Practical Wireless

The Radio Magazine

APRIL 1988 £1·20

ISSN 0141-0857

Reviewed THE ALINCO ALX-2E 2m Handheld

FREE INSIDE World HF Amateur Beacon Map

Also

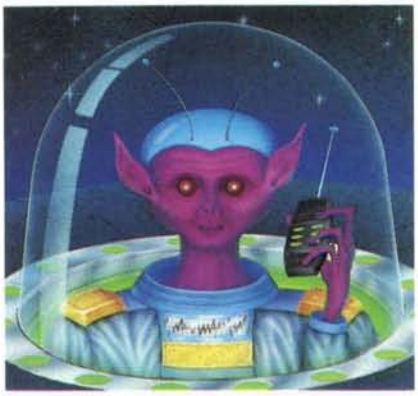
Build a VHF Monitor Receiver from Modules

And

A Digital Dial

www.americanradiohistory.com

Yaesu's FT-736R. Because you never know who's listening.



Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm, with two additional slots for optional 50-MHZ or 1.2-GHz modules (220-MHz North America only).

Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal *and* reverse modes) keeps you on target through a transponder.

The FT-736R delivers 25 watts RF output on 2 meters, 220-MHz, and 70 cm. And 10 watts on 6 meters and 1.2-GHz. Store frequency, mode and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. *CW Narrow Optional and FM wide/ narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU

*CW narrow optional

UK Sole Distributor ***South Midlands Communications*** *S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY. Tel: (0703) 255111*

Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

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Practical Wireless
The Radio Magazine

APRIL 1988 (ON SALE 10 MARCH 1988) VOL. 64 NO. 4 ISSUE 973

THIS MONTH

★ FREE INSIDE THIS ISSUE ★
(between pages 36 and 37)
PW HF Amateur Beacon Chart

Regular Features

NEXT MONTH

★ FREE ★
★ DATACARD ★
VHF/UHF/MICROWAVE BEACONS in the UK

The "Eightypole" Portable 3.5MHz Antenna

plus

PW REVIEWS of the Kenwood TS-680S HF/50MHz Transceiver and AFtronics SuperSCAF Audio Filter

and

All the usual features

Don't miss it—place your order with your newsagent now!

On sale April 14

Contents subject to last-minute revision

Editorial and Advertisement Offices:
Practical Wireless
Enefco House
The Quay
Poole, Dorset BH15 1PP
☎ Poole (0202) 678558 (Out-of-hours service by answering machine)
Prestel 202671191

Advertisement Manager
Roger Hall G4TNT ☎ 01-731 6222

Editor Geoff Arnold T.Eng FSERT G3GSR
Assistant Editor Dick Ganderton C.Eng. MIERE G8VFH
Art Editor Steve Hunt
Technical Features Editor Elaine Richards G4LFM
Technical Projects Sub-Editor Richard Ayley G6AKG
Editorial Assistant Sharon George
Technical Artist Rob Mackie
Administration Manager Kathy Etheridge
Clerical Assistant Claire Jackson
Accounts Alan Burgess

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Why did we design and produce the HF125 receiver? Simply to provide the keen short wave listener with a receiver which offered not only all the facilities he or she needed in an HF receiver, but to give at the same time a level of performance which would cope easily with HF conditions likely to be encountered in Europe.

You all know the problems, high power broadcast stations pounding in at night, blotting out the weak signals you wanted to hear – and many of the unwanted signals were generated in your receiver itself. That we succeeded in designing a receiver which could solve the listening difficulties is obvious from comments from reviewers, but we also did it at an attractive price.

The HF125 performance ranks equal to or better than imported receivers at twice its price, and its success stretches around the world.

So what did the reviewers say. I'll give you a few comments, but for the full story why not send a stamped addressed envelope marked "HF125" and we will return a fully descriptive brochure with all the review comments included.

Quotes

"What is particularly important is the fact that so much attention has been paid to RF and IF performance; areas so lacking in many Japanese sets. Short Wave Listeners will be particularly pleased about the many choices of selectivity on AM." – Angus McKenzie

"I tuned straight to the 40 metre amateur band to see how it stood up to the battering from high powered propaganda broadcasters when attempting to resolve relatively weak amateurs striving to get contacts. The simple answer was, no problem." – Chris Lorek

"After an hour, drift was less than 50Hz in each instance. This is comparable with receivers in much higher price classes." – World Radio and TV Handbook

"I have no doubt that the Lowe HF125 represents extremely good value for money, and the performance far exceeds so much of its competition, including some receivers costing rather more." – Angus McKenzie

"It's refreshing to find a receiver that does exactly what it claims." – World Radio and TV Handbook

The HF125 costs £375 including vat. Need I say more?

HF125
Short Wave Receiver

TS940S

Top of the range, the TS940S has everything the discerning HF operator requires. Amateur bands from 160 to 10 metres, together with a general coverage receiver tuning from 150 kHz to 30 MHz. Operating modes USB, LSB, CW, AM, FM, FSK. Forty memory channels, each effectively a separate VFO. Easy keyboard frequency entry. Leadership in the field. The TS940S is the transceiver everyone wants to own one day.

TS940S . . . £1995.00 (carr. £8)

TS140S

Kenwood common sense The TS-140S shows the way to go in balancing performance, operating features, and ease of use; all at an attractive price. All mode amateur band transmit with an excellent general coverage receiver. Full break in CW is provided for the real operators, but so is FM for idle chatting on ten metres (although why one would use FM in preference to SSB or CW I cannot imagine). Every TS-140S we can obtain is instantly sold. Ask around and you will find out why.

TS140S . . . £862.00 (carr. £8)

R5000

Virtually the receive section of a TS940S, the R5000 is probably the best HF receiver right now. Notice the family resemblance to the TS440S which gives it a clean, easy to operate look, and of course Kenwood have applied all their ergonomic skills to make you "at home" the moment you begin to use the R5000. All mode of course, and has an optional internal VHF converter which extends coverage to 108-174 MHz.

R5000 . . . £875.00 (carr. £8)

TL922

You Brute. If it wasn't for all the safety interlocks I would operate my TL922 with all the covers off, just to admire the sheer engineering beauty of the innards. The TL922 is THE linear amplifier, and once you own it you will never part. The effortless ease with which the TL922 produces RF power has to be experienced to be believed, and it is probably the world's most sought after station accessory.

TL922 . . . £1495.00 (carr. £8)

Glasgow: 4/5 Queen Margaret Road. .... Tel. 041-945 2626.
Darlington: 56 North Road. .... Tel. 0325 486121.
Cambridge: 162 High Street, Chesterton. .... Tel. 0223 311230.
Cardiff: c/o South Wales Carpets, Clifton Street. .... Tel. 0222 464154.
London: 223/225 Field End Road, Eastcote, Middlesex. ..... Tel. 01-429 3256.
Bournemouth: 27 Gillam Road, Northbourne. .... Tel. 0202 577760.

Note. All our shops open Tuesday to Saturday inclusive.

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The TS-440S from Kenwood

As many of you know, Kenwood have a current policy of running three HF lines; the '1' series which started with the TS-120, went on to the TS-130, and now crowned by the TS-140; the top of the range '9' series having the TS-930 and TS-940; and the '4' series which began with the TS-430 and is now completed with the TS-440S.

The TS-440S is designed to be a compact version of the TS-940, and in RF performance it proves to be so. Chris Lorek, when reviewing the TS-440S said "There was no suggestion of the dreaded reciprocal mixing . . ." and went on to say "Trio engineers have done well considering the standard TS-940S performance – the TS-440 actually outperforms it in this respect." What this means in down to earth listening terms is that the receiver presents you with a quiet background, with signals simply appearing and disappearing when you tune across them, with none of the "sharsh" noises as you approach a strong signal. Kenwood engineering at its best.

Whilst on the subject of the receiver, Geoff Arnold said in his review in Practical Wireless, "The receiver in particular is a joy to use, with clever use of spare microprocessor power to give automatic bandwidth selection according to mode." Against this typifies the Kenwood belief that their equipment is designed to be used by a human being, and they want to make it as easy as possible for you to enjoy your hobby.

Of course not everyone wants to use their amateur licence for actually communicating with other people, and it you want to sit and count control knobs then Kenwood is not for you. I have just been looking at a colour spread picture in an American magazine which shows the very latest HF transceiver to appear on the market. It has 84 push buttons and 30 control knobs – and that is just on the front panel. You chaps with 10 fingers on each hand should be well pleased. Mind you, the TS-440 has 37 buttons so even we mortals with 5 fingers will be occupied fully.

As a radio amateur, there are other excellent design features to which your attention should be directed. Amongst the most obvious of these is the frequency readout and the way it behaves. Sounds silly? Then consider tuning to 3750 kHz and chatting on lower sideband to Fred. The readout on the transceiver reads 3750 (of course). Then Fred says "Check me on upper sideband", and you move the mode switch to USB. If you are using a Kenwood rig, the readout still shows 3750 and you are indeed listening and transmitting on 3750 upper sideband. BUT – many other transceivers leap sideways by 3 kHz and you then have frantic retuning to find Fred. Small point you may say, but it is intensely irritating in use, and Kenwood make sure that it does not happen in their equipment; not HF, not VHF, not UHF.

By now you are probably thinking "The geriatric idiot is meandering again", but it never ceases to amaze me how lessons learned long ago need re-teaching at regular intervals, and minds need opening to old truths. That is, after all, what education is all about. Enough – back to the TS440S.

I absolutely guarantee that you will be impressed by the TS-440S when you sit down and use it; and that is best accomplished by going to one of our branches or your nearest Approved Kenwood Dealer. Don't bother with anyone who clearly doesn't have the background or connections to understand what the equipment is all about, because transceivers like the TS-440S are better explained by someone with genuine product knowledge and a willingness to do more than simply take your money.

For full details of the TS-440S, Kenwood produce an 8 page brochure which is yours for the cost of postage and packing. For full details of all the Kenwood range, simply send £1 and we will fill an envelope with info. and send it right back. If it takes 8 pages to describe the TS-440S there is no way in which I can adequately cram it into this space – send for the brochure.

73
John Wilson
G3PCY/5N2AAC

TS-440S £1138 inc. VAT

LOWE ELECTRONICS LIMITED

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 580800 (4 lines)

www.americanradiohistory.com

ICOM

THE NEW

IC-761, HF TRANSCEIVER with General coverage receiver.

The new ICOM IC-761 H.F. Transceiver has many features making it probably the best top of the line Amateur transceiver available today. This all mode transceiver features an internal tuning unit and A.C. power supply. The A.T.U. boasts a 3 second band selection and tune up with a VSWR matching of less than 1.3:1. For the serious operator the 100kHz-30MHz general coverage receiver and 105dB dynamic range make it ideal for DX chasing. Frequency selection is by the main VFO or via the front panel direct access keypad. And for when reception is difficult, pass band tuning, I.F. shift, notch filter, noise blanker, pre-amp and attenuator should enable you to copy even those weak DX stations whether amateur or broadcast. The C.W. operator will appreciate the electronic keyer, 500Hz filter and full break in (40wpm) other filter options are available. The IC-CR64 high stability crystal is standard as is the CI-V communications interface for computer control. Twin VFO's and split mode for cross band contacts,the IC-761 features program scanning, memory scan and mode select scan and the 32 memories can store frequency and mode. The transceivers operating system is held permanently in ROM and is not dependant upon the lithium battery. The cell is used for memory back up only. A new style meter gives P.O., A.L.C., IC, VC, COMP and SWR readings.

Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

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Count on us!

FACE OF HF.

You can count on Icom HF Transceivers to give superior performance, take a close look at the Icom range and see for yourself. Authorised dealers throughout the U.K.

IC-751A.

Features:

- All mode.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 12v Operation.
- 105dB Dynamic Range.
- 32 Memories.
- Electronic Keyer.
- Full Break In (40wpm).
- 500 Hz CW Filter.
- HM36 Microphone.

IC-735.

- Small Compact Size.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 105dB Dynamic Range.
- FM Standard.
- 12v Operation
- Large LCD Readout.
- 12 Memories.
- CI-V Communications Interface
- HM12 Microphone.

Later in 1988 Icom are launching a terrific new HF transceiver, similar in size to the IC-735 but simpler to operate. This new HF rig is also realistically priced and aimed at a large section of Ham operators. The introduction of this new HF transceiver emphasises Icom's positive approach to market requirements.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
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South Midlands C

SCHOOL CLOSE, CHANDLERS FORD IND. EST., EAST

FANTASTIC PERFORMANCE, FANTASTIC PRICE

NEW

The FT-747GX is a compact SSB/CW/Am and (optionally) FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminum heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

FM Unit **£39.99**
MMB38 .... **£22.00**
TCX6-747 .... **£TBA**

FT747GX RRP £659.00 inc VAT

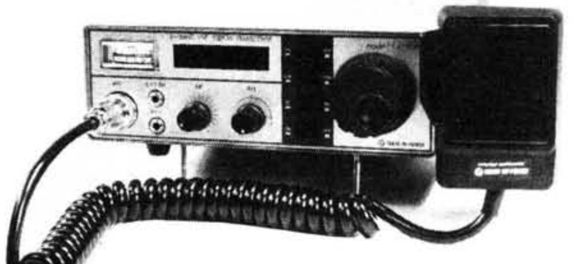
LET THE RADIO DO THE TALKING!

We are pleased to announce a new series of FM VHF and UHF mobile transceivers for the amateur. The 45/5W FT-212RH and the 35/4W FT-712RH. Smaller than their predecessors these models utilize a new cpu with greatly expanded features, most notable of which are 19 memories and support for the DVS-1 Digital Voice System, which can digitally record and playback from the microphone or the receiver.

FT212RH .... **£349.00.**
FT712RH .... **£375.00.**
DVS1 Voice Memory Unit **£79.00**
FTS12 CTCSS Unit **£60.38**

FT212RH & FT712RH
NEW FROM YAESU

COMING SOON from TOKYO HY-POWER
The HT-100 SERIES



The HT100 series is a series of compact lightweight HF/VHF SSB/CW monoband transceivers from TOKYO HI-POWER.
Despite being so compact the transceivers feature everything necessary for the dedicated HF operator, including 20W (PEP) output (10W (PEP) HT106), digital display, 'S' meter and semi break-in on CW. Options available for the radios are HP-100S external PSU c/w loudspeaker, 500Hz CW filter, noise blanker unit and mobile mounting bracket.

HT-106 6m **£325.00** HT-120 20m **£299.00** HT-180 80m **£299.00**

HP-100S External PSU c/w Loudspeaker ... **£99.00**
HBK-100 Mobile Mounting Brackert **£2.00**
HNB-100 Noise Blanker Unit **£59.95**
HCF-1000 500Hz CW Filter **£45.00**

ALL TOKYO HY-POWER PRODUCTS CARRY 1 YEAR GUARANTEE

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ommunications Ltd. YAESU

EIGH, HANTS. SO5 3BY TEL: 0703 255111 FAX: 0703 263507 TLX: 477351

NEW

INTRODUCING THE FT736R FROM YAESU

The FT-736R is a solid-state, frequency-synthesised VHF and UHF amateur transceiver incorporating up to four band modules covering the 50, 144, 430 and 1200 MHz amateur bands. The standard model provides 25 watts RF power output on the 144 and 430 MHz amateur bands in SSB, CW, and FM modes, with any two of the remaining three bands installable as options (10 watts output on the 50 and 1200 MHz bands). An 8-bit CMOS main microprocessor and 4-bit i/o coprocessor provide exceptional digital integration and control: including selectable tuning rates or mode-dependent channelized tuning in selectable steps for each mode. Operating conveniences usually found only on HF transceivers, such as front panel adjustable IF shift and IF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAs FET receiver RF amplifiers are provided in the 430 and 1200 MHz band modules. The innovative memory system includes one hundred general purpose memories plus ten full duplex cross-band memories, all of which store mode and receive and transmit frequencies independently. In addition, fourteen vfos are provided: two general purpose plus one PMS (Programmable Memory limit Scanning) on each band, two special-purpose full duplex vfos, and up to four clarifier (receiver offset) memories, one per band. Each of the two full duplex vfos can be selected so that its receive and transmit frequencies and modes can be displayed and tuned independently, or linked to tune synchronously in opposite directions for satellite operation. You can retain twelve satellite uplink/downlink modes in the special vfos and ten full duplex memories at all times. Of course, metering of either transmitter or receiver parameters is selectable during full duplex communications. For CW operators, the FT-736R offers quick-changeover semi break-in and includes provisions for an optional internal electronic keyer and narrow (600Hz) CW crystal filter. Naturally, with FM the predominant mode on the VHF and UHF bands, the FT-736R includes all manner of convenient features for both FM simplex and repeater operation, special narrow FM mode (to cut adjacent channel interference in crowded areas), Automatic Repeater Shift when tuned to 2-meter repeater subbands and a 1750Hz Burst Tone Generator is installed as standard. An enhanced CAT (Computer Aided Transceiver) System allows addition and customization of features and user-designed controls from an external computer. The FT-736R also includes a t/r-switched DC supply line for masthead preamplifiers, activated from the front panel, and digital input connection directly to the modulator for high performance packet radio tnc interfacing. Optional add-on accessories include the TV-736 Amateur Television Modulator/Demodulator for ATV operation, FIF-series CAT Interface Units, SP-767 External Loudspeaker, FMP-1 AQS Message Processor, and FVS-1 Voice Synthesiser and FTS-8 CTCSS Tone Squelch Unit (both mount internally).

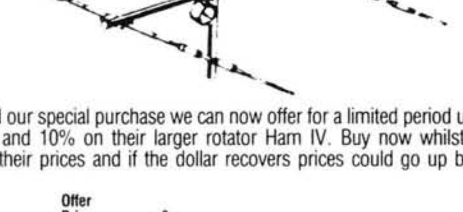
OPTIONAL ACCESSORIES

FEX 736/50	50MHz module	**£239.00**	XF455MC	600Hz CW Filter	**£60.00**
FEX 736/1.2	1.2GHz module	**£425.00**	SP767	External Spkr c/w Audio Filters	**£69.95**
FMP-1	AQS Message Processor c/w display	**£189.00**	MD-1B8	Desktop Microphone	**£79.00**
FTS-8	CTCSS Tone Squelch Unit	**£45.00**	MH-1B8	Hand Scanning Microphone	**£21.00**
FVS-1	Voice Synthesiser Unit	**£33.00**	FIF232Cvan	CAT/INC Interface for Packet & CAT	**£T.B.A.**
Keyer Unit B	Internal Iambic Keyer Unit	**£15.95**	FIF232C	CAT Interface for RS232 O/P	**£75.00**
TV-736	Fast Scan TV (ATV) Mod/Demod Unit	**£159.00**	FIF65A	CAT Interface for Apple II series	**£60.00**

SEE INSIDE FRONT COVER FOR MORE DETAILS

FT736R R.R.P. £1450.00 C/W 2M & 70cms.

HY-GAIN – LOW PRICES



Due to the strong pound and our special purchase we can now offer for a limited period up to 15% discount on their range of antennas and 10% on their larger rotator Ham IV. Buy now whilst stocks last (from January 1st they increased their prices and if the dollar recovers prices could go up by 30% to 40%).

			Offer Price	p&p
12AVQ	Vert. 10-15-20M	~~£78.95~~	£ 71.00	£3.75
14AVQ	Vert. 10-15-20-40M	~~£106.00~~	£ 95.00	£3.75
18AVT	Vert. 10-15-20-40-80M	~~£172.00~~	£146.00	£3.75
18V	Vert. 10-80M tapped coil	~~£48.50~~	£ 43.65	£4.50
TH2Jnr	3 Ele. Yagi 10-15-20M	~~£299.00~~	£254.00	£4.50
TH2MK3	2 Ele. Yagi 10-15-20M	~~£279.00~~	£249.00	£4.50
EX14	5 Ele. 10-15-20M Explorer	~~£499.00~~	£449.00	£7.50
QK710	EX14 to cover 40M	~~£139.00~~	£115.00	£6.50
TH5MK2	5 Ele. 10-15-20M T'bird	~~£649.00~~	£575.00	£7.50
TH7DXX	7 Ele. 10-15-20M T'bird	~~£755.00~~	£669.00	£7.70
103BA	3 Ele. Yagi 10M	~~£ 99.00~~	£ 89.00	£3.95

			Offer Price	p&p
105BA	5 Ele. Yagi 10M	~~£220.00~~	£187.00	£3.95
153BA	3 Ele. Yagi 15M	~~£135.00~~	£121.00	£3.95
155BA	5 Ele. Yagi 15M	~~£338.00~~	£288.00	£5.90
203BA	3 Ele. Yagi 20M	~~£269.00~~	£233.00	£4.90
204BA	4 Ele. Yagi 20M	~~£420.00~~	£357.00	£7.30
205BA	5 Ele. Yagi 20M	~~£499.00~~	£425.00	£9.40
DB10-15A	3 Ele. Yagi 10-15M	~~£209.00~~	£199.00	£4.80
AR40	Famous Bell Type		£125.00	Free
CD45	Medium Bell Type		£219.00	Free
Ham IV	Heavy Duty Bell	~~£359.00~~	£329.00	Free
T2X	Very Heavy Dury Bell	~~£440.00~~	£399.00	Free

5% OFF JAYBEAM

By purchasing large stocks during December, S.M.C. is able to offer 5% discount for a limited period.

