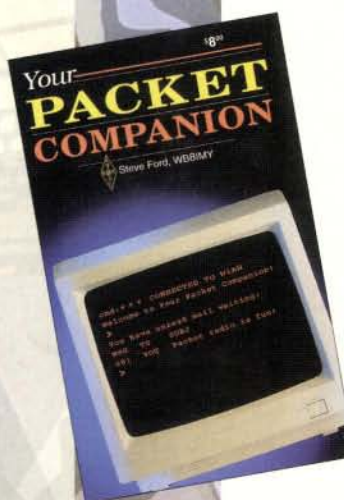
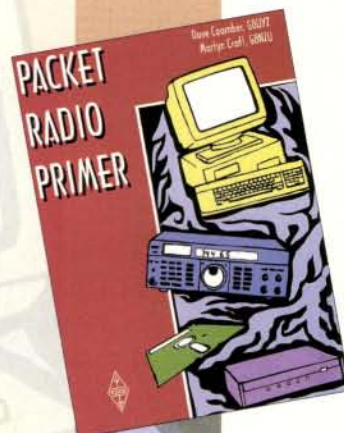
Although it's very American in approach, with the slightly larger typeface expected from the USA today, backed up with a profuse number of photographs, diagrams and illustrations, this book will provide good reading for any British reader. If it did nothing else (and in fact it does much more) the book provides a very interesting look at the American packet radio scene in the late 1990s.

It also provides an 'American Style' approach to getting going on Packet with examples of what equipment you can use. Very readable, helpful and 'non stuffy' approach. **Good Reading.** *Your Packet Companion* costs **£5.95.**

Packet: Speed, More Speed and Applications

This 'advanced' concepts and ideas book from the ARRL is essentially a collection of circuits, ideas, projects and suggestions gathered from many different sources. This fact is clearly shown in the variety of styles of typography, design, text lay-out and drawing quality throughout the book.

Although profusely illustrated, with many good photographs and drawings, some pages and sections while having a very high technical standard reflect their non-ARRL origins as they clearly differ in style and quality of presentation. It should be regarded as a working 'workshop' book rather than a textbook and as such is ideal for the advanced packet radio enthusiast. **Excellent Advanced Reference Source** and good value at **£11.50.**



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The Yaesu VX-1 is described as an 'ultra-compact' dual band transceiver with wide band coverage. 'Ultra compact' is a little bit of an understatement if you ask me! I have a Kenwood SMC-31 speaker-microphone for my own hand-held and my speaker-microphone is the same size as the VX-1!

The Yaesu VX-1 is supplied with a belt clip and strap, a battery pack, wall charger, helical antenna and a very well written and presented handbook. And rather unusually - the charger unit also acts as a mains power supply unit.

The helical antenna connects to the top of the radio by use of a SMA fitting. However, I wanted to be able to see how the VX-1 performed on an external antenna. My local emporium, The **Shortwave Shop** in Christchurch, kindly lent me an adapter that enabled me to connect the radio to the normal BNC type fittings. These adapters retail at around the £5 - £6 mark.

Transceiver Coverage

The VX-1 covers an incredible range of frequencies, and in order to organise the transceiver's coverage, Yaesu have divided the frequency range into nine bands of operation. Each has its own pre-set channel steps and operating modes programmed, however these can be changed. (I would have liked to have been able to disable and enable bands but I could not find a way to do this).

The VX-1 offers a choice of memory configurations. You can have 52 memories that store simplex or semi-duplex frequencies (including odd splits) tone mode and tone frequency. The other option is 142 memories that would only hold simplex frequencies, although repeater shift can still be saved.

Memories in both configurations I've mentioned would also store power output level, memory skip information and an alphanumeric name if you added it. In addition to these memories, the VX-1 has 10 pairs of programmable band scanning memories, 31 'Smart Search' memories (I'll mention 'Smart Scan' a little later) and 10 memories for the broadcast band. This all adds up to quite a comprehensive memory configuration!

Nine Bands

The nine bands on the VX-1 include the medium ('a.m.') wave broadcast band, (yes: 500kHz to 1.7 MHz!). What a shame they didn't go a little further and give us' 1.8MHz ('Top Band') as well! The Band II v.h.f. 'f.m.' broadcast band, the v.h.f. and u.h.f. 'Airband', the 144 and 430MHz amateur bands and the Television audio frequencies are also included.

To get the most from each band, Yaesu state that the supplied antenna may have to be replaced with a dedicated whip or external antenna system. And

Probably The Smallest Hand-Held In the World!

although I agree with Yaesu on this point, I'm pleased to report that I received transmissions on all the bands mentioned with the supplied antenna, although of course some were rather marginal.

The VX-1 is so small, it would easily fit into a pocket, one of those lady's 'clasp' bags or a cigarette packet! When I wore it on my belt it was like wearing a pager!

The Controls

The controls on the VX-1 are few but the facilities are numerous. A menu that can be accessed very easily, and a 'one-button' depression sets most of the advanced features.

Yaesu have been clever in their use of multi-function buttons. Most of these on the transceiver have two or even three functions - depending on how long they are depressed and if they are used in conjunction with the 'F' (Function key).

I'm not going to describe each button in detail. Instead I think it's sufficient to say that the back-lighting is very effective, and the buttons are well labelled and thoughtfully laid out. (The display is large and the readout is very easy to see, the display is actually larger than others I have seen on much bigger radios!).

The VX-1 has a power output of 500mW on 'high' power and 50mW on low power when operated from the supplied battery. It takes 6V external power, and when using this the power output is 1W 'high' and 200mW on low power. (All

**Richard
Newton
GORSN - PW's
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takes a look
at a truly
'compact'
transceiver.**

*"Ultra-compact? -
A Little bit of an
understatement if
you ask me"! says
Richard Newton*



Manufacturer's Specifications

General

Frequency Ranges

Receive:	0.5 - 1.7MHz
	76 to 300MHz
	300 - 580MHz
	580 - 999MHz
Transmit:	144 - 146MHz and 430 - 440MHz
Channel Steps:	5/10/12.5/15/20/25/50/100kHz
Frequency stability:	±5ppm (-10°C to +60°C)
Repeater shifts (default):	±600kHz (v.h.f.) ±1.6/5.0/7.6MHz (u.h.f.)
Emission types:	F3 (G3E), F2
Antenna impedance:	50Ω
Supply Voltage:	
Nominal:	3.6V d.c., negative ground
Operating:	3.2 - 7.0V, negative ground (ext. d.c. jack)
Current consumption:	150mA (Receive) 50mA (Standby, Saver Off)
	16mA (Standby, Saver On) 200mA (Auto Power Off)
	400mA (500 mW transmit v.h.f./u.h.f.)
Operating Temperature:	-20°C to +60°C
Dimensions:	47 x 81 x 25mm (w/o knob, ant.)
Weight:	125g. (Approx. w/ant. & battery)

Transmitter

Power Output:	1W (@ 6V ext. d.c. input) 500mW (@ 3.6V d.c.)
Modulation type:	Variable reactance
Maximum deviation:	±5 kHz
Spurious emissions:	At least 60dB below carrier
Microphone impedance:	2kΩ

Receiver

Circuit Type:	Double conversion superhet (v.h.f./u.h.f.)
Single conversion:	500kHz to 1.7MHz
Intermediate frequencies:	First 41.45MHz (v.h.f./u.h.f.), 455kHz (500kHz - 1.7MHz)
Intermediate frequencies:	Second 450kHz (Narrow f.m.)
Intermediate frequencies:	10.7MHz (Wide f.m.)
Sensitivity:	0.2µV for 12dB SINAD (144 - 146MHz)
Sensitivity:	0.2µV for 12 dB SINAD (430 - 440 MHz)
Selectivity (-6/-60 dB):	15kHz (35 kHz on narrow f.m.)
Audio output:	50mW @ 8W for 10% THD (@ 3.6V d.c.)
Audio output Impedance:	8Ω

my tests were carried out with the supplied battery pack).

The Yaesu VX-1 has full CTCSS and DTMF as standard. It also has a new facility similar to CTCSS called DCS (this is said to be far more reliable than CTCSS at controlling squelch operation).

A wise person once told me 'the proof of the pudding is in the operating'. So, in following this advice I tuned to the local 145MHz repeater, GB3SC in Bournemouth. I accessed this from my home on the outskirts of the town. I was very impressed with the audio from the small speaker in the front of the radio.

I also heard the Portsmouth repeater GB3PC this is about 50km away. Needless to say the 500mW and

Stan and I had a rather difficult contact and he was able to give me the report: "You are modulating the noise"! (Thanks Stan!). However, I was told that the fact that Stan **even heard me** at his location when I was using 500mW and a helical antenna was a good result!

My brother William then kindly offered to help me with a little test as he had to travel about 5km across town and offered to see how far we could keep in contact. He was using his mobile set-up on 145MHz (using a 5/8 wavelength antenna). I was using the VX-1 on 500mW with the helical antenna.

William intended to travel to the other side of the conurbation and over a hill. We both expected to lose contact when he dropped down on the other side of the high ground. However, **to our amazement we did not lose contact once**, I was still talking to him when he reached his destination. Needless to say - I was very impressed!

After the festive season I returned home to Bournemouth, a little disappointed that I had not been able to speak to anyone on 433MHz. This was no reflection on the VX-1 but more the lack of activity on the band. This was all put right by a chance QSO I had with **Terry 2E1EJC**. Terry was mobile about 5km away from my home location, we had a very pleasant chat, the VX-1 got an excellent report from Terry, and in return Terry got an excellent cup of tea from me.

Eye Catching Features

The VX-1 comes with several features that really caught my eye. One is an **Alarm** function and when depressed for a few seconds the alarm button activates an alarm sound, this is emitted through the radio's speaker and the unit automatically switches to high volume. It also defaults to a user-programmed 433MHz frequency and should the operator press the p.t.t button, the alarm sound is transmitted.

I would have to question whether the alarm sound is loud enough to summon help unless it was very close by. It may well be enough to distract a would-be attacker, at least long enough to aid an escape.

However, when all is said and done - it's all credit to Yaesu for thinking of the alarm feature. No identification is transmitted, just the sound, so it relies on someone knowing who you are and where you are, a family member or a friend for example.

Another useful feature is Automatic Range Transpond System (ARTS), which is perhaps useful for Scout or Guide groups with licensed members or maybe RAYNET. The ARTS uses the DCS code to keep two operators using VX-1Rs informed whether they are communications range or not.

When active and using ARTS, both transceivers automatically poll each other every 15 seconds and bleep to confirm whether they're in range or not. A call sign can also be sent in c.w. to confirm a station's identity. If they are out of range for more than one minute a warning signal sounds and the radio displays **OUTRNG**, meaning 'Out of Range'. It also tells the operator when they're back in range of the other transceiver!

The other VX-1 feature I'd like to quickly mention is the Smart Scan feature. This can continuously scan a user defined frequency range and automatically save any busy frequencies. It has many uses, and the one that springs to mind for me is that when you away on business or on holiday you can set the VX-1 to scan the 145MHz repeater band and let the VX-1 automatically save all the active repeater frequencies to the Smart Scan memories!

helical antenna was not quite enough to actually access it!

And although I could also hear the GB3SZ 433MHz repeater in Bournemouth, I could not access it. I could, however, access GB3DT. This 433MHz repeater is about 24km away near to Blandford Forum.

Over the Christmas holiday I took the Yaesu VX-1 away with me to Minehead in Somerset to see my family. We were planning to stay a while so I was looking forward to speaking to someone on the VX-1.

One afternoon following a rather generous lunch, the family decided to take a walk on the nearby beauty spot - North Hill. Some readers may have heard of North Hill as it's a rather impressive bit of high ground over looking the Bristol Channel and has a good 'radio' take-off.

My father **John G8EAM** and my brother **William G7GMZ**, accompanied me. We walked to a high point on the hill, I have to say not the highest (remember I had eaten the rather generous lunch!) and I put out a call on 145.500MHz, but nothing was heard.

So, undeterred I put out a call on 433.500MHz but again nothing was heard. I continued calling on 145.500MHz and got a reply from **Stan G3RNB**. Stan lives near a place called Woolston Moor, but this is not (as the name might suggest) a very good place for v.h.f. take-off.

"The VX1 covers an incredible range of frequencies"

"....very impressed with the VX1 on the Air Band"

"Don't sneeze - you'll never find it again!"

Base Station Antenna

I connected the Yaesu VX-1 to my main WX1 dual-band base station antenna I have on the rear of my bungalow. The antenna is not that high and I normally use it for local communications. My main antenna is out of use at the moment due to rather bad flooding in the main shack and the odd tornado being too close for comfort!

I tuned the 145MHz band and heard G4TST and G4RUC in QSO with another station. I did not manage to get their names but I think one of them was operating from the Portsmouth area. They were a good signal with me...but the 500mW was not enough to join in and say 'hello'.

The next (rather impressive!) reception was from F5ZBS in France, via the Caen repeater whose output lies on 145.325MHz. It was romping in, and I have to admit that this shows that conditions were a little 'up' but despite this it was impressive.

Somewhat 'Tongue-in-cheek' I called through the Caen repeater, and to my amazement I accessed it! To my further amazement **F1AMZ** replied: "QRZ QRZ the 'G0' station..." My luck then ran out. Another G station that obviously uses the input frequency of 144.725MHz for a local chat Net came up and completely knocked out the French repeater! (Not his fault, he was not to know, but how frustrating!).

I called out on 145.500MHz and got a reply from **Phil GODDI**. He lives in an area between Poole and Ringwood called St Leonard's, this is about 10km away from my QTH. Phil gave me a very good report, my 500mW was being received 59+ and Phil said the audio was very good.

Phil listened while I called him using the helical antenna and a quarter-wave telescopic. Nothing was heard from me on the helical and the telescopic just broke the squelch at Phil's.

Medium Wave

The Yaesu VX-1 handbook says that you should not expect to hear very much on the medium wave ('a.m.') broadcast band with the supplied helical antenna. Instead, they recommend you should use a long wire and I agree that a long wire would be preferable.

However, I have to say that Yaesu may have done the VX-1 a dis-service in their advice. I used the helical antenna and tuned the band and found several stations with good signals.

On the medium wave broadcast band the display only gives a linear representation of the band, it does not display frequency. I did not find this to be a problem. I quickly located the local station 'Classic Gold' on 828kHz and I have to say the audio quality was superb.

The Band II v.h.f. ('f.m.') broadcast band really needed a dedicated antenna. However, I did tune to 88.5MHz to Radio 2's frequency and it was booming in. Again the sound was incredible.

The Air band frequency is one of my favourites as I live very close to Bournemouth International Airport. The VX-1 received the low power departure information service from the Airport with the helical antenna (this is always a good test). On the external antenna it compared well with a dedicated receiver and I was very impressed with the VX-1 on Air band.

The other band of frequencies I played with were the TV audio transmissions. This, on the face Practical Wireless, March 1998

of it would seem pointless, however, do please do read on!

The VX-1 received all four (we don't get Channel 5 where I live) channels with the helical antenna. I have two small children, and like most people under five they are a little loud! I like listening to the news once in a while, normally my pleas to the boys go unheeded and I normally miss the news because I am too busy telling them off! But not while I had the VX-1!

It was a case of switching the TV on, turning the sound down and switching the VX-1 on. Bliss! Seriously though, those who are hard of hearing and have access to a VX-1 could also benefit in the same way as I did. You never know - you may find someone standing outside of the local Television

shop window with their VX-1 pressed against their ear watching the football!

Excellent Radio

The Yaesu is an excellent radio for what it is. It's truly a very small, QRP rig, jam-packed with useful goodies and very easy to use. For me however, **it's not a main rig**, but that choice would depend on personal needs.

Despite what I've said, the Yaesu VX-1 would be **my first choice** as a second radio. What a companion this radio would be on camping holidays, days out, walks around the neighbourhood, and even at work!

The Yaesu VX-1 is also a very smart, well made versatile radio. Considering its vast coverage I did not experience any problems as far as 'break-through' goes, living in a pager dominated area this was a pleasant surprise. The receiver seems to be very good 'across the board' and the audio quality, both received and transmitted is excellent.

I'm not normally one to carry a radio around with me all the time. The VX-1 changed that. It was small enough and interesting enough to be my constant companion. With a charge time of two hours and a battery that seems to last forever, it was rarely away from my side.

In conclusion, I would offer a word of caution for owners of this tiny transceiver. Whatever you do - don't attempt to use this equipment when you have a cold - because if you sneeze you may never find it again!

My thanks go to **Barry Cooper G4RKO** of **Yaesu (UK)** at **Unit 2, Maple Grove Business Centre, Lawrence Road, Hounslow, Middlesex TW4 6DR, Tel: 0181-814 2001, FAX 0181-814 2002**, for the loan of the transceiver. The recommended price for the VX-1R is **£269** it's available now from approved Yaesu dealers.

PW



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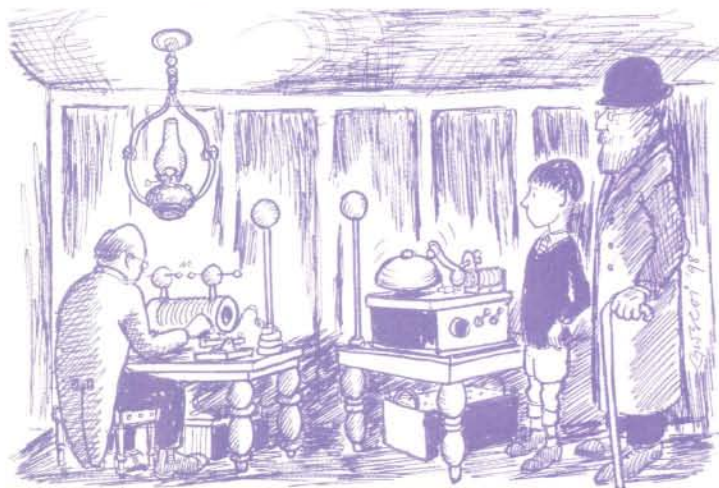
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Wireless Comes to Britain

CELEBRATING
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OF AMATEUR RADIO

Ron Ponting provides a personal history of his memories, which traces from the time he first encountered the 'magical' term wireless through to the changes he's seen right up to the present day.



A switch was pressed on the box with the copper rods, and a bright spark jumped across from one rod to the other, making the bell ring in the other room. I looked for any sign of connecting wires, but there were none, so the energy was being transferred through space!

If my memory serves me correctly, it was 1920-1921 when the word 'wireless' first came to my notice. My parents received a letter from relations in America telling them that, by means of a wireless set, they had been able to listen in their own home, to a church service taking place some 32km away!

I remember my father's comments at the time. He maintained that there had to be some connection, such as a telephone line between the two locations, but our folks had mentioned wireless and I was keen to find out more about this 'miracle'.

I was only 11 at the time, and had heard vaguely of Marconi's success in sending some sort of signal across the Atlantic. And that from this a means of communication between ships, using the Morse code, had developed. But, it still seemed that actual musical sounds were being sent 'through the air'.

My imagination was working overtime. How could I find out more about this amazing feat?

Fire Of Enthusiasm

The fire of enthusiasm was further fed when my grandfather took me to a demonstration of communication without connecting wires. This consisted of a piece of apparatus in one room, which had two copper rods on it whose ends were about an inch apart, and another box in another room with an electric bell on it.

A switch was pressed on the box with the copper rods, and a bright spark jumped across from one rod to the other, making the bell ring in the other room. I looked for any sign of connecting wires, but there were none, so the energy was being transferred through space!

I was left bewildered, wondering how I could find out more. Then a few weeks later when I came across a magazine article which explained in fairly simple terms, details for constructing a system similar to the one I had seen demonstrated.

I had a school friend who was just as keen as me to experiment and to establish communication between our two dwellings. We were soon engrossed in obtaining the various components, some of which we had to purchase, such as electric bells, Ruhmkorf coils to produce the spark, and the necessary batteries.

Other parts such as the coherers were made out of glass tubes, copper filings and copper wire. I can honestly say we tried but our experiment was a complete failure.

Soon after our failed attempts, other magazines appeared on the bookstalls, including *Amateur Wireless* and *Popular Wireless*. Also around the same time, a local shop displayed component parts for building what were known as crystal receivers, with headphones. This, for me, was the beginning of home construction.

During these years also saw the formation of the BBC, which meant that limited broadcasting commenced from various localities such as: London callsign 2LO, Cardiff 5WA, Birmingham 5IT, and others. This now made it possible to actually listen to sounds 'over the air' which was so exciting, though looking back, results with crystal sets were not very reliable.

A Giant Step

All these marked a beginning, and then a giant step was made. The invention of the thermionic valve, smaller, but similar in shape, to an electric light bulb, but with four pins at the base to plug into special bases. These first valves eventually took the place of the crystal detector.

Not only did the thermionic valve detect the incoming signal but there was also an amplifying factor which increased the volume. Also other types of valves were produced which were for amplification only, and therefore could be used in second and third stages to work a loudspeaker.

By now several firms were advertising kits of parts. There was even a kit to make your own tuning condenser, which in those days was a massive piece of equipment in itself. (This meant that a single valve set needed a hefty cabinet to accommodate the tuning condenser, the tuning coil and numerous other large components).

My first piece of home construction was a single-valved receiver, which worked a couple of pairs of headphones. Then I aspired to a three valve set, incorporating two amplifying stages, which was coupled to a loudspeaker.

Valves were then fitted with 6V heaters (instead of previous 2V types) and necessitated

"I was left bewildered, wondering how I could find out more."

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Brief Specifications

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Modulation type	F3
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Transmit RF Power	3V:Maximum 230mW
Receiver	Double conversion superheterodyne
CCTSS (For repeater)	67.0~131.8.0Hz

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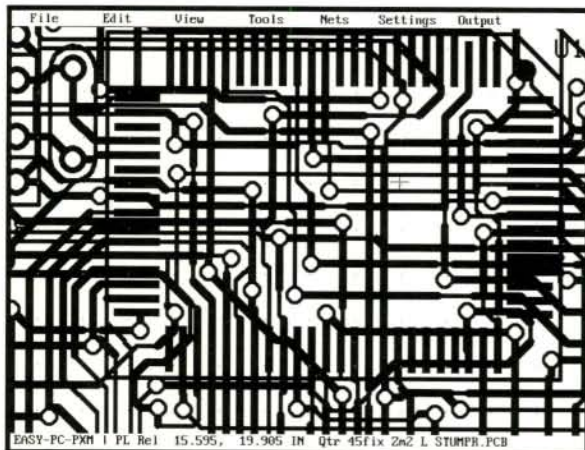
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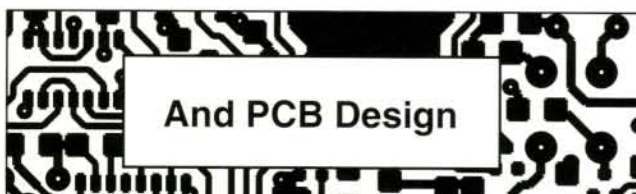
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6V batteries. The light given off from these valves was almost enough to dispense with the room light!

On several occasions, when we had overlooked the charging of the battery, someone would remove the car battery (6V in those days and mostly fitted onto the running board of the car) and use this until such time as the car was needed once again. These valves were referred to as 'bright emitters'.

Shortly after, what were known as 'dull emitters' came onto the market. These were still 6V heaters, but emitted hardly any light.

One aspect about home-made sets which is worth a mention was that misuse of the tuning system caused the detector valve to oscillate so that the set became a transmitter. This meant that all other sets in the neighbourhood tuned to the same wavelength not only heard the broadcast, but also a loud whistle (I proved for myself that this interference could be heard even over 8km away). Quite often the announcer at the broadcasting station would ask folks in certain areas to take more care as they were causing interference to their neighbours.

Periods of transmission were somewhat limited in the early days. Broadcasting usually commenced at 1pm and closed down at 1030pm. Programmes consisted of orchestral concerts, song recitals, entertainers at the piano, and short one or two act plays. As Sir John Reith was Head of the Service, Sunday broadcasts were strictly limited to sacred or classical music, religious talks or readings from the Bible. Nothing of a secular nature went out on the Sabbath.

It was around this time, 1928 I think, when I got a job, some 32km away, in a radio business. The premises consisted of a workshop in which radio sets were made, and a large shed where anything from 300 to 500 batteries could be on charge at the same time.

The sets we manufactured were of the two or three valve types, and named 'Melody Two' and 'Golden Chimes Three'. These sold extremely well and were installed complete with antenna scaffold poles, which were supplied by a local firm.

Very Fortunate

Whilst working away from home I was fortunate in being able to lodge with my grandparents. My grandfather was a chargehand, working in a large railway works, and I must have mentioned, in his hearing, that I wanted some kind of mast for a new antenna I was thinking of constructing back home.

My grandfather suggested that he'd try to obtain three 15ft lengths of second-hand boiler tubing. I could hardly believe my luck!

A forty-five feet high antenna! Gosh! I could listen to the world! He was as good as his word, the three lengths were drilled for bolting together and transferred home.

It took six of us to get it the antenna and in position. But, at last, there it was, the top almost in the low clouds, well perhaps that wasn't true, but I was proud of that antenna!

My last attempts at construction were really ambitious. I had seen in a magazine building details of a super set called The Exhibition Five. This was quite different from others I had put together in that the first two stages were incorporated for radio frequency amplification, so that incoming weak signals would be amplified before detection and the resultant audio frequency signal would be sufficient to listen to comfortably.

It took some time to assemble all the

components needed, especially as the first two valves with their tuning circuits had to be thoroughly screened by thin copper sheets to avoid interaction. Eventually it was completed and I was highly pleased with the results especially coupled to that forty-five foot antenna!

My Ambition

It was always my ambition to extend my listening field to the Americas and beyond. However, since the lowest waveband was around the 200m mark even with this receiver it was a forlorn hope.

Then much shorter wavelengths were developed, which were much more suitable for long distance listening. By then I had a shortwave set working, and listened to American stations such as KDKA Pittsburgh and WGY, Schenectady, New York, in the 30m (10MHz) band.

It did not take long to produce an adapter, which I plugged into the detector stage of my receiver which converted it into a shortwave set. Soon I was getting up at around 4am and

"My imagination was working overtime."



listening to America, and, wonder of wonders, news from Australia complete with the introductory Kookaburra bird!

From then on things moved quickly. Portable sets were developed. These 30 or 35 pound sets were only 'portable' in that one could carry them from room to room or take them in the car.

Next came the all mains receiver which required no batteries. Home construction, by now, had almost ceased. One reason for this was that a much improved circuit had been introduced known as the superheterodyne, which improved efficiency and meant there was no risk of interference with the neighbours.

Mains receiver sets were soon constructed for use on long, medium and short wave bands, and then frequency modulation (f.m.) came into being. This, again, improved the quality of the music and speech and there was no possibility of station interference.

So, now this brings us up to the present day, with the development of receivers, which fit into the waistcoat pocket, hand-held television sets and remote control of radios and TV. What delights are we in for next I wonder!

PW

Soon I was getting up at around 4am and listening to America, and, wonder of wonders, news from Australia complete with the introductory Kookaburra bird!

"A forty-five feet high antenna! Gosh I could listen to the world."

**This month
the Rev.
George Dobbs
G3RJV
discusses
simple
methods of
using a
separate
transmitter
and receiver -
after his
usual
(appropriate!)
quotation of
course!**

Carrying on the Practical Way

When I first began to disturb the ionosphere by generating radio waves, the integrated transceiver was still to come. We all used separate transmitters and receivers. It was a completely different game!

In the 'old days' the operator had to net the transmitter to the receiver frequency and devise methods of changing from transmit to receive. This could be as simple as a manual switch to remove the antenna from the receiver and attach it to the transmitter together with some method of protecting the receiver from the high signal levels during transmission.

I thought my first station, a valved transmitter for 1.8 and 3.5MHz used in conjunction with an BC342 receiver, was rather sophisticated. This was because it had a foot operated change-over system!

In truth, the foot switch consisted of two

pieces of plywood with a microswitch screwed to the bottom piece of wood. The lever action operated the microswitch, which in turn operated a series of relays to perform the transmit-receive changeover functions. It was laughable by today's standards but I thought it was the cutting edge of Amateur Radio technology!

Modern Station

The modern Amateur Radio station is usually a complete integrated transceiver. The frequency control is common to both transmit and receive functions and the changeover from transmit to receive is a built-in function.

Nowadays, the only time that you're likely to see separate transmitters and receivers in operation is the station of a home constructor.

One of the more simple routes to a home-built Amateur Radio station is to make a QRP transmitter and use it with an existing receiver. However, such a set-up requires the use of a system to operate the receive-to-transmit functions.

A modern transceiver may have a very complex series of transmit/receive operations. These will switch functions of the transmit and receive sections in a sequence that will produce a quick and efficient changeover without damage to circuit elements or annoying 'clicks' and 'bumps' in the receiver audio signal.

However, adding a QRP transmitter to an existing station receiver can be done with a minimal list of requirements. It really is easy!

The antenna has to be disconnected from the receiver input and attached to the transmitter output. The receiver input circuits may require protection from the strong signals present even after the receiver input has been removed from the antenna. It's also helpful to mute the received audio signal and perhaps add a sidetone signal to monitor the keying, in the case of a c.w. (Morse) transmitter.