		Normal Price	Offer Price
HO/2M	Halo head only	~~£9.78~~	£9.29
HM/2M	Halo with 2ft. mast	~~£11.50~~	£10.93
UGP/2M	Ground plain folded radiator	~~£16.96~~	£16.11
C5/2M MK2	Vertical Colinear 4.8dbd	~~£90.85~~	£86.31
LR1/2M	Vertical Colinear 4.3dbd	~~£37.95~~	£36.05
LR2/2M	Vertical omnidirectional	~~£29.61~~	£28.13
LW5/2M	5 Element Yagi 7.8dbd	~~£18.69~~	£17.76
LW8/2M	8 Element Yagi 9.5dbd	~~£23.98~~	£22.78
LW10/2M	10 Element Yagi 10.5dbd	~~£29.04~~	£27.59
LW16/2M	16 Element Yagi 13.4dbd	~~£42.55~~	£40.42
PBM10/2M	10 Element Parabeam 11.7dbd	~~£57.50~~	£54.63
PBM14/2M	14 Element Parabeam 13.7dbd	~~£70.15~~	£66.64
Q4/2M	4 Element Quad 9.4dbd	~~£37.09~~	£35.24
Q6/2M	6 Element Quad 10.9dbd	~~£48.59~~	£46.16
D5/2M	5 over 5 slot fed Yagi 10.0dbd	~~£33.93~~	£32.23
D8/2M	8 over 8 slot fed Yagi 11.1dbd	~~£46.58~~	£44.25
5XY/2M	5 Element crossed Yagi 7.8dbd	~~£36.23~~	£34.42
8XY/2M	8 Element crossed Yagi 9.5dbd	~~£46.00~~	£43.70
10XY/2M	10 Element crossed Yagi 10.8dbd	~~£57.50~~	£54.63
PMH2/C	2 Way harness circ. polarisation	~~£13.51~~	£12.83
PMH2/2M	2 Way harness for 2 Metres	~~£14.89~~	£14.15
PMH4/2M	4 Way harness for 2 Metres	~~£36.80~~	£34.96

JAYBEAM 4M/6M

DB4	4M/6M Dual Band 4 Ele	~~£117.88~~	£111.99
4Y6M	6M 4 Ele 7dBd	~~£49.45~~	£46.98
4Y4M	4M 4 Ele 7dBd	~~£40.54~~	£35.81
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Prices & availability subject to change without prior notice.

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NEW! 2M and 6M CONVERTER KITS

If you have a receiver that covers the 20M amateur band, you can use it to monitor the 2 and 6 Meter bands by adding the new **HOWES CV220** and **CV620** frequency converter kits to your station. Suitable for use with our popular **DcRx20** receiver kit, these new converters can also be used with any general coverage communications receiver (no modifications to the receiver are involved, they simply connect externally to the antenna socket).

An excellent constructional project could combine these two new kits, together with one of our DcRx20 SSB/CW receiver kits. This will give a great little monitor receiver covering three of the DX chasers most favoured bands. A really cost effective way of enjoying the "weak signal mode" DX on 2 and 6 meters, together with the most popular HF DX band.

CV220 or CV620 kit: £17.50 Assembled PCB module: £23.90

HOWES FINISHED EQUIPMENT RANGE

HC266 2M to 6M transverter. 10W RF output with ALC, VSWR protection and very low harmonics. Case specially manufactured to high standards by computer controlled machine tools. 1 to 5W drive level standard, 5 to 10W drive available as a no cost option. Operators handbook includes block and schematic diagrams. **HC246** 4M output version may be available by the time you read this. Price including post and VAT: **£179.90,** normally available off the shelf from us, and from selected retailers.

HOWES KIT RANGE includes:		KIT	Assembled PCB
DcRx20, DcRx40, DcRx80, DcRx160	SSB/CW Receivers	£15.30	£20.90
CTX40, CTX80	QRP CW Transmitters for 40 and 80M	£13.40	£19.40
MTX20	10W CW TX for 20M	£21.90	£27.70
CVF20, CVF40, CVF80	VFOs for above transmitters	£9.90	£15.90
HC220, HC280	2M to HF transverters, 10W output	£52.50	£83.50
CSL4	Dual bandwidth SSB/CW filter for DcRx	£9.90	£15.90
ASL5	Dual bandwidth filter for "black boxes"	£14.90	£22.50
TRF3	Shortwave Broadcast receiver	£14.50	£19.90
CTU30	HF bands ATU for receiving or 30W TX	£24.90	£29.90
SWB30	SWR/Relative power indicator, 160 to 2M	£11.90	£16.50
CM2	Quality microphone with VOGAD	£11.20	£15.20
AP3	Automatic Speech Processor	£15.90	£22.80
ST2	Sine-wave side-tone/practice oscillator	£8.60	£12.90
XM1	Crystal Calibrator with 8 marker intervals	£16.80	£21.90

All HOWES KITS include a high quality glass-fibre PCB with screen printed parts locations, full instructions and all board mounted components. Tuning capacitors to suit our receivers and VFOs (except 160M) are available at £1.50 extra (DcRx needs two, TRF3 and CVF need one).

A copy of our free catalogue and information sheets on any products you are interested in available for an SAE.

Please add 90p P&P for kit orders.

UK delivery is normally within 7 days.

73 from Dave G4KQH,
Technical Manager.

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ALL parts are included in the Kit. Not only the case, slow motion drive, good quality variable capacitor, knobs, hardware etc., but important features which, in some kits, are regarded as extras – stable VFO, Audio Filter, RIT – **PLUS** ready printed front and back Panels for that "Professional" finish.

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For further details of the DTR3 and other kits in our range, send a SAE to:

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Kantronics packet radio

Packet radio is one of the fastest expanding areas in Amateur Radio. Access is available to national and international data, messages may be left on 'mailboxes', and of course you may conduct a QSO just like RTTY or AMTOR.

KPC2 £159 inc. vat. (carr £8)
This is not just a basic TNC but more of a 'Packet Special'. Over 100 user commands are available, and operation can be on HF or VHF/UHF via its single port. Features include 3 – state squelch, multi connect, digipeat, TTL or RS232 compatible, personal mailbox – and now WEFAX is included.

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KPC4 £298 inc. vat. (carr £8)
A dual port TNC allowing simultaneous operation on two bands (if you can keep up the pace). All the features of the KPC2 plus gateway between ports.

P.S. WEFAX means you can receive those wonderful Met forecast pictures off-air.
P.P.S. You need a simple computer as well!

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A SAMPLE OF OUR RANGE OF PCB's

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Transmit Amplifiers		
TA2S1, TA4S1, TA6S1	£33.00	£40.25
TA2U2, TA4U2, TA6U2	£41.25	£52.50
Receive Preamps		
RP2S, RP4S, RP6S, RP10S, RP15S, RP20S	£14.75	£22.25
Transmit Buffer TB28E	£7.00	£9.50
Frequency Modulator & Demodulator FM455	£8.25	£12.25
Noise Squelch NS1000	£9.50	£14.00
Speech Processor SP444E	£15.00	£20.50
10.7MHz IF Filter Board SF10-7	£7.00	£8.00
10FM Conversion Board SC29	—	£18.50
Autotoneburst AT1750	£3.50	£5.50
Piptone PT1000S	£5.75	£8.00
Kaytone KT1000	£7.75	£11.25

And many more items including transverters and boxed kits or ready built. Send for list.

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Each filter is terminated in standard aerial co-ax plug and socket and requires no external power. Fitting could not be more simple. No technical knowledge is needed. There are 13 standard stocked filters in our range, but individual filters can be tuned to reject interference at specific frequencies if required. If you are not sure which filter type to order or have any questions regarding interference phone our helpline on 0438 351710 and ask for John who will be pleased to assist you in making the best choice of filter.

THE FILTER RANGE IS AS FOLLOWS:

FILTER TYPE RBF1
A range of filters designed to eliminate Radar Blip, especially noticeable on video recorders. Stocked on channel 36 and 846MHz (RAF Boulmer interference) can be tuned at our factory from 420MHz to 890MHz. **£6.75 each**

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WA1 **WAVEMETER £24.95**

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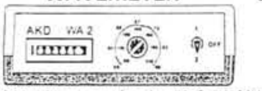
For the FRG 9600/965 our new HF Converter, connects to the aerial socket, and powered direct from the 8 Volt o/p of the FRG 9600. Tune from 100, 1Mhz to 160Mhz, gives tuning range of 100Khz to 60Mhz, uses double balanced mixer, with low pass filter on input.
★ Can be supplied with BNC termination for other scanners ★

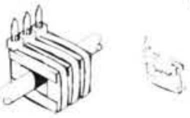
WA2 **WAVEMETER £24.95**



Our Wave absorption meter for the 50 & 70 MHz Bands. Meets licensing requirements. Can also be used as field strength meter within its range. Requires PP3 battery (not supplied).

Unifilter 'CLAMP-ON' RADIO-FREQUENCY CHOKE

PHONE OR SAE FOR PRODUCT SPECIFICATION & APPLICATION NOTES



Allows leads to be torroidially protected without the need to cut or remove plugs or connectors. Ideally suited for moulded plugs, leads, ribbon, and large diameter cables. Can easily be fitted and stacked in multiples to increase rejection. 'UNIFILTER' works by suppressing the interference currents that flow along the *outside* of cables without affecting the signals or power flowing inside. This means that you don't need to worry about upsetting normal operation or invalidating guarantees. Suitable for both reducing the emission of, or rejecting the effect of, 'common mode' interference as experienced on computer, hi-fi & speaker leads, as well as the normal mains & aerial cables.

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FA2	2m Helical BNC	9.20	(2.00)
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LC11	Leatherette Case 02E/04E + BP3	9.20	(2.00)
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AT940	Auto/ATU	244.88	(3.00)
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R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.50)
R5000	General Coverage HF/RX	875.00	(—)
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SC8	Soft Case TH21/41	11.86	(2.00)
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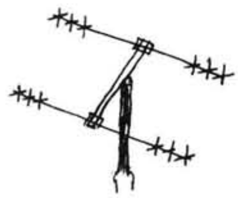

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Old Times

Two items in the February issue spurred me on to write to you to suggest a subject worthy of *Practical Wireless*. "Battle of the Beams" showed us how "practical" the professionals had to be, and "Cheque Books and Black Boxes" reminds us how "impractical" most of us are becoming, due to a few damned clever bits of imported hardware.

Could we please have, before it's too late, an article about the construction of receivers from junk and household items. I have heard of the bully-beef tin and bent-spoon receivers but did they exist, did they work, or were they occupational therapy for prisoners of war?

Perhaps the article could be followed by a constructional competition with two categories: (a) a working receiver on 198kHz made from household items available back in 1940. (b) a working receiver tuneable between 500kHz and 1800kHz using present-day household items. No "radio" components should be used in either category.

The object of the article should not be an attempt to turn the clock back, but should be to show us how those practical wireless men solved their problems, and help us to become modern practical wireless persons.

Finally, could we all bear in mind that when we buy imported gear, our brothers, aunts, uncles and fathers are not being employed in manufacturing it. How about *PW* publishing a British products directory, and maybe giving preferential advertisement rates for British products?

I. R. Willson
Epsom

Patience

In the January 1988 issue of *PW*, Chris Charles said that he was sure that the delay between taking an interest in amateur radio and finally obtaining a licence must put a lot of people off — "but perhaps that is the object of the exercise".

What a load of rubbish. I have to save and wait for my holidays but I still go! Many enjoy fishing and may wait for hours or even days to catch what they consider to be the reward for sticking with it.

The attitude of something for nothing is not the way forward, or does Mr Charles not conform to any system he may not agree with.

Bernard Prewitt G0FIR
Carterton, Oxon

The Way In

Oh dear, I think that Chris Charles (Letters *PW* January 1988) has a gross misconception of what amateur radio is all about. Referring to his final paragraph, despite the usual delays in the City and Guilds examination system, the time taken to obtain a licence is largely related to the amount of study required by the syllabus. It is not a ploy on the part of the system to put prospective amateurs off.

Mr Charles' comments are a little contradictory in nature. If we are to assume that his idea of an examless licence were introduced, this would require him to buy commercial equipment which is very expensive. Surely he would not be willing to spend in excess of £400–£500 on what was just a fleeting interest. If it is more than this, surely a few months of study is little enough sacrifice when it can lead to a rewarding and satisfying hobby lasting many years.

Assuming this previous situation, he would be limiting this hobby to those rich folk who could afford to buy equipment, and excluding the majority who could not. But with more knowledge, they could perhaps have built their own.

The RAE (in theory, at least) gives a sound background knowledge of the principles involved. This is the basic difference between CB and amateur radio. CB is a user service, as are the public telephone and television systems. They assume no technical knowledge or ability, so everything is couched in terms of non-interference with the system by the user. In amateur radio, we are privileged to use facilities which may cause interference to others, so it is necessary for all concerned to be conversant with the basics, and how to resolve interference problems, even if they only ever intend to use 2m f.m.

The "B" licence is a novice licence with **all** modes now being available on the permitted bands without the requirement of a Morse test. Which do you honestly want: 100 crowded f.m.-only channels for nothing, or the freedom of amateur radio for the sake of a few months of study?

Jon Carp GM8XFT, QTHR

PW COMMENT

It's a Date!

I NOTICED in a recent copy of ***IARU Region 1 News*** an item headed "Expression of Dates on QSL Cards" which read as follows.

> The following Resolution from the 1986 Region 2 Conference was discussed at the Noordwijkerhout Conference and referred to the next meeting of the IARU Region 1 HF Committee for consideration: "It is resolved that Region 2 adopt a Recommendation to all amateurs to use the convention of expressing dates on QSL cards with sets of two-digit numbers in the order YEAR/MONTH/DATE, as for example 86/12/31, and that the Executive Committee should inform the Administrative Council and Regions 1 and 3 to propose that this standard procedure be adopted worldwide."

Now International Telecommunication Union (ITU) Region 2 covers the Americas, where traditionally dates have always been expressed in the order MONTH/DATE/YEAR, much to the confusion of those countries following the UK system of DATE/MONTH/YEAR. Now, it is proposed that we adopt yet another system as a new worldwide standard. To quote a well-known American, "You cannot be serious, man!"

The Novice Question

THE NOVICE LICENCE QUESTION, raised by Chris Charles of Cheadle in our January issue, provoked one of our largest ever mailbags on a single topic. This was not entirely unexpected, but we did get an interesting cross section of views. Space simply does not allow us to print them all, but I have tried to include a representative selection last month and this.

The letters certainly proved the near-impossibility of producing an idea which will please all radio enthusiasts. Their individual interests and views are so varied, ranging from the ex-service radio operators who love Morse operating and would love to get back on the air, but are apprehensive of the technical examination, to those who are interested in experimenting in h.f. radio but find the Morse requirement terrifying, or those who would just like to chat with people in other countries but don't want to bother with either the Morse or the technicalities.

Any government department or representative body trying to put together a proposal for a change in the structure of amateur licensing has my sympathy—they're on a hiding to nothing!

Geoff Arnold

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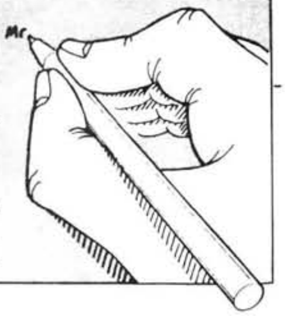

Safe Operation

In his letter in January *PW*, Mr Charles' assertion that a knowledge of radio theory is unnecessary to operate a modern transceiver is correct. The knowledge of radio theory is required to ensure its successful, interference free, safe operation in a domestic environment, since the acquisition of radio theory knowledge usually involves an elementary understanding of electrical and antenna safety. I would certainly stay well clear of a station of 100 watt capability if its operator had only the equivalent of a "driving test", having seen the results of ignorance of elementary precautions and knowledge.

In respect of the RAE, I believe G1ZEH will find this is a general problem — look at the teletext pages for some classic howlers — and could really only be solved by continually raising standards.

Finally, despite the criticisms, the RSGB is the only national body representing amateur radio in this country: it is the only recognised negotiating body for frequency allocations and licence conditions, and is the only real forum for general amateur radio interests (I do not include the various special interest groups). As such, though there may be many deficiencies, it requires our support. Without it we would all be far worse off.

P. J. Brent G4LEG
Crawley

Priorities

I am not in the least interested in the forthcoming 75th year celebrations which have been given much publicity in *Radio Communication*. Unless, of course, these celebrations which will be enjoyed by a few, will not be found to be an expensive charge on the membership as a whole.

On the other hand, I am much interested in what our National Society are doing about the DTI's report of March 1987 which recommended that pressure be brought to avoid further increases in amateur band allocations, or even to reduce these. As I have read, the RSGB were invited to comment by June 30 last. This they did not do.

Perhaps the RSGB, who I note have made strenuous efforts to present a more acceptable image to the membership these past twelve months, should spend more time concerning themselves with the DTI report rather than the 75th year celebrations. Otherwise we will find ourselves in a position where we have nothing to celebrate.

V. J. Copley-May G3AAG
Petersfield

Towards a kW?

Do we really want a 1 kilowatt amateur licence? The RSGB seems to think so. Their "21st Century Licence", *Radio Communication*, September 1987, page 667, paragraph 35, calls for a power limit of 30dBW, which is 1kW—or perhaps we should say 0dBk.

Those amateurs who already under-run linears would have a temporary advantage while the rest save up to buy one—just to restore the DX:QRM ratio. However, it is not just the cost of the linear, but also the cost of dispensing TVI filters to an even wider neighbourhood. You could escape TVI by going mobile, but beware, an oncoming driver may be using a cardiac pacemaker! Perhaps the QRP boys will have to increase their limit from 5W to 12.5W "in line with inflation".

Oh for the days when you could contact the other side of the world with a few watts, on 27MHz of course.

M. Mann G4FFO
Cambridge

OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
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NEWS DESK *... compiled by G4LFM and G8VFH*

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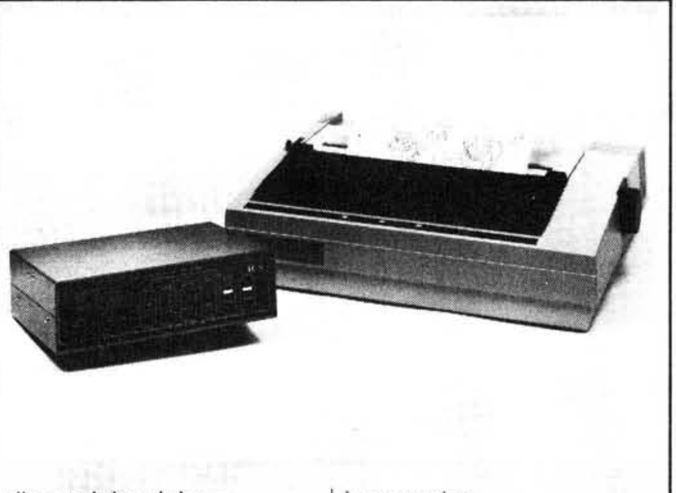

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75th Celebrations

The RSGB have quite a few events planned to celebrate their 75th Anniversary. On **July 15-17** it's the National Radio Exhibition at the NEC, Birmingham. This has, by now, become a very well known event in the radio amateur's calendar, but note it's during the summer this year and not the spring as usual. It will be a "bigger and better" event than previous years with a larger trade exhibition. There will also be an exhibition of amateur radio through the ages.

There will be various social events held during the evenings of the exhibition, either in the grounds or in one of the nearby halls—depending on the weather. They have arranged accommodation "packages" with the Metropolitan Hotel, which can be either for all three days or on a daily basis. You will also be able to purchase a package ticket for all the events or daily tickets, which ever suits you most.