The Circuit

The circuit, in **Fig. 1**, shows how the minimal requirements can be achieved with a simple QRP c.w. transmitter. It follows ideas from **Ian Smith VK8CW**, in the *LoKey Magazine* and circuits I have used in earlier projects.

The 2N2905A *pnp* transistor acts as a d.c. switch controlled by the transmitter key. The 33k Ω resistor goes to the key and when the key is down the transistor switches on. This places 12V on to the collector of the 2N2905A.

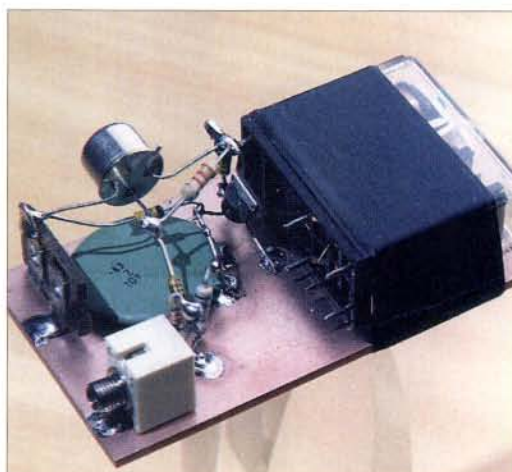
The appearance of the 12V at the collector follows the action of the keying. The circuit allows this keyed voltage to be available to drive a sidetone oscillator. (Almost any simple audio oscillator circuit could be connected between the collector of the transistor and ground).

The collector of the 2N2905A is connected via a diode to the gate of a VN10K VMOS device. This is switched on and off by the keyed 12V and operates a relay in the drain circuit. The VMOS device makes an ideal d.c. switch and is either 'hard on' or completely 'off' depending upon the state of the collector of the 2N2905A.

It's best to avoid the antenna changeover relay following the action of the key. This is

"Change is not made without inconvenience"

Richard Hooker (1545 - 1600)



Change-over switching the G3RJV way!

because it would produce a constant clattering of the relay, annoying clicks in the receiver audio signal and possible clipping of the keyed signal.

A better method is to allow some 'hang time' on the relay action. This is done by adding a capacitor and resistor to the gate circuit of the VN10K.

When the key is pressed and 12V appears at the collector of the 2N2905A, the VN10K switches on and the capacitor charges up. When the key is released and the 12V disappears from the collector, the capacitor discharges through the resistor. This 'holds on' the VN10K for a short time.

The hang time is governed by the values of the capacitor and resistor. (The decaying voltage **does not effect** the collector of the 2N2905A because this is on the other side of D2).

Relay Closed

The aim with a simple set-up of the type I'm describing is to keep the relay closed during normal keying speeds, only allowing it to switch back to the receive mode when the keying ceases. The ideal hang time is somewhere between 0.5 and 1 second.

In use the changeover remains in the transmit mode throughout the normal keying of the transmitter because the capacitor is being recharged every time the key is pressed. When normal keying ceases the capacitor discharges and the relay switches back to the receive mode.

The hang time can be changed by adjusting the values of the resistor and capacitor. Higher capacitance will increase the time, lower resistance will decrease the time. A VMOS device requires only low capacitance values (small C, high R) and is ideal for this application.

The relay has a protection diode, D3, to prevent high 'back e.m.f.' voltages destroying the VN10K. In practice D3, like the other diodes, can be any common silicon type. (I used a 1N4148 for all the diodes). The normally closed contacts join the antenna to the receiver and the normally open contacts join the antenna to the transmitter.

High Input Signals

In spite of the fact that the receiver input is disconnected from the antenna, it can receive very high input signals. Don't forget...it's only the distance of a relay contact away from the transmitted signal!

The diagram, **Fig. 1a**, shows an easy way to protect the input circuit of the receiver. A couple of diodes (again 1N4148 or similar silicon diodes) are placed 'back-to-back' across the receiver input circuit. They act as a limiter, only allowing about 250mV (quarter of a volt) of signal to reach the receiver input. This should avoid any possible damage to the input circuit.

Despite the diodes - **the input signal is still high and will produce a resounding audio signal.** And in an ideal world a muting circuit should be added to the receiver.

Some receivers are easy to mute but others are not. In practice the automatic gain control (a.g.c.) circuit, if present, will help Practical Wireless, March 1998

reduce the amount of audio output.

I usually just turn down the audio gain control. If this can be set at a reasonable level, it can be used as a monitor for the keyed signal, doing away with the need for a sidetone monitor.

The diagram, **Fig. 2**, shows an alternative system which allows complete break-in operation. This term is used

when the **changeover function follows the speed of the keying.**

My illustration shows a common circuit in use amongst QRP home constructors. It's based upon an original idea by **Roy Lewallen W7EL**, in his 'Optimised Transceiver' first published in *QST*, August 1980.

Typical Output Stage

The circuit in **Fig. 2**, shows a typical transmitter output stage with an r.f. choke in the collector of a bipolar transistor. The r.f. output goes via a capacitor to a lowpass filter, and then to the antenna.

The receiver input is taken from the input of the lowpass filter, which then serves as an input filter to the receiver. This input is taken through cC1 and cC2 via cL1 to the receiver. When transmitter, the diodes, D1-D4, protect the receiver and the capacitors become part of the lowpass filter circuit.

When receiving, the capacitors and the inductor form a low-Q series resonant network to reduce signal attenuation. The values are chosen to maintain an approximate 50Ω impedance to the receiver input.

In the circuit described no physical switching occurs and the changeover function is instantaneous. The trimmer capacitor, cC2, is adjusted for the best received input level without reducing the transmitter output level.

Unfortunately however, there's one drawback of this circuit in that it requires component values for a particular band. The values required for various bands are listed in the table. Again, the diodes can be any common silicon types.

Well, there you are - it really is easy to 'home brew' some change-over systems. Now you know - it should encourage to try a QRP set-up for yourself. Go on, plug that soldering iron in and have a go!

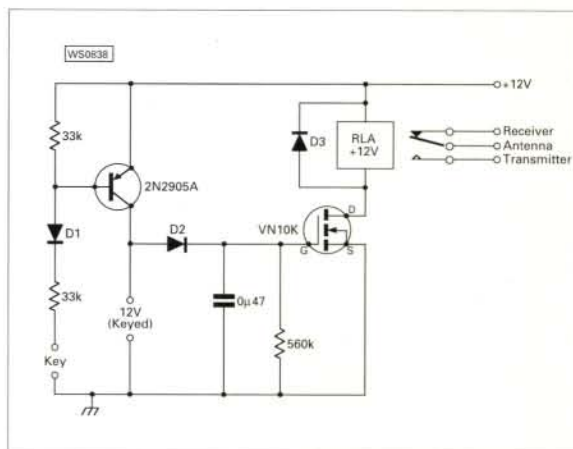


Fig. 1: A basic antenna change-over system (see text).

Fig. 1a: A simple input protection circuit using 'back-to-back' diodes (see text).

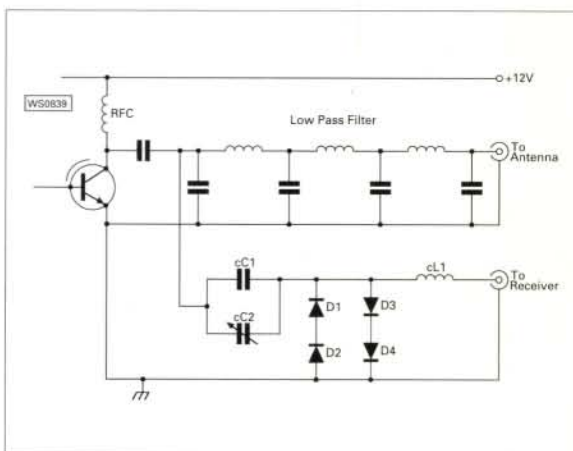
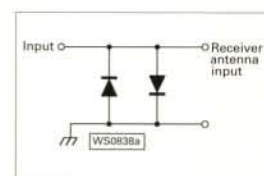
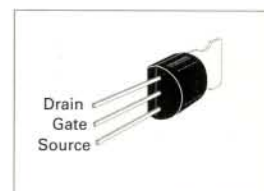


Fig. 2: Break-in the simple way but with the disadvantage that different value components are required for each amateur band (see text).



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John Brown G4UBB, describes his ideas on how to help protect your valuable radio equipment - by using a simple DIY photo-electric 'sentry' device. It doesn't require any 'rest' and is on duty whenever needed!

The possible theft of Amateur Radio equipment is always there - whether it be from your car or at home. And for many of us with 'outside' shacks - it's an even bigger problem.

Despite the problems however, help is at hand and as an example - the B&Q catalogue for March 1997 says it's a proven fact that constant light is one of the best deterrents against crime. A suitably mounted photo-electric (P/E) cell will give constant lighting when daylight fades to 70 lux.

By installing such a light you could deter potential theft of your radio equipment and make it easier to unload equipment (and even the family shopping!) when you come home in the dark. It's also a very simple job to carry out.

Porch Light

The photograph, **Fig. 1**, shows the existing type of porch light at my QTH. And of course, if you've got a shack

set-up in a shed or building remote from the house - a separate installation could be useful there.

The photo-electric cell in its



Fig. 1: The familiar 'porch' light - which can be easily arranged to operate via a photo-electric switching unit.

Fig. 2: The photo-electric cell unit (available from B&Q Ltd.) shown mounted at G4UBB's home.

weatherproof housing is shown in **Fig. 2**, adjacent to my v.h.f. mast/flagpole. Just out of 'shot' is the wind vane and anemometer cups of my 'Davis' electronic weather station. (This may be the subject of a separate report at a later date!).

Basic Wiring

Now, let's consider the basic wiring diagram, which is shown in **Fig. 3**. Incidentally - the 'Apt' photo-electric cell (the type used), socket and wall bracket kit includes installation instructions which are not given in this article.

The specified switch has flat rockers adjacent to each other, using impact adhesive

stick a piece of 30 x 23mm stiff plastic sheet over the rockers. This converts the switch to double-pole change-over operation, as shown in Fig. 3.

The cell switch is drawn in the normal **On** position. The **Off** position by-passes the cell enabling your light to work on manual control from the existing hall light switch (not shown in the diagram).

However, the switch (the type supplied with mine was made by MK Ltd.) **does not isolate** the photo-electric cell socket because its contacts only have limited separation and also because of the 'cross coupling' at the additional switch. You must be aware of this for safety reasons.

For anyone competent to install mains wiring, this is an interesting, satisfying and worthwhile little project. It could help you in many ways other than purely improving security - it could even encourage

you to venture out to the shack on those cold dark nights to build something!

PW

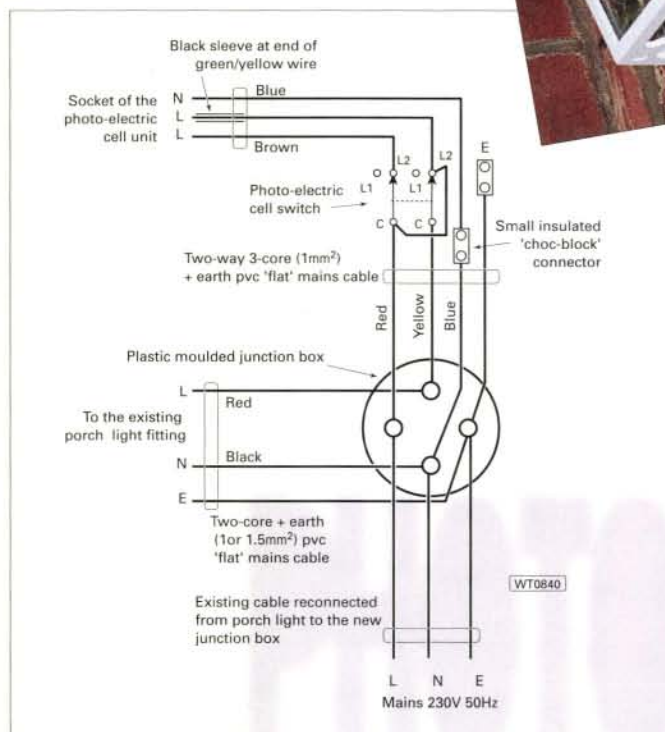


Fig. 3: Wiring diagram for the inclusion of the photo-electric switching unit to an existing porch light. For older houses in the UK and Ireland it's essential to remember that the old standard for mains cabling was: Red (live), Black (neutral) and plain green for Earth.

Shopping List & Equipment Details

Required: One 'Apt' photo-electric cell unit, socket and wall bracket kit (catalogue number PEC 1000/70 lux), by ElectroReplacement Ltd. Switch 2-gang 2-way rocker type light switch (MK Ltd.). Moulded junction box, four terminal 5A type, grommet to suit cable entry of cell unit and box to suit switch mounting.

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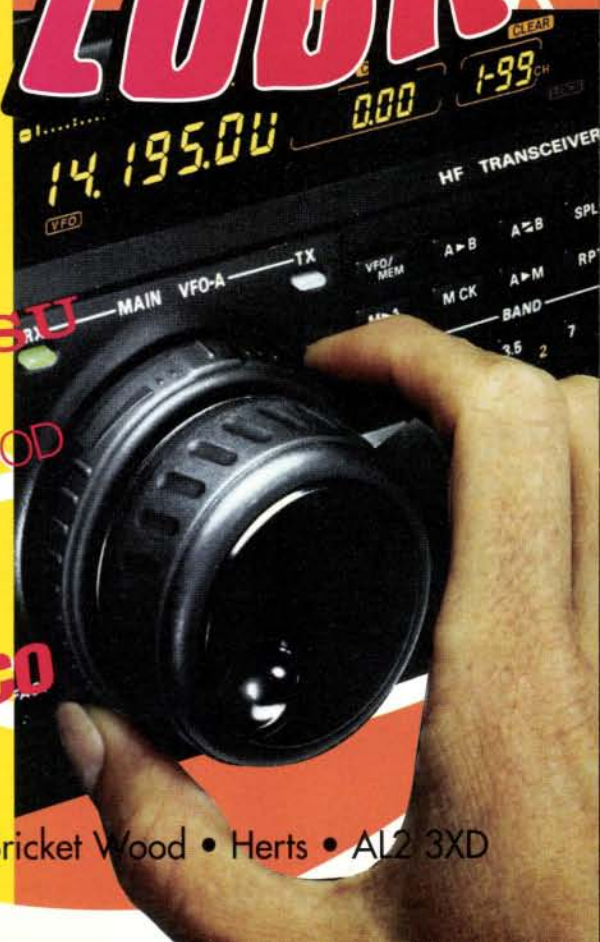
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PICKETTS LOCK SHOW NEWS... SNIPPETS FROM

Here's a pre-Picketts Lock look at who you can expect to find at this year's London Amateur Radio & Computer Show, together with the delights that will be on offer! (We've tried to include as many companies as possible but with over 130 exhibitors expected, we haven't had room for all you! So, this time we've concentrated on the dealers rather than the manufacturers).

Eastern Communications



Antennas built to last are featured on the Eastern Communications stand this year. **Tim G4CTT** and his colleagues will be displaying the CQ-DX beam antennas which are aimed at users who remember the days when antennas were really 'built to last'. The new range includes models for 50, 144 and 430MHz.

For keen c.w. enthusiasts the new Vibroplex 'double' Morse keys will be on display. These feature the Vibroplex 'straight' key with either the classic single paddle Vibrokeyer or the lambic paddle on one combined base, allowing instant switching from an electronic keyer to the 'personal touch' of the straight key.

Also featured will be band-pass filter from Delta Engineering and many other interesting products.

Martin Lynch & Son



Martin Lynch says that he and his band of 'merry men (women and children!)' have secured the largest stand at this year's Picketts Lock event.

As Martin was the very first retailer in the UK to place orders for the new **Yaesu FT-847** 50, 144, 430MHz & h.f. all-mode transceiver, he will be giving it 'pride-of-place' amongst his emporium of new and used equipment. In addition to this the new **Icom IC-746** will also be on offer and Martin promises a 'show down' between this and the new Yaesu as both radios will be in operation and available for demonstration through the two days of the show.

As usual the Lynch Mob will have plenty of bargains to choose from and with the facility of arranging finance for your purchase there's a good chance you'll come away from Martin's stand with a new addition to your radio 'family'!

Linear Amp UK



The **Ranger 811H** is Linear Amp's latest addition to their h.f. amplifier range. It's being billed as a low cost amplifier that doesn't compromise on power.

Four vertically-mounted **Svetlana 811A** valves give the Ranger an output power of over 800W with 100W drive from any h.f. transceiver. Although the cost of the Ranger is only **£895** **Gwen** and **Peter** of Linear Amp tell us that the efficiency and construction quality have not suffered in any way.

The standard features of the Explorer and Hunter amplifiers, such as the back-lit flush mounted meters, front panel a.i.c. and 6:1 reduction drives on the tune and load controls, have been incorporated into the Ranger. The power supply consists of a specially designed toroidal transformer and a voltage doubler board provides 1700V.

The first models are expected to be available at the end of February. For a demonstration of the Ranger 811H why not visit the Linear Amp stand at the show?

AOR (UK) Ltd



Derbyshire-based **AOR (UK) Ltd.**, a company well known for their specialised communications equipment have announced the launch of the portable **ARD-2 ACARS & NAVTEX** decoder and display unit. The new unit is completely self-contained and can be powered by four AA

batteries or from an external 12V d.c. source.

A built-in l.c.d. screen provides two lines of 32 characters with a 'scroll back' 512 character buffer. The l.c.d. screen means that it's not necessary to connect it to a computer, although an RS232 port is required for terminal operation, etc. An optional custom Windows based PC software package is under development and will be available in the near future.

Richard Hillier and the AOR 'team' look forward to demonstrating the ARD-2 for you at the show.

Vann Draper Electronics Ltd



Vann Draper Electronics Ltd., who manufacture and distribute test and measurement equipment will be exhibiting Kenwood equipment at discount prices. The

company, who are based in South Wigstone in Leicestershire, are planning to exhibit a wide range of products that are new for 1998.

Of interest to the constructor will be a range of temperature-controlled soldering equipment, including the SL20 bar graph display soldering station and the SL30 digital display soldering station. Also available will be the SL916 for soldering and desoldering, and all units are claimed to be "very low cost".

Vann Draper have also informed *PW* that they plan to have a wide range of digital multimeters on show, including the MX620 45 model which incorporates frequency measurement up to 20MHz. Additionally power supplies by Kenwood, Vann Draper and Wonix will be available, including the dual-tracking APD-5305D 0 to 30V 5A power supply.

Lowe Electronics



Lowe Electronics will be showing several new and exciting products.

On a recent visit to Taiwan, representatives from Lowe spotted the super mini **Hora 430MHz** shirt-pocket sized transceiver, which since their introduction to the UK have been selling like 'hot cakes'. According to Lowe this is no surprise as they say the Hora 'represents the best value in an Amateur Radio transceiver that they

SHOW GUIDE

FROM PICKETTS! 6 Page Special!

No Nuts

Fancy a combined oscilloscope and digital voltmeter? It's not only portable - it's little bigger than a marker pen. In spite of its small size, the **osziFOX** combined digital voltmeter and oscilloscope has a bandwidth of d.c. to 20MHz.

With scales of 1, 10 and 100V the osziFOX measures d.c. and a.c. voltages to around $\pm 1\%$ displaying the results on a small screen on the instrument itself. The osziFOX will be available for demonstration from the **No Nuts** team on their stand at the Show.

have ever sold in the last 30 years'. You'll have the chance to judge for yourself as the Hora will of course be at the show.

They will also be launching the new Europa version of the famous HF-150 with band switched front-end filters and a redesigned r.f. section amongst a number of other improvements. Also on the receiver front will be the first showing in Europe of the brand new top line DSP receiver from JRC, the NRD-545.

Finally, the Lowe full colour catalogue, which was launched in late 1997, has proved to be such a success that a new 1998 edition has been published. This will be given **free** away at the show.

Waters & Stanton PLC



There will be many delights on offer on the Waters & Stanton stand. These will include the first stocks from the Vectronics and

Nevada

The Nevada 'team' will be exhibiting many new and interesting products including the latest Palstar and Alinco products.

On offer in the Palstar range will be the **WM-150** power meter, which boasts a frequency range of 1.8 to 150MHz, peak power monitoring in two ranges from 300 to 3000W and a price tag of just **£89.95**. The second new Palstar product is the **AT-300CN**, which is a cross needle antenna tuner unit that can be used on all types of antennas for impedance matching. It employs a 48 position switched toroidal inductor with silver plated contacts to ensure easy tuning of almost every type of antenna. The AT-300CN costs **£139.95** and will be available for demonstration on the Nevada stand.

Finally, the range of Alinco products will also be on display and this will include the first production model of new **Alinco DX-77**. This is an h.f. base station transceiver capable of 100W output and retail price of **£699**. So, for all this and more make sure you 'stop-off' at the Nevada stand.

AKD

On display on the AKD stand this year is the new model of the popular Target communications receiver - the **HF3E**.

Following their success with the original Target receiver, AKD state that their HF3E "Has tighter filtering than existing models, more memories, l.c.d. back-lighting, tilting foot, spectral display and data leads and computer software". This version costs **£299**.

The long established range of AKD budget priced British-made f.m. transceivers includes the 2001 for 144MHz, which is now available with 12.5kHz channel spacing. The 50MHz version, the 6001 is now provided with CTCSS tone and full repeater facilities. (A kit is also available for customer up-grading for older transceivers).

To help customers, AKD's Technical Advisor **John Armstrong G8MVH** will be on hand throughout most of the show.



Mirage product ranges, as well as the new **SG 2020** QRP transceiver, which will be on sale for **£599**. Other products will include the new Cushcraft X-7 tri-band 7-element Yagi, the latest Fairhaven receiver, and of course the Garmin GPS III Navigational Unit.

The newly introduced Kachina 505 DSP computer controlled h.f. transceiver will also be on display and working demonstrations will be taking place throughout the two days of the show. So, if you stop by at the Waters & Stanton stand you're assured of lots of surprises.

Haydon Communications

Mike Haydon is aiming high this year! Mike's Edgware - based company is launching a new lightweight portable 30 foot mast kit in 1998.

The **PM-30K** mast, retailing at **£99** will be of interest to anyone contemplating portable or fixed station working on the amateur bands. Fabricated from aircraft-grade aluminium the mast consists of five swaged 2in diameter poles, which allow the mast to attain 30ft when fitted together (they are then secured by stainless steel bolts), and it comes complete with a galvanised base plate, braided nylon guy ropes and tensioners, a three-way guy ring and three steel ground stakes.

Radioworld (West Midlands)

Annette and David Hayward G1LBE of Radioworld are a fairly new to the amateur radio world and to the advertising pages of *Practical Wireless*. If you visit the London Show you'll be able to put faces to the names, as Annette and David will be travelling from their usual base, which is situated just five minutes away from Junction 11 on the M6 in the West Midlands to meet you at Picketts Lock.

As well as being official dealers for AOR, Icom, Kenwood and Yaesu, Radioworld have a large selection of second-hand equipment, which they state is the largest selection in their area. So, why not judge for useful and visit their stand at the show?

C. M. Howes Communications

Dave Howes and his team will, for the first time, be showing their new and up-dated version of the **DXR20** h.f. communications receiver kit.

The DXR20 s.s.b. and c.w. receiver covers the 3.5, 7 and 14MHz bands as standard and has the provision for adding optional plug-in band modules to extend the frequency coverage.

The new version of the receiver has been designed to make interlinking with transmitter kits easier than it was with the previous version. The DXR20 now has the same connection points for adding optional kits as their single-band DC2000 receiver kit. This enhances the 'mix and match' concept of the Howes Kits range, which enables a simple beginner' receiver to be expanded into a full amateur transmitting station in easy stages.

The full range of Howes accessory kits, including a.t.u.s, digital frequency displays, audio filters and transmitters remain compatible with the new version of the DXR20. The C. M. Howes team look forward to welcoming you to their stand where the full range of Howes Kits will be on display available for purchase!





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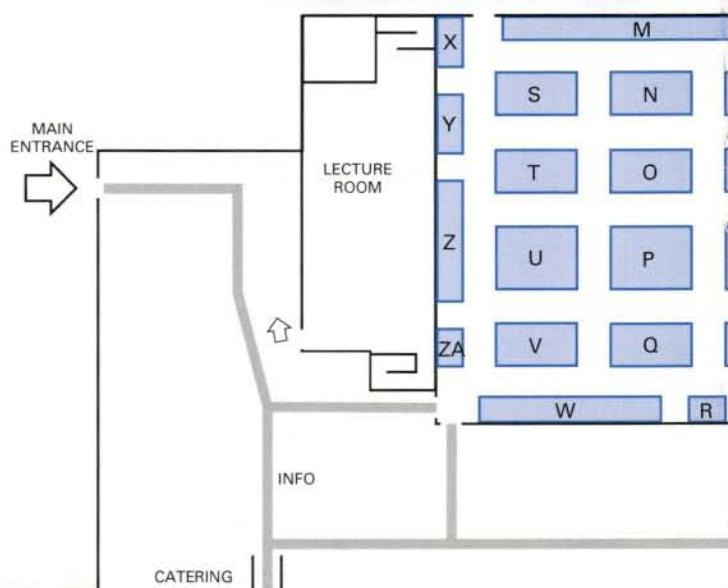
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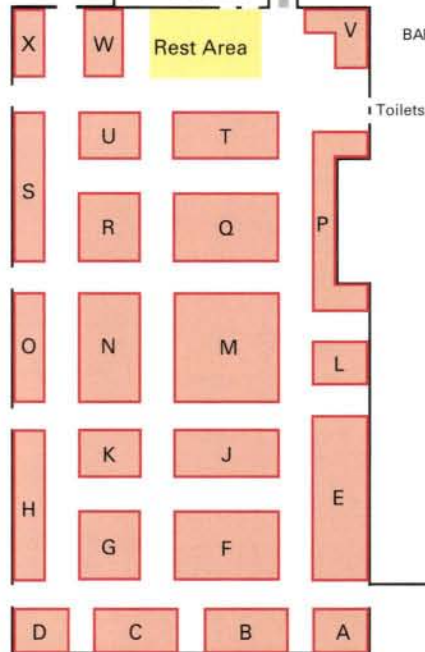
Your Guide to the London Amateur Radio Show

Saturday March 7

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RED HALL

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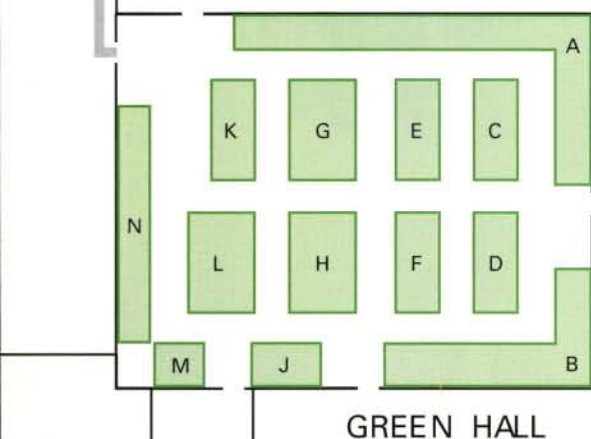
Red Hall Exhibitors	Block	
Agile Tools	P	Mailtech
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BEC	C	Music Maker
Bill MacDonald Ltd	P	Nevada
Capital Products	F	Pivot Computer Systems
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Garex Electronics	D	Rich Electronics
Gemini Electronics	O	RSGB
Holderness R J	J	Sandpiper
Icom UK Ltd	S	SMC
J & J Associates	G	Syon Trading
Kenwood Electronics UK	N	Timstep Electronics
Linear Amp UK	G	UBM
Lowe Electronics Ltd	F	Westlake W H Ltd
		Yaesu UK Ltd
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		R/U
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Amateur Radio & Computer Show

/ Sunday March 8

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AA Computers	M
AJP Communications	X
AKD	K
Belcyber	F
Computer Junk Shop	Y
Field Electrics	F
Haydon Communications	Z
Howes Communications	L
Keytronics	ZA
Loutronics	J
No Nuts	R
Proline	G
SGS	J
Southern Aerial Services	M
Squire V Ltd	G
Strikalite	M
Sudbury Electronics	S
SW Shareware	B
Three R Communications	N
TLX Electrical Ltd	H
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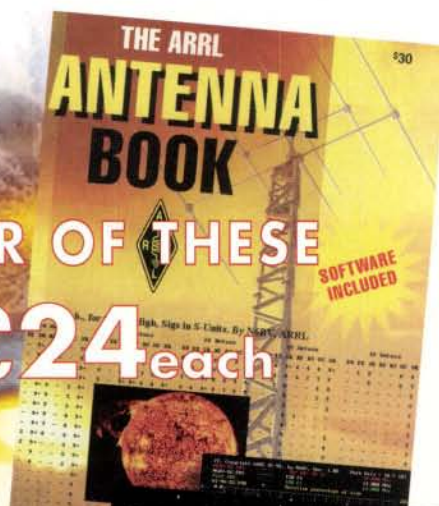
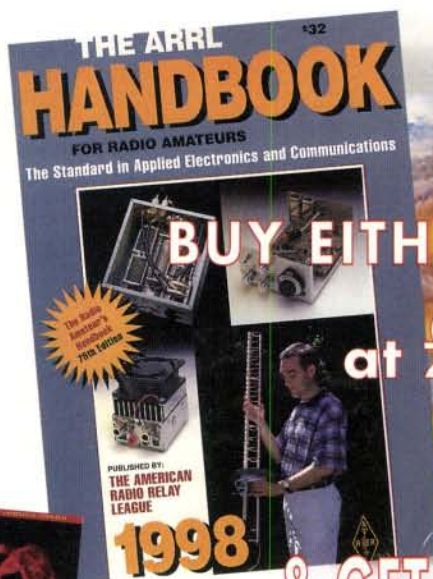


Sign-up for a three year subscription to *Practical Wireless* or *Shortwave Magazine* at this year's London Show and we'll only charge you for a two year sub! By taking advantage of this very special offer, not only are you ensuring that you get your monthly dose of radio reading without fail, but you're also getting a full year for nothing!