There will be a special 75th Anniversary luncheon on the first day of the exhibition and members can purchase these tickets on a first come first served basis.

On **July 18** the RSGB Headquarters will be closed, giving them a chance to return and re-install equipment taken from HQ, for use at Birmingham. **July 19-21** will be HQ open days when there will be guided tours of the operations there, as well as displays of archive material and of old amateur radio equipment. Tickets for this are free, but again on a first come first served basis, although you don't have to be a member to get tickets, RSGB members will get priority. They will have the HQ station running during these three days when visitors will be able to operate using the very special callsign of **GB75RS**. Opening hours will be 10am to 4pm, and during all this they are still intending to keep the HQ running and keep the work up together!

Then, on **July 22-23** there will be a Data Communications Symposium at the Historic Harrow School. There will be lectures and demonstrations of all types of data comms as used in amateur radio. It's the first chance that all the various data communications groups have had to get together for discussion. Tickets can be bought in various options, either a 2-day package which includes accommodation, food and entry; day tickets can be bought in advance and these include tea, coffee and lunch; and entry on tickets can be purchased at the door which includes entry and tea and coffee.

The next event is really quite unusual, **July 24** is a Families Day, when the individual affiliated radio clubs and societies will take over. Just about anything goes as long as it includes the family in amateur radio and there will be a prize for the club who dreams up the most unusual event. The RSGB HQ are hoping to involve RAYNET in another exercise like Operation Hilltop, where they will pass 75th Anniversary greetings messages around the country.

Onto **July 28**, when there will be an International Satellite Seminar near Guildford. This will be by invitation only and is very much an international event. Satellite builders, designers and engineers will gather to exchange information and views. The AMSAT Colloquium will take place on **July 29-31** and, as usual, the booking for this event will be handled by Ron Broadbent. The meeting during the day of the 29th is a technical meeting for engineers and is by invitation only, the social event that evening heralds the start of the open session.

Booking forms for most of these events will appear in the April/May copies of *Radcomm*, overseas visitors should contact the RSGB HQ for an information pack.

There should be a 75th Anniversary Award available too for working either: (i) The HQ Station GB75RS and 75 RSGB members or (ii) 5 special GB stations put on for the anniversary and 75 RSGB members. You can apply for the award of h.f. and/or v.h.f. but **not** mixed. Again full details will be *RadCom* later.

Special Event Stations

GB75RS: This station is already operating from the HQ. There are no published schedules or frequencies as it appears on air only when HQ staff have the spare time. As time goes on and more visitors turn up then the station should be heard a lot more.

GB0LBL: This station is being run by the Port Sunlight Centenary Radio Station. It is to celebrate the centenary of Port Sunlight as the home of Lever Brothers Ltd. The station will operate from the Gladstone Hall, within the Port Sunlight Village, during the weekend of March 18-20. They will be using 3.5, 7, 14, 144 and 430MHz in addition to Packet radio on 144MHz.

Various charities will benefit from sponsorship for all QSL cards received within one month of the event. All the cards received will be entered into a grand draw for a bumper pack of Lever products. More information from: ***Eric Gethin G6HWD, QTHR.***

GB2SWR: This will be used as the talk-in station for the Swansea Mobile Rally at the Swansea Leisure Centre on April 24.

GB5RN: The Royal Naval ARS London (HMS Belfast)

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Test Equipment Brochure

A free 10-page brochure outlining a comprehensive telecommunications test capability available from a single source has been produced by Megger Instruments Limited.

The brochure embraces testers for relatively simple line measurements through to cable fault location, power disturbance analysis, chart recording and testing the power loss in optical fibre networks.

All the instruments featured conform to international and British safety standards (BS4737 or BS5458). Each product description is supported by a detailed specification and the brochure also contains a wealth of illustrations.

A brochure is available from:
The Sales Department, Megger Instruments Ltd., Archcliffe Road, Dover, Kent CT17 9EN.

The RZ-1

The new Kenwood wide band receiver, the RZ-1, is a multipurpose receiver that covers the 500kHz to 905MHz range. There are 100 easy-to-operate multi-function memory channels with message capability. They can store frequencies with messages and band marks for convenience and operating ease. A message with a maximum of 7 letters and numbers can be memorised. Six different band marks can be selected and memorised.

There is a 10-band program capability, keyboard selection, auto-mode and auto-stop operations, multi-scan functions, it has a large easy-to-read liquid crystal display and has two different antenna sockets.

For more details of the RZ-1, contact:
Lowe Electronics Ltd. Chesterfield Road, Matlock, Derbys DE4 5LE. Tel: 0629 580800

Dalgety Flier

British Telecom International have helped keep microlight pilot Brian Milton in touch during his historic flight to Australia.

During the 19 000km journey from London to Darwin, Mr Milton has relied on BTI's Portishead Radio Station in Somerset to provide a link with home.

BTI radio officers assisted in preparations for the flight by advising on how to make maximum benefit of the extremely lightweight and compact radio equipment fitted into his *Dalgety Flier* microlight aircraft. The h.f. equipment on board is approximately half the size of a typical flight deck h.f. transceiver.

In the past, Portishead's aeronautical service has provided vital communications links for pilots involved in famine relief operations, and the service has handled calls from as far away as the South Pole.

Group will be active from Thursday March 17 to Wednesday April 13. This is to celebrate the fiftieth anniversary of the launch of HMS Belfast. A special QSL card will be issued, all QSLs via the RSGB or Derek Costello G4UKJ, Three Ways, The Green, Stalham, Norfolk NR12 9PZ. Requests for direct QSLs must be accompanied by s.a.e. and return postage. The correct address of the ship is ***HMS Belfast, Imperial War Museum, Off Morgans Lane, Tooley Street, London SE1 2JH.***

ZM1BCC: From April 15 to 25, an amateur radio station will be operating from the Public Library of the Birkenhead City Council. The station will be operated by local amateurs. Operations will be on the high frequency bands as well as v.h.f. and u.h.f. Times of operation will be from 9am (local time) to 5pm, with later times on Thursday and Friday April 21 and 22. If conditions are good, later times may be operated on other days.

A full-colour QSL card has been designed, showing the proximity of Auckland City. A brief history of Birkenhead from the time it was occupied by the Kawerau Maori tribe to the present, is on the back. Distribution is mainly by the bureau.

It will be of particular interest to the group in Birkenhead to contact other amateurs who live in districts of Birkenhead, Birkdale or Beach Haven in other parts of the world.

GB0IOS: Following the successful expeditions over the past few years to Lundy, Skye and the Western Isles, the Mid Northants Expedition Group are pleased to advise that this year's trip will be to the Channel Islands. A base station will be set up on the Island of Sark, and it is hoped that mobile and portable operation will be made from Jersey, Guernsey, Alderney and Herm. A special effort will be made for WAB collectors, and it is anticipated that all of the Parishes on both Guernsey and Jersey will be activated during the week April 30 to May 7. They will be on all h.f. bands. All QSOs will be QSLed via RSGB or direct via G4VID (s.a.e. please).

GB?CO: G4OBK and G0EJK, sponsored by the Central Lancashire ARC will be active from Wednesday March 23 to Tuesday March 29 from the Island of Colonsay. They will be using all h.f. bands and will be especially active in the WPX SSB contest as a multi op station. There will also be a limited amount of v.h.f. activity on 144MHz. DXCC status is Scotland. IOTA ref: EU08. WAB: NR39 Strathclyde. Island Collectors Isle of Oransay NR38 and NR39. QSL will be via G4OBK (1988 callbooks only) or via the RSGB bureau.

GB4IMD: On April 23 the Cornish RAC are celebrating International Marconi Day. They expect to operate from the site where Marconi made his first transatlantic transmission—Poldhu Cove, near Mullion on the Lizard Peninsula. This is very close to where the Goonhilly Satellite Station now stands. Operation will be on 3.5, 7, 14, 21 and 28MHz using s.s.b.

LA1D: On Saturday May 28, Norsk Radiohistorik Forening (NRHF) will be taking vintage communications sets, including equipment used for clandestine operations during WWII, to an open-air location similar to those used for war-time operations. Station LA1D would like to make contact with anyone interested in vintage radio. Tore Moe LA5CL comments, "It will be nice if other stations use vintage equipment too, but we don't mind if stations with modern equipment call us. We may have some more up-to-date equipment ourselves in case conditions become too difficult—at least on the receiving side."

LA1D will be operational with the following time/frequency schedule; it is thought that it may be difficult to reach to UK on 3.5MHz, but there should be a good chance of 14MHz.

UTC	NDST (Norwegian daylight saving time)	Main Freq.	Reserve Freq. (if QRM bad)
0700–0800	0900–1000	3.508	3.515
0800–0900	1000–1100	14.080	14.094
0900–1000	1100–1200	3.508	3.515
1000–1100	1200–1300	14.080	14.094
1100–1200	1300–1400	3.508	3.515
1200–1300	1400–1500	14.080	14.094

NRHF operate an "antique" net on 3.508MHz c.w. and 3.603MHz a.m. every Saturday from 0730UTC. They call CQ ANT and would be very pleased to hear from British stations running vintage equipment.

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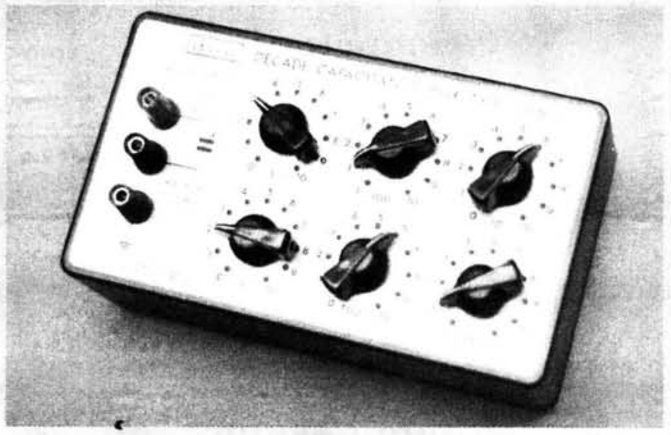
Decade Capacitance Box



Levell Electronics Ltd have added to their range of instruments a Decade Capacitance Box Type CB610. It costs £79 plus VAT.

The CB610 has 6 decades of capacitance from 10pF to 11.11111µF, with an accuracy of ±1%±2pF. Drift is <±0.3%≃1pF in one year below 50nF and <±1% above 50nF. The dissipation factor is <0.002 at 1MHz from 30pF to 1nF, <0.001 at 1kHz on 1nF to 50nF and <0.01 on 50nF to 11µF. Maximum input is 250V d.c., 160V a.c. and 1A at h.f.

The decade capacitors are selected from components with stable dielectrics and the switches have silver plated self-wiping contacts with low losses up to 1MHz. The minimum control setting of 10pF includes the residual capacitance, so the controls indicate total capacitance at all settings.

Levell Electronics Ltd. Moxon Street, Barnet, Herts EN5 5SD.

Rally Calendar

March 13: The Bury Radio Society will be holding their 1988 rally at a new venue. The bigger venue is the Castle Leisure Centre, Bolton Street, Bury. There will be the usual large number of stands, a bring & buy and masses of radio and electronic traders. Talk-in will be on S22. More from: ***M.L. Jamil G1VQE, 29 Harrow Close, Blackford Bridge, Bury.***

March 20: The Tiverton SW Radio Club are holding The Mid Devon Rally at the Pannier Market, Tiverton. There is easy access from junction 27 of the M5 and excellent parking facilities on site. There will be two halls of trade stands, a bring & buy and a mobile snack bar. Talk-in will be on S22. More details from: ***G4TSW. Mid Devon Rally, PO Box 3, Tiverton.***

March 27: A Citizen's Band Radio Rally is being held at Orsett Hall near Grays, Essex. There will be stands for suppliers and clubs to display their wares, a bring and buy section, a raffle and bar facilities. There is free parking for over 400 cars and Orsett House boasts four acres of landscaped gardens and a restaurant (book in advance). Doors open between 10am and 4pm. For further details, contact ***Bob or Pat on 0375 670841.***

April 17: The annual Trafford Rally and Components Fair will be held at the Lancashire County Cricket Ground (Old Trafford), Talbot Road, Old Trafford, Manchester. Doors open at 11am (10.30am for the disabled) and there is free parking for over 1000 cars. All the usual attractions will be there including the bring and buy, a free cash draw, bar and cafeteria. Talk-in will be on S22 using G1TRC. For more details ring ***061-881 3739*** or ***061 748 9804.***

***April 17**: The Trafford ARC are holding the Trafford Rally & Components Fair at the Lancashire County Cricket Ground, Talbot Road, Old Trafford, Manchester. Talk-in on S22 using G1TRC/A. Doors open 11am (10.30am for the disabled).

April 24: The Swansea ARS will hold their 7th Annual Rally in the Swansea Leisure Centre on the A4067, Swansea–Mumbles Coast Road. Note that it's a change of venue. Doors will be open between 10.30am and 5pm. There will be plenty of traders, a bring and buy, bookstall, refreshments, licensed bar and an h.f. station. Talk-in will be by GB2SWR. More details from the rally secretary: ***Roger Williams GW4HSH. Tel: 0792 404422.***

May 1**: The RSGB VHF Convention will be held at Sandown Park Exhibition Centre, Esher, Surrey. All the usual attractions will be there. For more details, contact: ***Les Hawkyard G5HD, The Eyry, Newtown St Petrock, Torrington, North Devon EX38 8LU.

May 2: The 1988 Doncaster Rally will take place at Bircotes Leisure Centre (near Bawtry). Talk-in will be on S22 using G4YRD. More details from ***Audrey Wilson. Tel: 0302 721259.***

May 15**: The Otley ARS are holding the 31st Northern Mobile Rally at the Yorkshire Agricultural Showground, Harrogate. More details from: ***G3CQO. Tel: 0943 602118

***May 22**: The Swindon & District ARC are organising a Radio, Electronics & Hobbies Fair at the Science Museum, Wroughton, Swindon. It is planned to have a model railway swapmeet, model aircraft show and flying display, model boat show and radio control boat pond, model car meet, model steam engine rally and many other hobbies too, as well as amateur radio. They also hope to have helicopter sight-seeing trips, vintage vehicles, traction engines, etc., to keep all the family amused for the day. There is ample free car parking on site. The venue is well sited for access from the M4 and there are AA signs for the Science Museum from the motorway. Gates open at 10am.

May 29**: The East Suffolk Wireless Revival will take place at the Civil Service Sportsground, The Hollies, Straight Road, Ipswich. This is between Bucklesham Road and Felixstowe Road (now the A1156) and adjacent to the Suffolk Showground. Doors open at 10am and there is plenty for all the family to do. More details from: ***Colin Ranson. Tel: Ipswich 688204.

PW and SWM will be in attendance at rallies marked *.

Analogue Multimeter

The Triplett Model 60 Type 2 multimeter can easily withstand drops onto hard surfaces from 1.5m.

It also has full overload protection on all ranges with three fuses and one diode. There is a separate, sealed, battery compartment and a carrying handle that doubles as a tilt stand.

The measurement are displayed on a taut meter with a 115mm scale. Eight ranges of d.c. voltages go from 300mV to 1000V at 20kΩ/V sensitivity and ±1.5% f.s.d. accuracy. Six ranges of a.c. voltages go to 1000V at 5kΩ/V and ±3% f.s.d. accuracy. Direct current is to 1A and alternating current to 300A with an optional adaptor. Five ranges of resistance go to 10mΩ with a "low" centre scale of 12Ω while decibels are from −20 to +62dB.

The cost of the 60 Type 2 is £132.50 plus VAT. For more details, contact:

Alpha Electronics Ltd. Unit 5, Linstock Trading Estate, Wigan Road, Atherton, Manchester M29 0QA.

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Versatile DMM

The new Model 199 System DMM/Scanner, designed for bench or system use, combines two instrument capabilities into one half-rack size, steel-cased package. The mainframe is a complete 6-function (d.c./a.c. volts and amps, ohms and dB) auto/manual ranging, true r.m.s. reading, $5\frac{1}{2}$-digit, IEEE-488 programmable d.m.m.

Key specifications include sensitivities of 1µV, 1mΩ and 100nA. A speed of 150 readings per second is available by selecting a $4\frac{1}{2}$-digit lower-resolution mode. There is an internal 500-reading memory for data logging.

The optional internal 8-channel scanner, Model 1992, offers 2-pole and 4-pole switching at 40 channels per second, with less than 1µV thermal offset in the switch contacts. With the scanner installed, the Model 199 can directly compute the ratio or difference of two values.

Other features include a running average filter that can reduce the effects of external noise; a message display capability that allows a controller to send messages to a non-skilled operator through the 4-digit, 14-segment alpha-numeric d.m.m. display; TRANSLATOR software, which allows the Model 199 to be integrated easily into existing automated test systems using different command formats, and also gives shorter mnemonic commands for improved efficiency when using the IEEE-488 bus.

The Model 199 System DMM costs £745, and the optional Model 1992 scanner a further £250. More details are available from:
Keithley Instruments Ltd., 1-3 Boulton Road, Reading, Berks RG2 0NH. Tel: 0734 861287.

Warnerdale Innovation Programme

Innovation is a natural resource, and this prompted Chris Parker, Engineer and Programmer, to form Warnerdale. His idea was to take the idea of the inventor, or the industrial manager with an eye for technical improvement, add his own expertise, and that of his colleagues and bring their plans to maturity.

The service is comprehensive, embracing technical design consultancy, advice on practical application, prototyping and even limited manufacture. Stage one, inevitably, involves detailed consultation. Stage two is technical design, using Warnerdale's database facilities to build and package a working model.

Chris Parker thinks he understands the needs of the industry. He recognises the needs of management to define problems and allow specialists to come up with the solutions.

For more information on Warnerdale, telephone Chris Parker on 0639 899276, or write to:
Warnerdale Electronics, Unit 44, Port Talbot Workshops, Addision Road, Port Talbot, West Glam SA12 6HZ.

Catalogues

The latest Alpha Electronics catalogue is now available and features a large range of test equipment to suit all kinds of applications and budgets.

Detailed colour-coded sections include digital and analogue multimeters, lightmeters, cable locators, continuity testers amongst others. Manufacturers include such names as Fluke, Avo, Megger, TMK, Black Star and Hitachi to name a few.

For your free copy, complete with price list, telephone: ***0942 873434.***

The latest copy of the Kanga Product Kits catalogue has arrived in the office. Kanga Products is a very small company, run by licensed and active amateurs for amateurs. There are such kits as a 160m s.s.b. transceiver, a dual-band receiver, a t.t.l. clock, r.f. sidetone generator and a variable frequency oscillator to mention a few. For a copy of the catalogue, send to: ***Kanga Products, 3 Limes Road, Folkestone, Kent CT19 4AU.***

We have received the 1988 catalogue from Technical Information Services too. They can supply repair manuals, circuit diagrams, technical manuals and books for all kinds of pieces of equipment and subjects. This is the first time that they have produced such a catalogue, and if you would like a copy, contact: ***Technical Information Services, 76 Church Street, Larkhill, Lanarkshire.***

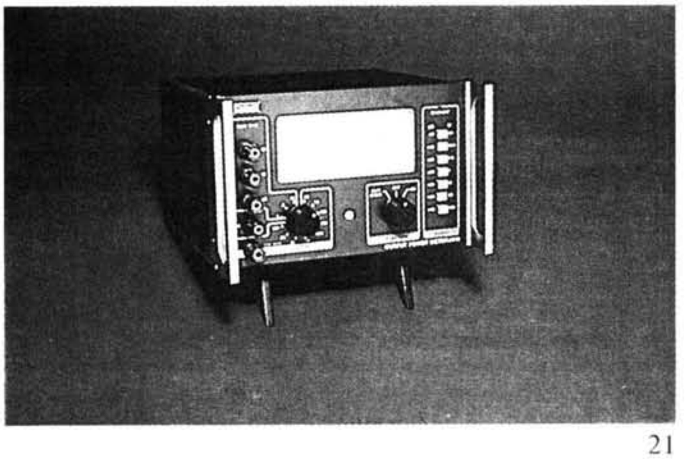
AF Power Meter

Power outputs of up to 150W into 4, 8 and 16Ω loads can be measured directly by the Crotech Type 2018 audio frequency power meter.

It is suitable for measuring the output of amplifiers and other audio circuits. It will measure from 5mW to 150W into standard loads and up to 15W into loads from 50Ω up to 10kΩ. Power measurement accuracy is ±3% of full scale from 20Hz to 20kHz.