The price of these very special offers is not to be missed at any price! A PW sub will cost you just £50 (usual 3 year rate = £25 x 3 = £75), while a SWM sub will only cost you £60 (usual 3 year rate = £30 x 3 = £90).

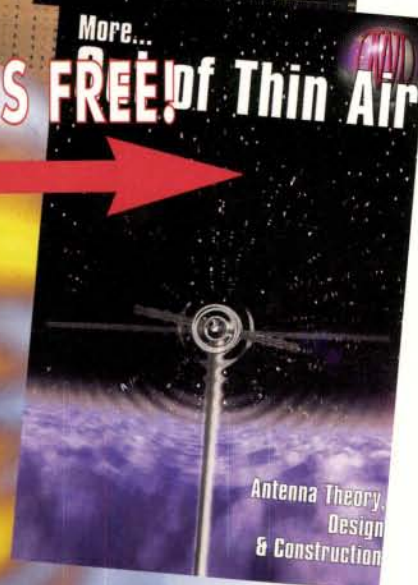
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Make sure you visit PW Publishing Ltd. on Stand T in the Red Hall!

BRING & BUY



Very acceptable for the beginner - but Eddystone equipment is very 'collectable' and prices tend to be high nowadays.

Taking The Sigh Out Of The Bring & Buy

Rob Mannion G3XFD is a regular visitor to the 'Bring & Buy' stands at the major shows and Picketts Lock is no exception! Here he passes on some advice to help you find what you need - particularly if you're starting off in the hobby.

Fast becoming a 'classic' itself - the Yaesu FRG-7 will prove a real 'bargain' if you can find one!



Whenver I'm at major shows I make a 'beeline' for the 'Bring & Buy' section. I do this not because I'm necessarily on the look-out for something myself - but often it's just to evaluate what's available on the second-hand market.

I'm also on the lookout for those seeking bargains - particularly those searching for 'beginner's equipment'. I do this because I've learned over the years that it's at this stage that anyone coming into the hobby is at their most vulnerable stage.

It's not that I think 'first time' buyers are liable to be cheated at the average Bring & Buy. No, it's more fundamental than that - because unless they have advice and help the beginner can be totally overwhelmed by what's on offer and go for something that although it's otherwise a good buy - is **totally unsuitable** for what they need.

Classic Example

A classic example of someone being overwhelmed by technology was clearly demonstrated to me at the 1997 Leicester Show where I met a delightful chap from County Donegal (now living in Leicester). He and I chatted about his beautiful part of Ireland before going on to discuss how he'd been mistaken in buying a 'scanner' for general purpose short wave listening.

The scanner my friend had bought worked extremely well but was fiendishly over-complicated and unsuitable for his requirements. Both he and I realised that a plain and simple older communications receiver would have suited him better - had he received the correct advice. So, I steered my new friend in the direction of the Leicester Club and I hope now he's amongst other friends who can advise him.

Success Story

One success story started when I first met young **James Reed** at the Leicester show back in (I think) 1991. James got to hear about Amateur Radio through something at school. He wrote to me and I suggested he and his father meet me at the Leicester show a few weeks later.

Fortune smiled on us that day and I was able to immediately suggest to James and his father that he should buy (it was either a Heathkit RA1 or a 'Mohican' - I can't remember exactly!) for £25. And after a look round the show we kept in contact and he got busy studying.

Within a year James got his B licence. Next - in between his studies preparing for university - he worked on his Morse. Then came my annual meeting at the Leicester show when he announced he was now **GW0UDM**. I was very proud - and even prouder when I heard he was off to Medical School (he chose

Birmingham because it had a good and active Amateur Radio Club!). It just 'shows' what can be achieved via a Bring & Buy doesn't it?

Right Receiver

The secret of success (if there is any secret) with James **GW0UDM** is that we aimed at something that wasn't too complicated. I also avoided choosing the (very attractively packaged but unsuitable) Japanese 'all singing and dancing' broadcast type receivers masquerading as communications receivers.

But despite the fact that James had chosen an older receiver it had many advantages. It was simple, straightforward to use, provided good reasonable selectivity and was capable of being easily modified. And quite honestly - I don't think you can go wrong with this approach.

Six years or so later things have changed on the Bring & Buy stalls. Older equipment is becoming prized and prices have risen. Eddystone equipment prices in particular have gone crazy and the chances of a 'beginner' s.w.l. getting an Eddystone 750, 888, 888a, 680, etc., have reduced dramatically. Even the good old reliable KW range of receivers and transceivers are becoming 'collectable' - complete with high prices!

"... make a 'beeline' for the 'Bring & Buy'

So, nowadays the enthusiast just entering our hobby has to look carefully because there is so much on offer. But it's always worthwhile asking for help - and although the hard-pressed sales staff on a Bring & Buy will often assist (if they've got time) - don't forget you can always ask for advice on the **PW & SWM** stand. I and my colleagues will always be pleased to help, as of course will your local club. (I hope you've joined!).

Finally, to sum up my advice I suggest you do the following: Join your local club and talk to your new friends. You may even get a 'loan' receiver (many clubs do this) along with good advice.

Additionally, it's well worth looking at older (valved amplifier staged) transceivers such as the Yaesu FT-101 range. They can be bought for reasonable prices, and if you're worried about temptation someone will disable the transmit side until you get your licence. In this way you'll get good performance, a good buy and an incentive to get your RAE pass!

But whatever you do - please ask for help before buying. The help is there for the asking - and I and many others are waiting to help when you call. Now get searching - and look carefully!

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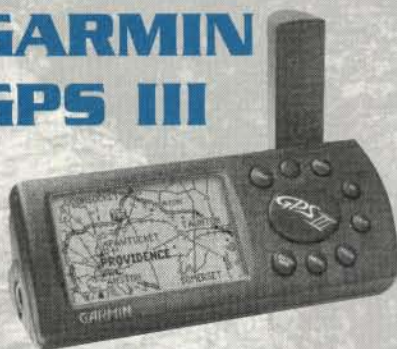
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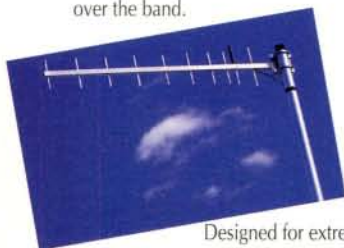
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antennas in action

NEWS & PRODUCTS ■ QUESTIONS & ANSWERS ■ ANTENNA WORKSHOP ■ REVIEWS ■

Cushcraft Spreads A Yagi

The Cushcraft Corporation of America has a new Yagi antenna designed specifically for spread spectrum use in the 928-960MHz band. The PC9010N 10-element Yagi has a nominal 12dBd gain with a v.s.w.r. of less than 1.5:1 over the band.



Designed for extreme weather conditions, and the feed systems is 'potted' in a pvc radome. For more details of this, or their other antennas, contact Cushcraft

Corporation, 48 Perimeter Road, Manchester, NH 03103, USA. Tel: 603-627-7877 or FAX: 603-627-1764.

Yaesu Rotates - CE!

Two new rotators are available from Yaesu. The G-450C and the G-650C rotators comply to EEC standards (EMC and LVD), and bear the CE Mark to show this. Based on an improved G-450XL and the G-650XL designs the rotators have a 450° turn capability with a 600kgf-cm turning torque. To reduce the stress on the rotator gears and so reduce binding, the GA-2500 and GA-3000 Tower Mounted Absorber Joints are suitable for a range of Yaesu rotators. These items are available now from Yaesu stockists. Yaesu UK Ltd. Unit 12, Maple Grove Business Centre, Lawrence Road,

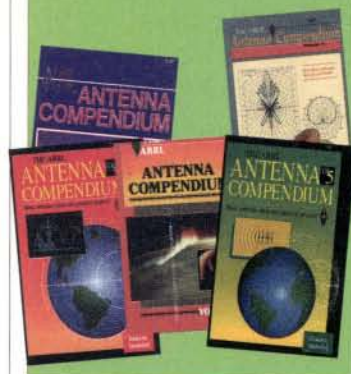
Hounslow, Middlesex TW4 6DR. Tel: 0181-814 2001 or FAX: 0181-814 2002.

Nevada Goes Outback

Nevada Communications have asked A-i-A to let the readers know that the range of Australian Outbacker mobile antennas has been increased by two. Both the Outbacker Junior Plus and the Outbacker Perth Plus antennas, cover the 3.5 to 28MHz bands plus the 50 and 144MHz v.h.f. bands. Both antennas feature a full 100W capability on all bands, and are available from Nevada Communications, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (01705) 662145/613900 or FAX: (01705) 690626.

Madness Marches Into April

The 'Antenna Compendium' series of books is deservedly popular, but now they should be more of a bargain. Order any two or more and save on the postage to anywhere in the world. The offer closes on 30 April 1997 - giving everyone a chance! *Antenna Compendium Volume 1* is £7.50, Volume 2 and 3 are £10.50 each and Volumes 4 and 5, both containing disks of programs and antenna 'models' cost £15.50 each. Please use the order form on page 90 of this issue.



Procom's UHF Bases

Procom of Denmark have sent A-i-A details of their CXL range of u.h.f. base station antennas. There are seven antennas available, tuned within the 380-470MHz range. The smallest of the group is the CXL-70-1 with 0dBd gain and a height of 560mm depending on the frequency. At the top end in gain is the CXL 70-8HD with 8dBd gain from its 5.8m (approx) length. For more information about the CXL or their other ranges of antennas, contact: Procom A/S, Vinkelvænget 21-29, DK-3330, Gørlose - Denmark. Tel: (+45) 48 27 84 84 or FAX: (+45) 48 27 85 48. In the UK contact: Communication Technical Services Ltd., Unit 15 The Gatwick Metro Centre, Balcombe Road, Horley, Surrey RH6 9GA. Tel/FAX: (01293) 822602.



welcome to AiA!



Welcome to 'Antennas in Action'. And first I must apologise for not being able to bring you the results of the questionnaire survey yet. But if you would like to know if you won one of the prizes, look at Tex Topics. If you didn't win,

don't despair, if we publish one of your ideas in *Antennas in Action* you can win a copy of *More Out Of Thin Air*, or an equivalent to voucher 'spend' in the PW Book Store. This month's A-i-A includes Maths, Myths and in the shape of 'Tex Topics' there are two reviews for you - antenna analysers from AEA and an antenna tuning unit from Lake Electronics. G1TEX

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'Tex' Swann G1TEX	

**8 pages of
antennas**

antenna workshop

Why is it a Skeleton Antenna? Well, it gets its name because it's just the 'bare bones' of a complete discone antenna. A discone antenna is essentially a horizontal disc mounted vertically above the apex of a cone as in Fig. 1. This vertically polarised antenna has proved to be very effective for use with v.h.f. and u.h.f. scanner type receivers due to its broadband and omnidirectional characteristics, together with peak performance at a very low angle to the horizontal.

To what extent could the antenna be 'skeletonised' whilst still retaining its desirable characteristics? What compromises would be acceptable? My own experience of the discone type of antenna was to design a suitable u.h.f. antenna for military use. The minimum number of elements that could be used to represent the disc and the cone, whilst retaining the required specification bandwidth, was found to be four for each part.

The 'disc' elements are essentially just two strips (or wires for the lower frequency versions) of twice the design dimension D , soldered together at their centres at right angles to each other. Further, it was found that each disc element D should be mounted vertically above each sloping cone element L , spaced by dimension S (at the apex). The last dimension necessary for the design of the antenna was the angle between the legs. This was found

Ray Fautley G3ASG 'comes clean' and describes the skeleton that he's been hiding away for a long time. Here he shows you how to calculate the dimensions involved.

to be 40° to give near horizontal radiation and provide a feed-point of 50Ω .

Resulting Design

The resulting design gave a useful bandwidth of up to 25% above the lowest useful frequency. More simply, if the lowest usable frequency was f (MHz) then the antenna could be used successfully up to $1.25f$. It had to be fairly rugged but light in weight and very easy to transport. My first thought had been to use metal rods or tubes, but these would necessarily have to be made into a suitable flat pack for carrying about. This requirement would mean that the elements would have to be screwed together to assemble and then unscrewed each time to repack - a bit time consuming.

Further thoughts lead me to utilise the type of metal strip used in manufacturing flexible steel rules. By using several strips riveted together for the first part of the sloping sides at the top of the cone, one less for the next part and so on, more strength was added to the weakest part at the top of the cone. This is where high winds

would produce most leverage and consequently, metal fatigue.

The skeleton disc mounted above the cone consisted of strips of the same material, riveted together in a similar way. A conical plastic moulding contained the ends of the sloping sides and the disc parts, separated by the necessary spacing. Due to the flexibility of the strips, all the elements could be folded downwards from the moulded cone and inserted into a soft plastic pocket for transport.

As this antenna is a reciprocal device (useful for both receiving and transmitting) it should be very attractive to amateurs with an interest in h.f. DX because of its low radiation angle. Of course, a full discone at these frequencies would be ridiculously large and very heavy, but a skeleton version becomes much more of a possibility as wires could be used instead of solid metal sheets!

Desirable Feature

Solid versions of discone antennas have the very desirable feature of being operable over several octaves above a

lowest frequency, which depends (not unexpectedly!) upon the dimensions of the disc and the cone sides. If we restrict operation to a single amateur band, the skeletonised version becomes practical because, although its bandwidth is no longer several octaves, it is still 25% of the design frequency.

For example an antenna designed for the 14MHz band would have a bandwidth of some 3.5MHz with a standing wave ratio (s.w.r.) not exceeding about 1.5:1 for an optimum terminal resistance of 50Ω . This means that it would be usable from 14MHz to about 17.5MHz. As the antenna is unbalanced with regard to earth it is suitable for direct connection of 50Ω coaxial cable. The coaxial cable inner wire is connected to the four skeleton disc elements and the cable outer screen to the four skeleton cone elements as shown in Fig. 2.

How do we go about designing these skeleton antennas? Well, the only thing to think about is 'what is the lowest frequency that I want the antenna to work at?' This lowest frequency will determine the dimensions of the antenna elements. The dimensions are shown in side and top views of Fig. 3 and Fig. 4 respectively.

Design Procedure

Now let's have a look at the design procedure. First you must decide the

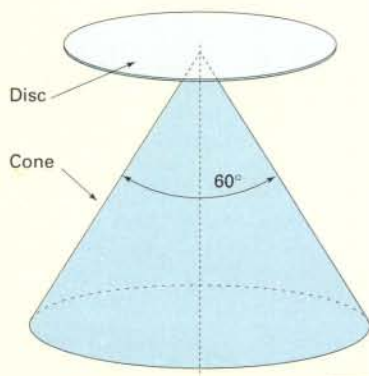


Fig. 1: The 'standard' discone antenna is, as its name suggests, made up from a disc element and a cone element.

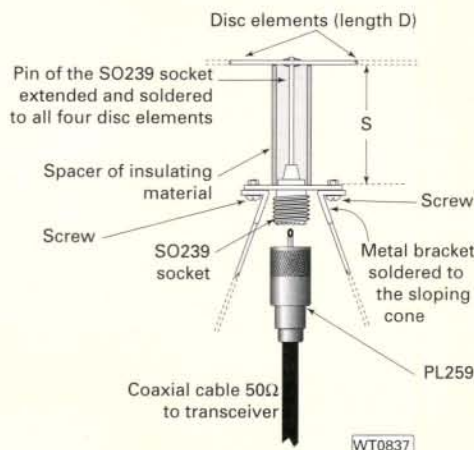


Fig. 2: A more detailed view of the feedpoint of the skeleton discone antenna.

lowest frequency of operation (f_{\min}) for the antenna. From which, the design frequency, f_D is obtained via the formula:

$$f_D = 0.8 \times f_{\min}$$

where both f_{\min} and f_D are both measured in MHz.

Next, calculate the length of the sloping sides (of the cone) L measured in metres via the equation:

$$L(m) = 75 \div f_D$$

The length of the horizontal elements D , also measured in metres, may be calculated now (this is also the diameter of a full disc) using the formula:

$$D(m) = 0.85 \times L$$

The last dimension we need to calculate is the spacing between the horizontal elements and the apex of the sloping sides, S , again measured in metres from the equation:

$$S = \frac{L^{0.75}}{27}$$

When constructing the antenna, the angle between the sloping sides and a vertical from the centre of the horizontal elements should be 20° . So the angle between any two sloping sides (the cone angle E_d) will be 40° . The effective upper frequency f_{\max} of the antenna will be:

$$f_{\max} = 1.25 \times f_{\min}$$

So, the effective bandwidth is from f_{\min} to f_{\max} .

Worked Examples

Let's look at a couple of worked examples. First a design for use in the 144MHz (2m) band which is 144 to 146MHz. The design frequency f_D for an f_{\min} of 144MHz is:
 $f_D = 0.8 \times f_{\min} = 0.8 \times 144$ (MHz)
On the calculator this would look like:

$$0.8 \times 144 = 115.2$$

So the design frequency of the antenna is 115.2MHz

Next find the length of the sloping legs L :

$$\text{where } L(m) = 75 \div f_D$$

On the calculator we have

$$75 \div 115.2 = 0.6510416$$

The legs will each be 0.651m (651mm) long. Now calculate the length of each horizontal element D :

$$D = 0.85 \times 0.651$$

On the calculator

$$0.85 \times 0.651 = 0.55335$$

So each horizontal will be 0.553m (553mm) long.

The final calculation will be to find the spacing S in metres.

$$S = \frac{(0.651)^{0.75}}{27} = \frac{0.724745857}{27}$$

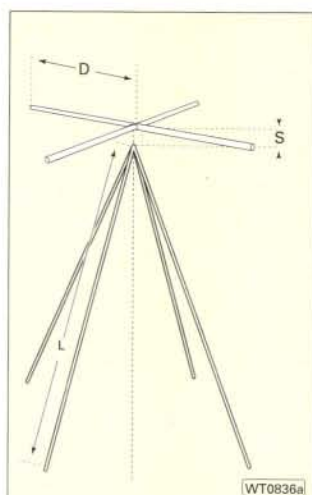


Fig. 3: The skeleton discone antenna is slightly different, in that the apex angle is less, and the top elements are larger than the equivalent discone elements.

On the calculator the keystrokes are:

$$0.026842439$$

The spacing S will be 0.0268 metres (27mm) The maximum useable frequency will be:

$$f_{\max} = 1.25 \times f_{\min}$$

On the calculator we have:

$$1.25 \times 144 = 180$$

The useful bandwidth of the antenna will be from 144 to 180MHz. If this antenna is made from 6mm diameter rod or tube, preferably copper which has been painted to prevent oxidation, it should be a self-supporting structure.

An Example

As an h.f. example of the skeleton discone design, let's find out the dimensions of a possible skeleton

discone for use in the 7MHz (40m) band. Following the above procedure:

The lowest operating frequency f_{\min} is to be 7MHz, giving the design frequency f_D of: (0.8×7.0) or 5.6MHz.

From the design frequency of 5.6MHz, calculate the length of sloping legs L : where $L(m) = 75 \div f_D$

$$75 \div 5.6 = 13.39285714$$

The sloping legs will be 13.39 metres long.

Now the length of horizontal elements D .

$$\text{where } D = 0.85 \times 13.39$$

$$11.3815$$

So, the horizontal elements, D , will be 11.38 metres long.

Lastly, we turn to the spacing S , worked out using the formula:

$$S = \frac{(13.39)^{0.75}}{27} = \frac{6.999796798}{27}$$

On the calculator this would look like:

$$0.25925173$$

Giving the spacing S as 0.259m.

Leaving, of course, only the upper frequency f_{\max} to be calculated, which for our 7MHz (40m) antenna, will be:

$$f_{\max} = 1.25 \times 7.0$$

$$8.75$$

Useful Bandwidth

This h.f. skeleton discone antenna should have a useful bandwidth of 7 to 8.75MHz. It could be made of wires, but would need a centre support at least 15m above ground, which isn't possible for most of us! Although this design procedure should provide a feedpoint of about 50Ω, it is always worthwhile using an antenna tuning unit between the shack end of the feeder and the transceiver. Yes I know - I have mentioned it before!

That about wraps up the skeleton discone story. I would appreciate feedback from anyone who uses these rules to have a go and make one for their own use.

Discone antennas have the very desirable feature of being operable over several octaves above a lowest frequency.

aa

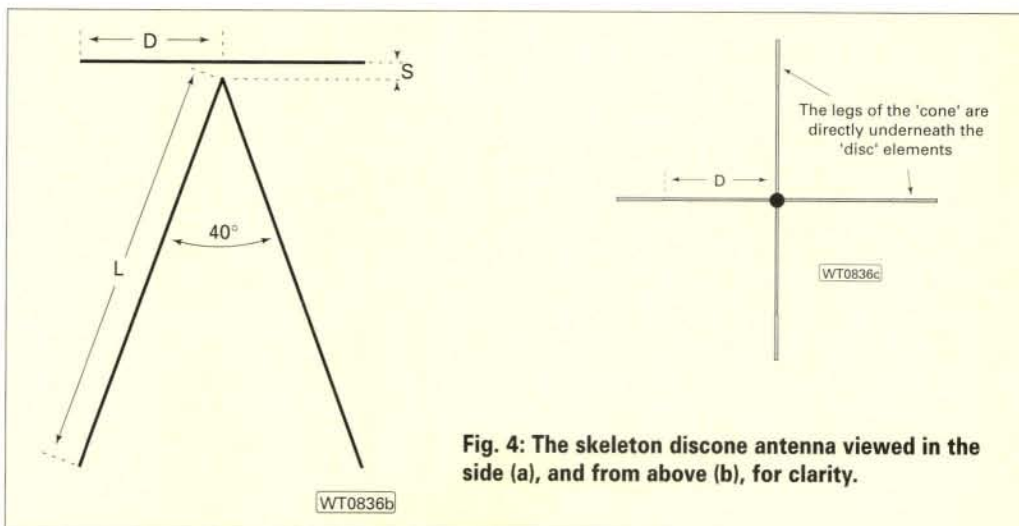


Fig. 4: The skeleton discone antenna viewed in the side (a), and from above (b), for clarity.

SWR - The Myths Minim

My intention is to try and explain in a practical fashion, the whys and wherefores of standing waves. Those who are qualified will doubtless spot the simplifications. But I'm talking to the poor chap who eyes glaze at the mere thought of s.w.r.! I won't go into the subject of transmission lines, as that was covered by **Gerald Stacey G3MCK** in an 'Antenna Workshop', (October 1995 issue of *PW*).

So, let's get down to it! We could prove the value of the characteristic impedance (Z_0) of any given line to be constant at any frequency in the r.f. range, (it does change when we get down into the audio range), in accordance with the formula:

$$Z = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$$

The formula may, for r.f. purposes, be simplified to the formula given in most of the textbooks:

$$Z = \sqrt{\frac{L}{C}}$$

And there's the simplified formula:

$$Z = 276 \log_{10} \left(\frac{d}{r} \right)$$

that covers coaxial cable over all the r.f. frequencies. Thus a 50Ω characteristic impedance line is, as far as I'm concerned, 50Ω at 1.8MHz or 10GHz.

Kippers & Feeders

There are coaxial s.w.r. bridge meters available, but if you use twin open wire feeder it's another story and I've shown a simple solution, the 'Kipper', in **Fig. 1**. By moving the kipper along close to the (energised) main line and watching the relative brilliance of the bulbs, you will be able to measure, reasonably accurately, the wavelength of the standing wave and how strong they are. This method of measuring the wavelength (and thus the frequency) is called the Lecher line method, and it was used before accurate frequency measuring devices were available.

Another effect (common to transmission lines of all types) is the

Paul Essery GW3KFE, talks about the 'modern' problem of standing wave ratio and what you can do to reduce the problems.

differing speed at which the energy moves along the line and it's called the Velocity Factor. This factor may lie between unity for an ideal line, right down to around 0.66 for solid polythene coaxial cable. To illustrate its use, assume a 14MHz signal in a line with a velocity factor of 0.66. The standing waves will appear to be, not ten metres (in round terms) long as you might expect, but 6.6m instead.

You've been told that radio waves travel at the speed of light (modified by the velocity factor). So, how can there be an r.f. wave that stands still? This would appear to be a contradiction in terms! However, the answer is that s.w.r. is a pattern, like the wheels of a stagecoach that, on TV, seem to run backwards or even stand still (technically this is known as 'Aliasing').

Power Absorbed

If the line is terminated in the characteristic impedance then all power is absorbed in the load (the antenna) and the s.w.r. is 1:1. But should the load resistor be any other value than the characteristic impedance, there will still be some power left unabsorbed. So, I'll now consider the load to be an open circuit, where nothing can be absorbed.

As the r.f. energy hits the open circuit, none is absorbed, leaving it no alternative but to go straight back towards the transmitter. Now, due to interaction of the various flows of r.f. energy a pattern of voltage peaks and troughs (standing waves) appears on the transmission line.

Mathematically, the frequency multiplied by the wavelength equals the speed of propagation. From the physical distance from the load, you can calculate this distance in terms of wavelengths. Consider a point (A) on the transmission line near the load defined as a fraction of a wavelength. The distance from A to the load and back is a constant fraction of a wavelength.

So, whatever the mis-match, the phase relationship between the outgoing signal at A and the return signal is constant. It can only change by changing the wavelength (frequency). Now plot the voltages present at A (algebraically summing both outgoing and return). Another pattern may be created by algebraically summing the currents at point A.

Now, imagine other points on the line, where each has, by the same argument, its own constant phase relationship

between the outgoing and returning wave. So, if you repeat the summing exercise at these other points, and plot the results... you've just plotted a standing wave pattern!

Additionally on a transmission line with no load, at a point one half-wavelength back from the load, there's also an open circuit condition. At one quarter-wavelength back from the end, you will see conditions implying a dead short. At other points along the line there will exist something other than an open or short circuit (inductive or capacitive).

Up to now I've talked about the s.w.r. from a purely resistive termination. In a practical antenna, the termination is a combination of reactive impedance as well as resistance. The difference now, is that the reactance of a capacitor or inductor changes with frequency ($Z_L = 2\pi fL$, or $X_C = 1/2\pi fC$). So, when we change signal frequency, the s.w.r. will change as well.

Purely Resistive

Given a 2:1 s.w.r. (created by a 'pure' resistive termination) it's 2:1 at any r.f. frequency. But for a real antenna, a change of frequency for the outgoing signal changes the s.w.r. reading. Because in a 'real' antenna load there are reactive components that cause changes in loading with changes in frequency, changing the s.w.r. at the same time.

By terminating a 600Ω line to give 2:1 s.w.r. (using a 'pure' 1200Ω rather than 300Ω), at the 'half-wave back' point there exists the same voltages and currents as at the termination. At a point a quarter-wave back from the

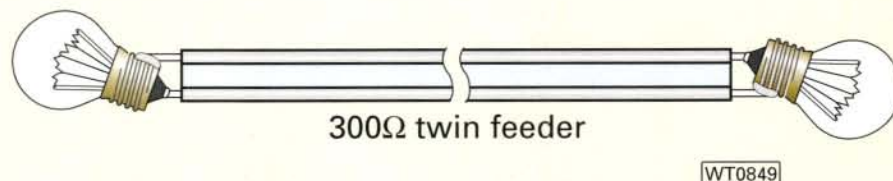


Fig. 1: The simple 'kipper' as described by Paul to measure the standing waves on twin feeder. Changing the length of line (keep it shorter than $\lambda/10$) changes the sensitivity.

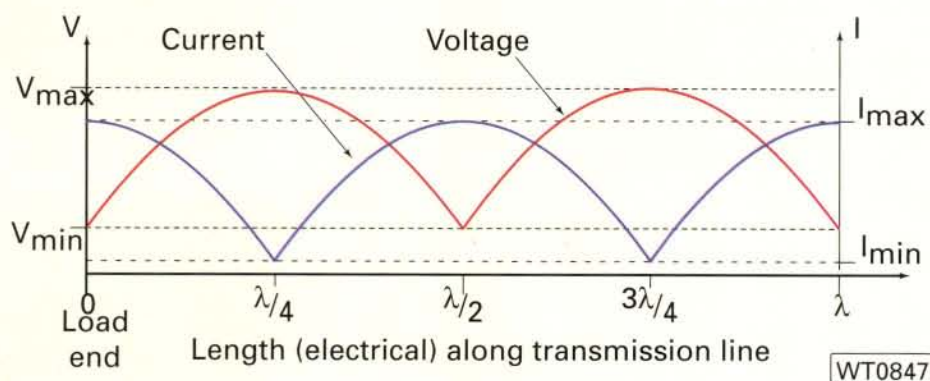


Fig. 2: Peaks and troughs in the voltage and current standing waves are $\lambda/4$ apart - but remember the velocity factor modifies the physical wavelength.

load, the voltages and currents would represent a resistance of 1200Ω. (The illustration of Fig. 2, shows the basic idea).

At other points along the line there are different combination values of resistance inductance and capacitance. With the aid of mathematics or, of a Smith Chart, you can predict what impedances are present, given the Z0 of the line and the load impedance. You can then show what loading the transmitter end will see due to the effect of the line length.

Knowing the effect of line length on reflected impedance, you can then go on to use this effect to make a stub to turn an awkward impedance into something more amenable (**but only at one particular frequency**). Since the impedance at the end of the line is repeated at half-wave length intervals, it's usual when measuring the feed-point of an antenna to employ a feeder line of precisely (electrical) half wave long.

Cloud Nine

Now it's time to come off 'Cloud Nine' and look at what s.w.r. means in real practical terms. Modern textbooks seem to place great importance on s.w.r. and I wonder why? The old *Admiralty Handbook* didn't even mention s.w.r. and they managed to communicate well enough! Again, I ask why?

I've talked of a perfect transmission line, but in a practical line, the spacing method and material all contribute to the losses. And of course Ohms Law applies to any practical feeder of any type. The common ribbon twin feeder is markedly affected by the presence of damp or raindrops on the spacing section between the conductors (the web), for which silicone polish is a partial cure. It's also quickly broken by strong wind, and better material can help here. And with any practical feeder, **losses per unit length increase as the frequency used increases.**

Often the s.w.r. is the only parameter of an antenna system that you can measure. And that's certainly true when using home constructed or simple test equipment. It's also easy to look for resonance with a suitably adapted grid (or gate) dip oscillator (g.d.o.), but this provides only an indication of the impedance.

Let's take for example, a dipole for 14MHz to be resonant at 14.175MHz (using the g.d.o.), and this will present a resistive load on the transmission line at mid-band. If at the antenna feed-point, you have some form of matching device such as a gamma or delta match, it is possible to achieve a 'perfect' 1:1 s.w.r. Then it's a fair certainty that the antenna is 'doing its thing'.

But let's now return to our finite length of 'ideal' line, and still with fixed

frequency but no termination. In this situation a small amount of radiation will still occur at the end. Now, it follows that if you have a transmitter with a 'bomb-proof' (protected or insensitive to high reflected voltages) p.a., most of the r.f. output to reach the 'far-end' will 'bounce' straight back to the transmitter end.

At the transmitter the energy will again encounter a mis-match, and be reflected back up the line towards the open circuit end again. In the end all the r.f. will radiate, even if some goes up and down the line 'umpteen' times. The perfect line, therefore, does not cause significant losses. (Various levels of reflected power and the resulting s.w.r. are shown in Fig. 3).

Practical Line

But what about the practical line in the same situation, one with a quoted 3dB loss in the run between rig and antenna? However, you should bear in mind the 3dB loss figure applies when new. Older 'tatty' cable has even greater losses.

Now let's imagine 100W of r.f. energy from a transmitter put into the line, but only 50W gets to the load end. A little of the energy reaching the load is radiated, but most is reflected, of which only 25W arrives back at the transmitter end. On the second trip these figures are 12W at the load and 6W at the

transmitter. (I've simplified and ignored adding the transmitter power in again).

As I'm sure you have noticed most of the power from the transmitter is used up in the coaxial line. So, the greater our feeder line loss, the more you should worry about a high s.w.r. Notice though, that the losses due to s.w.r. are, in fact, due to the line deviating from perfection. **A lossy line will give a 'better' s.w.r. than it should be.**

So, if your s.w.r. gradually improves over a period of several months, you can lay odds that when you check you'll find the cable has deteriorated, usually (but not always) due to ingress of water. Of course, if the s.w.r. gets worse in service, then something has gone wrong up aloft, but it's not likely to be a feedline problem.

Lossless feeders

With lossless feeders, the s.w.r. figure doesn't mean anything! Before the Second World War, amateurs simply used open wire line feeders and tuned for maximum 'urge' using an r.f. ammeter in each leg of the feeder. The p.a. current meter 'dip' would have been a good indication. Though crude, the system worked nonetheless, and everybody had fun communicating.

Then, after the Second World War came full television coverage on Band I channels and the 'horrors' of 'a.c./d.c.' television receivers. Suddenly Radio Amateurs found they had problems! Or rather they realised just how many problems they had had - and had not noticed them before!

To reduce interference, low-pass filters to reduce the harmonic content became the order of the day. Fortunately filters that need to work in a matched line, are easily made in a coaxial configuration. Another improvement was to use a high-pass filter in the TV antenna lead, again in a coaxial configuration.

There were many myths that came about in the early TV period. Interestingly enough these myths were largely generated by professionals, though to be sure amateurs believed and propagated them. To this day, the professional engineer who understands

transmission lines and antennas is quite a rare bird.

Soon, because of TV, coaxial cable suitable for 100W transmitters was available at the local TV shops. And Lo! 'King Coaxial' cable had arrived. Unfortunately however, coaxial cable, (length for length) has more losses than open wire feeder, and open wire feeder can be home-brewed! But King Cable got another boost when the transistor came along. Transistors being low voltage and high current, output impedances are of the order of an ohm or two. Many early solid states p.a. stages died instantly if mismatched, so the solid state p.a. that, by sensing s.w.r., shut down when disaster loomed came along. So, although the s.w.r. doesn't matter too much, we must take more care for our s.w.r. to maximise the output power

Is there an alternative approach? You could just use a single 'Top-Band' half-wave centre fed antenna with an open wire feedline as an all-band antenna. All that's needed is an a.t.u. to transform the bottom of the feedline into 50Ω for the transceiver. The antenna might put lobes in differing directions on other bands, but you'll get it to radiate. Given an a.t.u. that is versatile enough, you can load up any old piece of wire, or an old bedstead!

In Practice

Now that you've seen that it exists, and that modern rigs like a low s.w.r., in practice, you can live happily with any old s.w.r., just so long as the feeder from a.t.u. to antenna is not lossy. However, you need to consider carefully just how to build an antenna system that works, and how you can satisfy yourself in the future that it still

"The wavelength of the standing wave is the same as the wavelength of the input frequency"

works as well as the day it was put up. Obviously, to do this you need some test equipment.

You can start with a multi-range test meter with decent ohms ranges up to 20MΩ, followed by a g.d.o. or its solid-state equivalent, covering all bands for which you are likely to want. If necessary, you could accept two

g.d.o.s, one for h.f. and one for v.h.f./u.h.f. You'll also need some sort of s.w.r. indicator that we can accept up to the highest frequency to be worked on, and this may be a commercial s.w.r. meter or home-brew.

Accurate Instrument

Whatever s.w.r. indicator used, it's vital that, within reason, it's an accurate instrument to the highest band to be used. I know that W6SAI claims that

the 'Antennascope' design given in his *Beam Antenna Handbook* is good to 150MHz if built to the instructions. It uses the g.d.o. for energisation. If you are lucky enough to have a Bird Thru-line bridge, then you need to have the correct head or heads to cover the range. (But beware of extrapolating outside the range of an existing piece of equipment).

One thing that often first flags up a problem with an antenna, is a change of s.w.r. You should record the s.w.r. measured across the bands when you first put the antenna up. Every so often repeat the measurements and compare the results. You should also record the weather condition on the day you took the original measurements. If the s.w.r. has just gone up markedly, and stays high right across the band, you probably have either a short or an open circuit. It could be likely that one leg of the feeder has come adrift. (Some people recommend the addition of a 1MΩ resistor across the feedpoint of the antenna so, you can then check the feeder continuity by using the ohms range of your meter).

Should the s.w.r. show the same basic pattern as before, but the s.w.r. at the ends of the band is lower ('better') than before, then the chances are that your coaxial cable (if you're using it) contains water. If your coaxial cable is ancient surplus from the junk box, the problem may well be that the

plasticiser used in the pvc outer sheath has corroded the braid. Either way, you should drop the antenna and investigate.

I'd recommend using ribbon or open wire feeder and the same general pattern although the details will change. But remember that 300Ω ribbon is dreadfully prone to break off up from the effects of wind. And that in wet weather, it is normal for the 300Ω ribbon to become lossy due to rain upon the 'web' as I've mentioned before.

Unless you are lucky enough to have some reliable means of measuring a change of s.w.r., you'll have to look out for changes in the setting of the a.t.u. to give you warning of trouble. So, it's fortunate you've already plotted and recorded the readings across the band when it first went up!

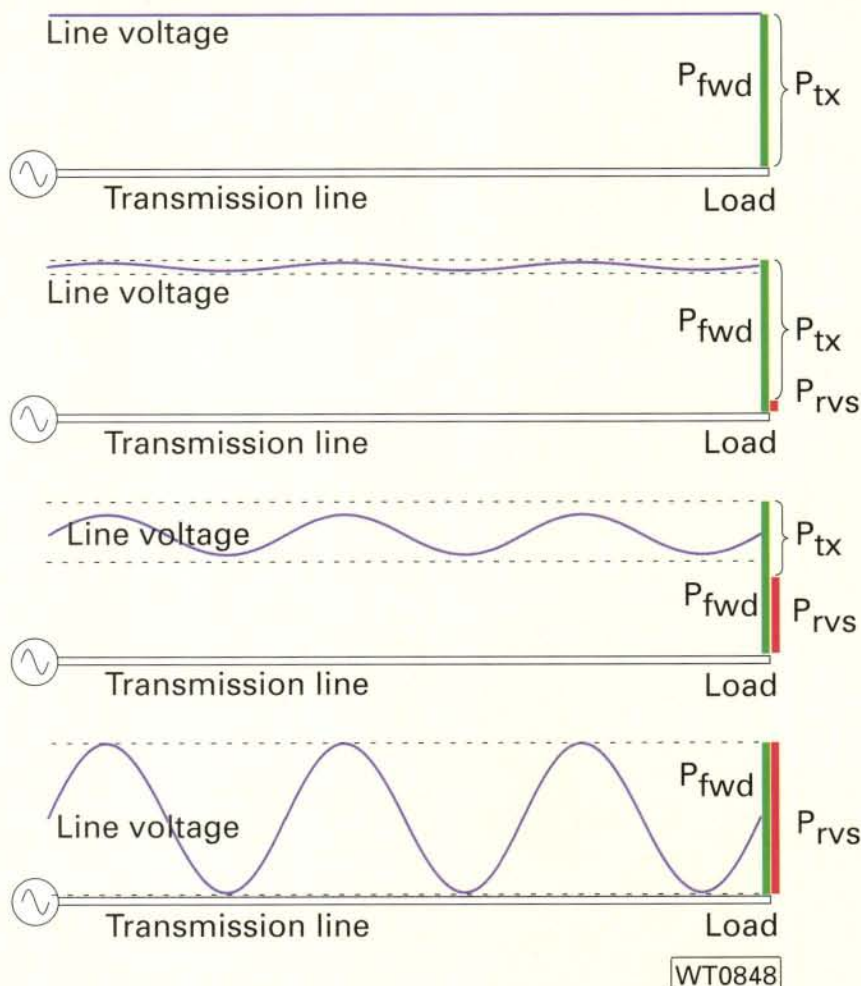


Fig. 3: Four states of s.w.r. on a feedline. The states range from: at the, a 'perfect' 1:1 s.w.r. (with 100% absorption in the load) - to at the bottom an infinite s.w.r. (no absorption in the load at all). The terms P_{fwd} , P_{tx} and P_{rvs} are the forward, transmitted (absorbed) and reflected powers respectively.

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■ ANTENNA ANALYSERS FOR HF TO UHF FROM AEA, AND THE LAKE ELECTRONICS TU4 ANTENNA TUNER REVIEWED.

tex topics

Tex takes a look at the SWR-121 HF and SWR-121 V/U graphical antenna analysers from AEA and a Lake Electronics TU4 antenna tuning unit to build.

I have to start this edition of *Tex Topics* with congratulations and an apology to you all. Back at the end of last year, I said I'd let you know the results of all the returned questionnaires. Well the congratulations must go out to all of you that managed to swamp me with the questionnaires, which I'm still working on. I'm sorry I'm unable to give you a complete breakdown of the answers at present, but I have read your replies and I thank you all for taking the time to take part.

But more importantly congratulations go out to the three winners drawn out of the editorial hat. The winners of the Antenna-in-Action Questionnaire draw are: **J. Lawrence G3MEY**, was the name on the first form drawn out of the hat. The prize was the B&W Portable Antenna donated by **Syon Trading**. Next out of the hat came the form of **John Randall G3OAZ**, who asked for and got a subscription to *PW*. And lastly, from the many questionnaires returned from readers around the world, **Apostolos Bourousis SV1EDY** had the *ARRL Antenna Handbook* as a Christmas present from us all here at *PW*.

As I write this it's just into the new year, and we have to put the holiday behind us. Although I have to admit apart from two days when the grandchildren ran their usual riot throughout the house it's been a bit of a 'busman's holiday' for me. I've had two items to have look at from **Nevada Communications**, a

matching pair of s.w.r. and antenna analysers from AEA. The two units are the **SWR-121 HF** for the h.f. bands from 1-32MHz, and its up-frequency sibling the **SWR-121 V/U** covering sections of the 120-475MHz range. The units work in exactly the same way, only the frequencies are different. So, let's have closer look at them!

I've shown in the photograph, **Fig. 1**, the h.f. SWR-121 HF, but the v.h.f./u.h.f. version looks almost identical. They are large hand-held units (204 x 104 x 54mm) that weigh in at about 750g, though they give the impression of being a little heavier. The outer casing has a pleasant and comfortable feel to it and sits in the hand very well.

The energising r.f. power comes from a phase-locked loop oscillator covering 1-32MHz in the case of the SWR-121 HF and 120-175, 200-225 and 400-475MHz for the SWR-121 V/U version. There are 110 distinct frequency steps on each range which can be from 1-200kHz per step on h.f., or 10-1000kHz per step on v.h.f./u.h.f. Each unit can be 'locked' to supply a single frequency for measurements.

The output of the oscillator is some 5mW into a 50Ω load, which is normally attached to the output socket of the s.w.r. bridge. The bridge impedance measurement is internally selectable between 50 or 75Ω

and capable of measuring an s.w.r. of between 1:1 and 65.5:1, although the maximum displayed s.w.r. is 9.9:1. But let's face it antenna system giving an s.w.r. reading of 5:1 or higher is really a problem so, the displayed s.w.r. range is more than adequate.

Everything is controlled from the large membrane keyboard (although there is a serial interface that can duplicate the keystrokes). Above the keyboard is a very readable liquid crystal display (l.c.d.) that has a number of indicators on it. Have a look at the close-up view of a typical screen, shown in **Fig. 2**, where I've shown the readings from my low-slung receiving dipole.

In use, the units are simple to use with the centre frequency, F_c , being set up to start with. and on the display shown in **Fig. 2**, it's shown as ' $F_c=15000$ ' or 15.000MHz. To the left is the legend

' $=150$ ' signifying that every dot (step) is 150kHz so, the whole display is 16.5MHz wide. The display shows ± 55 steps either side of F_c .

The two other figures shown on the legend are the actual s.w.r. figure

at F_c and the return loss, again at F_c . Although it may be difficult to see on the photograph, my antenna exhibits a low s.w.r. at around 9.6MHz (about

1.8:1 at that frequency). Similar displays may be obtained on v.h.f./u.h.f. antenna systems using the SWR-121 V/U.

I would like to have seen coverage of the 50MHz band, outside of America the 200-225MHz band is less useful. Perhaps AEA have it 'in the pipeline'. That would, to my mind, make the SWR-121 V/U a very much more useful



Fig. 1: The SWR-121 V/U (v.h.f./u.h.f.) unit looks almost identical to the SWR-121 HF shown here.



Fig. 3: The Lake Electronics TU4 Antenna Tuner unit.



Fig. 2: The graphical display of s.w.r. on a low-slung dipole over the 6.75-22.75MHz range.

box. But I cannot fault the SWR-121 HF as it's an excellent piece of test equipment.

I would certainly like to add one of the AEA instruments to my workshop. It would complement the MFJ antenna analyser that I already have. I'd use the MFJ one for the preliminary 'guestimation', and the AEA-121 HF would be brought on to do the more 'scientific' work to finish the antenna project off.

The units cost **£299** (inc. VAT) for the SWR-121 HF and **£399** (inc. VAT) for the SWR-121 V/U and are both available from **Nevada Communications** at **189 London Road, North End Portsmouth, Hants PO2 9AE. Tel: (01705) 662145, or FAX: (01705) 690626.**



Fig. 4: A fluted reamer is useful for circular holes up to 12mm diameter.



Fig. 5: A 'spare' 10mm chuck from a power drill make a good handle for a fluted reamer up to 20mm diameter.

Lake's ATU

As a little light relaxation over the holidays, I built up a **Lake Electronics TU4 Antenna Tuning Unit**. Lake Electronics claim that they supply 'kits with all the bits' so, I thought I'd put it to the test over the holidays. The TU4 unit, based on the well-known 'L-match' circuit, and has the ability to match a very wide range of antenna (or feedline) impedances to the 50Ω required by most modern rigs.

On opening the kit up I found a number of self-seal polythene bags of

So, down to work - read the instructions first! The steps involved in putting together the TU4, shown in **Fig. 3**, are described in the instructions in an order that is fairly easy to follow. There's a bit of 'metal-bashing' to do and I prefer to use handtools. More so as the chassis provided is quite soft and power tools can 'run-away' occasionally.

There are several round holes to be made in the front and rear panel, for which I used two sizes of fluted reamer, shown in **Fig. 4** and **5**. The 'T' handled reamer is ideal for sizes up to 12mm, but for the slightly larger holes I find

that an old chuck from an electric drill makes a good 'handle' for the other reamer.

There are two rectangular holes to cut out, one for the meter on the front panel and a larger one for the 'patch panel' on the back of the TU4. I tried a hand 'Nibbler' for these, before cleaning up the edges with a file. Of the other small mounting holes to be made - there's nothing that needs a power drill. When you're satisfied with the holes (and with great care) the printed legend front and back panels can be stuck on and carefully trimmed to fit.

The multi-tapped p.c.b. coil is shown in **Fig. 6** fits across the unit and should be mounted after the tuning capacitor is fitted, on the insulated mounting block and to the front panel. The s.w.r. sensing board, **Fig. 7**, is fitted in the left rear of the chassis, leaving only the interconnecting wiring to be done, **Fig. 8**.

What makes the Lake Electronic TU4 such an interesting unit is the 'patch panel' on the back of the unit, **Fig. 9**, allowing the coil and capacitor to be 'wired-up' in a variety of ways to suit the impedance to be matched. The input is by ubiquitous 50Ω coaxial cable through an SO239 socket, but output to the antenna may be either, via another SO239 socket or through a Balun transformer and out to balanced twin feeder.

The Lake TU4 unit makes an ideal unit for either receiving or for QRP work. I tried it on my low-slung dipole, and several 'long-wires' into a selection of receivers and I found I could get an improvement in signal in all cases. I also found I could even tune-up two short lengths of wire to give an adequate signal into the receiver.

That's all I have time for this session. See you all in the next issue of A-i-A.

antennas in action

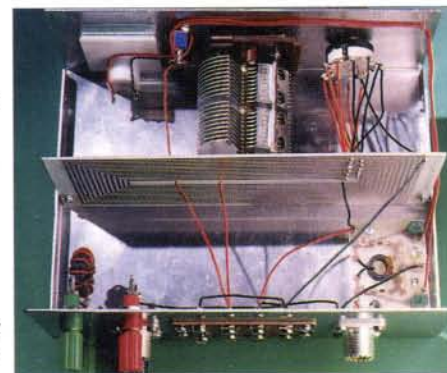


Fig. 8: The Jackson capacitor and the p.c.b. coil dominate the inside of the TU4 unit.



Fig. 9: Several configurations are possible using the 'patch panel' on the rear of the TU4 unit. Both balanced and unbalanced output are possible with the unit.



Fig. 6: The p.c.b. coil used in the Lake Electronics TU4 antenna tuner.

components and parts, a large(ish) box made from two interlocking 'U's and two soft 'aluminium' fascia panels. There was also a rather strange flat coil made from a piece of p.c.b. material with the tapped, rectangular coil etched on it. To complete the kit of course were the instructions, comprising six double-sided A4 sheets stapled together.



Fig. 7: The s.w.r. sensing board included in the TU4 a.t.u.

I let several people in our radio club 'loose' on it as a QRP transmitting accessory. The s.w.r. meter works with less than 1W on the h.f. bands. But because of the many possibilities of connection you would have to do several experiments to find out the best set-up for your antennas on each band.

The TU4 is available as either a kit or as a fully built unit. The kit costs **£68**, and as a fully built unit **£88**. Post and package is **£4** in either case and is available from **Lake Electronics, 7 Middleton Close, Nuthall, Nottingham NG16 1BX. Tel/FAX: 0115-938 2509.**



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February 15: Northern Cross Rally to be held at Thornes Park Athletics Stadium, Wakefield, South Yorkshire, just out of town on the Horbury Road. Easy access from M1 junctions 39 & 40. The event is well signposted and talk-in will be on 144 and 430MHz. Doors open at 1100 (1030 for disabled visitors and Bring & Buy). Details from **Peter G0BQB** on (01924) 379680 or mobile on (0976) 834938, Internet on rally@waveg.demon.co.uk
Web page at <http://www.waveg.demon.co.uk/rally/>

February 28: The 13th Rainham Radio Rally is to be held at the Rainham School For Girls, Derwent Way, Rainham, Kent ME8 0BX. It is very easy to find from junction 4 M2 motorway A278 to Gillingham or from the A2 at Rainham. Just follow the RRR Arrows. Talk-in on S22 GB4RRR. Doors open at 1000 (0930 for disabled visitors and items for the Bring & Buy). Admission is £2. There will be the usual excellent mix of trade stands, many special interest groups will also be represented: BARTG, Kent Repeater Group, Kent RAYNET, RNARS, KEPAC, TCP/IP, Kent ATV Group, G-ORP Club, BYLARA and local club stands. There is a large hardstanding carpark, a licensed bar, hot food and drinks and refreshments will be available plus somewhere to sit and eat. **Martin M0AAK** on Medway (01634) 365980 at any reasonable time.

***March 7/8:** The London Amateur Radio & Computer Show will be held at Lee Valley Leisure Centre, Picketts Lock Lane, Edmonton, London, N9. Doors open 1000 to 1700 each day. There will be trade stands with over 100 exhibitors, a Bring & Buy, RSGB committee and book stands, on-demand Morse tests, talk-in on 2m and 70cm, Special Interest Groups, disabled facilities, bars, catering, ample free parking and lectures. Adults £3, pensioners/under 14s, £2. (01923) 893929.

March 8: The Wythall Radio Club are holding their 13th Annual Radio Club Rally at Wythall Park, Silver Street, Wythall, near Birmingham on the A435, just two miles from junction 3 of the M42. Doors open from 1000 to 1600 and admission is just £1. There will be the usual traders in three halls and a large marquee, bar and refreshment facilities on site plus a Bring & Buy stand. Talk-in on S22. Contact **Chris G0EYO** on 0121-246 7267 evenings and weekends, FAX on 0121-247 7268 or E-mail at g0eyo@compuserve.com

March 14: The 5th West Wales Amateur Radio & Computer Rally will be held at Penparcau School, Aberystwyth. Doors open 1030 to 1600 (disabled visitors from 1000). Admission is £3 only. There is good

parking facilities with easy access for disabled and traders to all stalls, demonstration area and catering facilities. Features include Amateur Radio, Bring & Buy, computers, software and hardware, electronics, h.f. and v.h.f. on air, packet station, repeater group, RAFARS, RSARS, WAB, RAYNET and other special interest groups, trade stalls and lots more. Talk-in on S22. Come and enjoy yourselves. For details and trade stand bookings contact **Katy GW0SFO** on (01545) 580675.

***March 15:** The 'Norbreck' Amateur Radio, Electronics and Computing Exhibition by the Northern Amateur Radio Societies Association is to be held at Norbreck Castle Hotel, Exhibition Centre, Queens Promenade, North Shore, Blackpool. Doors open at 1100 (disabled access from 1045). There will be over 100 trade stands, club stands, Bring & Buy, RSGB stand and book stall, construction competition, amateur computer stands and free car parking at the hotel, bus from extra car park. There is also wheelchair access to all the exhibitor stands. Radio talk-in on S22. Admission is £2, OAPs £1 and under 14s free. **Peter Denton G6CGF** on 0151-630 5790.

March 22: The Bournemouth Radio Society will hold its 11th Annual Sale at the Kinson Community Centre, Pelhams, Kinson, Bournemouth, Dorset. Doors will be open from 1000 until 1600. Talk-in by RAYNET will be available on S22. As usual, there will be a mixture of radio and computer equipment on sale plus a Bring & Buy stall. More information from **John G1HOK** on (01202) 535219 or mobile on (0850) 240931 or E-mail: jbutens@asgard.co.uk or via Packet as g1hok@gb7bnm with 'BRS Sale' as the subject.

***March 29:** The Cunninghame District Amateur Radio & Computer Rally will be held at the Magnum Centre, Harbourside, Irvine, Ayrshire, Scotland. Doors open at 1100 (1030 for disabled visitors). There will be a Bring & Buy, Morse tests and all the usual traders, etc. **Mr W. Gebbie** on (01560) 321009, E-mail: supergit@msn.com or gm3usl@qsl.net

March 29: The Pontefract & District Amateur Radio Society Component Fair is to be held at Carlton High School. The venue is 300 yards from the Carlton

Community Centre. Car parking will be at the school as usual. The venue will be signposted from the major roads. There will be a talk-in on 2m.

For unlicensed visitors, Nigel Ferguson G0BPK can be contacted 0900 to 1400 on (mobile) (0411) 420409 for directions. Doors to the fair open at 1100 (disabled visitors will be admitted at 1030). Once again all traders will be on the ground floor. The bar and tea room (tea room open for early visitors) will be on the first floor. Morse tests will be conducted. Admission will be by prize programme. Contact **Nigel G0BPK** on (01977) 616935 in the evening or on (01977) 606345 during the day, or E-mail at g0bpbk@aol.com Traders please contact **Colin G0NQE** on (01977) 677006.

April 5: The Cambridgeshire Repeater Group (CRG) are holding their annual rally at The Bottisham Sports Centre (Part of Village College), Lode Road, Bottisham, Near Cambridge. The event will feature an Auction Sale, Trade Stands, a Bring & Buy and a Car Boot Trading area. For further details and booking in of traders may be obtained from: **Paul Dyke G0LUC, 41 High Street, Puckeridge, Ware, Herts SG11 1RX** or telephone on (01920) 821536.

April 5: A Radio Fleamarket is to be held at the University Sports Centre - Via Wilrijk/Antwerpen in Belgium, close to A-12, Belgium. Open from 1200 to 1800 local time. Radio stb: 145.7625MHz Repeater Antwerpen and 145.425MHz simplex freq. Call ON40SA. More information from **ON4CDV Gaetan CM/OSA**, E-mail: on4cdv@mail.dma.be club site: <http://bevoner.dma.be/on40sa/main.htm>

April 19: The Yeovil ARC 14th QRP Convention is to be held at Digby Hall, Hound Street, Sherborne, Dorset. Doors open 0900-1700. There will be high quality lectures with the Reverend George Dobbs as 'VIP', plus trade stands, Bring & Buy and refreshments, etc. Talk-in on S22. Entry is £2, which includes prize draw ticket. **Peter G3CQR**, QTHR, or telephone on (01935) 813054.

April 19: The 17th Mobile Rally of the Lough Erne Amateur Radio Club will be held at the Killyhevin Hotel, Enniskillen, Northern Ireland. Doors open at 12 noon. Tyrone Amateur Electronics will be there and it is

hoped Icom, Yaesu, Waters & Stanton as well as the usual interesting variety of other traders and the Bring & Buy. **Keiran G17NET** on (01365) 348063 (daytime) and (01365) 327133 (evenings).

May 10: The Drayton Manor Radio & Computer Rally will be held at Drayton Manor Park, Fazeley, Tamworth, Staffordshire on the A4091. Main traders are in four marquees, there will also be a large outside traders flea market, a Bring & Buy stall, local clubs and special interest stands. Doors open 1000 onwards. For Trader information call **Norman** on 0121-422 9787, for general enquires, call **Peter G6DRN** on 0121-443 1189, evenings please.