Overload protection is provided by an autotrip feature in the 150W range. This is operated when the temperature of the load exceeds 90°C and is indicated by a front-panel overload l.e.d. It is powered by internal 6V batteries and can be used both desk-top and as a rack mounted instrument.

For further details, contact:
Crotech Instruments Ltd. 2 Stephenson Road, St. Ives, Huntingdon, Cambs PE17 4WJ.



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IoM Exhibition

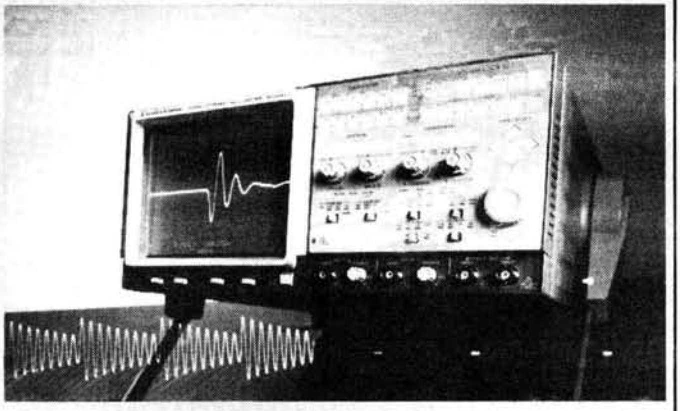
The Isle of Man Radio Club are holding an exhibition on March 20 in the Sea Terminal, Douglas. They are aiming the afternoon (12 to 6pm) at youngsters. There will be demonstration stations and old radios and plenty of home-brew equipment on show.

Help, Please

Further instalments of Chas E. Miller's popular series on Valved Communications Receivers are being held up by the lack of copies of the circuit diagrams, good enough for reproduction in the magazine.

To be usable, the drawings must be reasonably clean. Good photocopies are acceptable, provided they are not made up of sheets joined together with Sellotape. The tape comes out as a black band when the circuit is processed for printing in the magazine!

We are presently looking for circuit diagrams for the following receivers: Collins 75A; Collins TCS; BC348 series; RCA AR-77. If you think you can help, please drop a line to the Editor, Geoff Arnold, PW Publishing Ltd, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.



Digital 'Scope

The digital storage oscilloscope BOS from Rhode & Schwarz can handle single shots or rarely occurring events (e.g. "glitches"), fast signals with low repetition rates, pre-triggered events or very slow signals. This is because it has a built-in IEC/IEEE-bus interface.

The maximum sampling rate of 100MHz and the 10224-word memory make it possible to record a time interval longer than 102μs. The BOS is fitted with a 7in c.r.t. and two cursors aid trace evaluation.

Programming of up to 10 test sequences (with option 45), and front-panel set-ups can be made without an external controller. The memories have a battery back-up so even when the unit is switched off the memory contents are not lost. The screen display can be printed out onto an IEC/IEE compatible digital plotter or an XY recorder.

Licence Fees

The DTI have just announced that the licence fee for amateur radio, both A and B licences, will stay the same at £12. Beacon and repeater licences will also stay at £12 for each station. Citizen's Band radio licences are £12 too.

Out of the 47 different standard types of licences, 25 have changed, so amateur radio has been lucky to be amongst the 22 that have remained the same.

If you would like to know more about licence charges for all kinds of licences then you will need to buy a copy of The Wireless Telegraphy (Licence Charges) (Amendment) Regulations 1988, available from the HMSO.

Morsum Magnificat

This newsletter/booklet is published quarterly to provide international in-depth coverage of all aspects of Morse telegraphy, from its earliest concept to the present time.

In the Winter 1987 issue there are articles written by W3WRE, G8PG, GD3RFH to name a few and cartoons by PA3ALM. Topics range from the historically informative to the easy-reading humorous.

It is for all Morse enthusiasts, amateur or professional, active or retired. One of the aims is to bring together material, which would otherwise be lost to posterity, providing an invaluable source of interest, reference and record relating to the traditions and practice of Morse.

The subscription rates are £6 per annum for the UK and Eire. Cheques should be made payable to Morsum Magnificat and sent to:
Tony Smith G4FAI,
1 Tash Place,
London N11 1PA.

Comtest Series 200

The Comtest Series 200 range consists of three models, the 212, 225 and 250. They are complete data communication troubleshooters for engineers, computer salesmen and those who install, repair or use RS232C/V24 equipment.

The state of the interface is easy to read as the breakout system, monitors and signal description are all on the same line. The line monitors show signal strength and function without battery power. The Model 212 offers all functions needed to locate RS232 interface problems, it monitors the 12 most important lines and has one extra undedicated monitor to test secondary signals.

The Model 225 monitors all 25 signals and has cable and parallel test capabilities. The Model 250 monitors all 25 signals on both interfaces and has convenient null MODEM switching and the pulse trap option built-in as standard. The Comtest Series 200 testers are housed in sturdy ABS plastics case, and the contact system is gold plated. Each model comes with jumper cables and user manual. For more information, contact:
M-Trade (UK) Ltd.,
PO Box 35,
London SW1W 8TX.

Practical Wireless 144MHz QRP Contest—Sunday 12 June 1988

New Telex Course at Portishead

New training courses at British Telecom International's Portishead Radio Station will help customers make more efficient use of maritime communications.

Staff at the station at Highbridge in Somerset are training ship's officers and their shore-based managers in the use of automatic radiotelex. Portishead operates the world's busiest and most advanced automatic radiotelex service for shipping.

With increasing demand for Portishead's service, the courses have been introduced to meet customer training requirements for personnel both at sea and on shore.

The one-day course provides officers and shipping managers with a good working knowledge of all aspects of marine telex operation, leading to faster and more efficient use of communications facilities.

Mr Ernie Croskell, Head of Long Range Services and Station Managers at Portishead Radio, said, "Radiotelex is progressively replacing Morse as the standard form of maritime communication. We believe our courses are helping our customers get the best out of a service which is second to none."

For further details on the courses, telephone ***Portishead Radio on 0278 781111*** and ask for Customer Services.

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Realistic DX-440. Tune into international news, views and entertainment from all over the world! This exciting "Voice Of The World" receiver features PLL synthesized circuitry which locks onto exact frequency so you can enjoy drift-free reception from around the globe. Receives FM stereo and full AM (150-29,999 KHz) including longwave, mediumwave and SW bands. Simply punch in any frequency with the direct-entry keys or use the 9-station memory for even faster access! Features automatic and manual scanning modes to locate any station on the air. With built-in monaural speaker, LCD quartz clock with timer, telescoping aerial and headphone socket. Requires 2 "AA" and 6 "C" batteries or AC/DC adapter.

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PW REVIEW

If you're looking for a pocket sized v.h.f. hand portable transceiver, then this new model from Alinco, the ALX-2E, could be for you. Mike Richards G4WNC takes a look inside.

The ALX-2E from Alinco is a very compact v.h.f. transceiver with many features which should appeal to the amateur who requires a dedicated portable rig.

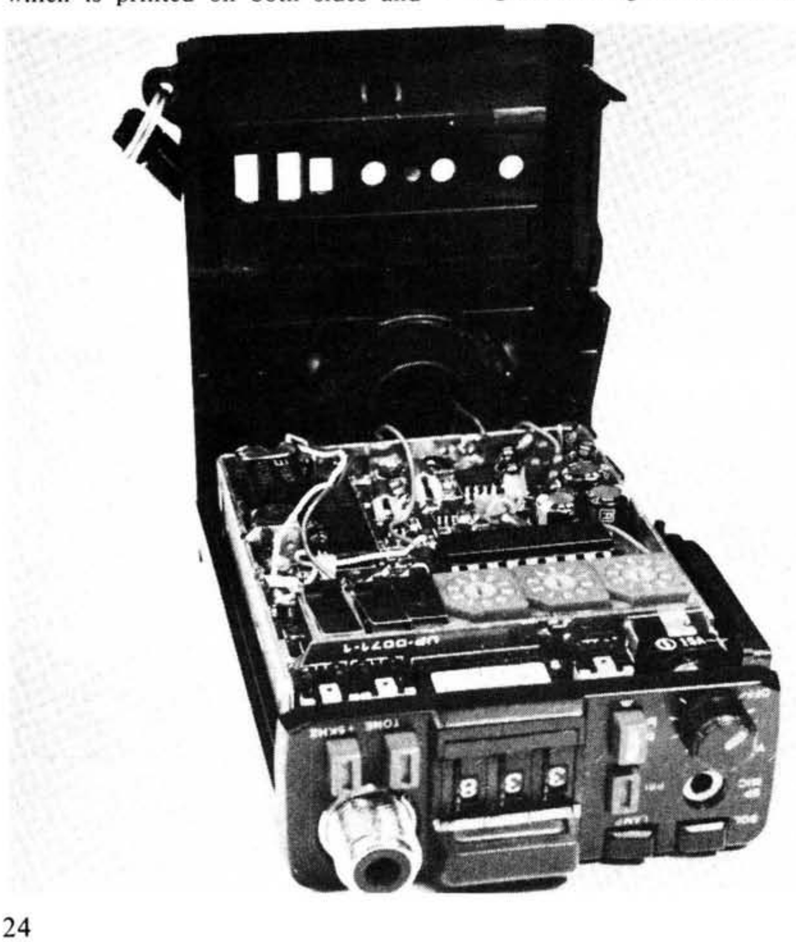
Operation

As this is a specialised portable rig, the connections are very simple. The very compact 85mm rubberised helical antenna screws into a rather unusual antenna socket on the top panel. This socket is very similar to a phono socket except that the outer or screen has a screw thread to ensure a good fit. The reason for using this type of connector appears to be to save valuable space on the top panel. The next job is to connect the supplied battery pack (after it's been charged). The standard EBP-2N 160mAh battery pack is a firm slide fit onto the base of the ALX-2E.

The supplied instruction manual comprises a 265mm × 255mm sheet which is printed on both sides and folded into four making it roughly equivalent to a seven-page A5 booklet. In addition to this manual, there is a full circuit diagram and block schematic. The only other literature supplied was a leaflet describing the various battery packs that are available for the ALX-2E.

All the controls, with the exception of the p.t.t., are located on the top and front panels with no awkward switches tucked away. The only rotary control is the combined volume/on/off switch which is mounted on the top panel and is fitted with an 8mm diameter knob. The squelch level is pre-set, but it can be overridden by depressing a non-locking button on the top panel. The ability to override the squelch can be very useful when working under difficult conditions.

Frequency selection is by three thumb-wheel switches on the top panel. The convention used follows normal practice with the lefthand digit representing units of MHz, the next indicating 100s of kHz and the final digit indicating 10s of kHz. In order to cover the normal 25kHz spaced f.m. channels an extra button is used to add 5kHz to the frequency indicated by the thumb-wheels.



When operating via a repeater it is necessary to introduce a frequency shift so that the transmitter operates 600kHz below the receive frequency. This facility is provided on the ALX-2E and is enabled by a three-way slider switch on the front panel. The central position of this switch is marked S for simplex operation whilst the positions marked + and − introduce either a positive or negative shift of the transmitter frequency. The positive shift position can sometimes be very useful if you want to work in "reverse repeater" mode.

One other essential feature for repeater working is a 1750Hz tone burst, again this feature is included in the ALX-2E and is operated by another non-locking push-button on the top panel. Not only does the tone burst button operate the 1750Hz tone, but it also keys the transmitter which is very convenient.

Another useful feature on the top panel is an illuminated strip immediately above the thumb-wheel switches. This strip is activated either by pressing the lamp button, also on the top panel, or by keying the transmitter. When the transmitter is keyed the strip shows a red light whilst if activated by the lamp button in receive mode a green light shows.

As well as the main frequency selection via thumb-wheels the ALX-2E has a very useful memory channel feature. The memory frequency is selected in a similar manner to the main frequency

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but using three miniature rotary switches on the front panel. These miniature ten-way switches are operated by using a small screwdriver blade, fortunately the required tool is incorporated on the hand strap making adjustment very easy. As with the main thumb-wheels an extra switch is provided to enable the addition of 5kHz where necessary.

The selection of either main or memory frequency is achieved using a locking push-button on the top panel, this enables the operator to change frequencies very quickly which can be handy. Another feature associated with the memory is the priority function. When this is activated the receiver will monitor the priority channel every 1½ seconds and emit a "beep" to alert the operator when a signal is detected, the priority frequency being whichever of the two pre-set frequencies is not in use. The priority feature can be very useful, for example to monitor the local repeater whilst listening to a QSO on a different frequency.

The final switch on the front panel controls the transmitter power and the battery economy circuit. This switch has three positions: the first selects high power for the transmitter and activates the battery save circuit. The second position leaves the battery save on, but also reduces the transmitter output power. The final position disables the battery save and selects high transmitter power. These combinations seem to be well chosen and should prove very useful, particularly when using the ALX-2E in remote locations for extended periods.

For those of you who prefer to operate using a speaker/mic there is a 1.5mm stereo jack on the top panel carrying the necessary connections.

Circuit Description

A modern synthesised 144MHz transceiver is obviously a fairly complicated piece of equipment so I will describe the main functional blocks rather than a full circuit description.

Taking the receiver first, the signal from the antenna is fed to a bipolar r.f. amplifier via a diode switch and low pass filter. The r.f. amplifier output is then coupled to a f.e.t. mixer and 16.9MHz filter to produce the first i.f. This i.f. is further amplified before passing to a BA4114 combined i.f. amplifier and n.b.f.m. demodulator. This integrated circuit contains the second local oscillator and mixer which produces the 455kHz second i.f. This second i.f. is filtered once more before finally being demodulated. The audio signal is then fed to an LM386 audio amplifier via the volume control and pre-amp. The resultant high level audio signal is connected to the 25mm internal speaker via the speaker/mic jack on the top panel.

The transmitter chain starts with the microphone signal which can be either from the internal electret element or from the speaker/mic. The low level audio signal is first amplified by an automatic level controlled amplifier to reduce the dynamic range. This amplified signal is then limited and filtered before being passed to the reactance modulated v.c.o. (voltage controlled oscillator). The v.c.o. frequency is controlled by the local oscillator phase locked loop and runs at half the output frequency, i.e. 72MHz.

The v.c.o. output is then fed to a frequency doubler before being amplified and filtered. The final amplification is achieved using a power module which is coupled to the antenna via a diode switch and low pass filter. The high/low power switching is achieved in the pre-driver stages.

The local oscillator signals are derived using diode switched crystals and a dedicated phase locked loop/divider integrated circuit.

The battery saving circuit is worthy of mention and works by enabling the receiver for only ½ second in every 2½ seconds. This reduces the receiver power consumption from about 25mA to 6mA, a worth while saving.

Performance

The ALX-2E has performed very well throughout the review period of several weeks. One point to remember is that the ALX-2E is a dedicated portable rig and as such has no facility for accepting external power. The type of antenna socket used may also prove

★ SPECIFICATIONS

Frequency coverage:	144–145.995MHz (140.005–149.995MHz)
Signal type:	F3
Antenna impedance:	50Ω
Power requirement	Receive, battery save off 25mA (24mA). Receive, battery save on 8mA (6mA). Transmit, High power 750mA (980mA). Transmit, Low power 350mA (420mA)
Dimensions:	66mm × 150mm × 28mm
Weight:	240g
TRANSMITTER	
Output power:	High 2.0W (2.2W) Low 400mW (400mW)
Modulation reactance:	Max. deviation ±5kHz
Spurious radiation:	-60dB (-62dB 2nd harmonic)
RECEIVER	
Reception system:	Double superheterodyne
Intermediate Frequency:	1st 16.9MHz, 2nd 455kHz
Sensitivity:	0.25µV (0.22µV) for 12dB SINAD. Signal/noise 26dB (25dB) at 0.5µV input
Squelch sensitivity:	0.25µV (0.2µV)
Selectivity:	-6dB ±7.5kHz (±12kHz). -60dB ±15kHz (±28kHz)
Audio Output:	200mW (170mW) for 10% t.h.d. 8Ω

Measured results are shown in brackets and were taken using the EBP-3N 450mAh battery with a fully charged voltage of 7.5V.

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to be a problem if you want to connect an external antenna, though I have heard that there is a BNC converter on the market.

As with all miniature rigs the control panels are quite crowded and may create problems for anyone with thick fingers, though I personally found most of the controls to be well placed and easy to use. The only change that would slightly improve the layout, is to reverse the positions of the 5kHz and tone-burst switches.

The technical performance of the ALX-2E is worthy of some comment. The results of the laboratory tests agreed with the manufacturer's figures on most counts, with the majority of the discrepancies explained by different supply voltages. The only major difference occurred with the selectivity measurements. My normal technique is to apply a 60% modulated on-channel signal at a level adjusted to produce 15dB SINAD. A second signal generator is then set 6dB higher than the first and tuned towards the channel frequency until the SINAD is reduced to 12dB. The process is then repeated from below the channel. The result of this test gives the ±6dB frequencies, the 60dB point is measured using the same technique but with the second generator level set 60dB higher. Unfortunately the manufacturer's measurement technique was not specified so a direct comparison is rather unfair. The selectivity results obtained from the lab tests were actually quite satisfactory for a portable transceiver. The 6dB selectivity at ±12kHz is rather wider than normal, but this would only really cause problems if channel spacing was 12.5kHz as opposed to the normal 25kHz. The 60dB figure although not particularly good should not cause any serious problems with the rig's intended use.

The transmit and receive frequency coverage of the ALX-2E was 140.005MHz to 149.995MHz, rather wide for the 144MHz band! The receive sensitivity was well maintained throughout most of this extended band, dropping off rapidly below 141MHz.

The supplied protective case, although cleverly designed with a separate section for the battery, made the operation of some of the controls rather awkward. This problem could probably be overcome by attacking the case with a sharp knife, but this type of remedy shouldn't really be necessary.

Conclusion

Overall I think that the ALX-2E is quite a useful rig for dedicated portable use. I'm sure many users will find the memory channel and priority working to be a boon on RAYNET exercises and the like. The battery saving circuitry was also very effective and is a valuable if not essential feature on a modern portable transceiver.

One point which will need special care is the extended frequency coverage of the ALX-2E which makes out of band transmission frighteningly easy!

My thanks to ***Waters and Stanton, 18-20 Main Road, Hockley, Essex SS5 4QS*** for the loan of the Alinco ALX-2E. The rig costs £189.

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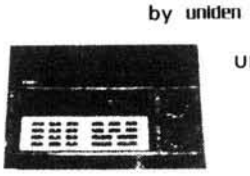

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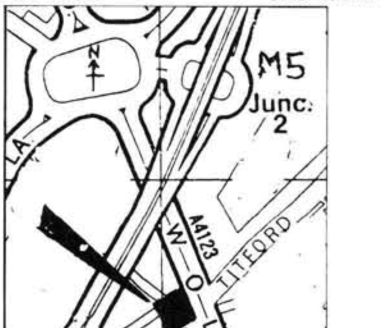

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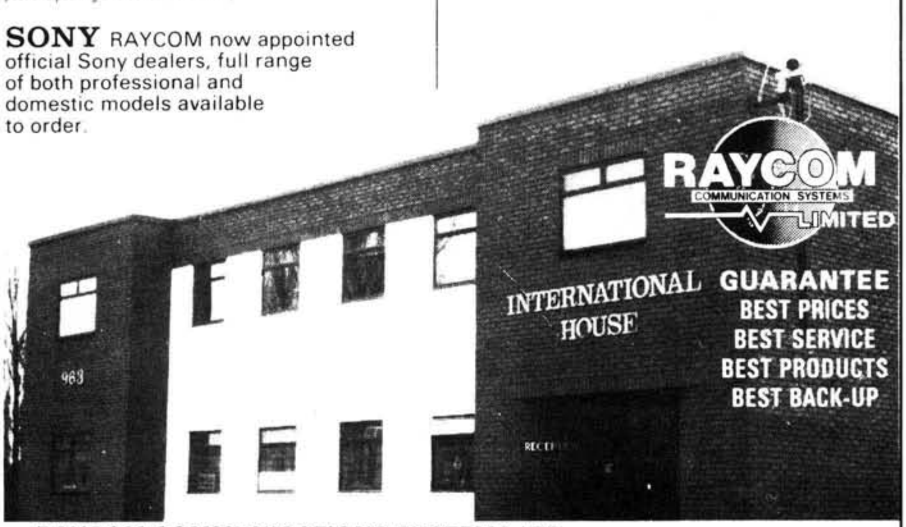

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Earlier in this series we talked about the gain of an antenna and its relation to the aperture. Now we'll have a look at how to achieve gain and the relationship between gain and the directional properties of an antenna says A. J. Harwood C Eng MIERE G4HHZ.