May 17: The Dunstable Downs Radio Club will be holding its Annual Amateur Radio Car Boot Sale at the Stockwood Country Park, Luton, Bedfordshire. The site opens at 0900 until 1300. Leave M1 at junction 10a, turn left and follow signs for 'Mossman Collection'. Talk-in on S22. Please note new address for bookings!, please do not use any other address or 'phone number. **DDRC, PO Box 4053, Dunstable, Beds LU5 5ZJ**.

May 24: The Plymouth Radio Club Rally is to be held at the College of Further Education, Kings Road, Devonport, Plymouth. It will run between 1030 and 1600. There will be Morse testing on demand and there will also be a canteen serving meals, snacks and drinks and a licensed bar also. There is ample free parking at the venue and easy access for the disabled. Talk-in will be on S20 and the venue will be signposted on the A38 'Devon ExpressWay'. Anyone who would like more information should contact **Stephen Ramsden**, during office hours, on (01752) 662051.

June 7: The Royal Naval Amateur Radio Society are holding their annual mobile rally at The Playing Field, opposite HMS Collingwood, Fareham, Hants (off M27 at J11, follow A32 & B3385 towards Lee-on-the-Solent). All the usual RNARS Rally attractions, with trade stands, Bring & Buy, RAYNET, SUNPAC, Club stands and a talk-in via PC/PH. There is also a children's play area and various other stalls and attractions. A grand day out! Further details from the **Secretary, RNARS, 103 Torrington Road, North End, Portsmouth**.

June 7: The 30th Annual Rally of the Spalding & DARS RadCom 98 is to be held at Springfield Exhibition Centre, Springfield, Spalding, starting at 10am. Talk-in on S22. There is easy access for any disabled visitors, a licensed bar and catering, trade stands, a huge car boot area and acres of free parking. **Mick Pell G1APV** on (0976) 271796 or **Dennis Hoults G400** on (01775) 750382.

June 21: The Denby Dale (Pie Hall) Amateur Radio Society are holding a Computer & Amateur Radio Fair at Shelley High School, near Huddersfield, making a fresh start in what will be their 25th Anniversary as a club. There will be ample free parking and easy access for any disabled visitors, trade stands, a Bring & Buy, raffles, in addition to Computer Traders with hardware and software plus great catering and a talk-in on S22 and Morse test facilities. Look out for signs on the A629 from Huddersfield and off the M1 junction 39, A636 or M1 - A637 then A636 towards Denby Dale. Doors open at 1100 (1030 for disabled visitors). Information from **Sue G0WFE**, Rally Manager, on (01484) 861782 or **Tony G4LLZ**, Secretary, on (01484) 664360.

June 21: The Newbury & District Amateur Radio Society will be holding their 12th Annual Amateur Radio Car Boot Sale at Cold Ash playing field, near Newbury. Sellers/Traders should arrive at 0830, no earlier please. The sale will be open from 0900 to 1500. Ian Trussion, Secretary NADARS on Tel/FAX: (01635) 826019.

June 28: The Horncastle Rally is to be held at Horncastle Youth Centre. This Rally is held as a joint venture between the Youth Centre and the Fenland Repeater Group. The Rally is held on one level with very good access for disabled visitors. Food and drink is available, including the now legendary Horncastle Bacon Butties. Tables are only £2 for six foot table (bookable and payable in advance). Cheques should be made payable to the Horncastle Youth Club, sent to: **Area Youth Office, Cagthorpe, Horncastle, Lincs LN9 6HW**. Entry fee for customers is £1. Please call **Tony Nightingale G6CZV** on (01507) 522482 or E-mail Tony at: antony.n@virgin.net for further details.

July 5: The 9th York Radio Rally will be held in the Knavesmire Building, York Racecourse, York. Doors open at 1030 and admission is £1.50. Children accompanied with an adult go free. There is ample free car parking. There will be amateur radio, electronics and computers, Morse tests and repeater groups, refreshments and a licensed bar. Talk-in on S22. Further details from **Pat Trask G0DRF** on (01904) 628036.

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.

The Editorial Staff of PW cannot be held responsible for information on Rallies, as this is supplied by the organisers and is published in good faith as a service to readers. If you have any queries about a particular event, please contact the organisers direct. Editor

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Valve & Vintage

The huge pile of old PW 'back numbers' on the desk tells us that it's Phil Cadman G4JCP's turn to look after the 'shop'. This time he's looking at a 'classic' transmitter design first published in PW in 1963.

A rather belated 'Happy New Year' from 'darkest' Dudley! I hope you enjoyed the holiday...but now it's time to start 'work'. The Editor tells me that he has received numerous requests to re-publish some old valve transmitter circuits. The transmitter designed by **Steve Appleyard G3PND**, whilst he was studying for the RAE, being particularly popular in this respect and the story behind it was featured in 'A Hobby For Life' by G3PND on page 58 of the August 1997 issue.

Not wishing to upset the Editor (he's bigger than me!), I'm devoting the whole of this column to Steve's transmitter. The circuit - which was first published in the April 1963 issue of *Practical Wireless* - is reproduced in **Fig. 1** together with the original components list and numbering. The original article also included a power supply but I've omitted that because of space considerations.

I'm not proposing to lead you through the construction of the transmitter. Instead, I'll be dealing with the obstacles you might encounter should you decide to build the transmitter and haven't got a well-equipped junk box. And even if you have all the necessary components to hand there are EMC issues that need to be addressed before this, or any similar transmitter, is used on the air.

The Circuit

The circuit, Fig.1 is straightforward and the v.f.o. is a standard Colpitts oscillator. Notice that it can be switched independently of the rest of the transmitter. This is to let you tune the v.f.o. to the frequency you want simply by listening for it on your receiver. (You'll find the equivalent of switch S1 frequently marked 'net' in similar designs).

I'd suggest one circuit modification associated with S1 - put a 1N4007 rectifier diode between the two switched h.t. rails. Connect the anode to the 'top' of R5 and the cathode to the 'top' of R3. Then, when S4 is closed, power will also be applied to the v.f.o.

As the circuit stands it's possible to apply power and key the p.a. with no drive present whatsoever. Alternatively, substitute a double-pole switch for S4 and connect the extra pole in parallel with S1.

The frequency of the v.f.o. is varied by adjusting VC2. The low-value variable capacitor (VC1) in parallel with VC2 is only there to help with fine adjustments. It can be left out of circuit if VC2 is

fitted with a slow-motion drive (or if you have steady 'slow-motion' hands!).

The next stage, incorporating V2, operates as an un-tuned buffer on 3.5MHz and as a frequency doubler on 7MHz. In addition, the potentiometer VR1 controls the power output of V2 and hence the amount of r.f. that is fed to the driver valve, V3. Unusually, the circuit shows no by-pass capacitor connected to V2's screen grid. (A 10nF capacitor from pin 8 to ground wouldn't hurt).

The driver valve V3, which is un-tuned on both bands, feeds the p.a. valve V4. Nothing special here, the output stage uses a familiar pi-network to match the aerial to the p.a. valve.

Winding Coils

No winding details for the coils were given for L1 and L2 in the original article. They **can** be wound purely by trial and error but to start you off the combination of L1, VC1 and VC2 has to resonate over the range 3.500MHz to 3.800MHz. That gives a value of about 7 μ H for L1.

The combination of L2 and VC3 has to resonate over the range 7.000MHz to 7.100MHz. Remember, L1/VC3 are only in-circuit when V2 is operating as a frequency doubler. Try 10 μ H for L2.

I suggest you either dig out my June 1996 column, which gave design equations for winding coils, or get the book *Coil Design and Construction Manual* by Babani - see the PW Book Store. Alternatively, both *The ARRL Handbook* and the RSGB's *Radio Communication Handbook* have coil design charts.

If you are going to wind r.f. coils on a regular basis then get hold of a grid-dip meter and learn how to use it. Steer clear of LCR bridges and modern digital LCR meters as they are not generally suitable for measuring very low inductances.

Radio frequency chokes are a problem! Once upon a time, all radio component shops sold radio frequency chokes. These days new ones are about as common as 'hen's teeth'. I'm loathe to recommend any of the so-called r.f. chokes found in the components catalogues. It seems they are mainly designed for use in transistor circuits and switched-mode power supplies. Has anyone used them successfully in valve designs, I wonder?

Wattage Ratings

Use either carbon or metal film resistors with the wattage ratings specified. Don't worry if you can't get the exact value. As long as you're within 20% of the stated resistance then it'll still work.

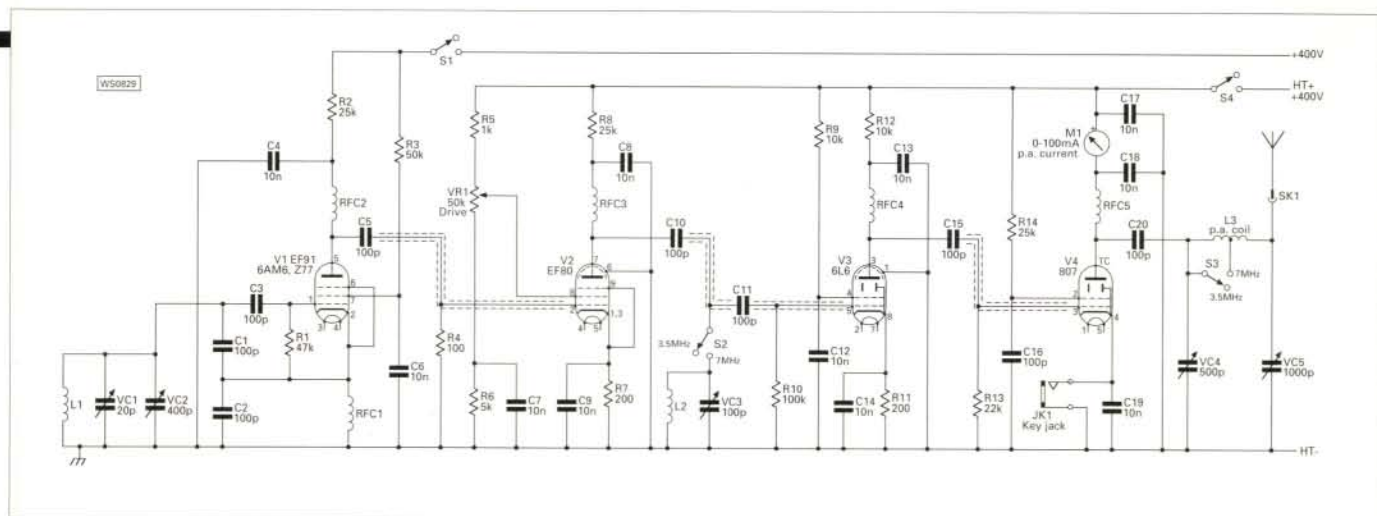
The wire-wound potentiometer, VR1, is more of a problem. Maplin sell a 47k Ω , 2W, cermet type but it's expensive. If you haven't got something in the junk box try asking around. Don't be tempted to use a carbon potentiometer. The track will quickly overheat and cause problems and the smell is dreadful!

Fortunately, the fixed capacitors are easy to get hold of. You may already have noticed that only two values are required - 100pF mica and 0.01 μ F (10nF) paper. For the 100pF mica you could use Maplin's 'High Stability Silvered Mica' type WX13P. Similarly, each 10nF paper capacitor could be replaced by Maplin's 630V-rated 'High Voltage Metallised Polyester Film' capacitor type DS81C.

One of the variable capacitors might be a problem. The p.a. 'tune' capacitor, VC4, needs to be a wide-spaced air-dielectric type due to the high r.f. voltages present at the anode of V4. Standard air-spaced types liberated from (or intended for) broadcast receivers are likely to flash-over in this application.

One point; the specified maximum capacitance of VC4 seems a little on the high side. A 250pF capacitor ought to be sufficient. I hope so because you're more likely to find a wide-spaced 250pF capacitor than you are a 500pF capacitor.

If you haven't got a suitable capacitor to hand



then you'll need to either ask around or scour the surplus and ex-equipment advertisements in the magazines. Wide-spaced variable capacitors can be bought new but they are very expensive. At least a broadcast-receiver type is more than adequate for the p.a. 'load' capacitor, VC5.

Valves Available

All the valves used in the transmitter are readily available. Steve G3PND originally suggested using a 6V6 instead of a 6L6 for V3. I'd go along with his suggestion because a 6V6 will do the job and it's cheaper, smaller and only takes half the heater current of the 6L6. The base connections are the same as the 6L6.

Actually, both the 6V6 and 6L6 are **metal** types and are likely to be expensive. Far more appropriate for this job is either a 6V6G or a 6L6G, both of which have glass envelopes. Even better is the 6V6GT which has a much smaller glass envelope than the 'G' version. It's usually cheaper, too.

The p.a. valve, V4, is an 807. This is a bit of a nuisance because it uses a UX5 base and has a top cap. You could try the octal-based 6L6G here but do take care to keep the anode and grid wiring well separated.

If you are content to run low power then a 6V6G/GT will work fine in the p.a. However, you must reduce the h.t. to 300V. In fact, it might be a good idea to run the transmitter on 300V anyway.

The lower voltage is marginally safer and you can use a receiver-type p.s.u. as long as it will supply 90mA or more. Moreover, the reduced drive requirements of a 6V6G/GT p.a. might mean that another EF80 would suffice for the driver valve, V3.

By the way, the EF91 has a B7G base and the EF80 has a B9A base. All variants of the 6L6 and 6V6 take octal bases. All the valves I've mentioned have the same 6.3V heater voltage but the total heater current will, of course, depend on the actual valves used.

The following information will help you work out the heater current the transmitter will require. The EF91 and the EF80 require 300mA. The 6V6G/GT requires 450mA and the 6L6G and the 807 both require 900mA.

In Operation

In operation and with a 6L6G or 807 for V4, the p.a. can be loaded to around 60mA, which is an input of 24W. However, you should keep to around 45mA if you use a 6V6G/GT instead. These figures may seem overly conservative but at least at these power levels the p.a. valve cannot be damaged through over-dissipation.

When operating on 7MHz, adjust VC3 for maximum r.f. output. And on both 3.5 and 7MHz you should increase V2's screen voltage (adjust the drive control) until the r.f. output flattens off.

Overdriving the driver and p.a. doesn't help either efficiency or harmonic suppression.

Don't forget to switch both S2 and S3 together. Get them backwards and you'll be wondering why the p.a. won't tune or you'll end-up doubling in the p.a. (which is rather frowned upon). And no, you can't use a double pole switch for S2/S3. (You'd get feedback from the anode of the p.a. to the grid of the driver. **Very bad news!**).

Harmonic Suppression

As it stands, **the original transmitter design has poor harmonic suppression** for use in these EMC problem filled days! And this is particularly true on 3.5MHz where only the p.a.'s pi-tank provides any real suppression of harmonics, all the other stages being un-tuned.

Although the transmitter can be tested into a dummy-load as-is, you must use a suitable filter between it and the antenna.

Unfortunately, the common 30MHz low-pass filters that are commercially available are in no way suitable by themselves.

Consider the transmitter operating on 3.575MHz. The second harmonic will be at $2 \times 3.575 = 7.150\text{MHz}$. A low-pass filter with a cut-off of 30MHz will have almost no effect at this frequency (if it does, take the filter back to the shop and ask for your money back). The commercial broadcasters on 7.150MHz, and their listeners (and the RA!) will not be pleased.

The third harmonic at 10.725MHz will also upset the h.f. broadcasters. While the fourth harmonic at 14.300MHz might result in you being chastised by a nearby 14MHz s.s.b. DXer!

Changing band will not help. Tune the transmitter to 7.020MHz and you'll upset the c.w. types on 14.040MHz. And as the transmitter will still have significant output on 3.510MHz (the v.f.o. frequency) you'll have the 3.5MHz users on your back too.

Fig. 1: The circuit of the 63PND transmitter as originally published in 1963. Please note that although this transmitter works extremely well in the original form - the extra filtering recommended is very necessary indeed for modern day operation [see text].

Common Problem

The problem of poor harmonic and sub-harmonic suppression is common to all transmitters of this type and not just to Steve's design. The only satisfactory way to operate this, and similar transmitters, is to follow it with a low-pass or band-pass filter specifically designed for the band in use.

In our case, a 4MHz low-pass filter is sufficient when operating on '80' because the transmitter's output is at the same frequency as the v.f.o. Therefore, there are no sub-harmonics to worry about. But on 7MHz, the output is at twice the v.f.o. frequency. A 7MHz low-pass filter will not attenuate the v.f.o.-frequency component that makes it through the pi-network. So a band-pass filter is necessary.

Both the ARRL and RSGB *Handbooks* have filter design tables, although, in my opinion, neither devote enough attention to band-pass filter design. One final point - key clicks. The only key-click suppression included is C19, a 10nF capacitor. This is unlikely to be sufficient and so I'd recommend augmenting this with additional filtering. Again, both *Handbooks* have suitable designs.

Cheerio until it's my turn 'in the shop' again. Please send your comments and letters to me either via the *PW* offices, via E-mail to phil@oldpark.demon.co.uk or direct to: **21 Scotts Green Close, Scotts Green, Dudley, West Midlands DY1 2DX.**

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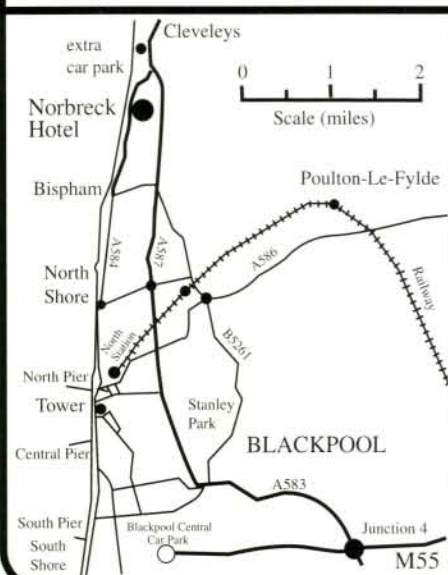


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VHF REPORT

REPORTS & INFORMATION BY
SATURDAY 28TH FEBRUARY.

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THIS MONTH DAVID BUTLER G4ASR HAS REPORTS OF THE GEMINIDS METEOR SHOWER, AURORAL OPENINGS AND NEWS OF WHAT'S BEEN HAPPENING 'DOWN-UNDER' ON THE 50MHZ BAND.

Propagation conditions during December were generally quite poor. Apart from a few days of meteor scatter (m.s.) propagation during the Geminids meteor shower and some brief auroral back-scatter openings very little else was reported.

In other parts of the world though conditions have been excellent. This was especially so on the 50MHz band with many contacts being made via Sporadic-E (Sp-E) and Trans-Equatorial Propagation (t.e.p.).

GEMINIDS METEOR SHOWER

The main propagation event during December was the Geminids meteor shower which occurred between December 10-15. As with all major meteor showers it provided the opportunity to contact DX stations on the 50, 70 and 144MHz bands.

The principle of m.s. is relatively straightforward. Both stations point their antennas towards each other and, using timed periods, await for an incoming meteor to briefly ionise the E-layer region between them to allow communication to occur. Because the meteor trail occurs in the E-layer, around 90-120km high, the two stations will normally be about 1000-2000km apart.

Sometimes you can make use of meteor trails in other directions to either suit your shielded QTH or to contact stations a little nearer than the minimum 1000km distance. So, if your QTH is screened in any particular direction both participating sta-

tions could beam to a specific bearing, well away from the direct path, to make backscatter or sidescatter contacts.

All m.s. activity is conducted via high speed c.w. or conventional s.s.b. High speed meteor scatter (h.s.m.s.) involves the use of Morse nominally at 400w.p.m. A memory keyer or computer is usually used for transmit and a multi-speed tape recorder, computer or the DF7KF DTR (digital recorder) used on receive.

The 50MHz band is ideal for h.s.m.s. propagation but strangely there is very little activity on this band especially in the UK. Perhaps everyone wants to make those easy Sp-E contacts in the summer instead?

Activity on the 70MHz band is very limited primarily because of the geographical constraints in the UK. Occasionally an expedition may be active from GI or GM but these usually take place during the Perseids meteor shower in August.

Most m.s. activity takes place on the 144MHz band with hundreds of enthusiasts all over Europe. From the UK it's possible to contact stations as far away as Iceland, Scandinavia, the ex-Russian Republics, Romania, Bulgaria, the Mediterranean area and North Africa.

As a means of creating further activity, the **Bavarian Contest Club (BCC)** organised a c.w. meteor scatter contest to coincide with the Geminids meteor shower. The aim of the contest, held between December 11-15, was to make random c.w. operation more popular and to create more use of IARU Region 1 letter system. Random operation means making contacts without prior arrangement (skeds).

The letter system is used on c.w. when calling CQ around the m.s. centre of activity 144.100MHz. The letters of the alphabet indicate how many kHz up from your transmitted frequency you will listen and conduct the QSO on.

So, if someone heard me calling CQG G4ASR on 144.100MHz it would indicate that I will QSY 7kHz up to 144.117MHz to conduct any possible m.s. contact. The rules of the contest were heavily biased in favour of making random c.w. contacts using the letter system and as a consequence all participants were heard using this method.

At my QTH (IO81) I used an Yaesu FT-221 (with an optimised replacement Mutek front-end), 2 x 3CX400's running 400W and a

single 17-element Yagi at 20m above ground. For transmitting the c.w. I used a home-made memory keyer directly keying the FT-221 at 500w.p.m. and a DF7KF DTR for receive processing.

Unfortunately, I missed the peak of the Geminids (December

plete the contact.

Making m.s. contacts over 2000km is rather difficult although not impossible. The current top five European distance records for m.s. on the 144MHz band are GW4CQT (IO81) to UW6MA (KN97) at 3101km, made over 20 years ago on August 12 1977, OZ1IUK (JO66) to UA4CDT (LO41) 2354km, OZ1FDH (JO65) to UA6YB (KN93) 2353km, GM4CXM (IO75) to UA1MC (KP59) 2293km and PA0JMV (JO21) to JX7DFA (IQ50) 2279km.

During the BCC contest some stations did manage to make crack the 2000km barrier.



Fig. 1 The Bulgarian Radio Club LZ1NWT Meteor Scatter Expedition. Left to right: LZ1DP, LZ1DX, LZ1ZX, LZ1BI and LZ35Q.

13-14) but did make a number of random c.w. contacts using the letter system during the contest period. These were EA3BTZ (Spain) at 1250kms IC8FAX (Italy) at 1822km, LY3GM (Lithuania) at 1740km, RW2F (Kaliningrad) at 1615km and SP2OFW (Poland) at 1422km.

I also heard many stations calling CQ including DL5MAE (Germany), EA6SA (Balearic Is.), I6BQI (Italy), LA0BY and LA2AB (Norway), OE3JPC (Austria), OH2BNH (Finland) my longest distance heard at 1943km, SP4MPB (Poland), S51AT and S57EA (Slovenia), 9A1CAL and 9A5Y (Croatia).

Bill Thomas G4AEP (IO91) was also active for some of the contest making completed random QSOs with LY3GM (KO14), RW2F (KO04), SP2OFW (JO93), YU7MS (KN05) and 9A5Y (JN85). Bill also had a schedule with EU6MS (KO45) at 2008kms but despite receiving 16 bursts (maximum 3 seconds) could not com-

Claudio I4XCC (JN63) reported a 2020km contact with RU1A (KO48) and amazingly OF8UV (KP34) heard IC8FAX (JN70) over a distance of 2783km, although a complete contact was not made.

My best DX ever via the m.s. mode is three contacts with OH5LK (KP30) at 2107km. However, I've heard the club station LZ1KWT (Bulgaria) at 2520km on a few occasions but have been unable to complete an m.s. QSO with them so far.

And nicely on cue is a letter I received from **Christo Mintchev LZ1DP** who is a member of the Bulgarian club station **LZ1KWT**. He writes to thank me for the 'VHF Report' information which he reads in *PW* with much interest.

Christo explains that the club station was formed in 1988 in memory of **Wasil Terziev LZ1AB**, a well respected Bulgarian radio amateur interested in v.h.f. and u.h.f. DX operation. Wasil made the first LZ m.s. expedition, the

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first v.h.f. and u.h.f. QSO's and the first contacts via satellite.

Every year since Wasil's death the Bulgarian club have organised an m.s. expedition during the Perseids meteor shower. Last year the group (shown in the Fig. 1) operated from locator square KN21. Because the distance between Bulgaria and the UK is very long only two s.s.b. contacts were made via m.s.

However the Bulgarians were very fortunate to catch an Sp-E opening on August 14 and completed s.s.b. contacts with 37 stations. Amongst these were the stations of G0CUZ, G0FIG, G0GMS, G0KAS, G0KVA, G1YFA, G3BNE, G3COI, G3IMV, G3JHM, G3WZT, G3YVR, G4RKY, G4SEU, G4TIF, G4VPD, G6HKM, G6ZDQ, G7MHZ, G8IYG, GW4UWR and GW4ZQV. The equipment at LZ1KWT consisted of a Yaesu FT-736R, 2 x 4CX250B running 1kW and a pair of 16-element F9FT Yagis with a GaAs f.e.t. mast-head pre-amplifier.

AURORAL OPENING

Ken Osborne G4IGO (IO90) reported hearing a weak auroral opening between 1800-2100UTC on December 6. He noticed that TV video signals at 48MHz were being reflected on a beam-heading of 330° whereas signals at 49MHz were peaking on a beam-heading of 40°.

The station of PA3FJY (JO32) also heard the 48.25 and 49.75MHz TV carriers go auroral from 1745UTC. However, **Zaba OH1ZAA** disputes whether it actually was auroral back-scatter being received. He mentions that he has heard similar signals under very quiet conditions.

Sometimes the v.h.f. spectrum sounds very vibrant and signals exhibit a very rapid fading with a shaky hiss. Zaba reports that the Finnish magnetometer observatory (situated in locator KP37) showed the magnetic activity to be extremely quiet during the period but he does question whether the magnetometer indicators are sensitive enough to detect very weak auroras. He also wonders if there are any other geophysical processes that exist which generate a similar auroral type sound onto received signals.

Neil Spokes AB4YK suggests that the auroral sound could be caused by meteoric clouds of very low mass particles. Neil surmises that there could be endless belts or clouds of particles orbiting the sun in unpredictable directions.

The clouds would be undetectable, orbiting the sun for millennia until they encounter the earth's magnetic field. The impact with the earth could then give rise to aurorally sounding signals.

Whether it was a 'real' aurora on December 6 we may never know but

there definitely was one on December 30. It commenced around 1530UTC and lasted for nearly three hours.

On the 50MHz band a number of operators reported the stations of GM3WOJ (IO77) and MM0AMW (IO75) putting good signals into central England. Up on the 144MHz band Scottish stations were heard making c.w. and s.s.b. contacts into ON, PA and DL.

From Scandinavia the Swedish station SM5BSZ (JO89) was putting in a cracking signal for much of the opening and was reported as far south as the London area. **Dick PA3FJY** reported working a total of 15 stations, mainly in LA and SM, between 1650-1850UTC. The only UK station worked on the 144MHz band was GM0GMD (IO86).

SOUTHERN HEMISPHERE

As you no doubt know when it's wintertime here, it's summertime in the southern hemisphere. Similarly, whilst the northern hemisphere can only dream about last year's Sp-E openings, operators on the other side of the world are actually participating in their DX season right now.

Over in the Antipodes some of the paths being worked include VK (Australia) and ZL (New Zealand) to JA (Japan) via t.e.p. and a number of islands in the South Pacific Ocean region via Sp-E. However, one of the problems associated with operating 'down-under' is actually alerting stations in sparsely populated areas to the possibility of making contacts on the 50MHz band.

One recent success was when the station of N5OLS/KH8 was contacted on h.f. who then alerted the station of AH8A (American Samoa). Bill AH8A, running 60W into a quarter-wave vertical, then made a number of contacts with stations in VK and ZL.

Mike ZL3TIC (New Zealand) reports that this year's Sp-E season is quite different to that in 1997. At his QTH more long haul indicators are being heard, such as video on 49.750MHz, almost daily and it's also appearing very early in the day. This point was picked up by **Graham F/G8MBI** on the Internet 'v.h.f. reflector'. He mentioned that this was characteristic of the Sp-E openings in Europe last year.

The lower frequencies opened up much earlier than in previous years, often wide open by 0500UTC and even two openings on the 144MHz band before 0700UTC. Propagation then took the local midday dive but failed to recover for the early afternoon peak.

The result was that Sp-E openings during 1997 were very poor on the 144MHz band and well below par on the 50 and 70MHz bands. Graham suggests that you should

change your Sp-E monitoring strategy to earlier rises and longer afternoon siestas!

Sporadic-E openings have also occurred in Southern Africa. **Paul ZS6PJS** reports that on December 7 the station of ZS6AXT (KG33) contacted 7Q7RM (KH74) and on the following day ZR1EV (JF96) worked ZR6AUI and ZS6PJS (KG46).

In South America a number of t.e.p. paths have been worked with the station of WP4O (Puerto Rico) working LU2FF, LU3EMK, LU9EHF, LW5EJU (Argentina) and PY5CC (Brazil). The station of PP1CZ (Brazil) made his first QSOs with the USA in Solar Cycle-23 on December 19 when he made c.w. contacts with W3BTX and KJ4E.

There may have been transatlantic propagation on the 50MHz band between North America and Europe on December 12. A report from **Tom Mott W2DRZ** (FN02) mentions that he heard the station of DL2LDU (Germany) at 2054UTC but signals disappeared into the noise.

Although unconfirmed I can't totally dismiss the W2DRZ report as there may have been some additional E-layer ionisation caused by Geminids meteor shower. (And this was on the same evening when OF8UV heard IC8FAX over the 2783km path on the 144MHz band.) Did anyone hear anything unusual during this period? A few days later, on December 17, Jimmy Treybig W6JKV reported working TG9SO (Guatemala) and XE1BEF (Mexico) possibly via Sp-E.

On November 30 the stations of KP4EIT (Puerto Rico) and CX9DK (Uruguay) contacted each other via t.e.p. on the 50MHz band. As both stations were running low power and signal strengths were very strong they decided to try for a contact on the 144MHz band.

Signals were not immediately heard but eventually a successful two-way s.s.b. contact was made on 144.300MHz. The opening, over a path approaching some 6000km, lasted for about 10 minutes with signals peaking 55/53.

Incidentally the European t.e.p. distance record is held by the stations of I4EAT (IN54) and ZS3B (JG73). They made a c.w. contact on the 144MHz band on March 30 1979 over a path of 7784km. If only the UK could be in the main t.e.p. zone!

NATIONAL VHF CONVENTION

What is claimed to be Europe's largest VHF event, the **RSGB National VHF Convention**, is being held on **Sunday 22 February**. The location is the **Sandown Exhibition Centre, Sandown Racecourse, Esher, Surrey**.

The convention and exhibition will be open between 10.30am to

5.00pm and admission costs only £3. It features a comprehensive trade exhibition and RSGB Committee stands (including amongst others the VHF Committee, the VHF Contests Committee, the Microwave Committee and the Propagation Studies Committee).

There will also be a main RSGB stand for general enquiries and for book sales. Many specialist groups will be there including AMSAT-UK (Satellites), BATC (Television) and UKSMG (Six Metre Group). The UKSMG will be holding their AGM during the morning and this will provide an opportunity for membership enquiries.

Several 50MHz operators from overseas have already mentioned they will be attending the VHF Convention. Among them will be I2ADN, PA0TLX, PE1NWL, PA3BFM, SM7FJE, VK3OT and WA6BYA. Following the presentation, around midday, of trophies for various RSGB v.h.f., u.h.f. and microwave contests there will be a series of afternoon lectures, which are always worth attending.

MEETING OF IARU

During the weekend of **February 21-22** there will be an International Amateur Radio Union (IARU) Region 1 v.h.f., u.h.f., microwaves committee meeting to be held in Vienna. Representatives (normally the v.h.f. and microwave manager) from most national societies will be attending (including the RSGB) and will be discussing a number of proposals that affect the various band plans. Some of these papers only propose minor 'tweaks' to the sub-bands involving the use of e.m.e. (moonbounce), meteor scatter and a change to the 24GHz narrow-band allocation. However, there are some, that if agreed (and that's a big IF), may have an effect on how the v.h.f. and u.h.f. bands are utilised.

One proposal from the IARU Satellite Co-ordinator ZS5AKV is requesting uplinks for manned space mission operations on 144.490MHz (temporarily agreed at the IARU meeting 1997) and additional channels on 144.450MHz and 144.470MHz. Further it's proposed that operation to the MIR Space Station moves to 144.490MHz uplink and 145.800MHz downlink from 31 March 1998.

On the 430MHz band a number of additional sub-bands are being proposed for satellite operation. These are 435.700-435.800MHz, with 2.2MHz off-set, for duplex operation and 437.500-438.000MHz for the manned space segment. AMSAT-NA (North America) have also requested that consideration be given to include a satellite segment somewhere within the 50MHz band.

A paper written by the German Society DARC mentions new wide-band transmissions technologies such as Spread Spectrum (s.s.). The DARC is interested in setting up new s.s. systems and propose using the digital communication sub-bands 144.800-144.990 and 434.800-435.000MHz for such tests. It must be stressed that all these are only proposals which can only be fully ratified at the

(three-yearly) IARU meeting, the next one being held in 2000.

That's it again for another month. Don't forget to keep sending me your list of locator squares, counties and countries worked for the 1997 table. Forward any news, views, comments or photographs to reach me to the address and by the date given at the top of the column.

THANKS FOR SENDING IN YOUR REPORTS KEEP THEM COMING, SEE YOU NEXT MONTH.

HF FAR & WIDE

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As I write this (just before Christmas) the month of December has brought the first snow of the winter. But along with the cold weather, we've also been experiencing some very good propagation conditions on both the high frequency and lower frequency bands.

Our reporters this month continue to log that conditions are steadily improving. However, on some days the bands have been 'somewhat flat' at times.

The lower h.f. bands have shown a marked improvement during the dark evenings. This became evident even to the extent that on one particular evening I was receiving strong north American stations on the 1.8MHz band as early as 2100, as they were working stations all over Europe.

I even managed to work the USA on 1.8MHz with an end-fed wire (this is not exactly a DX antenna on this band, one needs a vertical for real DX work here of course, but still it was a first for me). Mind you, I had to run 50W to make the contact - a massive amount of power for a 'normally QRP' operator!

The 21MHz band has been supporting DX traffic on a regular basis of late, as well as a few openings on the 24 and 28MHz band being apparent on a few days. So, there's no doubt in my mind there will be quite a few readers having a go at these

bands as conditions generally continue to improve.

It's the higher bands where most of our reporters have been operating lately. And judging by what they've been working, who can blame them, eh?

THE DX NEWS

Now it's over to the RSGB's *DX News Sheet*, edited by **Chris Page G4BUE**. And to start, for enthusiasts of SSTV there's news that Camel 7X2BK is regularly active using this mode on the 14MHz band, while Agalega & S. Brandon Islands will be activated by Dov 4Z4DX and others during the month of May, callsigns will be 3B7AZ and 3B7HB9JA1.

Charlie K4VUD will be active from Nepal as 9N1UD during March. For more details he can be contacted on 407-349-221. Fiji Island is where Hide JM1LJS will be operating under the call-sign 3D2LJ between the 30th of April and the 7th of May. QSLs to go to his home call address.

Using QRP from the Canary Islands during March will be Brian GM4XQJ, operating as EA8/GM4XQJ/P - QRP. Any QSLs should go to his home call address.

THE ZB2FUM SAGA

It seems that the ZB2FUM saga continues! Following reports in the column a few months ago regarding the pirating of the ZB2FUM call-sign, and the later claim by someone purporting to be ZB2FU/M that he was legitimate even if ZB2FUM was not, news has arrived direct from **Wilfred Guerrero ZB2IB**, Secretary of the **Gibraltar Amateur Radio Society (GARS)**.

After reading the story in 'HF Far & Wide', Mr Guerrero and his colleagues at GARS did some detective work. They checked with the Wireless Officer at the Department of Trade and Industry



Fig. 2: Richard GW0WNI has been busy up on 28MHz 'ratcheting up the DX'. Perhaps it's time to try '10' for yourself! (see text).

regarding the matter.

It turns out that both the callsigns are illegal. Mr Guerrero states that 'the callsigns have not been renewed within the past two years, so therefore I regret to say that whether it's ZB2FUM, ZB2FU/M or ZB2FU, all three callsigns are illegal'. So readers beware! It's a shame that this sort of thing goes on, but many thanks to ZB2IB and his colleagues for clearing this matter up.

SOUTHERN HEMISPHERE 1.8MHz

One of the most well known 1.8MHz operators in the southern hemisphere is **Jim ZL2JR**, pictured in Fig. 1. And with 146 countries worked on 1.8MHz certainly puts out a remarkable signal on the band.

Jim, on the left in Fig. 1, is pictured with **Bernie G4CWO** on a recent visit to New Zealand. Apparently Jim's QTH consists of 25 acres rising to 350ft above sea level, adjacent to the shore.

"However", says Bernie, "all is not sweetness and light, as across the bay, just two and half

kilometers away is a 730ft mast pumping out 1.5kW of a.m! Luckily Jim has been able, through much experimentation, to neutralise any untoward side effects from this station". (Whew! I'd like to know how he does it, because I can't even escape from the timebase QRM emitted by my TV set downstairs!).

YOUR REPORTS

On to your reports now, beginning with 1.8 and 3.5MHz. First comes all-c.w. man **Ted Trowell G2HKU** in the Isle of Sheppey in Kent, who hooked up with TF3IRA (Iceland), and TK5NN (Corsica) at 0700, along with OH3KFB (Finland), LA4PHA (Norway), and FM5GUI (Martinique Island) at around 2100 on the 1.8MHz band. Ted has been taking it easy of late, on doctors orders, so hope you're feeling better now Ted.

Next comes **Eric Masters G0KRT** from Worcester Park in Surrey, who due to examination work has not been as active as he's like. Nevertheless, Eric's QRP c.w. signals went out to DL7BK (Germany) at 2045 on 1.8MHz, and Novice station 2E0AOZ at 1719 on 3.5MHz.

Your scribe GW0LBI managed to hook up with TF3IRA (Iceland) at 2300, K3UL (USA) at 0117, and IS0/YO3RA (Sardinia) on 1.8MHz using 50W of c.w. On lower power 5W of c.w. brought contacts with UU4JMG (Russia) at 0005, LA5FHA (Norway) at 2355, and UA2FJ (Kaliningrad) at 0014, again on 1.8MHz.

THE 7MHz BAND

Using a G5RV dipole on the 7MHz band is **Sean Gilbert G4UCJ** in Milton Keynes. This month Sean reports c.w. contacts with NP3G (Puerto Rico) at 2337, EP2MKO (Iran) at 2339, 5A2A (Libya) at 0200, 9Y4S (Trinidad) at 0105, 5V7A (Togo) at 0210, 6Y4A (Jamaica) at 0113, and J39A (Grenada) at 0037UTC. Seems like the band has been open rather well to the Caribbean area.

Ted G2HKU lists a couple of contacts on 7MHz in the form of DJ4GX/HI3 (Dominica) at 0800, with W0IAK (USA) and VP2EEB



Fig. 1: A wonderful location in New Zealand! One of the most well known 1.8MHz operators in the southern hemisphere is Jim ZL2JR (left). He's pictured with Bernie G4CWO, who visited him recently.

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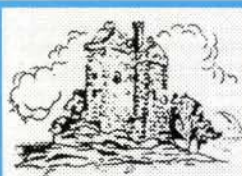
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GEOFF G4AQU - JOHN G6VJC

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(Antigua) coming in at around 2100UTC.

Eric GOKRT reached out with his 5W of c.w. to UTSEH (Ukraine) at 2332, and K1WGM (USA) at midnight.

Down in deepest Somerset Don McLean G3NOF in Yeovil used s.s.b. to hook up with FM5GU (Martinique island) at 2300 and YV4ARB/QRP (Venezuela) at 0019UTC.

THE 14MHz BAND

Over to Don G3NOF again now, for his monthly propagation report followed by your 14MHz band reports. Don says "The bands 14-28MHz have generally been open during daylight hours. 14MHz has been open around 0700 - 0900 on the long path to Australia and New Zealand, and the west coast of the USA came in at around 1500 to 1700. Generally the band was closed by 1800, although on a couple of days it stayed open until 2000.

Don continues: "The 18MHz band has been open most mornings around 0830 to 1000 on the long path to New Zealand, with a few Japanese stations being heard, along with other Pacific area countries, 21MHz was often open on the short path to Australia around 1100 to 1230, while north America and some African countries came in between 1300 and 1700.

The 24MHz band has been patchy, although on some days there were long path openings to Asia and the Pacific area between 0900 and 1030. Some African stations were also heard at this time. On 28MHz, African stations came in during the mornings and afternoons, along with south American stations quite strong during the afternoon as well".

Don's 'worked' report includes 14MHz s.s.b. contacts with FG5GG (Guadeloupe) at 1936, KH6/W7GMH (Hawaii) at 1846, VE7DXQ (Canada) at 1649. Finally, there was ZD8T (Ascension Island) at 2051UTC.

New reporter Robert Adlington G7UTO in Romford has been actively 's.w.l'ing on the 14MHz band, and lists reception of VP8CTR (Falkland Islands) working DL5EBE in Germany at 0700, 9X0A (Rwanda) working IT9TJH at 1300, A92GE (Bahrain) in contact with WA9HMN in the USA at 1351, and 7X2DB (Algeria) working I0BAM in Italy at 0820UTC. Welcome to the column Robert!

Also busy at the receiver is Derek Blunden BR5 171057 in Swindon. Derek's 14MHz log shows s.s.b. reception of VK6LC (Australia) working EA4MY at 0925, N3MXT (USA) in contact with EA3OT in Spain at 2047, FG7FC (Guadeloupe) working YU1AVO at 2054, and UA4BOU (Russia) in contact with LZ1KSD in Bulgaria at 0944UTC.

Meanwhile, Ted G2HKU hooked up with VE6JY (Canada) P40J (Aruba island, Netherlands

Antilles) and W7AJ (west coast USA). All QSOs were around 1700UTC.

THE 18 & 21MHz BANDS

The 18MHz band is where Charlie Blake M0AIJ has been rather busy of late. Using just a simple straightforward dipole, Charlie hooked up with 6W1QV (Senegal) at 0900, CT3FT (Madeira Island) at 1129, and 4Z5IS (Israel) at 1100UTC.

Operating on 21MHz, Charlie also 'snagged' CN8NK (Morocco) at 1257, 9K2MU (Kuwait) at 1230, EA8BYR (Canary Islands) at 1443, and CU7DT (Azores Islands) at 1144UTC. All contacts were using s.s.b.

Down to Skewen now, and Carl Mason GW0VSW, who, using 70W of c.w. and a G5RV dipole on 18MHz worked BV7FC (Taiwan) at 0800, and SV2AVP (Greece) at 1546, while on 21MHz he worked 5B4/UA9LAC (Cyprus) at 0900, ZP5XF (Paraguay) at 1115, HC5AI (Ecuador) at 1248, TI4SU/5 (Costa Rica), and C6A/N4RP (Bahamas) at around 1300, CE2LZV/MM of the coast of Brazil at 1429, and HK6HFY (Colombia) at 1712.

Operating under his Novice callign of 2E0ANZ, John Constance, otherwise known as G0VGD of Aylesford in Kent lists contacts using 3W of c.w. on 21MHz with Z32CY (Macedonia), WA4YGN (USA) at around 1300, VE3HBF (Canada) at 1520, RK6AJ (Russia) at 1225, and UX5TR (Ukraine) at 1000.

THE 28MHz BAND

The 28MHz band has been open of late, but not on a regular basis. However, any signs of life on this band is a good sign of better conditions to come. John Wheeler G0IUE in Melksham reports some good openings here, and lists s.s.b. contacts with VK6BOT (Australia), VR2KF (Hong Kong), PP5UA (Brazil) K1AMF (USA) and Z5J (South Africa).

Carl GW0VSW used c.w. on the band to work 3B8/F6HMJ (Mauritius), LU3WEA (Argentina), CX5X (Uruguay) and W8PBO (USA), all between 1400 and 1600, while Don G3NOF lists s.s.b. contacts with 5A2A (Libya) at 1046, and 9G1BJ (Ghana) at 1629.

Richard Lewis GW0WRI in Brynaman, West Glamorgan (see Fig. 2) has been racking up some nice DX contacts on 28MHz in the shape of FR5DX (Reunion Island) V26B (Antigua island), HH2PK (Haiti), F55PL (French St. Martin) and HC8N (Galapagos Islands) at around midday, while late afternoon brought in TI4C (Costa Rica), VP5T (Turk & Caicos Islands), and CE6ABC (Chile), all on s.s.b.

And the final word this month goes to George Woods G3LPT of Bury St. Edmunds, who runs a regular f.m. net on 28MHz (see PW Listening Watch) has been working American stations on

PW LISTENING & OPERATING WATCH LIST (All times in UTC)

Charlie Blake M0AIJ listens: 0500 - 0700 on 7.061MHz s.s.b. with an NRD 525 receiver and sloping wire antenna.

Steve Locke GW0SGL operates: 1100 - 1500 most days around 14.180MHz s.s.b. using a Kenwood TS-940 & TH7 beam antenna, normally beaming to other continents.

George Woods G3LPT (Suffolk) operates: an open net on 29.570MHz on f.m. every weekday morning (except Mondays) at 0930.

Don McLean G3NOF operates: 1030 Saturdays on 3.685MHz on the International Short Wave League (ISWL) Net or 1030 Sundays on the Yeovil ARC. Net on 3.665MHz s.s.b. using a Kenwood TS-950 & trap dipole antenna.

John Wheeler G0IUE monitors: 28.5MHz s.s.b. every evening between 1700 and 2200 regardless of conditions using an Icom IC-706 and a two element TET triband beam antenna.

Leighton Smart GW0LBI operates: Most weekday evenings at around 2100 - 2300 on 1.949MHz s.s.b. using a Yaesu FT-747 transceiver and a long wire Marconi antenna.

Rob Mannion G3XFD listens and operates: (weekdays & weekends) 1800 - 1830 3.7MHz 100W s.s.b., & 3.530MHz QRP c.w. using an Alinco DX-70 transceiver and a long wire antenna. Also at 2300 on either 3.530, 7.025MHz (c.w.) or 3.7MHz s.s.b. Occasionally on 7.025MHz c.w. between 0100 - 0200. All operations dependent on PW work load!

Sean Gilbert G4UCJ operates: around 0700 to 1100 and 2100 to 0000 seven days a week on 14MHz and 7MHz c.w., using a FT-307 and Alinco DX-70 Transceivers at 5/25W output and a G5RV dipole antenna in the loft space.

T Ibbitson G0VTI operates: each evening between 1900 - 2000 on or around 7.020MHz c.w., or 14.035MHz c.w. using a Ten-Tec Scout at 50W.

28MHz f.m. lately. He reports that G4UJV in Newmarket has been working Australia, Japan and Brazil on the band also using f.m. George says 'He who listens works the DX!' Quite right too, George!

SIGNING-OFF

Well that just about 'ties up the ribbons' for this month folks as it's 'signing-off' time. Thanks to all our reporters for your invaluable help and assistance with the column.

**KEEP UP THE GOOD WORK
AND GOOD LUCK WITH ALL
THAT JUICY DX OF COURSE!**

RADIO 'SCAPE

REPORTS & INFORMATION TO ME PLEASE.

♦ **Mike Richards G4WNC,** PO Box 1863, Ringwood, Hants BH24 2ZD.

♦ **E-mail:** mike.elaine@btinternet.com

♦ **Web site:** <http://www.btinternet.com/~mikespage>

Over the past few months Mike has been reporting on many of the radio-related sites to be found on the Internet, so to reflect this we've re-named his column. But don't worry, Mike will still report on other aspects related to computing, as well as the Internet. Ed.

Let's start this month with a request for help. I may have asked about this before but I certainly don't remember any responses. Does anyone out there know of a source of decoding software suitable for the Psion series of computers?

There are lots of these machines in circulation and they have the potential to make a very handy and compact decoding systems - it just needs a bright programmer to take an interest and put together some software. If you know of anyone who either has some software or is working on some please drop me a line with the details. In fact I'm always interested to hear of any new radio related software for any computer so please keep me updated and I will make sure everyone gets to know!

INTERFERENCE SPECIAL

With more and more electronics coming into the home these days it's no surprise to find that r.f.

RadioScene

interference from Amateur Radio transmitters can be a real headache. For most the only time you have to even think about interference problems is when you get that fateful knock at the door with you neighbour complaining of problems with his 'phone/video/TV/hi-fi/computer, etc!'

Other than having to muster-up the appropriate level of tact you then find yourself craving for information as to how to work-out whether it's his or your equipment that's at fault. Fortunately for those of you with Internet access there's a new source of help in the form of the *FCC Interference Handbook*.

To help you get started with utility listening there's a copy of the excellent RadioRaft decoder by F6FJT.

Also included are full schedules of all clandestine, domestic and international broadcasting services on short wave. This database has been compiled by **Michiel Schaay** and is available in full open access as a standard .dbf file. This means you can easily export the data and process it in a host of different formats.

There is also a huge glossary of abbreviations and a list of over 15000 formerly active stations. In case you're wondering, these old frequencies are still useful to know because the host stations

usually retain them for use in case the satellites links fail.

As if all this is not enough, the latest CD also contains demo versions of some of the best rig control programs currently available.

Included on the review sample was Radio Manager,

RCON and Visual Radio. Not only do these programs offer excellent control facilities but they are also able to directly access the frequencies on the CD-ROM so making for a real slick monitoring station.

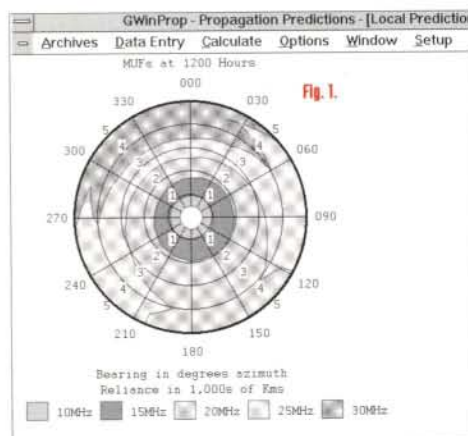
For your copy contact the PW Book Service or watch-out for Joerg Klingenfuss' adverts. My thanks to Joerg for supplying the review copy.

The *FCC Interference Handbook* excellent document is now available on-line and can be found at <http://www.fcc.gov/Bureaus/Compliance/WWW/tvibook.html> In addition to providing some interesting text, the handbook also contains a number of TV images showing the effects of different types of interference. Remember the golden rule with all interference problems is to tackle the problem in a logical step-by-step process carefully recording the results and so eventually finding the root cause by a process of elimination.

FREQUENCY GUIDE

Knowing that many of you like to try your hand at utility listening from time-to-time you may be interested to know that the latest *Super Frequency List* on CD-ROM is available from Joerg Klingenfuss. This latest version has been much enhanced and looks to be very interesting.

As well as featuring an extensive database covering more than 11800 frequencies there are a few other goodies on the latest version of the *Super Frequency List*.



ments go you will need a system that runs Windows 3.1 or later which means a minimum of a 386 processor. Once installed the program occupies about 1.8Mb of hard disk space - if you haven't got that much to spare you're already in trouble!

The first

thing to do is to modify the table of local values to cover your QTH and station details. Once this has been done you can get down to business and do some serious prediction.

The predictions can be broken in to two distinct groups, i.e. those providing a general view of propagation conditions and those providing specific predictions for the propagation between two defined sites.

The range and detail of the predictive material available from the *GWinProp* program is really quite amazing. Probably the most informative for the new user are the graphical displays.

I've shown an example of the Local Prediction output in **Fig. 1**. This shows the maximum useable frequencies (m.u.f.) and frequency optimum transmission (f.o.t.) at ten radial distances and twelve bearings from your home position, or any other that you care to specify. This sort of data is really useful for DX work.

If you want to get really serious the full numeric outputs are also provided in separate screen displays. I've only scratched the surface of the potential of this program and if space allows I'll provide some more detail later.

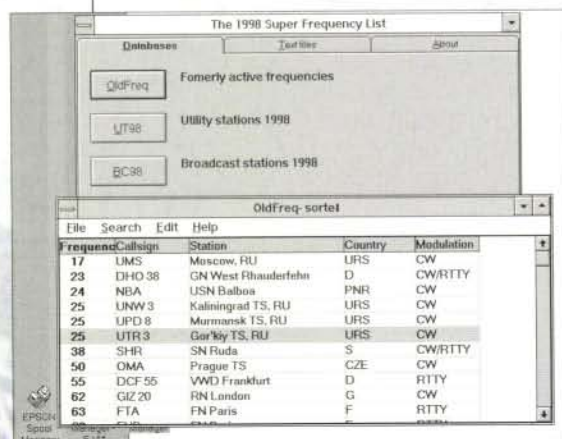
One of the really great points about the *GWinProp* program is that Gordon has made it freely available for non-profit use, so you should soon see it starting to appear in all the usual software archives.

I'm also hoping to add it to my own web site soon. My thanks to Gordon for the excellent work he's done in producing this excellent package.

SPECIAL OFFERS

If you'd like a copy of Hamcomm/JVAX, etc. I've arranged a very special offer with the **Public Domain and Shareware Library (PDSL)**. They have put together a library set of all five disks for just £12, all inclusive.

Using PDSL also makes ordering simpler as they accept all the usual credit cards so you can order by phone - you don't even have to write a letter. Please direct all orders and enquiries about this disk set to **PDSL**



Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel: (01892) 663298 and request library volume: H008739abcde.

The software is only available as a set of five disks as follows: IBM PC Software (1.44Mb disks); **Disk A** - JVFX 7.1, HAMCOMM 3.1 and WFX 3.2; **Disk B** - DSP Starter plus Texas device selection software; **Disk C** - NuMorse 1.3; **Disk D** - UltraPak 4.0 and **Disk E** - Mscan 1.3 and 2.0.

THAT'S ALL FOR THIS MONTH, SO UNTIL NEXT TIME, CHEERIO AND KEEP SENDING YOUR NEWS AND VIEWS TO ME AT THE ADDRESS AT THE START OF THE COLUMN.

DATA DIARY

ROGER COOKE G3LDI REPORTS ON THE DATA MODE SCENE. HE STARTS OFF BY ANSWERING SOME QUESTIONS BEFORE MOVING ON TO CONTRUCTION PROBLEMS AND THEN FINISHING OFF WITH A COMPUTER PROGRAM FOR THE MILLENIUM.

I've received a letter from Owen James 2E1FQY, who lives in Warwickshire. This lad is 12 years old and has just saved up his pocket money and purchased a PCW 8256.

I don't know how much Owen paid for his machine, but he is now having problems trying to use it for Packet. He's finding it difficult to carry the project through.

I've tried to help Owen by issuing a bulletin asking for information, but the general consensus from the replies I received were no more than I expected. Buying a machine of the age of a PCW 8256, together with the peculiarity of its use, is fraught with problems. Although Owen is a member of his school Amateur Radio Club, it would seem that there is not sufficient experience in this club to advise him on a better route.

Owen, and others like him, should be able to obtain an older model PC, even as old as a 286, to dedicate to Packet. There are machines of this age being lobbied into skips by commercial organisations, so why don't they do the younger generation a favour and make these machines available to them? It seems that they must follow the Ferengi Rules of Acquisition ('Star Trek') relating to profit, which clearly state that if there is no profit to be obtained then the equipment will be dumped!

So, to all you young aspiring amateurs. Before parting with your pocket money, please seek the advice of an older experienced amateur. It could save you a lot of head scratching, plus a lot

of money!

A letter I received from Gordon Pope G3ASV, a while ago now, bemoans the problems of trying to obtain parts for constructional projects, in particular a modem. Gordon had trouble in his search for a TCM3105 and was quite surprised when he did track one down to find out that the price was £99 (He did not ask whether this included VAT!).

It's not surprising that there are fewer home-constructed pieces of equipment these days. If the parts list adds up to more than a purchased unit, then it hardly seems worthwhile trying to indulge in home-construction. Plus, of course, on a home-made unit, there is little re-sale value!

BETTER BAUD

One target that we should all strive for in 1998 is a base user speed of 9k6bauds. The G3RUH modem is still available and works well, with few problems, so why not consider up-grading your 1200 to 9k6?

There is even a cheaper way of up-dating, which might be a good idea for the user. Details on this have been sent to me by Rob M1ATV.

The modem is called YAM and is a FPGA-based FSK 9K6bps modem for Packet Radio from Nico Palermo IV3NWV and will cost about £20 to build.

The modem is capable of 9600 bit/s operations and interfaces directly to the PC serial port from which it is also powered. It has a built-in HDLC controller which greatly simplifies the development of driver software and allows fast and reliable HDLC frame synchronisation. The baseband codec features a GMSK - or cosine NLF - G3RUH compatible modulator, a powerful hardware digital carrier detector and a high resolution receiver clock recovery circuit. The modem is full-duplex.

Like all 9k6 modems, it cannot be directly connected to the microphone and speaker connections of the transceiver, and must be used with specially designed or modified radios.

The p.c.b. (which is single sided and measures 3 x 2in), component overlay and schematic drawing is readily available. There are also drivers available to use the YAM with the following:

1. The Net Node. (Network Node Software)
2. Flexnet (Network Software.). This means that Winpack will work with YAM
3. NOS (TCPIP).
4. BPQ This is being looked into.
5. AGW... (Windows 32bit Packet Software)

The above is too big to transfer over the Packet Network but is available via M1ATV's Website on the Packet Page which can be found at <http://www.amber.force9.co.uk> or <http://Fast.to/amber>

THE MILLENIUM PROBLEM

The year 2000 is fast approaching and the possible computer clock problem is worrying lots of commercial organisations. I recently saw a program being circulated on the Packet network.

It's freeware so, I am reproducing it here for those of you that missed it. If you would like the .EXE version, send a disk together with the usual mailer and return postage or you won't receive a reply!