Making Waves-A Guide to Propagation

Part 5—Gaining direction

To begin with let's consider the half wavelength dipole which we will use as a reference, although we could if we wished use the isotropic source. The dipole itself has a directional radiation pattern in the plane containing the dipole's length. It radiates omnidirectionally in the plane at right angles to this as shown in Fig. 5.1. To calculate the radiation pattern of the dipole involves some fairly difficult mathematics, but the result is that in any direction the field strength relative to the maximum is given by the equation:

$$E = \frac{E_0 \times \cos(\pi/2 \times \sin(\theta))}{\cos(\theta)}$$

where the maximum field strength is E_0 (usually taken as one) and is in the direction at ninety degrees to the dipole's length ($\theta = 0$). When plotted in polar form, this equation results in the familiar figure of eight pattern. The plane parallel to the dipole is the one containing the E field, so it is referred to as the E plane. The field that is perpendicular to the dipole is called the H plane. Similarly, we can refer to the E and H plane polar diagrams. For the dipole the E pattern is the figure of eight and the H pattern is circular.

As an example of a more complex antenna system, let's consider what happens when we take two dipoles and feed each of them with power. In the case I've chosen (Fig. 5.2), the two dipoles are placed parallel and separated by a distance d. The current in each dipole is in phase since they are equidistant from the feedpoint. In order to relate back to the single dipole fed with a current I, this current is assumed to be:

$$\frac{I}{\sqrt{2}}$$

This is done so as to make the total radiated power the same for the dipole and for the pair of dipoles. For the single dipole, the radiated power is $I^2 \times R$. For the pair, each radiates $(I/\sqrt{2})^2 \times R$, giving a total power of $I^2 \times R$ where R is the radiation resistance which, as we saw in Part 2, is 73.2Ω. Each dipole will therefore produce a field strength

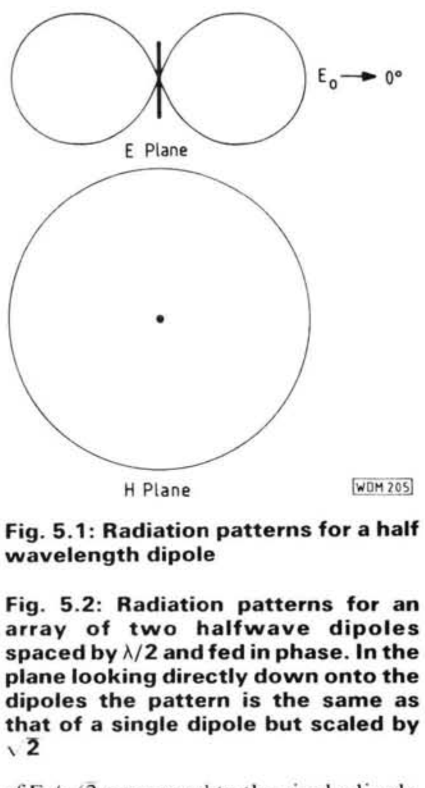
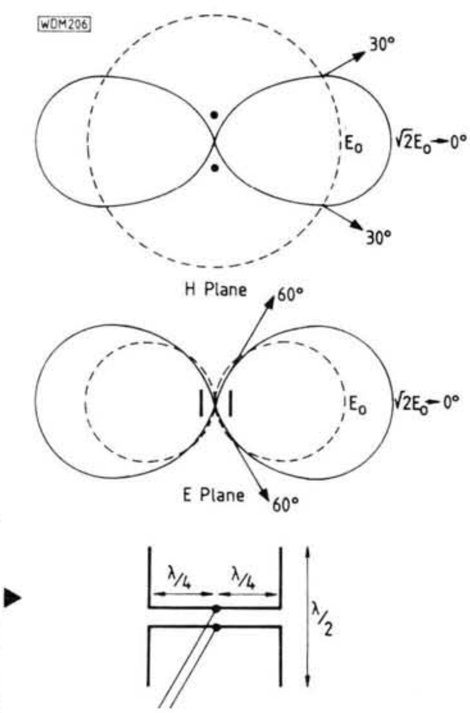


Fig. 5.1: Radiation patterns for a half wavelength dipole

Fig. 5.2: Radiation patterns for an array of two halfwave dipoles spaced by λ/2 and fed in phase. In the plane looking directly down onto the dipoles the pattern is the same as that of a single dipole but scaled by √2 ▶



of $E_0/\sqrt{2}$ compared to the single dipole and the maximum field strength we can get is $e_0 2/\sqrt{2}$ or $\sqrt{2} \times e_0$. We can also deduce that the power gain of the array is 2.

Commonsense tells us that if we look directly down on the dipoles, we have done nothing to alter the radiation pattern. So for the pair, the E plane diagram is the same as that of a single dipole but with an increase of field strength of $\sqrt{2} \times e_0$ in all directions. What about in the H plane where we are looking at the dipoles end on?

One way of looking at this is to consider the waves from each of the dipoles some distance away, and to calculate the total field strength due to the pair. The distance is measured along a line which is at an angle to the line joining the two dipoles, it passes through the mid-point of the pair as shown in Fig. 5.3. Using the mid-point as a reference results in a pattern for which, at a given distance in any direction from the point, the resultant wave is in phase. The point is therefore called the phase centre of the array.

If we consider the phases of the two waves and refer them to this mid point, one wave will have travelled the distance from the mid-point to the receiving point less the distance $d \times \sin(\theta)/2$ and the other by a correspondingly longer distance. This distance is equal to a phase difference of:

$$\frac{2\pi/\lambda \times d \times \sin(\theta)}{2} \text{ radians}$$

$$\text{or } \frac{180 \times d \sin(\theta)}{2} \text{ degrees}$$

The two waves are therefore twice this difference apart in phase as shown in Fig. 5.3b. The magnitude of the received wave is given by the sum of these two waves taking into account their phase difference, their vector sum. This is given by the length of the diagonal of the parallelogram whose sides are drawn equivalent to the size of the waves, which in this case are equal, and where the angle between them is their total phase difference and is:

$$E = E_0 \times \sqrt{2}\cos\left(\frac{\pi \times d}{\lambda} \times \sin(\theta)\right)$$

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We now have an equation relating wave size and direction in the H plane. In the direction at right angles to the line joining the two dipoles, the magnitude is greatest and is $\sqrt{2}$ as we anticipated earlier. Remember, this gain is compared to a single dipole radiating the same power, so again we can see that the antenna has a power gain of 2 in this direction. The pattern is obviously different for different values of d and a frequently used case occurs when d is one half wavelength. The equation for the H pattern then becomes:

$$E = E_0 \times \sqrt{2}\cos\left(\frac{\pi}{2} \times \sin(\theta)\right)$$

Plotting the patterns to scale on common axes (see Fig.5.2), shows that while the array has a gain over the dipole for values of between 0 and 30 degrees, for larger angles the dipole produces greater field strengths. The array in effect spreads the power over a narrower angle and consequently is said to have a narrower pattern. In general, the greater the gain of an array then the narrower is the pattern.

If θ is 90 degrees then the answer is 0, so the array radiates nothing along the line joining the dipoles and the maximum broadside on to this direction; it is referred to as a broadside array. For other spacings, if d is smaller than a half wavelength there is always some radiation in all directions; whilst if d is made larger than a wavelength the pattern becomes a number of lobes whose size and direction is dependent on d with the maximum radiation always in the direction $\theta = 0$ degrees.

This analysis assumes that the current in each dipole is always in phase with the voltage across its terminals but in practice this isn't so. The current in one also induces a current in the other since they have a mutual impedance as well as their own input impedance—they are after all fairly closely spaced. This also has an effect on the radiation pattern and the gain.

For the array we have just considered, the gain is in fact at a maximum of almost 3 when $d = 0.65\lambda$, with the pattern becoming narrower. As a first approach, however, the method mentioned is a good way of getting an idea of the pattern. The principle can be used for any array of radiating sources. The pattern can be calculated by finding the magnitude and phase of each contribution in all directions and then adding these contributions vectorially. In fact, this is the way the pattern of the dipole itself is calculated.

There is yet a third pattern (shown in Fig.5.2), also an E plane pattern, in the plane containing their lengths and this can be calculated by a similar process to be:

$$E = \frac{\sqrt{2} \times E_0 \times \sin(\pi/2 \times \cos(\theta)) \times \cos(\pi/2 \times \sin(\theta))}{\cos(\theta)}$$

when the spacing is a half wavelength and is similar, but narrower than the dipole pattern. The gain over the dipole is greater than one for values of θ between ± 60 degrees.

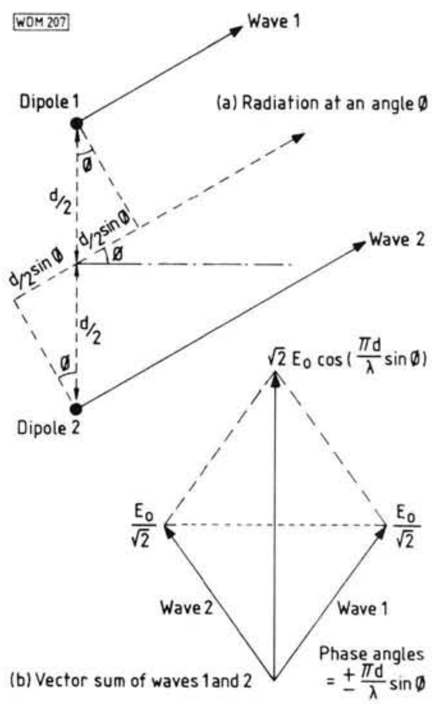

Fig. 5.3: At angles other than 0 degrees, the two waves from the dipoles differ in phase by an amount depending on the angle and spacing. The vector sum of the two waves results in the radiation pattern

We can, of course, get a different pattern by either feeding the array differently or by adopting a different layout. If we reverse the connections to one of the dipoles, then the pattern changes completely. With d a half wavelength, there is no radiation at right angles to the dipoles ($\theta = 0$ or 180) since the waves from the two dipoles are in antiphase in these directions whilst there is now a maximum along the line joining them. The array has become an endfire one and equations for the E and H patterns are given by:

$$E_H = \frac{E_0 \times \sqrt{2} \times \sin(\pi/2 \times \cos(\theta)) \times \cos(\pi/2 \times \sin(\theta))}{\cos\theta}$$

$$E_H = E_0\sqrt{2} \times \sin(\pi/2 \times \sin(\theta))$$

Another way of arranging the dipoles is to place them in a straight line, referred to as a collinear array, and once again we can feed them either in or out of phase. The radiation patterns are:

Co-phased (fig.5.4)

$$E = \frac{E_0 \times \sqrt{2} \times \cos(\pi/2 \times \sin(\theta)) \times \cos(\pi/2 \times \sin(\theta))}{\cos(\theta)}$$

Anti-phased

$$E = \frac{E_0 \times \sqrt{2} \times \sin(\pi/2 \times \sin(\theta)) \times \cos(\pi/2 \times \sin(\theta))}{\cos(\theta)}$$

In either case, the H plane pattern is, of course, circular. When the dipoles are co-phased, the pattern is identical to that of a full wave dipole fed at the centre.

An interesting case is where the two are fed not quite in phase and the direction of maximum radiation is moved from the direction at right angles to the array as shown in Fig.5.4, when the direction of maximum radiation is moved to a direction given by:

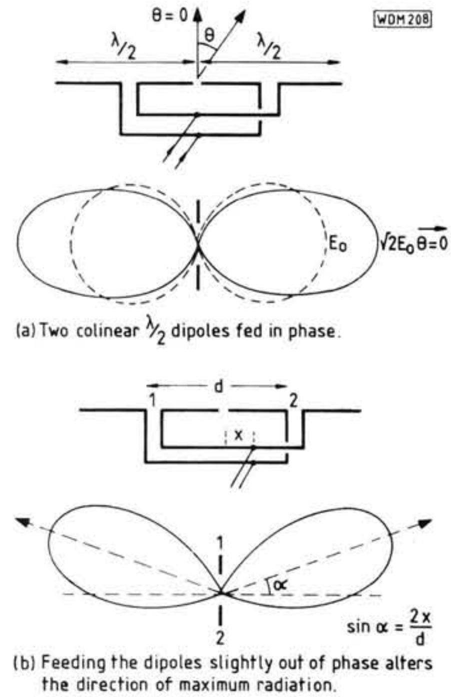

Fig. 5.4: Two collinear dipoles fed in phase have a gain of 2 in the E plane and a pattern which is identical to that of a full wave dipole. The direction of maximum radiation can be altered by moving the feed point

$$\sin\alpha = 2 \times x/d$$

This principle is a very valuable tool for the antenna designer, and can be extended to larger arrays consisting of many elements each of which is fed separately. It can allow the direction of radiation of a short wave array, erected between two fixed masts, to be altered simply by moving the feed point—a practice called slewing. A high power u.h.f. television antenna usually has its maximum radiation directed slightly below the horizontal in order to put the maximum signal into the service area, a technique referred to as beam tilt.

The bigger an array is made, then the greater is its gain and the narrower its pattern. In the case of arrays made up entirely of co-phased dipoles, the greatest gain is n for n dipoles. In the case where the array is built of a number of elements in two dimensions, and where the area occupied is A square metres, then the isotropic gain approaches that we found earlier for an illuminated aperture. It is given by:

$$G = 4\pi \times A/\lambda^2$$

The gain relative to a half wave dipole can be found by dividing this value by 1.64.

There are also some rules which give an approximate idea of the directivity of an antenna in terms of its dimensions when these become fairly large in terms of the operating wavelength. If an array has a particular dimension D

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then its pattern in the plane containing D consists of a main lobe and a number of sidelobes separated by minima. The main lobe can be described in terms of the angular width from the direction of maximum radiation to the first of these minima and the relationship between D and angle θ is:

$\theta = \lambda/d$ radians or

$180 \times \lambda/\pi \times D$ degrees

The minima being spaced by approximately half this angle. The points where the gain has dropped to a half of this value (corresponding to a field strength of $1/\sqrt{2}$), occur approximately half way between the direction of maximum radiation and the first minimum. This is shown in Fig.5.5, with the polar diagram plotted this time in linear rather than polar form.

In the examples used previously, each element has been considered as having power applied to it, usually referred to as driven elements. This does not always have to be the case, putting an element reasonably close to one which is radiating will cause a current to flow in the non-driven element and it will then radiate and is referred to as a parasitic element. The magnitude of the current will be very close to that of the driven element for the sort of spacings likely to be used in practice, and the relative phase is determined by the length of the element and the spacing from the driven one.

A well known case is that of the dipole and reflector, where the parasitic element is positioned about a quarter wavelength from the driven one. It is also made slightly longer than

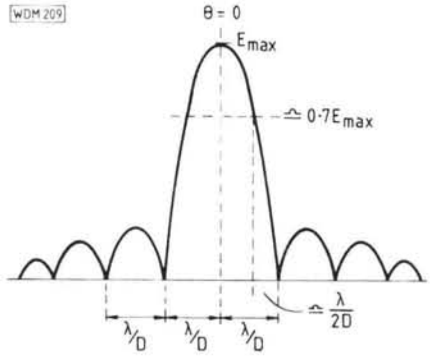

Fig. 5.5: The radiation pattern of a large co-phased array or aperture of length D approximates to that shown here

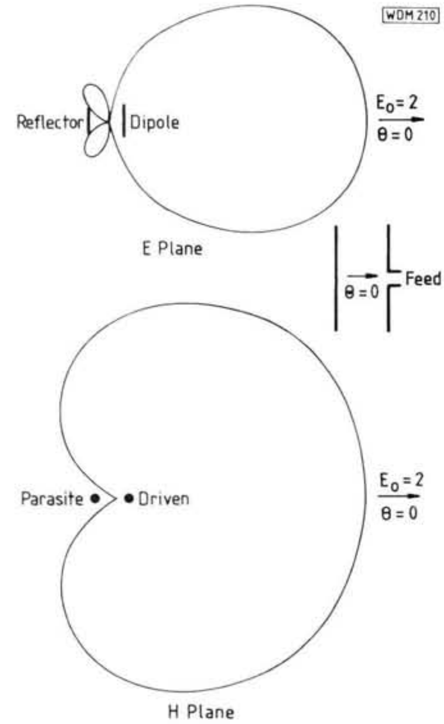

Fig. 5.6: Radiation patterns of an array consisting of a driven half wave dipole and parasitic reflector spaced by a quarter wave length

a quarter wavelength, the combination of spacing and length aims to make the current in the parasite lead that in the driven element by 90 degrees. Assuming this to be true, then the E and H patterns are as shown in Fig.5.6. The array is an end-fire one with no radiation in the direction dipole-to-parasite, and maximum forward radiation in the parasite to dipole direction. All power is radiated in the forward direction and the gain rises to 4, which makes this arrangement a compact array with quite high gain. Since the parasitic behaves as if it reflects backward radiation in a way which increases the forward signal, it is called a reflector.

More gain can be obtained by adding further parasitic elements, referred to as directors, with spacing and lengths such that there is an increase in radiation in the forward direction. Such an array is, of course, the well-known Yagi.

Control of the radiation pattern is a powerful tool in the hands of the communications engineer, and in the next article we'll see how it is used in the design of a transmission system.

A few errors crept into the February part of Making Waves.

Column 1 should have read:

$$P_r = P_t \times G_t \times G_r \times \left(\frac{\lambda}{4\pi \times D}\right)^2$$

and

$$\left(\frac{\lambda}{4\pi \times D}\right)^2$$

And column 2 should have read:

$$P_t \times G_t = \frac{P_r}{G_r} \times \left(\frac{4\pi \times D}{\lambda}\right)^2$$

$$P_t \times G_t = \frac{(7 \times 10^{-12})}{2860} \times \left(\frac{4\pi \times 3.9 \times 10^7}{0.025}\right)^2$$

Short Wave Magazine Short Wave Magazine

NITON RADIO

The British Telecom radio station at Niton on the Isle of Wight dates back to 1909. Since then it has seen many changes and Elaine Richards looks at its long and varied history.

COMPETITION

Win a Lowe HF-125 short wave receiver worth £375.

REGULARS

Airband, Scanning, Seen & Heard, Grassroots, What Receiver, Bookcase.

REVIEW

Peter Shore looks at the Sony PRO80 hand-held scanning receiver

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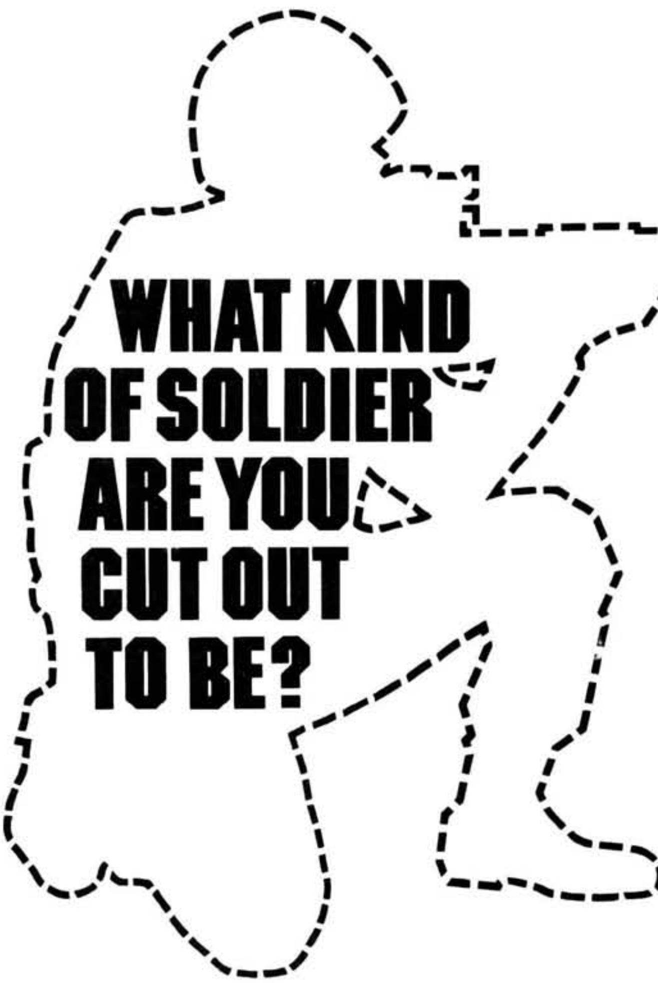

Special Telegraphists are fully trained in the use of sophisticated equipment in the related fields of military communications and communications security. Skills learnt include morse code, teleprinter touch typing and the operating of high grade receivers and direction finding equipment. Other careers in communications include Radio Telegraphist, Data Telegraphist, Radio Relay Operator and Technicians.