The program is in QBASIC source code for your use. If you have a PC and virtually any DOS version from 5 you will have QBASIC available to you. Enter the following text as a program by copy and paste or loading.

```
REM START PROGRAM HERE!
REM This program is written in Q BASIC for the PC.
REM It checks to see if your PC will have any problems when the year 2000
REM comes along. Some machines will not update their clock correctly.
REM These problem machines will be very rare. The biggest problem will
REM be the software run on these, and other machines. Most current software
REM will need a re-write to solve the software problem.
REM
REM This program is FREEWARE and you can do with it as you wish, including
REM modifying the code. If you do modify the code or distribute please leave
REM my identifier lines intact and add your own as extras.
REM Help yourself and have fun!
REM

CLS
PRINT " YEAR 2000 CLOCK CHECKER, BY STINGRAY SYSTEMS (1997)"
PRINT " MM0ANT@GB7EDN.#77.GBR.EU robertv@fview.nildram.co.uk"
LOCATE 4, 1
PRINT "Wait until 50 seconds...."
DO
d$ = DATES: d$ = MIDS(d$, 4, 3) + LEFT$(d$, 3) + RIGHT$(d$, 4)
t$ = TIMES
LOCATE 4, 30
PRINT t$; " "; d$
LOOP UNTIL RIGHT$(t$, 2) = "50"

ct$ = TIMES
cd$ = DATES
DATES = "12-31-1999"
TIMES = "23.59.50"

LOCATE 4, 1: PRINT " WAIT WHILE TESTING..."
DO
d$ = DATES: d$ = MIDS(d$, 4, 3) + LEFT$(d$, 3) + RIGHT$(d$, 4)
t$ = TIMES
LOCATE 4, 30
PRINT t$; " "; d$
LOCATE 10, 25
IF VAL(RIGHT$(t$, 2)) < 10 AND VAL(RIGHT$(t$, 2)) > 0 AND RIGHT$(d$, 4) <> "2000"
THEN PRINT "The clock will fail after year 2000"
IF RIGHT$(d$, 4) = "2000" THEN PRINT "Your clock is GOOD for year 2000."
LOOP UNTIL RIGHT$(t$, 2) = "10"

DATES = cd$
h = VAL(LEFT$(ct$, 2))
m = VAL(MIDS(ct$, 4, 2))
m = m + 1
IF m = 60 THEN m = 0: h = h + 1: m = 0
ct$ = LTRIM$(STR$(h)) + "." + LTRIM$(STR$(m))
TIMES = LEFT$(ct$, 6) + ".10"

LOCATE 4, 1: PRINT SPACES(29)
LOCATE 15, 15: PRINT "Correct time has been set... PRESS A KEY TO EXIT..."
DO
d$ = DATES: d$ = MIDS(d$, 4, 3) + LEFT$(d$, 3) + RIGHT$(d$, 4)
t$ = TIMES
LOCATE 4, 30
PRINT t$; " "; d$
LOOP UNTIL RIGHT$(t$, 2) = "00" OR INKEY$ <> ""
CLS
SYSTEM
REM This is the last line of the code. <<<END OF FILE>>>
```

My thanks to Robert MM0ANT for this program and I'm sure he won't mind me reproducing it herre. His old call-sign is **GM7AVE** and he can be found as such in the call-book or via packet @ **GB7EDN** (Ex GM7AVE) Stingray Systems or by E-mail at robertv@fview.nildram.co.uk or call **(0860) 114431**.

RadioScene

For those without Internet Access send two 1.44 disks in a padded envelope enclosing return postage and Rob will return all files and information to you. Rob's packet address is: M1ATV @ GB7NND and his E-mail address is: m1atv@amber.force9.co.uk

Editor's note: This will be the last edition of 'Data Diary'. I've had to take the decision to close this column because of the inevitable and increasing 'cross-over' and parallel subject coverage of this column and the Mike Richards' column. The PW team thank Roger G3LDI for all his hard work in the past and of course he will still be writing reviews and other articles for Practical Wireless on a regular basis. So thank you Roger! **Rob Mannion G3XFD.**

BROADCAST

REPORTS & INFORMATION TO ME

◆ **PETER SHORE,**
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THIS MONTH PETER SHORE HAS NEWS OF A NEW AMERICAN SHORT WAVE STATION AND LOTS OF CURRENT SCHEDULES FOR YOU TO CATCH UP ON.

Choosing the right broadcast channel at high frequency is an art; some people, including frequency engineers, might suggest that it's something of a black art! At almost every international radio station is a group of highly experienced frequency engineers who plan the extensive use that is made of the short wave broadcast bands to reach listeners world-wide using limited transmission facilities.

Making sure that signals reach the correct target at the right time with decent strength means working out the propagation path from transmitting station to target zone. As well as making sure that there is a transmitter and antenna with correct characteristics for the frequency that has been selected as not all antennas operate at all frequencies. Broadcasters which have a

large number of language services which need to reach a particular geographic region simultaneously face the greatest difficulties in marshalling these finite resources and keeping programme makers and listeners happy.

The **BBC World Service**, for example, needs to serve East Africa with English (sometimes both the African and European streams), Somali and Swahili during peak listening times, and yet has only two 250kW transmitters on the Seychelles, the nearest transmitting station. So, it has to rely on the East Mediterranean relay on Cyprus and signals from the UK to serve all its audiences.

And each of the transmitting stations will have to operate on different frequencies and different bands to take account of the differing propagational paths from each of the transmitting stations. Not to mention sunspot numbers and the maximum useable frequency (m.u.f.), which is dependent on the time of day!

TRICKY PROBLEMS

To help the engineers with the tricky planning problems is a raft of software which has been developed by the biggest broadcasters to calculate all the imponderables. And listeners now have access to some of this software.

The **Voice of America** has its Coverage Analysis Program (CAP) available for anyone to download free-of-charge from the VoA Internet site (www.voa.gov). The CAP is about 5Mb in size, and you'll need a reasonably fast computer to run the program with any degree of success.

Once you've got the CAP, you have access to pretty much the same sophisticated planning tool that the world's largest short wave engineering department uses. It will take you some time to work out how it works, but if you fancy a career in high frequency engineering, then the program is definitely something that will give you good insight into how international broadcasters get reasonable results from the 'ionospherically challenged' short wave bands.

NEW RELAY STATION

The **Voice of America's** frequency engineers in Washington DC are currently working hard on the plan for the broadcaster's powerful new relay station in Sri Lanka. This station will ultimately have four 500kW senders (currently one is under test).

The station will improve reception for listeners in India and the former Soviet Central

Asian republics. The station can be heard testing between 0300 and 1100 and 1200 to 1400UTC on a variety of frequencies.

There have been reports of a station in Eritrea, formerly part of Ethiopia, being heard around 1700UTC. **Radio Fana**, which may be a clandestine, is on the air using 6.21MHz and can apparently be reached by mail through **PO Box 30702, Addis Ababa**, the Ethiopian capital. This address leads me to think that the station may be beaming anti-Eritrean propaganda to the young country.

In neighbouring Somalia, **Radio Hargeisa** has been noted around 1600UTC on a variable frequency of 7.065MHz. The station seems to sign-off at 1800UTC.

Across in west Africa, there's a new station in Liberia. **Radio Veritas Liberia** seems to be a Christian Catholic station. It has been reported on the air during the European evening until sign-off around 2200. Try 3.45MHz during the evening period, and the early morning at around 0400UTC.

TWO TRANSMISSIONS

Radio Budapest's English service is on the air with two transmissions for European listeners every day. Tune in at 2000-2030UTC on 3.975 and 9.840MHz and on the

0330 and 0400UTC on 9.840 and 6.010MHz.

CURRENT SCHEDULE

China Radio International's current schedule for English world-wide is: Europe 2000-2200UTC on 6.950, 9.920MHz; 2200-2300 on 7.170 (3.985 to 2230) North America; 0300-0400 on 9.690; 0400-0500 on 9.560, 9.730; 0500-0600 on 9.560; 1400-1600 on 7.405 on South East Asia; 1200-1400 on 11.660, 9.715 South Asia; 1400-1500 on 11.825, 9.535 1500-1600 on 7.160, 9.785 South Pacific; 0900-1100 on 9.785, 11.755 1200-1400 on 7.385 (6.950 to 1300) Africa; 1600-1700 on 9.565, 9.620; 1700-1800 on 7.150, 9.750, 7.405; 1900-2000 on 6.955, 9.440; 2000-2100 on 7.160, 7.170, 7.175, 9.440 and 2100-2130 on 7.170, 7.180 and 9.535MHz.

Radio Prague, which looks set to continue during 1998 despite government attempts to entice a private organisation to run the country's external broadcasting service, can be heard with English: 0000-0027 on 5.93, 7.345; 0100-0127 on 6.20, 7.345; 0300-0327 on 5.93, 7.345; 0330-0357 on 7.35, 9.48, 11.60; 0800-0827 on 9.505, 11.60 (Europe); 1000-1030 on 17.485, 21.705; 1130-1157 on 7.345, 9.505 (Europe); 1400-1430 on 13.58, 21.70; 1700-1727 on 5.93, 9.43 (Europe); 1800-1827 on 5.93, 9.43 (Europe); 2100-2127 on 5.93, 7.345 (Europe) and 2230-2257 on 5.93, 7.345MHz.

NEW USA STATION

A new US short wave station, **WWBS**, was due to be on the air by the beginning of February. Located in Georgia in the southern USA, WWBS plans to use 11.91MHz to reach Canada. Let me know if you hear this station soon after its launch.

Radio New Zealand's current short wave schedule is as complex as ever. Here it is in full: 1650-1850 on 9.810 Monday-Friday; 1851-1950 on 11.735 Sunday-Friday; 1859-1958 on 11.735 Saturday; 1951-2050 on 15.115 Sunday-Friday; 1859-2155 on 15.115 Saturday; 2156-0458 on 17.675 Sunday-Thursdays; 2205-0458 on 17.675 Friday-Saturday; 0459-0815 on 11.905 Monday-Friday; 0459-0758 on 11.905 Saturday & Sunday; 0816-1206 on 9.700 Monday-Friday and 0758-1206 on 9.700MHz Saturday & Sunday.

THAT'S ALL FOR THE TIME BEING. UNTIL NEXT TIME, GOOD LISTENING, AND GOOD LUCK IN CATCHING THOSE POTENTIALLY INTERESTING, BUT DOUBTLESS ELUSIVE, AFRICAN STATIONS! DROP ME A LINE VIA THE PW OFFICES IF YOU'RE SUCCESSFUL, THOUGH.

PW



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same frequencies two hours later.

There is also a service to North America between 02.00 and 02.30UTC on 6.035 and 9.840MHz and then between



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**CLOSED
THURSDAYS**

Alinco (New low prices) From 1.8-50MHz



Alinco DX-70T (with CTCSS), 100W HF, 10W 6m, all mode. C/W SX-20C 3.5-30/50-54/130-150SWR/power meter.

£695.00 carr FREE

Alinco DX-70TH, 100W HF, 100W 6m, all mode C/W SX-20C 3.5-30/50-54/130-150 SWR/power meter.

£775.00 carr FREE

IC-706 MkII



100W HF + 6m, 20W 2m

PA price £1095.00 (PRICE MATCH)

DEPOSIT £120.00, 24 PAYMENTS OF £51.54.
COST OF LOAN, £261.96.

YAESU FT-920 HF Transceiver



The new FT-920 has been released and offers some great features at a great price. 1.8MHz to 54MHz plus wideband receive, 33MPS digital signal processor, digital IF shift, auto notch filter, dual VFOs, 100 memories, band stacking VFO system, break-in CW with electronic keyer, TNC interfacing, digital voice recorder, 13.8V DC operation.

Limited period only **£1399.00**



P-2512M

25-30 amp power supply with variable volts (3-15). Dual meters (VS + amps) and over voltage protected.

£89.95 carr £10

SAVE £10

ICOM'S LATEST MID-PRICE TRANSCEIVER

The IC-746 is Icom's latest HF/VHF transceiver, providing wideband coverage; HF to 50MHz through to 144MHz. Superior design. VHF base station capabilities. DSP and 100 watt RF output will make this THE transceiver to own in '98.

- 1.8MHz-144MHz multimode coverage
- 100W output for all HF, 50MHz and 144MHz bands
- DSP fitted as standard
- Continually adjustable noise reduction
- Auto notch filter
- Selectable APF with 3 passband widths
- Twin PBT capability, first in a mid-range radio
- Large, easy-to-read function display
- Auto antenna tuner with preset memories
- Compact dimensions 287 x 120 x 317mm
- Memo pad with 10 channels
- Tone squelch standard with 50 tone frequencies
- Ample CW functions with 4-channel memory keyer
- 12.5kHz FM narrow capability
- Quick split, ideal for DX'ers
- 3 different antenna connections
- 2-step pre-amp (single for 144MHz)
- Optional UT-102 voice synthesizer

£1695.00 (PRICE MATCH)



SG-230 Smartuner®

Antenna Coupler SSB, AM, CW & DATA

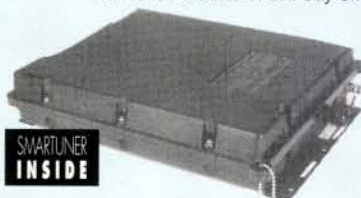
(SG-230 special offer £299.00)

Carr £10.00

You can't buy a smarter tuner than this. An automatic antenna coupler so intelligent it precisely tunes any length antenna - 8 to 80ft - in the HF band.

The Smartuner® automatically evaluates and switches 64 input and 32 output capacitance combinations, plus 256 inductance combinations in a "pi" network. The amazing result is over a half-million different ways to ensure a perfect match for your transceiver. And the most intelligent feature of all is that the Smartuner® remembers the chosen frequency and tuning values, and will automatically reselect those values - in less than 10ms, each time you transmit on that frequency.

The SG-230 Smartuner®. Buy Smart.



**SMARTUNER
INSIDE**

ICOM IC-T8E

Tri-band handheld 2/6/70. NEW.

- Triple band 2/6/70
- Wide band Rx
- WBFM for FM broadcast RX up to 5W output!
- Splash resistant
- CTCSS as standard
- Switchable TX narrow FM (12.5kHz) for 2M band
- 123 memories
- Very compact - smaller than most single banders

RRP £349.00 (PRICE MATCH)



YAESU VX1-R

Latest edition from the Yaesu stable. Ultra-compact, dual band transceiver with wide band coverage receiver.

- 500mW output on 2/70
- Lithium Ion battery
- 5-1300MHz receive
- 6 character alpha-numeric display
- Built-in CTCSS function
- Dual watch feature
- AM airband RX
- Size: H81xW47xD25mm
- Weight: 125g with antenna & battery.

RRP £269.00



YAESU FT-847

FEATURES:-

- 100W on HF and six meters
- 50W on 2m and 70cm
- SSB/CW/FM and AM
- Built-in DSP
- Full duplex crossband operation
- Voice announcement
- Built-in keyer
- CTCSS built-in

£1695.00



**100W HF
100W 6m
50W 2m
50W 70cm**

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- Membership information and assistance
- Introduce a new Member who joins at the show and claim your free gift - An RSGB 1998 Amateur Radio & SWL Diary or RadCom Easibinder

AND

In the Green Hall - Stands F and H

RSGB Committee and Council Representatives

and Special Youth Stand:

- Specialist Committees
- Council Members
- Special Event Station run by young people from various youth organisations

PLUS

On Sunday 8th in the Green Hall - DON'T MISS:

- Special Announcement on the Millennium Project - MILLECOM
- 1998 RSGB Diary Draw

REMEMBER - the RSGB's work is for the benefit of all radio amateurs but by joining the Society you can actually get much more out of your hobby by being on the 'inside looking out'



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TS50S
TS120S
TEN TEC CORSAIR II

ALINCO
DX70
DX70TH

YAESU
FT1000MP AC
FT920
FTONE (LM)
FT890AT
FT77

HF LINEARS
TL922
IC2KL + AT500
IC2KL
KW1000
SB200
FL21002

KENWOOD
TS930SAT + FILTERS
TS850SAT

DRESSLER D200 2M

ATU
AT500
TM1000
SP3000
MFJ949E

PSU
MANSON 30AMP
FP800
ICPS15
ICPS515
DRAE 24 AMP

VHF/UHF
FT736R + 6
FT736R
FT736R + 6 +23
IC275H
IC275E
IC271E
IC471E

IC575A
FT290II
FT690II
FT8000
FT8500
TR751E
TM733
TM732
DRM06
DR610E
IC2350
IC207H
FT50R
DG5EY
TH79E
ADI446
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DR190
DR180

RECEIVERS/SCANNERS
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LOWE 125
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9000
AOR 8000
AOR 5000
AOR 3030
AOR 7030

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DC2000 built in HA22R hardware option

HOWES DC2000 Electronics kit: £22.90

(Extra band module kits: £7.90 each).

HA22R Hardware (case etc., pictured): £18.90

HOWES DC2000

Amateur SSB/CW Receiver Kit - £22.90

The ease of construction combined with excellent performance make this a great project for both the beginner and the experienced operator. Plug-in band modules (one included) give flexible frequency coverage. There is a full range of matching accessories including transmitters, so you can expand your receiver into a transceiver as you build up your station! There have been excellent reviews in many radio magazines, (UK and overseas). Enjoyable to build, great results, and expandable!

"Tune the receiver ... you will be amazed" - RadCom



Multiband SSB Receiver

DXR20. Covers SSB and CW on 20, 40 & 80M bands as standard. Optional extra plug-in band modules available. Can link to TX2000 or AT160 for transceiver (by adding LM2000 linking module). Versatile and popular, with great performance!

DXR20 Kit: £39.90. DCS2 "S meter" Kit: £10.90. HA20R hardware pack: £28.90

Enjoy your radio more with great projects from HOWES!

ACCESSORY KITS

ASL5	SSB and CW AF external filter	£15.90	DFD5	Digital Frequency Counter/Readout	£54.90
ASU8	RX Antenna Selector/Attenuator	£27.90	SPA4	Scanner Preamp. 4 to 1300MHz	£15.90
CSL4	Internal SSB & CW Filter for our RXs	£10.50	ST2	Morse Side-tone/Practice Oscillator	£9.80
DCS2	"S Meter" for direct conversion RXs	£10.90	SWB30	SWR/Power Indicator, 30W 1-200MHz	£13.90
CBA2	Counter Buffer (fit to Rx to feed DFD5)	£5.90	XM1	Crystal Calibrator, 8 intervals + ident	£16.90
DFD4	Add-on Digital Readout for superhets	£49.90	(optional hardware packs are available to suit most kits)		

The famous HOWES Active Antenna Kits

AA2. Covers 150kHz to 30MHz. The neat compact answer for those with limited space.
Kit: £8.90 Assembled PCB module: £14.90

AA4. Covers 25 to 1300MHz. Broad-band performance in a neat, compact package.
Kit: £19.90 Assembled PCB modules: £28.90

AB118. Optimised for long distance reception on 118 to 137MHz air-band.
Kit: £18.80 Assembled PCB modules: £27.90

MB156. 156 to 162MHz marine band active antenna system (the brother of AB118!)
Kit: £18.50 Assembled PCB modules: £27.60



GRP transmitter built with TX2000 and HA22R

TRANSMITTERS

AT160 10W AM/DSB/CW 80 & 160M.Kit: £39.90 HA160R Hardware for AT160: £22.90
TX2000 5W CW. Plug-in band filter. Kit: £24.90 HA23R Hardware for TX2000: £16.90
LM2000 Links the above transmitters to DC2000 or DXR20 for transceive. Kit: £16.30

Please add £4.00 P&P, or £1.50 P&P for electronics kits without hardware.

HOWES KITS contain good quality printed circuit boards with screen printed parts locations, full, clear instructions and all board mounted components. Sales, constructional and technical advice are available by phone during office hours. Please send an SAE for our free catalogue and specific product data sheets, or you can browse this information on our Internet Website (address at top). UK delivery is normally within seven days.

73 from Dave G4KQH, Technical Manager.

Due to the fast turn around of popular secondhand items, readers should check on availability of advertised stock. In other words...if you spot something you fancy...don't delay or you could miss it!

Trader

YOUR GUIDE TO SECOND-HAND EQUIPMENT

WATERS & STANTON

01702 206835

PLEASE NOTE SECONDHAND ITEMS COME WITH FULL 3 MONTH PARTS & LABOUR GUARANTEE. FOR MORE INFORMATION PHONE BARRY HILLSON 01702-206835 OR FAX 01702-205843.

HF TRANSCEIVERS

Icom IC-725 Base Transceiver 12V	£495
Icom IC-726 x2 Base Transceiver with 6m 12V	£549
Icom IC-729 Base Transceiver with 6m 12V	£595
Kenwood TS-440S Base Transceiver 12V	£525
Kenwood TS-930S Base Transceiver	£750
Kenwood TS-940SAT Base Transceiver with ATU	£1049
Kenwood TS-950S Base Transceiver	£1895
Ten-Tec Scout 555 Mobile Transceiver (80m, 40m)	£379
Yaesu FT-757GX II Base Transceiver 12V	£525
Yaesu FT-77 Base Transceiver 12V	£249

VHF/UHF BASE/MOBILE TRANSCEIVER

AKD 6001 6m FM Mobile	£129
Icom IC-551 6m All Mode Base	£395
Kenwood TR-2300 2m FM port with VB-2300 Amp	£99
Kenwood TR-9000 2m All Mode Mobile	£199
Yaesu FT-2700RH 2m/70cm FM Mobile	£269
Yaesu FT-2908RII x3 2m All Mode Portable	£299
Yaesu FT-480R 2m All Mode Mobile	£199
Yaesu FT-5200 2m/70cm FM Mobile	£379
Yaesu FT-8000R 2m/70cm FM Mobile	£299

VHF/UHF HAND HELD TRANSCEIVER

Alinco DJ-191 2m FM H/Hand	£119
Alinco DJ-560 2m/70cm FM H/Hand	£169
Alinco DJ-F1E 2m FM H/Hand	£119
Alinco DJ-G5 2m/70cm FM H/Hand	£199
Icom IC-24ET 2m/70cm FM H/Hand	£179
Icom IC-2iE x2 2m FM mini H/Hand	£119
Icom IC-P4E 70cm FM H/Hand	£169
Icom IC-M11 VHF Marine H/Hand	£219
Icom IC-T7E 2m/70cm FM H/Hand	£199
Icom IC-W21E x3 2m/70cm FM H/Hand	£199
Kenpro KT-44 70cm FM H/Hand	£99
Kenwood TH-25E 2m FM H/Hand	£99
Kenwood TH-26E 2m FM H/Hand	£99
Kenwood TH-28E 2m FM H/Hand	£199
Kenwood TH-77E 2m/70cm FM H/Hand	£199
Standard C-510 2m/70cm FM H/Hand	£165
Yaesu FT-203R x2 2m FM H/Hand	£79
Yaesu FT-411R 2m FM H/Hand	£99
Yaesu FT-470R x2 2m/70cm FM H/Hand	£199

SHORTWAVE RECEIVERS

AOR AR-7030 Base Station Rx with Remote con	£525
Drake R8E x2 Base Station Receiver (P/Sale)	£695
Grundig YB-206 Portable Receiver	£79
Grundig YB-500 Portable Receiver with SSB	£99
Icom IC-R70 Base Station Receiver	£449
Icom IC-R71 x4 Base Station Receiver	£525
Icom IC-R72 Base Station Receiver	£549
JRC NRD-525 Base Station Receiver	£549
Lowe HF-150 x2 12V Base/Mobile Receiver	£279
Lowe HF-225 x3 12V Base/Mobile Receiver	£299
Lowe HF-250 x2 12V Base/Mobile Receiver	£449
Panasonic RFB-65 Portable Receiver with SSB	£109
RadioShack DX-394 12V Base/Mobile Receiver	£159
Roberts R-808 Portable Receiver	£69
Roberts RC-818 Portable Receiver with cassette	£119
Sangean ATS-803A x3 Portable Receiver with SSB	£89
Sony ICF-SW30 Portable Receiver	£55
Sony ICF-SW55 x3 Portable Receiver with SSB	£189
Yaesu FRG-7700 Base Receiver with FRT-7700	£225

SCANNERS MOBILE/BASE

Realistic Pro-2036 66-950MHz (with gaps)	£119
Realistic Pro-9200 66-512MHz (with gaps)	£145
Yaesu FRG-9600 x3 60-905MHz All Mode Rx	£269

SCANNERS HAND HELD

Alinco DJ-X1 100kHz-1300MHz AM, FM, WFM	£139
AOR AR-1500 x2 500kHz-1300MHz All Mode Rx	£139
AOR AR-2000 500kHz-1300MHz AM, FM, WFM	£139
AOR AR-2700 500kHz-1300MHz AM, FM, WFM	£159
Commel Com-204 68-999MHz (with gaps)	£129
Icom IC-R1 100kHz-1300MHz AM, FM, WFM	£129
RadioShack Pro-28 x2 66-512MHz (with gaps)	£99
Sony ICF-Pro80 x2 150kHz-108MHz (no converter)	£79
Sony ICF-Pro80 150kHz-108MHz 115.15-223MHz	£129
Yupiter MVT-7100 100kHz-1650MHz All Mode	£199

LOWE ELECTRONICS

01629 580800

HF TRANSCEIVERS

Icom IC 706 Mk1 HF transceiver with 2m and 6m £650	
Icom IC 728 HF transceiver	£550
JST135 HF Transceiver	£975
Kenwood TS50 Mobile HF Transceiver	£550
Kenwood TS530S HF Transceiver	£495
Kenwood TS820 HF Transceiver	£395
Yaesu FT747GX HF Transceiver	£400

DATA COMMS

Kantronics KAM Multimode TNC	£185
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VHF/UHF TRANSCEIVERS

Alinco DJ500E Dual Band Handheld	£249
Alinco DJ560 Dual Band Handheld	£199.00
Alinco DR599 Dual Band Mobile	£425.00
Icom IC24ET Dual Band Handheld	£269
Icom ICW2E Dual Band Handheld	£249
Kenwood TH205E 2m Handheld	£159
Kenwood TH78E Dual Band Handheld	£290
Kenwood TM732E Dual Band Mobile / detachable front panel	£380
Kenwood TR2500 2m Handheld	£140
Yaesu FT290R 2m Multimode	£250.00
Yaesu FT470R Dual Band Handheld	£259
Yaesu FT2200 2m FM Mobile	£289
Yaesu FT4700RH Dual Band Mobile with detachable front	£375

HF RECEIVERS

Lowe HF225 HF Receiver with all accessories	£345
Lowe HF225 Europa HF Receiver	£450
Sony ICFSW55 World band Portable	£229
Lowe HF150 Portable HF Receiver	£295
Grundig YB217 Portable receiver	£95

SCANNERS

AOR AR1000 Handheld	£169
AOR AR2001 Base Scanner without PSU	£159
AOR AR2700 Handheld Scanner	£160
AOR AR2800 Base Scanner with SSB	£195
Icom ICR1 Handheld Scanner	£199
Yupiter MVT7000 Handheld Scanner	£200
Yupiter MVT7100 Handheld Scanner	£225
Yupiter VT225 Airband Scanner	£180
Yupiter VT125 Airband Scanner	£150
Yupiter MVT5000 Handheld Scanner	£180

Items are held at various branches, please contact our Matlock branch for further details on 01629 580 800

SOUTH EAST COMMUNICATIONS

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HF TRANSCEIVERS:

Kenwood TS850sat with extra filters	£995
Yaesu FT1000MP/DC demo	£1699
Icom IC737A auto ATU etc	£899
FT990DC boxed mint with auto ATU	£1099
Kenwood TS680s HF+6m base/mobile transceiver	£649
Kenwood TS50s also AT50 auto ATU	£699

VHF/UHF TRANSCEIVERS:

Kenwood TM702E 2m/70cms 25 watt mobile	£269
Yaesu FT51R top spec hand held	£299
ADI 146 50watt 2m demo	£199
Kenwood TH78E 2m/70cms handi	£199
Alinco DR150E 50watt mobile	£199
Alinco DR112E 25watt 2m mobile	£150
Yaesu FT726R 2m/70cms multimode base	£649

SHORTWAVE RECEIVERS:

AOR 3030 boxed mint as new	£329
AOR 7030 boxed mint as new	£549
Kenwood R5000 the Rolls Royce receiver	£649
Yaesu FRG8800 0-30mhz mint	£349
Yaesu FRG7700 again 0-30mhz mint	£289
Lowe HF225 plus FM and keypad, boxed	£349
Lowe HF150 boxed with keypad	£299
Realistic DX394 boxed as new	£139
Sony SW55 as new, a bargain at	£199
Sony PRO80 0-225mhz ssb	£199
Sangean ATS818 portable rx	£129

SCANNERS BASE/MOBILE:

Icom IC-R7100DC 25-2000mhz base demo	£899
AOR 3000 0-2036mhz	£399
Icom ICR7000 25-2000mhz	£699
AOR 3000A demo	£599
Realistic PRO 2035	£249
AOR 8000 0-1900mhz boxed etc	£249
Yupiter MVT7100 0-1650mhz	£199
Bearcat 3000xlt 25-1300mhz	£169
Icom ICR10 latest hand held	£249

STATION ACCESSORIES:

Diamond DL-1000 dummy load	£109
Diamond SX100 swr/pwr meter	£79
Vectronics VC300DLP 300watt tuner	£99
MFJ 948E 300watt tuner mint	£89
MFJ 259 antenna analyzer	£189

ALL PRICES ARE STERLING

NEVADA

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ADONIS 508G	£79
ALINCO DR-605	£325
AMP UK HUNTER 600W	£895
ALINCO G-5 Handie	£225
AOR 3000A	£575
AOR 7030	£599
ATLAS 350XL HF	£299
BEARCAT DX1000, rare	£185
DAIWA PS304 II PSU	£89
DRAE 24A PSU	£79
DRAKE R8A	£825
DRAKE R8E	£750
FDK MULTI 2700 Base	£399
ICOM IC-W2E	£199
ICOM 706	£675
ICOM IC-728	£629
ICOM R-72	£675
JRC 345 RX	£499
JST 100 COMPLETE	£499
KENWOOD R-2000 + VHF	£399
KENWOOD TH-G71E	£245
KENWOOD TH-215E	£145
KENWOOD TM-241E	£225
KENWOOD TM-451E	£299
KENWOOD TR-751E	£425
KENWOOD TS-440s	£525
KENWOOD TS-680s HF+6m	£625
KENWOOD TS-850.....Choice from	£999
KENWOOD TS-4505 - MINT	£675
LOWE AP 150	£155
LOWE HF 225 + Extras	£425
MFJ-784 DSP Filter	£175
REALISTIC 2036	£179
REALISTIC PRO-50	£69
SANGEAN ATS-803A	£85
SATCOM P40 (PAIR)	£149
SENTEC 20M HANDIE	£195
STANDARD C78 + AMP	£199
STANDARD C500	£185
TEN TEC CORSAIR II	£475
TEN TEC OMNI VI S.O.B	£1999
TIMEWAVE DSPs	from £99
TOKYO HC-200 ATU	£99
TOKYO HL-1KGX AMP	£799
TOKYO HX-640	£175
TOKYO HX-650	£199
TRIO AT-120	£65
TRIO AT-230 ATU	£189
TRIO JR-599 RX	£125
TRIO TR-9130	£299
TRIO TS-700S + VFO	£325
TRIO TS-930S	£695
W9-GR DSP II	£185
YAesu FP-707 20A PSU	£139
YAesu FRG-8800 + VHF	£425
YAesu FRG-9600	£325
YAesu FT-11R	£169
YAesu FT-77 FM	£399
YAesu FT-107M 100W	£425
YAesu FT-208 + EXTRAS	£179
YAesu FT-212H - 45W	£225
YAesu FT-290 I	£245
YAesu FT-290 II	£325
YAesu FT-411 + EXTRAS	£189
YAesu FT-470 + ACCS	£225
YAesu FT-650 24-54MHz	£699
YAesu FT-707	£349
YAesu FT-726 Tribander	£799
YAesu FT-727	£169
YAesu FT-736R - 3 Band all options	£1195
YAesu FT-747 FM	£450
YAesu FT-757 AT	£2250
YAesu FT-840 + FM	£599
YAesu SP102 Speaker	£59

PLEASE MENTION TRADERS' TABLE WHEN ENQUIRING ABOUT ANY ITEMS ON THESE PAGES!