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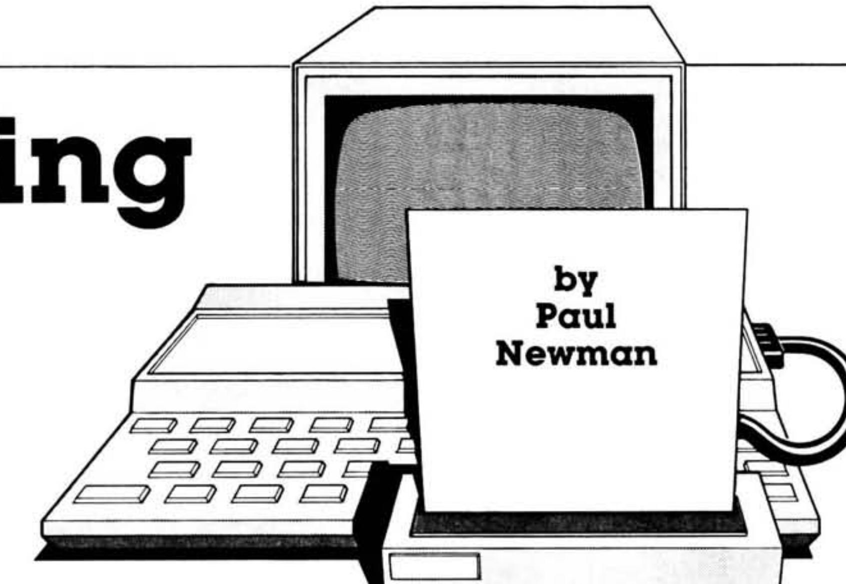
Computing Corner



Our main item this month is a Packet Radio Terminal program for the Amstrad CPC range, sent by Saku OH1KH and modified slightly by myself. I hope I have Anglicised the messages accurately!

Pertii OH2VZ wrote concerning difficulties in contacting the MSX radio software supplier "MSX Software Shack" mentioned in November 1987 *PW*. So far as I'm aware, the information I gave was correct and I hope they answer you soon Pertii, in the meantime all MSX users should find something of interest in the JEP catalogue (1). If anyone does succeed in contacting MSXSS then please let me know, for the benefit of other users. Atari 520/1040ST SSTV decoding seems to be their most recent addition.

An IBM PC and XT "FAX-1" facsimile decoding system has been launched in Italy and published samples seem to be quite impressive. A Meteosat version is available although I'm unsure of the additional hardware required other than the 450K of RAM! The sample Meteosat frame (of Northern Italy under a virtually cloudless sky) is better than most I've seen(2).

Also reaching me from Italy is a Commodore C64 program to drive the Kantronics Pacterm unit via an RS232 unit. It's a fairly short listing and although all accompanying text is Italian, I'm sure operation will be fairly self-evident. Anyone interested can contact me(3).

P A Electronic Services(4) produce a BBC-B, B+ and Master FAX decoder and software with a variety of options including definition quality and number of colours. I'll be pleased to hear from any users of this system.

Several readers wrote concerning the listing of the AMT-2 "tiny" terminal program for the QL published several issues ago. Although I had not noticed it myself, the line numbers in the published listing were incorrect, causing problems in reproducing it. Anyone having problems is invited to contact me—I'll willingly supply a fresh listing together with another which might help you too.

John G1FTU informs me that most of his programs should be available in Spectrum Plus-3 formats by the time you read this; Technical Software programs should be available in this format by now too.

And now to the main program listing. This terminal program is designed for use with the Amstrad CPC range, the Amstrad RS232 interface and a TNC2A Packet terminal unit. Doubtless other terminals could be controlled with few, if any, modifications.

The listing is supplied complete, but for convenience you should run the first section to set up and save the machine-code section, and then use DELETE 10-790 to remove the un-

```
10 DATA F3,3E,11,CD,6F,32,21,91,30,CD,55,32,3E,01,CD,5F2
20 DATA B4,BB,26,00,16,4F,2E,00,1E,13,CD,66,BB,3E,02,487
30 DATA CD,B4,BB,26,00,16,4F,2E,16,1E,18,CD,66,BB,3E,56D
40 DATA 03,CD,B4,BB,26,00,16,4F,2E,15,1E,15,CD,66,BB,52E
50 DATA 21,9B,30,CD,55,32,21,EC,30,CD,17,32,30,FB,21,5DF
60 DATA 4A,30,E5,CD,F1,30,C4,1A,31,CD,09,BB,D0,FE,FC,8B7
70 DATA 20,08,E1,3E,13,CD,6F,32,FB,C9,FE,F3,CA,9D,32,816
80 DATA FE,F1,CA,42,33,FE,F0,CA,F9,33,F5,3E,02,CD,B4,9CB
90 DATA BB,F1,FE,7F,CC,B6,33,C4,08,31,FE,0D,C2,8A,32,864
100 DATA F5,3E,0A,CD,5A,BB,F1,C3,8A,32,04,02,1C,00,00,5B1
110 DATA 00,1D,00,00,FF,50,41,43,4B,45,54,20,52,41,44,3CB
120 DATA 49,4F,20,54,45,52,4D,49,4E,41,4C,20,56,31,2E,3E9
130 DATA 31,20,20,4F,70,74,3A,20,46,49,4C,45,28,F0,29,45F
140 DATA 20,43,57,49,44,28,F3,29,20,4D,45,4D,4F,28,F1,4F2
150 DATA 29,20,45,4E,44,28,65,73,63,29,20,20,A4,20,4F,3FF
160 DATA 48,31,4B,48,20,2D,38,37,0D,0A,FF,1B,40,1B,3E,392
170 DATA 0D,C5,01,DD,FA,ED,78,CB,47,28,03,0B,ED,78,C1,77D
180 DATA C9,FE,11,28,12,FE,13,28,0E,FE,20,30,06,FE,0E,5B9
190 DATA D0,FE,07,D8,CD,5A,BB,C9,32,9C,32,C9,F5,3E,01,855
200 DATA CD,B4,BB,F1,FE,0D,CD,7D,31,CC,A5,31,CD,00,31,853
210 DATA C9,00,00,00,00,00,00,00,00,00,00,00,00,00,00,0C9
220 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,000
230 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,000
240 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,000
250 DATA 00,00,00,00,00,00,00,00,00,00,00,00,0D,0A,20,037
260 DATA 3C,55,41,3E,0D,0A,E5,D5,C5,F5,21,2E,31,11,2D,559
270 DATA 31,01,4F,00,ED,B0,F1,32,7C,31,C1,D1,E1,C9,E5,80F
280 DATA C5,F5,21,2D,31,06,4F,AF,77,23,10,FC,F1,C1,E1,776
290 DATA C9,E5,D5,C5,F5,21,2D,31,3E,2A,06,4F,BE,28,08,667
300 DATA 23,10,FA,F1,C1,D1,E1,C9,C5,E5,11,F9,31,01,C6,906
310 DATA 31,C5,18,14,11,03,32,01,D1,31,E1,E5,C5,18,09,517
320 DATA 11,0D,32,01,F2,31,E1,E5,C5,01,09,00,1A,ED,A1,5B1
330 DATA E2,E7,31,C0,13,18,F6,C1,E1,E5,CD,17,32,3E,0A,7C0
340 DATA CD,5A,BB,E1,C1,CD,94,31,18,BD,2A,2A,2A,20,43,6CC
350 DATA 4F,4E,4E,45,43,2A,2A,2A,20,44,49,53,43,4F,4E,3D1
360 DATA 2A,2A,2A,20,4C,49,4E,4B,45,44,7E,E5,F5,FE,07,5B2
370 DATA 28,05,CD,2B,BD,30,36,F1,E1,23,FE,0D,20,ED,3E,693
380 DATA 0D,CD,2B,BD,30,F9,3E,0A,CD,2B,BD,30,F9,37,C9,711
390 DATA 0D,0A,50,72,69,6E,74,65,72,20,69,73,20,6F,66,4EC
400 DATA 66,6C,69,6E,65,21,20,20,07,0D,0A,FF,E5,F5,18,57E
410 DATA 08,3E,02,CD,B4,BB,21,3A,32,7E,23,FE,FF,C4,5A,6CD
420 DATA BB,20,F7,F1,E1,37,3F,C9,C5,F5,01,DD,FA,ED,78,9DA
430 DATA CB,57,28,FA,F1,0B,ED,79,C1,C9,7E,FE,FF,C8,CD,A40
440 DATA 6F,32,23,18,F6,F5,3A,9C,32,FE,13,28,06,F1,CD,6CC
450 DATA 6F,32,37,C9,F1,37,3F,C9,11,E5,D5,C5,F5,21,CF,846
460 DATA 32,CD,80,32,11,68,10,21,DF,32,7E,23,47,FE,FF,651
470 DATA 28,10,D5,1B,7A,B3,20,FB,D1,10,F7,3E,44,CD,6F,706
480 DATA 32,18,E9,21,DA,32,CD,80,32,F1,C1,D1,E1,C9,13,81F
490 DATA 03,0D,03,43,41,4C,49,0D,4B,FF,51,4B,0D,11,FF,43C
```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wanted section. Alter the commented lines with your own details and save the resulting BASIC under a suitable name.

Switch off completely and make sure the RS232 and Packet units are connected. Switch on and enter RUN "Packet" (or whatever name you chose). This should load the BASIC followed by the machine-code. If the printer is not online, you will be reminded until it is so before you can proceed further.

Typed text appears in the bottom section of the screen beneath the reminder line whilst received text is scrolled in the top section. The display is in 80 column mode. Controls (other than normal character-keys and "control" keys) are:

The up-arrow cursor key will make the program ask for a filename to be loaded from disc. This must be an ASCII-file otherwise a "bad command" error will be given. If present the file will be read and sent to the terminal unit. To illustrate this, do SAVE "PACKET.ASC",A after you have saved the original listing. Giving this filename at the prompt will send the program-listing to the terminal unit. ASCII-files with embedded control characters are liable to cause bizarre results or even crashes so beware.

The down-arrow cursor key will prompt you for a memo message of less than 80 characters. Any message entered will be sent to the printer allowing you to make notes during use. The CLR key aborts this and the DEL key operates.

The right-arrow key sends a c.w.-id although I'm unsure exactly how this operates.

Pressing F-keys 3 or 6 will place the stored message into the transmit area. Similar messages can be placed into the other keys by editing the original listing. In this case don't forget to add a linefeed to each—see the original listing.

The program could also be used with most intelligent terminals, for RTTY for example. I tested the program by connecting my Spectrum Plus-3 to the Amstrad serial unit and LLISTing a program which was displayed on the Amstrad monitor. Similarly, any terminal unit which sends and receives ASCII will operate satisfactorily. In this case other serial speeds and bit formats (5,6,7 or 8 bits; parity, etc.) can be set with the SETSIO line in the main listing; the Amstrad serial interfaces' operating manual explains this.

The Listing

In forthcoming articles, I hope to be covering the use and programming of one of the latest "intelligent" terminal-units including, I hope, FAX reception. I shall attempt to cover its use with a variety of micros in the hope that this will enable users of most leading machines to extend operation into the areas without having to wait for hard-to-get software.

Some time ago, I received a sample of a ZX81 "Comlink" which gives a ZX81 the ability to communicate with modems and packet-radio terminal units. Unfortunately, the volunteer was unable through pressure of work to carry out the promised review. If you would like to help my carrying out a review then please write to me at the address below. I'll be happy to cooperate in the writing of course. I feel that the ZX81 is under-estimated and could still fulfill a useful role in the shack.

I recently received advance information of an entirely software based Packet system for the Spectrum computer and hope to be able to review this soon. Also promised was information on a Spectrum picture system that "will beat most SSTV systems" (their words not mine!). More news next time I hope.

Finally, thank you all for your letters over the past months. I'm pleased that these articles are found useful. If you have any ideas for features that you would like to see, then please write in either direct or via Practical Wireless Editorial office. 73 until next time.

References

1. JEP Electronics, New Road Complex, New Road, Kidderminster DY10 1AL. SAE for catalogue.
2. R Fontana, Str. Ricchiardo 13, 10040 CUMIANA (TO), Italy.
3. Paul Newman G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ. SAE with all enquiries please.
4. P A Electronic Services, 464 Whippendell Road, Watford, Herts WD1 7PT.


```
500 DATA 0A,03,01,03,01,03,03,01,01,01,01,01,01,01,03,022
510 DATA 01,01,03,01,03,01,03,01,03,03,03,01,01,01,03,01D
520 DATA 03,01,01,01,01,01,01,01,FF,0D,0A,45,6E,74,65,2AC
530 DATA 72,20,75,72,20,4D,53,47,20,28,6D,61,78,20,38,466
540 DATA 30,20,63,68,72,2E,43,4C,52,20,74,6F,20,61,62,482
550 DATA 6F,72,74,2E,2E,2E,20,44,45,4C,20,62,61,63,6B,485
560 DATA 73,70,63,2E,29,3A,0D,0A,FF,AF,32,C8,33,E5,C5,673
570 DATA F5,3E,13,CD,8A,32,3E,02,CD,B4,BB,3A,C8,33,FE,77E
580 DATA 00,20,05,21,06,33,18,07,FE,01,20,36.21,C9,33,310
590 DATA CD,55,32,CD,94,31,21,2D,31,06,4F,CD,09,BB,30,57B
600 DATA FB,FE,10,28,1F,FE,7F,28,2C,FE,0D,CD,5A,BB,77,785
610 DATA 28,03,23,10,E8,21,2D,31,3A,C8,33,FE,00,CC,17,4DB
620 DATA 32,FE,01,CC,01,34,CD,94,31,3E,0A,CD,5A,BB,3E,62C
630 DATA 11,CD,8A,32,F1,C1,E1,C9,78,FE,4F,30,C2,2B,04,7DC
640 DATA CD,B6,33,18,BB,F5,3E,08,CD.5A,BB,3E,20,CD,5A,72B
650 DATA BB,3E,08,CD,5A,BB,F1,C9,00,47,69,76,65,20,66,6AE
660 DATA 69,6C,65,6E,61,6D,65,20,74,6F,20,73,65,6E,64,5A8
670 DATA 2E,2E,61,73,63,69,69,20,6F,6E,6C,79,20,28,43,4D2
680 DATA 4C,52,20,61,62,6F,72,74,29,3A,20,FF,3E,01,32,4C9
690 DATA C8,33,C3,46,33,3E,0A,CD,5A,BB,3E,0D,CD,5A,BB,68E
700 DATA 3E,11,CD,6F,32,3E,4F,90,47,11,46,34,CD,77,BC,5AC
710 DATA C8,30,25,CD,80,BC,30,20,F5,CD,F1,30,C4,1A.31,768
720 DATA F1,CD,8A,32,30,F3,F5,3E,02,CD,B4,BB,F1,CD,5A,926
730 DATA BB,CD,09,BB,30,DF,FE,10,20,DB,CD,7D,BC,C9,00,833
740 N=15:A=&3000:L=10:WHILE L<740:GOSUB 750:WEND:GOTO 790
750 CS=0:FOR X=1 TO N:READ V$:V=VAL("&"+V$):POKE A,V
760 CS=CS+V:A=A+1:NEXT:READ C$:C=VAL("&"+C$)
770 IF C<>CS THEN PRINT" DATA ERROR IN LINE",L:END
780 L=L+10:RETURN
790 SAVE "packet.bin",B,&3000,&450:STOP
800 '
810 KEY 139,CHR$(10)+CHR$(13):REM <ENTER> defined as <1f> <cr>
820 '
830  KEY  131,"My name is xxxx,  qth is yyyy  ZZ99ZZ."+CHR$(13):REM
Your name/qth etc on F3-key
840 '
850 KEY 134,"Hr: IC730/dipole (80w)"+CHR$(13)+"TNC2a/Amstrad CPC
6128 micro program by OH1KH"+CHR$(13):REM details on F6-key
860 '
870 KEY 130,CHR$(13) +CHR$(13)+ CHR$(13)+ CHR$(13)+ CHR$(13)+
CHR$(13)+CHR$(13)+CHR$(13):REM F2-KEY gives 8 linefeeds to clear
bottom screen area.
880 '
890 '----------- load MC --------------
900 '
910 MEMORY &2FFF:LOAD"packet.bin",&3000
920 |SETSIO,300,300,0,8,0,2
930 ON BREAK CONT
940 CALL &3000
950 CLS
```


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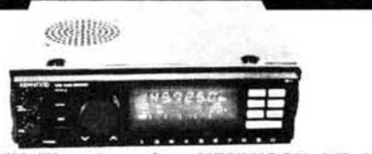

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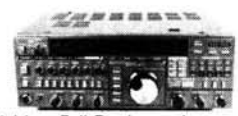

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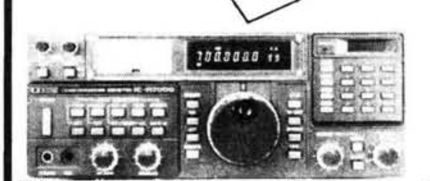

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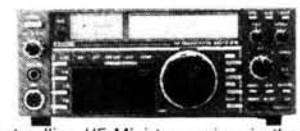

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CN410M 3.5-150MHz SWR/PWR	£58.00
CN460M 140-450MHz SWR/PWR	£62.00
NS448 900-1300MHz SWR/PWR	£86.00
MS660PA 1.8-150MHz SWR/PEP + RMS & Averaging meter	£115.00
30/300/3 kW	
U66VN 140-525MHz (NS660P)	£55.00
CNW727 Dual Band Aerial Tuner & SWR/PWR Meter	£110.00
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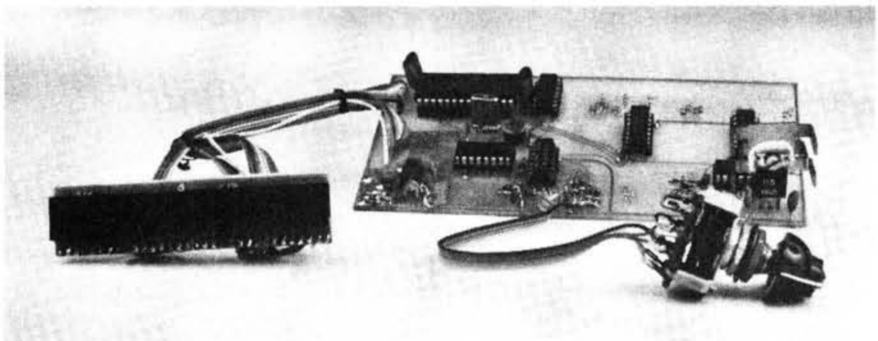
This latest project from The Kanga Gang takes a novel and elegant approach to a problem that has dogged home constructors for years, that of accurately displaying a transmitter's or receiver's operating frequency, while taking into account almost any i.f. offset frequency.



Digital dial prototype, note that IC1,2 must not be mounted in sockets as this will affect their h.f. performance

A Less Complex Digital Dial

The two biggest problems when designing a new transceiver are a suitable gearbox to reduce the tuning rate and an accurate method of displaying the frequency being used. This article concerns the digital dial that formed part of an all-band, all-mode QSK transceiver which has been constructed by several members of the Gang. It has saved the immense amount of work generally associated with making a complete pre-settable counter assembly, and hopefully through its publication it will save someone else going to all that trouble as well.

When we first came across the need for the digital dial we thought the device used in the older Yaesu models could be used. This was a complete pre-settable counter chip, but on investigation it was found that the hundreds of kHz digit was unpre-settable. This did not matter in Yaesu gear due to the odd i.f. used, but in our rig using 9MHz it was imperative. Many hours were spent trying to trace a suitable device but without any luck, so in the end we decided to revert to the pre-settable counter . . . Then the old brain box started to work.

In the majority of designs the local oscillator is run h.f. of the signal frequency to avoid various problems.

It is therefore necessary to subtract the i.f. frequency from the oscillator frequency. Standard counter chips such as the MSL7216 work up to 10MHz but without offset facility. What if we were to "swallow" the i.f. frequency from the input frequency and only allow the remainder to reach the 7216? In effect we would display the received frequency. With a simple bit of logic decoding we would be able to change the "swallowed" chunk of signal to suit the mode in use, i.e. 9.0015MHz for l.s.b., 8.8993 for c.w., 9.0000 for f.m. and a.m., and 8.9985 for u.s.b.

The resulting circuit is far more compact and simple than the presettable counter would have been and not a very great difference in price. The big problem at the time of writing was the 7216, but Maplin Electronics came to the rescue here with the 7216D. Although this device is relatively expensive, it proved a worthwhile investment, making the finished project reasonably compact and uncomplicated.

Swallow Counter

The problem in "swallowing" the i.f. offset frequency was that we had to have the swallow counter synchronised with the main counter. In other words when the counter wanted to start counting the input signal to the swallow counter had to start from all zeros.

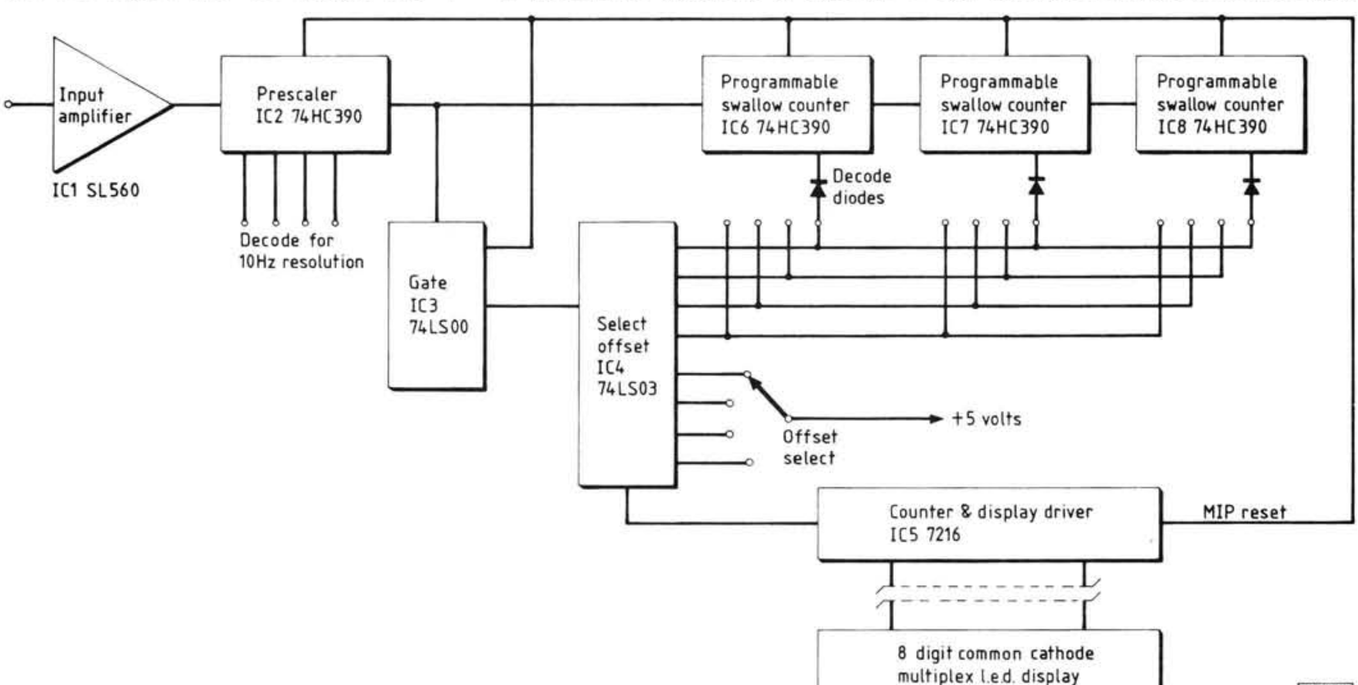


Fig. 1: Block diagram of digital dial with i.f. offset capability

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Luckily for us the designer of the 7216 decided that it would be a good idea to have an output so that external circuitry could be synchronised. This output is called the $\overline{MIP}$, or measurement in progress output. This pin is at zero volts when the main counter is in the count mode and at 5 volts when in the waiting mode.

If this $\overline{MIP}$ line was connected to the reset lines of the swallow counter, the counter could only count when the $\overline{MIP}$ line was low and would be reset to zero when the 7216 finished its count.

Having outlined that action we will jump to the input of the counter. The input signal varies between 11.8MHz when the set is on 1.8MHz (160m) and 39MHz when on the top range of 28MHz (10m). The amplitude of the signal to be counted is no problem as it comes from the local oscillator but the frequency range is fairly large. To make the interface problem as simple as possible we have used a SL560 wideband amplifier, and with the devices used so far these give reliable output to above 40MHz. This signal is divided by 10 using one half of a 74HC390. The resulting signal is then passed to the swallow counter and via the gating circuit to the main counter. We started off requiring to swallow 9 001 500 pulses (in the l.s.b. mode), but having prescaled by 10 it is now 900 150 pulses. But because we are going to run the 7216 in the 100ms count-period mode, the number of pulses have again been reduced by a factor of ten leaving a swallow count of 90 015.

As mentioned earlier at the beginning of the count period the signal is passed to the swallow counter but inhibited from the 7216 main counter. Both counters are at zero. When 90 015 pulses have been fed into the swallow counter a pulse is generated by the diode AND gate on the swallow counter "Q" outputs, this pulse is used

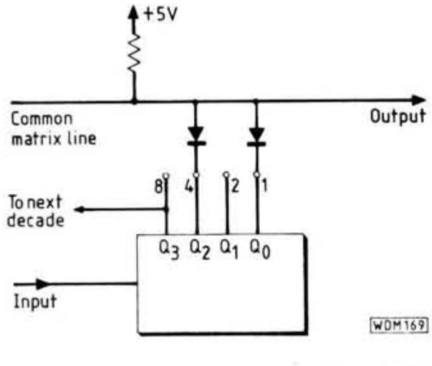

Fig. 3: Example of decoding "5" using decade counter

to switch the signal into the main counter. At first it was thought necessary to inhibit the signal to the swallow counter, but it was soon realised that this was not necessary as any further pulses would have no effect on the gate circuitry. The remaining pulses are counted by the main counter and will display the received frequency. The 74LS03 wired OR gate is used to select the required offset for the mode in use by selecting the correct pulse from the diode matrix.

Provision for four offsets is provided and in many cases this will be too many. If one of the unused offsets is gated for zero offset by not including any diodes the counter will read the input frequency. If the unit is included in a transceiver it would be worthwhile including an input on the front panel to enable the counter to be used as a piece of test equipment when not being used on the air. Although it only has a resolution of 100Hz, this is often sufficient in amateur shacks.

Adjustable Offsets

The diode matrix has been drilled for the Kanga transceiver offsets, but room has been left for any offset right up to 40MHz. All that is necessary is to include the diodes in each decade to select the figure required. If, for example, the figure 5 is required, insert one diode cathode into 4 and another into 1, with the anodes connected to the common matrix line. The figure 5 will then be selected for that decade. Other offsets can be catered for, by connecting extra diodes between the common matrix lines and each of the required decades.

Table 1: Binary coded decimal truth table

Input pulses	8 Q_3	4 Q_2	2 Q_1	1 Q_0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

Clarification of Switching Pulse Generation

A single decade of the swallow counter is shown in Fig. 3, at the commencement of the count all the "Q" outputs are at zero. The diodes are therefore all conducting and the output is at about 0.5 volts, logic *0*. As pulses arrive the outputs change state as shown in Table 1. As shown in Fig. 3, two diodes are connected, one on "Q_0" and the other on "Q_2". On arrival of the first pulse "Q_0" goes to logic *1* but although diode 1 stops conducting, diode 2 is still conducting so the output remains at logic *0*. On arrival of the second pulse "Q_0" goes logic *0* but "Q_1" goes logic *1*; both diodes are still conducting so the output remains at logic *0*. On arrival of the third pulse both "Q_0" and "Q_1" are at logic *1* and diode 1 stops conducting, but diode 2 is still conducting, holding the output at logic *0*. On arrival of the fourth pulse "Q_0" and "Q_1" go to logic *0* but "Q_2" goes to logic *1*; diode 2 stops conducting but still the output stays at logic *0* as now diode "1" is conducting.

(Where the heck is all this leading?) On arrival of the fifth pulse (ah! here it is!) "Q_0" goes to logic *1*, "Q_1" goes to logic *0* and "Q_2" goes to logic *1*; both

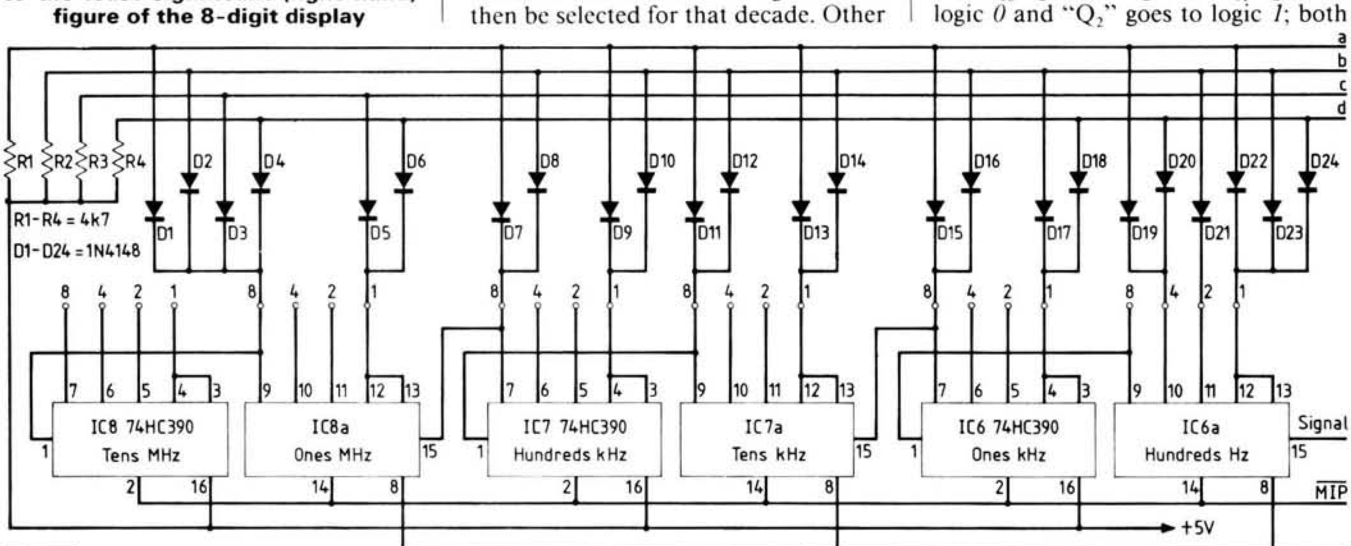

Fig. 2: Circuit diagram with simplified display detail, note that digit 0 output from IC5 (Fig. 5) is connected to the least significant (right hand) figure of the 8-digit display

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AMATEUR HF BEACONS

The beacons shown on the chart can provide an excellent clue to band conditions hour by hour, and are a valuable aid to propagation research. Many of the beacons are co-ordinated under the auspices of the International Amateur Radio Union (IARU) in the International Beacon Project (IBP).

Most operational beacons transmit continuously, identifying themselves by means of their callsign, keyed in slow Morse. The majority use on/off keying (mode A1A), but some use frequency shift keying or f.s.k. (mode F1A). Tuning a receiver to the "wrong" side of an f.s.k. signal produces unreadable Morse characters, as it is the spaces which will be heard, rather than the marks of the signal. By adjusting the receiver tuning so that the pitch of the received note falls, a different received note will be heard filling the gaps in the first signal. This new note is the correct signal, which can be tuned for a comfortable listening pitch.

Many beacons in the USA's sphere of influence include the suffix /B or /BCN at the end of their callsign.

The output power of each beacon may be anything from one or two watts upwards, generally to an omni-directional antenna, though a few beacons use directional antennas. World-wide reception of operational beacons cannot therefore be expected, even under favourable propagation conditions.

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Frequency (MHz)	Callsign	Location
10.144	DK0WCY	
14.100	4U1UN	New York
14.100	4X4TU	Tel Aviv
14.100	CT3B	Funchal
14.100	JA2IGY	Ise City
14.100	KH6O	Honolulu, Hawaii
14.100	LU4AA	Buenos Aires
14.100	OH2B	Espoo
14.100	W6WX	Stanford, CA
14.100	ZS6DN	Pretoria
28.050	PY2GOB	Sao Paulo
28.175	VE3TEN	Ottawa
28.195	IY4M	Bologna
28.200	GB3SXE	Crowborough
28.200	KF4MS	St Petersburg, FL
28.201	LU8ED	Buenos Aires
28.2025	ZS5VHF	Durban
28.205	DL0IGI	Mt Predigtstuhl
28.2075	W8FKL	Venice, FL
28.208	WA1IOB	Marlboro, MA
28.210	3B8MS	Tamarin Fall
28.210	K4KMZ	Elizabethtown, KY
28.212	ZD9GI	Gough Island
28.212	EA6RCM	Palma, Majorca
28.215	GB3RAL	Slough, Berks
28.215	LU4XI	Cape Horn
28.217	WB9VMY	Oklahoma City
28.220	5B4CY	Zyyi, Cyprus
28.222	W9UXO	Chicago, IL
28.2225	HG2BHA	Tapolca, Hungary
28.2275	EA6AU	Palma, Majorca
28.230	ZL2MHF	Mt Climie
28.232	KD4EC	Jupiter, FL
28.232	W7JPI	Sonoita, AZ
28.235	VP9BA	Hamilton, Bermuda
28.2375	LA5TEN	Oslo
28.240	5Z4ERR	Kiambu, Kenya
28.240	OA4CK	Lima, Peru
28.242	LU4FM	Rosario
28.2425	ZS1CTB	Cape Town
28.245	A92C	Bahrain
28.247	EA3JA	Barcelona
28.248	K1BZ	Belfast, ME
28.250	4N3ZHK	Mt Kum, Yugoslavia
28.250	Z21ANB	Bulawayo
28.252	WB4JHS	Durham, NC
28.253	OH2TEN	Finland
28.255	LU1UG	General Pico
28.257	DK0TEN	Konstanz
28.260	VK5WI	Adelaide
28.262	VK2RSY	Dural, Nr Sydney
28.264	VK6RWA	Perth, WA
28.266	KB4UPI	Birmingham, AL
28.266	VK6RTW	Albany, WA
28.268	VK8VF	Darwin
28.2685	W9KFO	Eaton, IN
28.270	VK4RTL	Townsville
28.270	ZS6PW	Pretoria
28.272	9L1FTN	Freetown
28.275	AL7GQ	Jackson, MS
28.277	DF0AAB	Kiel
28.280	LU8EB	Buenos Aires?
28.280	YV5AYV	Caracas

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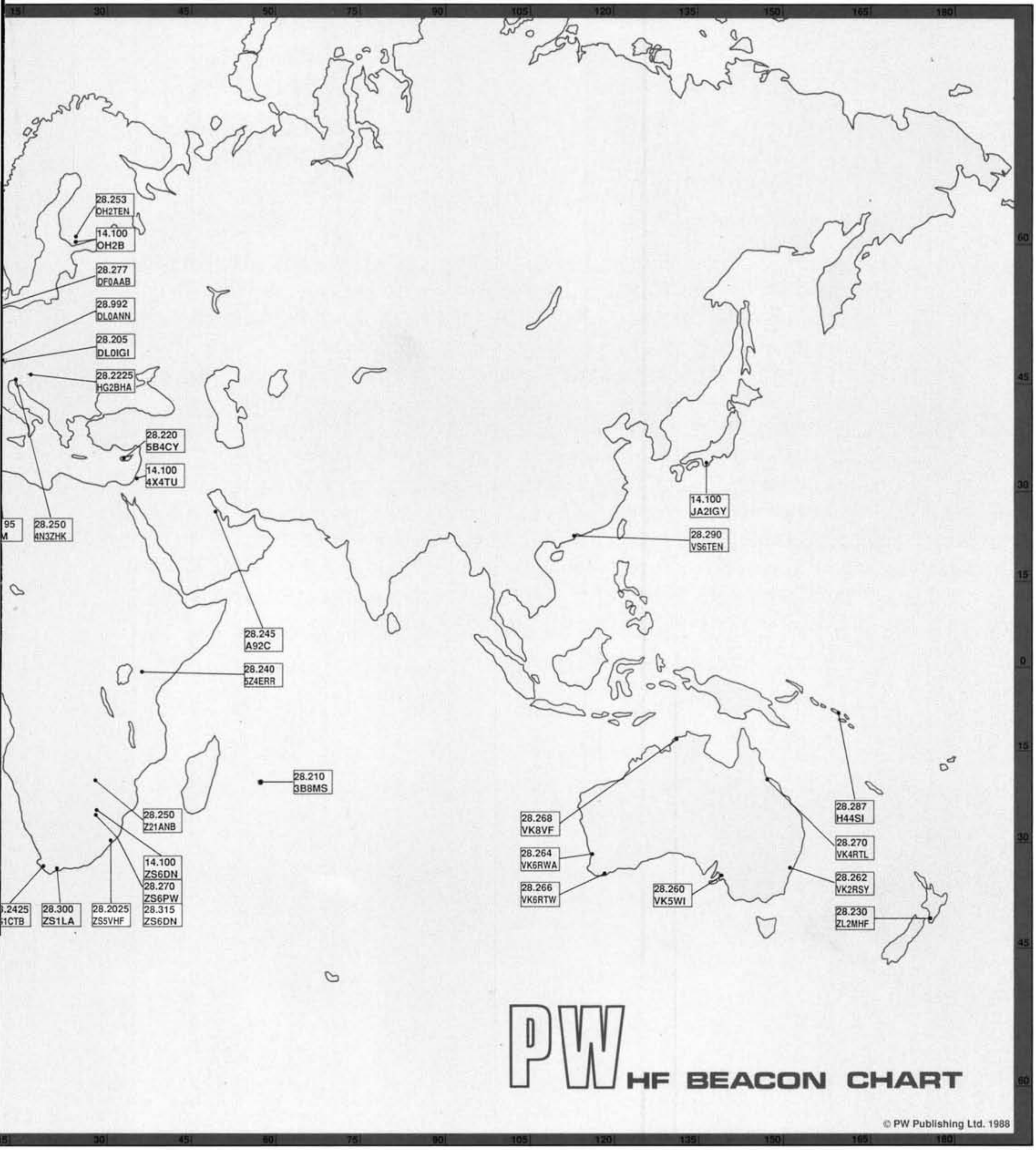

Frequency (MHz)	Callsign	Location
28.281	VE1MUF	Newfoundland
28.284	VP8ADE	Adelaide Island
28.286	KA1YE	Rochester, NY
28.287	H44SI	Honiara, Solomon Is
28.287	W8OMV	Ashville, NC
28.288	W2NZH	Moorestown, NJ
28.290	VS6TEN	Mount Matilda, HK
28.292	LU2FFV	San Jorge
28.295	WB4DJS	Ft. Lauderdale
28.295	WB8UPN	Cincinnati
28.296	W3VD	Laurel, MD
28.299	PY2AMI	Sao Paulo
28.300	VE2MO	Quebec
28.300	ZS1LA	Still Bay
28.301	VE2HOT	Quebec
28.315	ZS6DN	Irene
28.888	W9IRT	Hollywood
28.890	WD9GOE	Freeburg, IL
28.992	DL0ANN	Mt Moritzberg

14MHz (20m) BEACON CHAIN

The chain of beacons on 14.100MHz, sponsored and supported by the Northern California DX Foundation (NCDXF), transmit in sequence every 10 minutes as shown below, commencing on the hour, then at H+10min, H+20min, etc.

Time	Callsign	Location
T+0min	4U1UN	New York
T+1min	W6WX	Stanford, CA
T+2min	K6HO	Honolulu
T+3min	JA2IGY	Ise City
T+4min	4X4TU	Tel Aviv
T+5min	OH2B	Espoo
T+6min	CT3B	Funchal
T+7min	ZS6DN	Pretoria
T+8min	LU4AA	Buenos Aires
T+9min	Silent	Reserved

NOTE: The frequency 21.150MHz is reserved for a similar chain of beacons to be established in the 15m band.

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ABOUT THIS CHART

This chart shows the operating frequencies and callsigns of all beacons which may be heard in the h.f. amateur bands. Not all the beacons were necessarily operational at the date the chart was compiled (January 1988). Reports of beacons heard appear every month in PW in the "Propagation" section of "On the Air".