's Table

YOUR GUIDE TO SECOND-HAND EQUIPMENT

ARC EARLESTOWN 01925 229881

HF TRANSCEIVERS

2 x Yaesu FT-757GX1 + boxed	£TEL
Yaesu FT-980	£799
Yaesu FT-101ZD MkIII + FC-902/FCV-901R incl 2m/6m	£799
Yaesu FT-747 + FC-700 boxed	£TEL
Yaesu FT-102	£375
Yaesu FT-101Z	£299
Kenwood TS-50S	£550
Yaesu FT-757GX + FC-750S/AT	£650
Kenwood TS-140S boxed	£499
Icom IC-735 boxed	£550
Yaesu FT-767GX + 2m/70cm/speaker	£899
2x Icom IC-765 VGC	from £1300
Yaesu FT-707	£275
Yaesu FC-700 boxed	£99

MOBILE/BASE VHF/UHF TRANSCEIVERS

Kenwood TS-700S	£450
Icom IC-229 - boxed	£225
Icom IC-290D	£300
Yaesu FT-230	£175
Icom IC-271H + 100W internal PSU	£550
Icom IC-2410H boxed	£TEL
Yaesu FT-790R + linear	£TEL
2 x FT-290RII	from £200
Kenwood TR-751 - boxed	£350
Icom IC-251E	£TEL
Yaesu FT-290RII boxed	£325
Yaesu FL-2025	£99
Kenwood TM-733 dualband	£350
Trio TR-9130 VGC	£299
Yaesu FT-690RII ex cond.	£299

RECEIVERS/SCANNERS

ICOM IC-R71E boxed	£599
Regency MX-7000	£TEL
Lowe HF-225	£299
Yaesu FRG-9600 - HF converter	£350
Yaesu FRG-7	£150
Icom IC-R7100 boxed	£TEL
Sony SW-55 mint condition	£199
AOR AR-2800 boxed	£250
Grundig Satellite 500 + IC-FAX 1/Datong AD-270	£175
Icom IC-R1000 - mint condition	£275
Realistic DX-394 boxed mint condition	£TEL
Yaesu FRG-7700M + ATU	£325
Pocom AFR-2070	£75
AR-7030 mint condition	£550
Kenwood R-5000 as new boxed + all access	£599

HANDHELDS

Kenwood TH-21	£99
Icom IC-4E	£115
Kenwood TH-79 as new boxed	£225
Yaesu FT-51R boxed	£275

MISC.

SDU-5000 Spectrum Display Unit - as new	£599
AT-230 - box	£175
Tokyo HL-160V linear	£175
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Kenwood TS680S - HF+WARC+6M (100W/10W)	£595
Kenwood TS570S - HF+WARC Latest offering with DSP	£895
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Yaesu FT890AT - HF+WARC auto ATU	£650
Yaesu FT840 - Basic HF with FM option fitted	£550

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ADI AT48 - 70cms handheld with keypad	£95
AKD 7003 - 70cms 3W channelised mobile	£125
Kenwood TS711 - 2M multimode base	£525
Kenwood TH79E - 2M/70cms dualband handheld	£295
Kenwood TH42E - 70cms handheld with keypad	£175
Kenwood TH22E - 2M handheld with keypad	£175
Trio TR9130 - 2M multimode base/mobile	£350
Trio 2550E - 2M mobile 5/50W	£165
Trio 221E - 2M 35W mobile	£145
Yaesu FT530 - 2M/70cms handheld with display mic	£225
Yaesu FT290RII - 2M multimode mobile	£325

RECEIVERS

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20 channels	£135
Eddystone EC10 - HF receiver with BFO	£85
Icom ICR72 - HF gen cov receiver with mains PSU	£525
Icom ICR71 - General coverage receiver all options	£495
Lowe HF125 - General coverage HF receiver	£235
Sony ICF2001 - General coverage RX + FM broadcast	£165
Sony Air 7 - airband and PSB receiver	£145
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Watkins Johnson - HF-1GHz receiver with handscope	£795
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Yaesu FT-707 80 - 10M transceiver	£299.00
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Dell 20MHz 386, 5.25", 3.5" h/drive comms software, loaded Win 3.11, Dos 6.2, £125. Spectrum 48k with Quark, RTTY, Morse, transceiver, packet can be added, £50. BBC B drive monitor, loads software, offers. Tel: (01963) 34938.

Drake MS-8 external speaker, £25. Drake R8E, full unused, service manual, £20. Both new, plus post. Harmer, 9 Park Square East, Jaywick, Essex CO15 2NL.

Eddystone 358X with p.s.u., original condition, full set of coils in wooden box, £85, 19 Set with rotary p.s.u. and variometer headset, control box, etc., unmodified, working order, £275. Some Larkspur military wireless and spares for sale. Tel: (01274) 824816.

Eddystone 840C h.f. RX, 480kHz to 30MHz, a.m., c.w., s.s.b. (b.f.o.) with copy handbook, lovely condition,

£80 o.n.o. or swap (p/ex?) for S770R or S750 in similar good condition/f.w.o., round diecast speaker wanted. Howard, 9 Melbourne Court, Nottingham NG8 5DE, Tel: 0115-970 4184.

Eddystone 1837/2 professional receiver, solid state, digital, five filters, excellent performance, £350. Trio 1000, excellent, £190. Sony 7600D s.s.b., £80. Sony 7600DA, 15 bands, Grundig MkII, seven bands, world clock, Grundig 230, 16 bands, Roberts R808, FRG-7, like new, £125. Toshiba F11L, 11 bands, Philips AF3405/20 world band, each £60. Tel: London 0181-813 9193.

Eddystone collector's items for sale, models 888A, EA12, two 730/4 receivers, clean condition and working order, but need overhaul, £300 the four, no offers, cash please. Buyer collects. Tel: London 0171-350 0438.

Eddystone radio, a few models for sale from £50 plus post, etc., 358X, EC10, 870, 870A, 770, etc., ask! Peter, Surrey. Tel: (01372) 454381 or (0374) 128170 anytime.

Eddystone sets: 358X, ten coils in box, p.s.u., £110. EC10, choice two, £50 and £85. 770R scrap, £25. 870-870A, £85 each + carriage! Peter, Surrey. Tel: (01372) 454381 or (0374) 128170 anytime.

Elektra professionally built model Normende 4 band a.m./f.m. valve radio, £15. Portadyne valve record player with Garrard auto changer, £15. Tel: (01772) 463444.

Excellent 2m (144MHz) station, FT-2500M transceiver, Manson p.s.u., NISSEI s.w.r. power meter, 125-525MHz, r.f. lead, PL259 to PL259, Sirio 2m/70cm (144/430MHz) vertical antenna (base), £175 o.n.o. G7ULS, Harlow. Tel: (01279) 641248.

FT-2772D Sommerkamp h.f. TX/RX with FT-901R transverter, 2m (144MHz) only, £425, only will separate FT-2772D £350. FT-901R, £100. Also IC-735 h.f. TX/RX, £550, no offers. Alan G4QJN, QTHR. Tel: Essex (01277) 624386.

FT-470 dual-band hand-held transceiver, 2m and 70cm (144/430MHz), with manual, charger, soft case, flexible antenna, dry cell pack and virtually unused NiCad pack, all in good condition, £140. Alan on (01403) 259019.

FT-726R 144/430MHz dual-band base station, all-mode, full duplex

satellite module fitted, variable power output 1-10W, processor, etc., facility to fit 50MHz/h.f. unit, totally unmarked, as new, manuals included, £650. Tel: Norfolk (01953) 884305.

FT-736R 2m + 6m + 70cm (50, 144 & 430MHz), speech board installed, satellite capabilities, a.c.-d.c., original box and manual, £995 o.n.o. Tony M1BQX, Lincolnshire. Tel: (01790) 763712 anytime.

FT-747 h.f. receiver with 500Hz c.w. filter and mic., £330 o.n.o. GW3COI on (01758) 712675.

FT-757GX, FP757HD, immac. condition, handbook, boxed, £450. DR112E 35W 2m (144MHz) mobile with mobile bracket, handbook, new lithium battery just fitted, £120. Datong Morse practice oscillator, £40. George G4CBN, Somerset. Tel: (01935) 862505.

FTV707 transverter with 2m (144MHz) module for FT-77 or FT-707, boxed with manual, £95. Tel: 0141-632 5408.

Global AT2000 s.w.l. a.t.u., £50. MFJ 815 2kW s.w.r./watt meter, £30. MFJ 260C 300W dummy load, £20. CX401N coax switch, £15. Solid wood and brass Morse key, £25. SWR30 p.w.r./s.w.r. meter, £15. AKD WAI wave meter, £10. QS300 hand mount, £10. Terry G4QXD on (01462) 435248 after 6pm.

Heath HW9 ORP TX/RX, fitted WARC band kit, also HM9 s.w.r. meter and HFT9 a.t.u., all manuals and boxes, no mods, v.g.c., £300. KW E-ZEE match a.t.u., suit G5RV's, £45. Pete, Glos. Tel: (01452) 741036.

Heathkit collection X-Y recorder, IR5207 transistor, f.e.t. tester, i.c. tester ITT400, semi conductor curve tracer IT1121, excellent condition, complete with original manuals, offers. Tel: (01705) 255459.

HF-3 Target receiver, 150kHz to 30MHz, a.m., i.s.b., u.s.b., complete with mains adaptor, manual and wire antenna, as new condition, £130. Alan on (01403) 259019.

Icom AT500, original box, instructions, accessories, all immaculate, as new, sale, £350 (list £525). No offers please. 1kW a.s.t.u. steel case, new high power components, home-built to commercial standards, £125. G2FZU, Notts. Tel: (01636) 813847.

Icom IC-28E v.h.f. mobile, 5-25W,

£140. Yaesu MD1 desk mic., £45. Hygain medium duty rotator, £65. Jaybeam cophased dipoles u.h.f., £95. Microset 70cm (430MHz) amplifier with Gasfet pre-amp, unused, model RU20, £60. Tel: (0468) 756762.

Icom IC-451E 430MHz multimode transceiver, mains or 12V operation, 10W output, good condition with handbook, mic. and leads, £275 o.n.o. plus carriage. Bob G8VOI, Waterlooville. Tel: (01705) 250830 after 6pm please.

Icom IC-706 MkII, as new, in box, bargain, £800. Tel: (01294) 463114.

Icom IC-735 h.f. all-mode TX/RX with general coverage receiver, extra filter fitted, hand mic., manual and boxed, unmarked, as new, £475. 70cm (430MHz) amp, new, unused, £65. Tel: East Anglia (0468) 756762.

Icom IC-M5 v.h.f. marine radiotelephone, £65. BBC B software, Context Bank Manager, £5, pineapple PCB and auto routing ROMS, £10. Amstrad FD9 external 3.5in floppy disk drive, new, £10. Tel: (01286) 678584.

Icom IC-R8500 wide band h.f. to u.h.f. receiver, as new, in box, £1000 (£548 below list). Arthur G8AWS on 0151-355 2085 or mobile on (0468) 908509.

Icom IC-R8500 wide band receiver, covers 100Hz to 2GHz top range, professional quality, will swap for h.f. transceiver or high spec. computer, cash either way. SG230 smart tuner, £200, h.f. Mr Howlett on (01438) 750450 evenings or (0831) 660944 days.

Icom IC751A TX/RX, complete with power supply, good condition and boxed, carriage extra, £450. Tel: (01443) 683912.

Icom ICR-7000 v.h.f. 25MHz to 2GHz, boxed with manual, excellent condition, £495. Also FT-8000 dual-band rig, seven months old, slight fault, £275. Brian, Sheffield. Tel: 0114-288 4145 anytime.

Icom R70 comms receiver, f.m. fitted, excellent RX, £325. Kenwood AT230 a.t.u., £120. Kenwood DFC230 freq. controller, £45. Kenwood MC60 mic., new and boxed, £40. Tel: Stroud (01453) 764090.

J-Beam 70cm (430MHz) 8/8 slot, £15. Morse Tuition record, £5. G8AHE, Birmingham. Tel: 0121-458 2406.

Kenwood 7700 u.h.f./v.h.f. base TX/RX, £350. TS-120 h.f., £250. Nova MR225 converted to two metres (144MHz), £90. Wanted/swap Kenwood SM220 monitor/scope, late FT-101E, also display for 101E. Tel: (01603) 745512 weekends only.

Kenwood R2000 v.h.f. converter, excellent condition, £275. Tandy DX-394, boxed, guarantee, £99. Matsui MR4099, £45 excellent performance. Grundig YB207, 12 bands, compact, guarantee, boxed, £25. Panasonic RFB-65 s.s.b., £65. Buyer pays P&P. Tel: (0585) 111181 anytime.

Kenwood TH-42E 70cm (430MHz) hand-held, boxed, unused, under warranty till Nov '98, £165 o.n.o., buyer inspects and collects. Also HF3 VNB tri-band vertical, WARC bands, boxed, unused, £60 o.n.o. Buyer inspects and collects. Mark GWOPZZ on (01222) 707395.

Kenwood TM441E 70cm (430MHz)

f.m. transceiver, v.g.c., seldom used, handbook, £225. Peter G3UXH on (01634) 250562.

Kenwood TS-450SAT, very clean, £700. HF-225, keypad whip pre-amp, a.m.-f.m. Syncro, manuals, £250. Midland home-base CB, 80ch, auto squelch, beep, filter, variable r.f. 12V a/p. £300. RF sensing switcher, £15. Vic, Stoke on Trent. Tel: (0973) 538502 or (01782) 205538.

Kenwood TS-570D, as new, boxed, 1.8kHz s.s.b. filter, £900. Alinco DR-MO6TH 6m (50MHz) mobile, £195, still has the plastic over the display, genuine reason for sale. Mike G0MVE, QTHR. Tel: Herts (01582) 626246 evenings or (0468) 263343 anytime.

KW Viceroy s.s.b./c.w./a.m. 150W transmitter, 10m through to 80m (3.5-28MHz), good condition, £75. Class D No. 1 MkII wavemeter, £12. 1944 Canadian 52 Set, nice condition, working, three bands, 1.7-4, 3.5-8, 7-16MHz, £70. Peter GM3PIP, Tel: (01771) 623654.

KW2000B s.s.b. transceiver for six amateur bands, 10-160m (1.8-28MHz) (no WARC), complete with KW a.c. and d.c. power supplies microphone, handbook and circuit, v.g.c., sale by original owner, £140. Tel: 0161-973 1472.

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MFJ 901B 200W tuner, as new condition, £55 p/paid. Realistic PRO-2039 scanner, as new, boxed, £85 post paid. John G3OAZ on (01256) 465126.

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Microwave Modules MML 432/100 432MHz, 100W PA (10W in), £285. Microwave Modules MM4001/KB RTTY transceiver with keyboard (computer built-in), needs only monitor to view, has printer port, offers around £115. Yaesu mobile antenna RSM-2.2m (144MHz) with whips for 80, 20, 15 and 10 (3.5, 14, 21 & 28MHz), £85. Adrian G4ROA, Coventry. Tel: (01203) 412201.

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NRD-525 with manual, unmarked, as new with a.t.u. and manual, £550 o.n.o. HF Q30 antenna, £30. Antron antenna, £30. All as new. Tel: (01487) 823879.

Offers invited for 'The Wireless Telegraphists Pocket Book, 1915, by JA Fleming, nice clean copy, also Keys Keys and mobile handbook by Dave Ingram K4TWJ, £3.50 each. R. Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

PA valves, 4CX250 (CCS1) power tetrode, QQV0640 QQV0320, beryllium blocks, heat sinks (conduction cooled for 4CX250), big value transformers and electronics for h.f., v.h.f., u.h.f. linears, new and ex stock. Ken G4ZLX, QTHR. Tel: 0118-922 5019 weekdays or (01258) 455507 weekends.

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Silent key: complete h.f. station, many other items, send s.a.e. for full list. C. M. Smith G8KVJ, 48 Sherbourne Crescent, Coundon, Coventry CV5 8LE.

Sony 2001D airband, manual, £149. D70 Morse tutor and key, £45. DX200 s.w. receiver, £45 plus P&P. Tel: N. Wales (01766) 780043.

Sony 2001D, p.s.u., manual, reel aerial, shoulder strap, v.g.c., f.w.o., £145. Roberts R827, used twice, boxed, p.s.u. unused, £115. Edystone 840C, £60. 870A, mint, £65. Realistic DX-100L, mint, receiver, £50 o.n.o. Tel: Cheshire (01928) 773628 anytime.

Tandy DX-394 short wave receiver, boxed, guarantee, £100. Matsui MR5000 receiver, v.g.c., £45. National Panasonic RF-B65, excellent condition, s.s.b., £75. Grundig Yacht Boy 207, 12 bands, compact, boxed, guarantee, £25. For details Tel: (0585) 111181 anytime.

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Trio TS-120S, manual and PS30 power supply, £323. Diawa 12V 12A power supply, £23. Bill on 0141-562 4571.

Trio TS-530S h.f. transceiver, good condition, £300 o.n.o. Tel: Burnham on Crouch (01621) 783995.

Trio TS-530SP h.f. transceiver, as new, spare p.a. valves, desk mic. with clock and hand mic., Jaybeam vertical antenna, model VR3, 10-15-20, £350 all. Tel: (01246) 236496.

TS-570D h.f. transceiver, s.s.b. & TX crystal fitted, Diawa PS304 MkII p.s.u., Heil headset with boom mike and foot switch, £990. Grundig Satellit 700 portable RX, Lw., m.w., s.w., and f.m. RDS, u.s.b., l.s.b. and memories, £120, postage extra. Terry G4OXD on (01462) 435248 after 6pm.

TS-850SAT, £875. DRUZ, £50. YK88CN filter, £20. YG455EN filter, £50. £950 the lot. PC Interface unit for Kenwood, £20. FL1000 linear, new valves, £200. FT-530R handie, spkr/mic., spare battery, £260. John, Dorchester (01305) 854039, E-mail: jwayman@compuserve.com

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Yaesu 1012D 100W TX, fan, FH board, WARC bands, h/book, no faults, mint, £275 o.n.o. Ken G4MIV on (01509) 813175 after 6pm or w/e.

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Yaesu FRG-7700 h.f. receiver with FRV-7700 v.h.f. converter, 118MHz to 150MHz plus manuals, accept £200 plus carriage. Frank on (01295) 670108.

Yaesu FRG-7700 with FRV-770, plus manuals, only £200 or exchange best lap top computer. Frank on (01295) 670108.

Yaesu FRG-8800 RX + v.h.f. converter, £380, v.g.c. Pocon decoder Baudot ASCII ARQ/FEC Sitor Amtor, c.w. and monitor, £160, s.a.e. for list of various other RXs, etc. Peter, Harwich. Tel: (01255) 502195.

Yaesu FT-102 and FC-102 a.t.u. rig, has a.m. f.m. board, 200W, v.g.c., little used with Shure desk mic. and c.w. key, £450. Also FRG-7, no mods, £90. Andy on (0802) 426063 daytime or evenings on 0121-684 1695

Yaesu FT-221R 2m (144MHz) multi-mode base transceiver, immaculate condition, genuine reason for sale, £250 o.n.o. plus postage. Joanna G4MOWD on (01975) 563833 anytime, leave message with contact number.

Yaesu FT-221R 144MHz multi-mode base station, sell or exchange for general coverage receiver or h.f. transceiver, base scanner, 50MHz linear amplifier or what have you radiowise? (No computers). Ian G7BZH, QTHR. Tel: Cumbria (01229) 582867.

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Yaesu FT-290R MuTek front end, mobile slide mount, little used, original boxes, £250, Cambridge area. Tel: (01223) 836941 or FAX on (01223) 834274.

Yaesu FT-290R, MuTek front-end, mobile slide mount, little used, original boxes, £250, Cambridge area. Tel: (01223) 836941, FAX: (01223) 834274.

Yaesu FT-41R 70cm (430MHz) hand-held transceiver, good, as new, hardly used, complete with base charging stand and battery charger and manuals, £160 o.n.o. Tel: 0181-346 0548.

Yaesu FT-4700RH 2m/70cm (144/430MHz) mobile 50/35W with remote head kit, v.g.c., £265. 4m (70MHz) Pye Westminster with linear, five channels fitted, £60, both o.n.o. Karl, Suffolk. Tel: (01394) 411443.

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Yaesu FTD401 h.f. tcwr with spare valves and desk mic., £160. KW107 super meter, £100. Datong FL3 multi filter, £85. Heathkit monitor scope, £50. Please phone for list. Peter GODRT, Kent. Tel: (01795) 876277.

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Exchange

Oscilloscope Hitachi VC5430 battery or mains, colour l.c.d. display, 50MHz, all probes, power supply, etc., worth £800 for h.f. base rig also Tait's v.h.f. and u.h.f. for handie dual-band. Tel: (01908) 642506 or (0411) 550306.

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Sony 2001D, mint, boxed, with paperwork, exchange for 2010, must also be boxed, mint with paperwork. Tel: Bristol (01275) 845351 after 5.30pm, ask for John.

Swap Icom IC-451E 430MHz multi-mode transceiver for HP432A power meter c/w 478A head and lead or RN Electronics 70MHz transverter or Timewave DSP59+ audio filter. Bob G8V0I, Waterlooville. Tel: (01705) 250830 after 6pm please.

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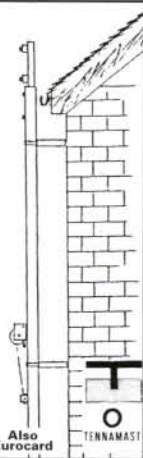
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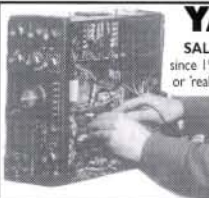
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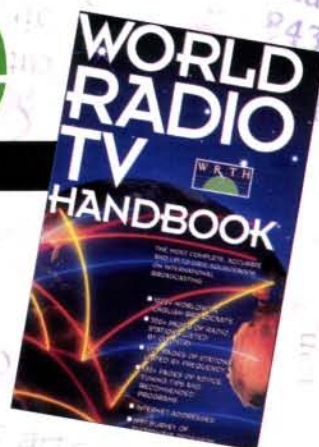
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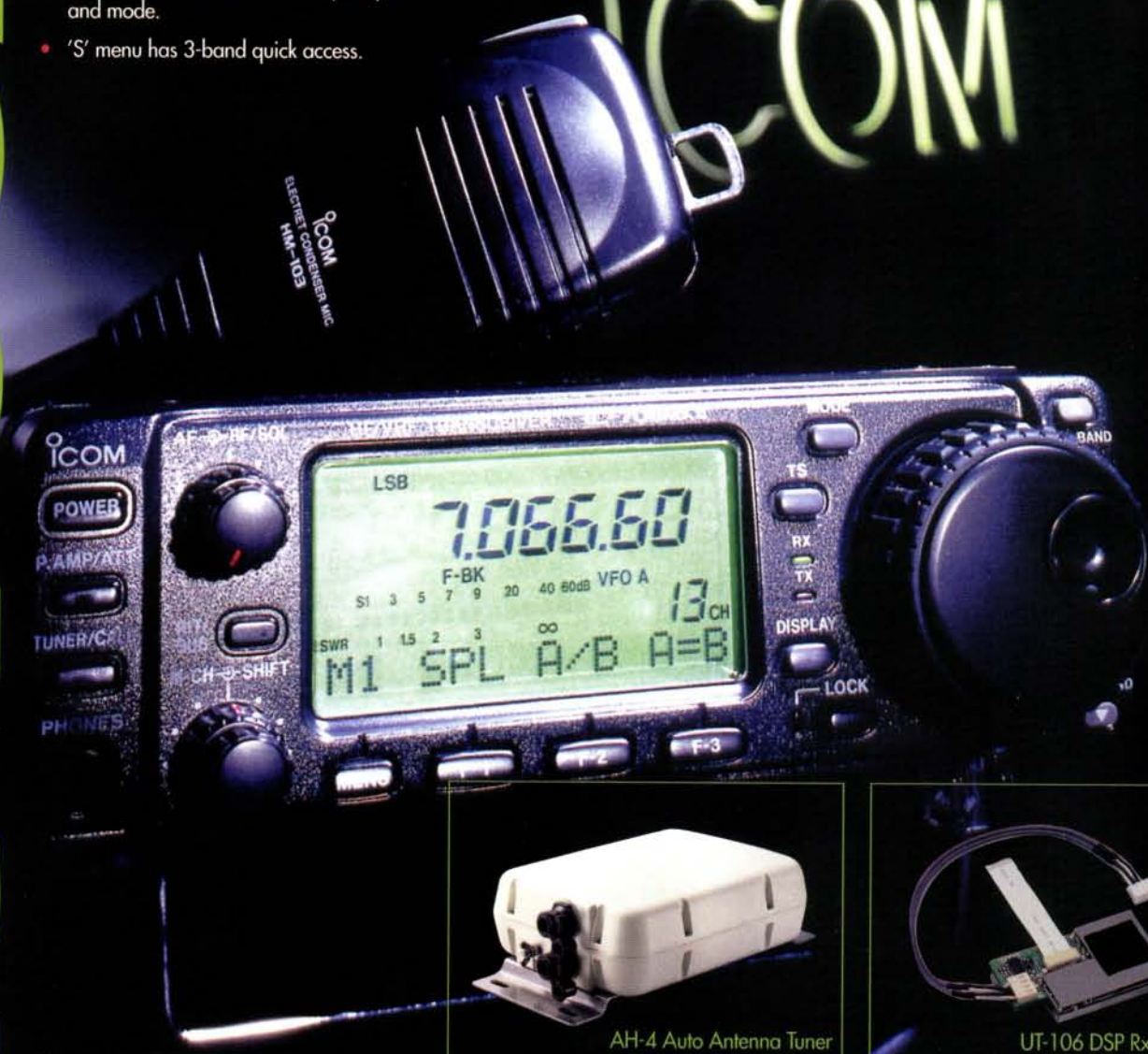
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