Published lists of h.f. amateur band beacons, tend to some extent to conflict in the details they provide. This chart has been compiled from data supplied by various sources including the RSGB, the ARRL, Alan Taylor G3DME (IBP Co-ordinator), and readers of Practical Wireless. Their assistance is gratefully acknowledged.

Information on exact geographical location is sadly lacking for many amateur h.f. beacons, but within the limitations of the scale of the chart, all beacons are believed to be accurately placed. Corrections to position, callsign or frequency details, based on good information, would be welcomed for incorporation in future editions of the chart. Please address them to the Editor, Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP, quoting the source of your information.

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diodes stop conducting and at last the output goes to logic *1*. On arrival of the sixth pulse "Q_0" will go to logic *0* and pull the output down to logic *0* . . . The output will remain at logic *0* until pulse 15 (remember the dividers are decades) when both "Q_0" and "Q_2" will be at logic *1* and a pulse will be produced. If several of these decades are cascaded it will be evident that when all the "Q" outputs that are connected with diodes to the common matrix line are at logic *1* a pulse will be produced, but only when all "Q" outputs are at logic *1*.

Switching Circuit

The four pulses, one on each line, have to be selected at will and for this we use a quad NAND gate with open collector ouputs. The "normal" level on each data line is 0 volts and the pulse goes to +5 volts for one half-cycle of the input signal. If we connect each data line to one of the inputs on each of the four gates, and pull the other input of each gate to 0 volts via a resistor, all the gates will be off and the output level at +5 volts. None of the pulses from any of the four lines will be passed to the output. If we now apply +5 volts to one of the inputs that is connected to zero volts via a resistor, this will enable the other input of that gate to pass any positive-going pulse. The gate, being an inverter, will show this pulse on its output as a negative-going pulse with a pulse length of one half-cycle of the input frequency. This will set the bistable and pass the remainder of the signal during the current count cycle to the main counter.

At the end of the count period the $\overline{\text{MIP}}$ line goes to +5 volts and this resets all the counters on the board, resets the bistable, and updates the display. At the commencement of the next count cycle, the $\overline{\text{MIP}}$ line goes low, the input signal is passed to the swallow counter and the cycle is repeated.

Conclusion

A very simple action really, and we hope not too difficult to grasp! The fact is that it works well and when one

SHOPPING LIST

Resistors
0.25W 2% Metal film

220Ω	4	R5–8
4.7kΩ	5	R1–4,9
10kΩ	3	R10,12,13
10MΩ	1	R11

Capacitors

Sub-miniature ceramic disc		
10nF	5	C2–6
Miniature polyester		
0.1µF	3	C1,10
Sub-miniature ceramic plate		
47pF	1	C11
Foil trimmer		
5–60pF	1	C9
Tantalum bead		
4.7µF	2	C7,8

Semiconductors
Diodes

OA91	2	D25,26
1N4148	24	D1–24,27

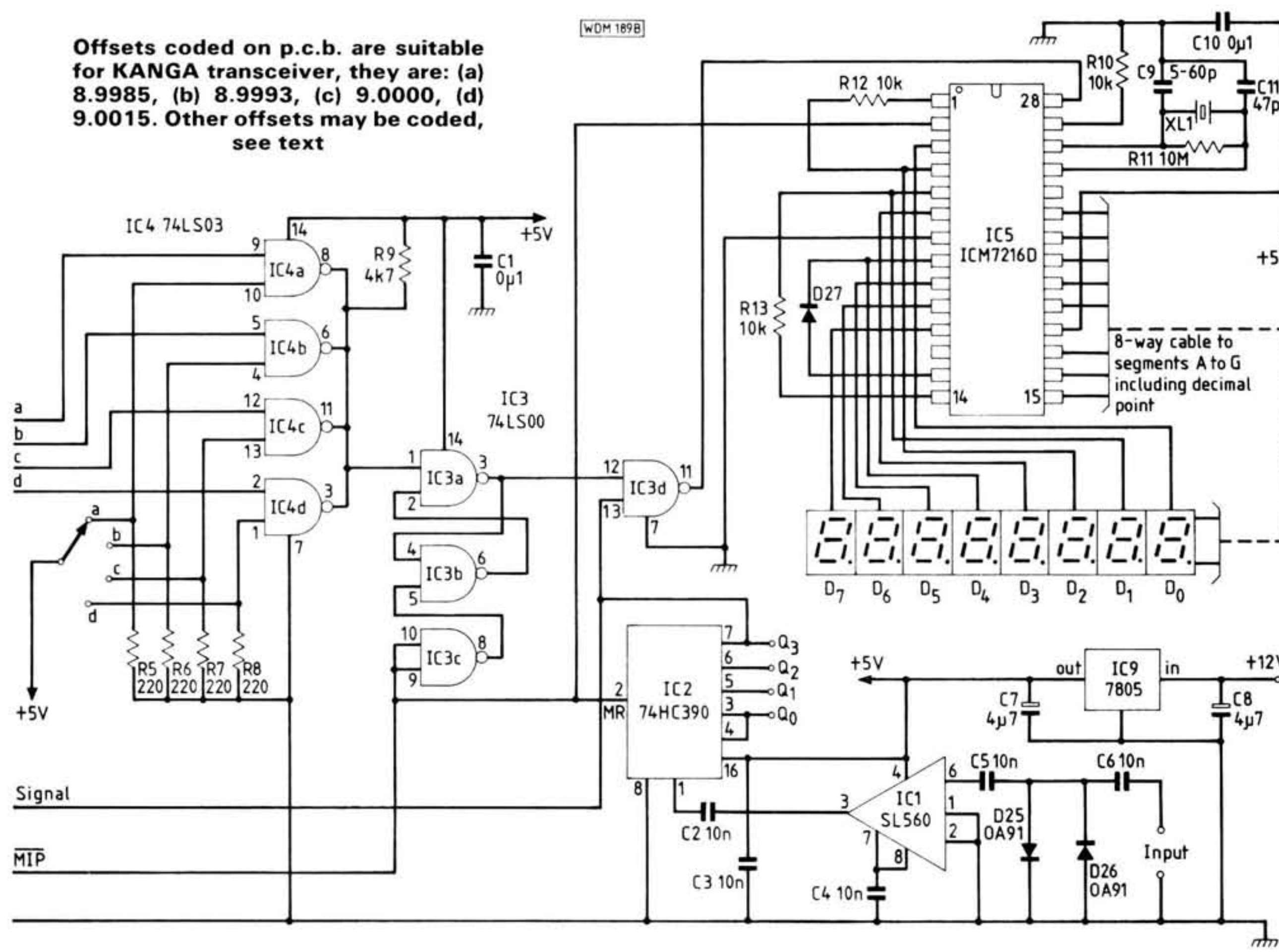
4 digit 0.5in high red l.e.d. common cathode multiplexed display (2) (RS 587-507 or similar)

Integrated circuits

ICM7216D	1	IC5
SL560	1	IC1
74LS00	1	IC3
74LS03	1	IC4
74HC390	4	IC2,6–8
7805	1	IC9

Miscellaneous
XL1 10MHz HC18/U crystal; 28 pin d.i.l. socket (1); 14 pin d.i.l. i.c. socket (2); 16 pin d.i.l. i.c. socket (3); 1 pole 4-way rotary switch; p.c.b.; 8 way ribbon cable.

How Much? & How Difficult?
£66.50
Advanced



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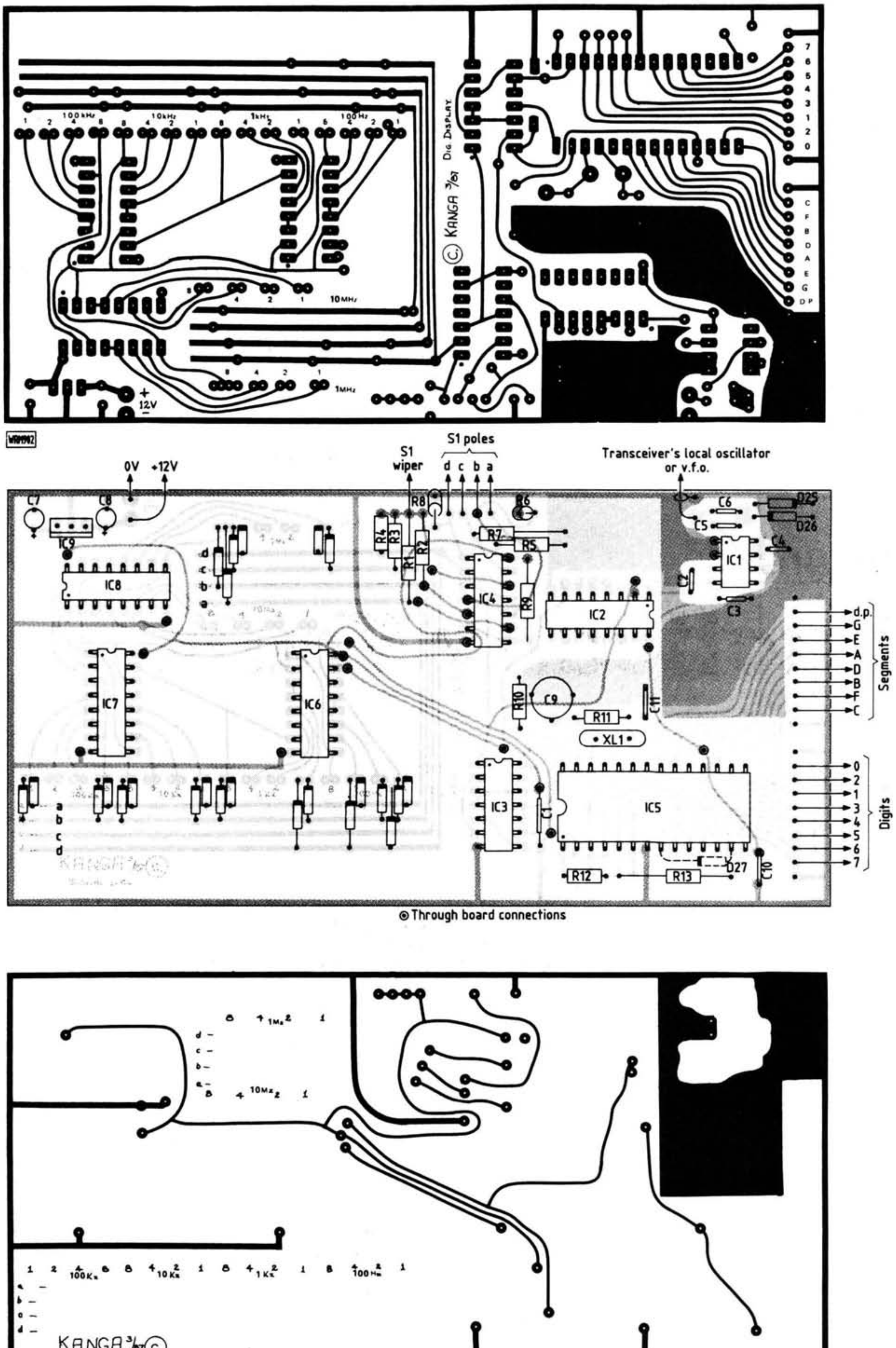

Fig. 4: Full-size double-sided track pattern and component location diagram
Note: diode D27 is connected between pins 8 and 13 of IC5 on reverse side of p.c.b., cathode to pin 8

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considers the work involved in the other methods of display it can be considered fairly cost effective. ***PW***

A semi kit of parts for this dial, which omits the counter chip and display but includes the p.c.b., and all the other devices and components, is available for £19.45 from: Kanga Products, 3 Limes Road, Folkestone, Kent CT19 4AU.

The counter chip and display devices have been omitted, as displays are generally available at rallies at silly prices, but may either be common cathode or common anode type. Depending on which one you obtain, you will need a different version of the counter chip. Kanga Products can supply either version of the display chip, and to this end they supply an order form with each kit. All you have to do is to select the device you require, add a cheque and post the order.

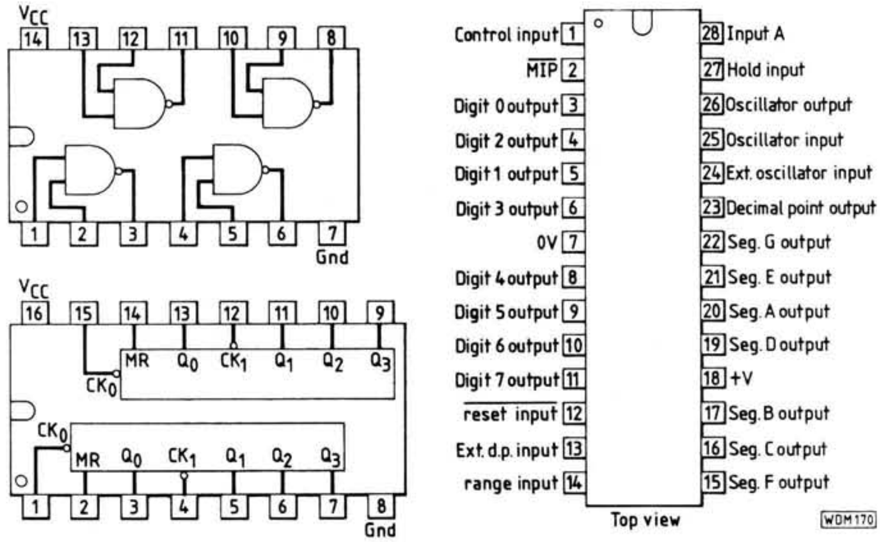

Fig. 5: IC pin-out data

Feature

Practically Yours

By Glen Ross G8MWR

Practical dBs

One of the terms one hears used regularly in our hobby is the magic decibel. It is, unfortunately, one of the least understood. It is used to describe antenna gain, losses in feeders, gain of pre-amps and many other things. If you ask many amateurs what a gain of 16dB means in terms of input and output voltages you would find a certain reluctance to provide an answer.

Reference

The first thing to grasp is the statement that something has "a gain" or "loss of 10dB" actually means nothing. This is because the decibel indicates a ratio between two different values and is therefore only meaningful if a reference of some sort is quoted with it. To give some firm examples, a beam may be quoted as having a gain of 10dB with reference to an isotropic radiator, a dipole or another antenna. If we take the isotropic as a reference with a gain of one, then the dipole with a figure of eight pattern will have a gain of about 2.5dB. The beam can then be quoted as 10dB above isotropic or 7.5dB above the reference dipole. If the beam is quoted as having a gain of 10dB reference the dipole, it can also be claimed to be 12.5dB above isotropic. There is also the possibility of quoting the dipole as being 7.5dB DOWN compared to the beam. Perhaps you can see now why the isotropic source (one which radiates equally badly in all directions) is the favourite of antenna manufacturers; it provides impressive gain figures.

Stage Gain

Now we come to the case of the pre-amp or linear which is quoted as having, say, 15dB of gain. This figure is always assumed to be with reference to whatever input level you are using, provided that this is within the handling capability of the equipment. Now 15dB power gain means that the output will be 30 times the input level. So, if you feed one watt into your linear you should get thirty watts out, 3 watts in gets 90 out and so on. There is obviously a limit to what you can get out and eventually you come to the point where the output does not come up to what you expect, this is known as the point where compression sets in. The level is usually quoted as the input level which results in 1dB less output than the maths would lead you to expect.

Power Output

This is usually quoted as so many watts out, but it is also possible to use our friend the dB provided you quote a reference level. A linear could be advertised as providing 100 watts or having an output level of 20dBW. The 20dB is a power gain of 100 and the "W" indicates the reference as being 1 watt. The reference could equally well be given as dBm (milliwatt), or micro or pico watt depending on the levels you are measuring and what is convenient. Putting two sets of figures together we could now advertise our linear as having an output of 20dBW (100 watts) and a gain of 13dB (times 20); meaning that it needs 5 watts drive to get the quoted output.

Table 1

Power, voltage and dB relationship. (Some figures have been slightly rounded.)

dB	power	voltage
0	1	1
1	1.3	1.15
2	1.6	1.3
3	2	1.5
4	2.5	1.65
5	3	1.8
6	4	2
7	5	2.3
8	6	2.6
9	8	2.85
10	10	3.2
11	13	3.6
12	17	4
15	30	5.6
18	63	8
20	100	10
30	1000	32
40	10000	100

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Reading & Understanding

(with a bit of theory thrown in)

In Part 2 of this series, R. F. Fautley G3ASG looks at parallel circuits and a simple crystal receiver.

The Parallel Circuit (d.c.)

What does connecting components in parallel mean? It means connecting **one end** of every component together to make a single connection, and then connecting the **other ends** of all the components together to make the other connection. The circuit could look rather like a ladder, where the various components are the rungs. A circuit of five resistors connected in parallel could look like Fig. 2.1.

Electrically, these five resistors (R1 to R5) may be replaced by just **one** resistor, if we can find out how to do it! There is a "fairly simple" way to calculate the effective resistance (Rt) for the five resistors in parallel, and this is it:

$$\frac{1}{Rt} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \frac{1}{R4} + \frac{1}{R5}$$

It looks a bit upside-down, doesn't it? but let's have a try:

$$\frac{1}{Rt} = \frac{1}{1000} + \frac{1}{1000} + \frac{1}{800} + \frac{1}{500} + \frac{1}{200}$$

$$= 0.001 + 0.001 + 0.00125 + 0.002 + 0.005$$

$$= 0.01025$$

Inverting both sides of the equation:

$$Rt = \frac{1}{0.01025}$$

$$= 97.56\Omega$$

So, it is possible to replace the "ladder" of five resistors in parallel by a single resistor of 97.56Ω.

What happens if we connect a battery also in parallel with the five resistors, as in Fig. 2.2? It is obvious that **each** resistor has the 6V (6 volt) battery connected across it, so using Ohm's Law again:

The current through R1 will be
$I1 = E/R1 = 6/1000 = 0.006A$ or 6mA

The current through R2 will be
$I2 = E/R2 = 6/1000 = 0.006A$ or 6mA

The current through R3 will be
$I3 = E/R3 = 6/800 = 0.0075A$ or 7.5mA

The current through R4 will be
$I4 = E/R4 = 6/500 = 0.012A$ or 12mA

The current through R5 will be
$I5 = E/R5 = 6/200 = 0.03A$ or 30mA

If we add the five currents together we get:
$I1 + I2 + I3 + I4 + I5 = 6 + 6 + 7.5 + 12 + 30 = 61.5mA$

A total current of 61.5mA will be drawn from the battery. When we worked out the effective resistance of R1 to R5 in parallel, we found it was 97.56Ω. Employing Ohm's Law again, we find that if the 6V battery were to be connected across a 97.56Ω resistor, the current drawn from the battery would be:

$$I = \frac{6}{97.56}$$

$$= 0.0615A$$

or 61.5mA

Surprise, surprise! The same current value we found when adding the separate current I1 to I5. So, as far as the battery is concerned, its load is 61.5mA whether resistors R1 to R5 are connected in parallel across it, or just a single 97.56Ω resistor.

The Parallel Circuit (a.c.)

If the components connected in parallel with a supply are **resistors only**, then the effective resistance of the parallel circuit may be calculated as in the previous paragraph, **whether the supply is a.c. or d.c.**

The snag comes when the components are inductors, capacitors and resistors in **any** mix of the three types —**except for all resistors.** To start with, we will look at the parallel tuned circuit as in Fig. 2.3, and we will use the same component types and values as we used in describing the series tuned circuit. Pictorially, we can represent the circuit as in Fig. 2.4. Note the difference in connections between Figs. 1.5 and 1.6 and Figs. 2.3 and 2.4. For the parallel arrangement, there is still the similarity to the "ladder", with the components as rungs.

There is a very great difference in operation between the parallel connected inductor and capacitor and the previously described series circuit. For, if we vary the frequency **only** of the alternating supply (and again if we had a means of measuring it), the current I drawn from the supply (i.e. the signal generator) would again also vary. This time it would diminish to very nearly zero at one frequency (again call it f_o) and increase both at higher and lower frequencies.

This phenomenon is called resonance, but whereas formerly it was **series resonance,** this is called **parallel resonance.** Again, the frequency f_o would not be affected by amplitude of the alternating voltage from the signal generator. The parallel resonance frequency f_o is calculated **in exactly the same way** as for the series resonant frequency. As we have the same component values as before, f_o is also the same, 1.59MHz.

The numerical value of the inductive reactance will again be the same as for the capacitive reactance. Also again, the inductive reactance is conventionally positive and the capacitive reactance negative. In this case, however, the two reactances are connected in **parallel** so we can't just add them together arithmetically as in the series case. The method is very similar to the one we used to determine the effective

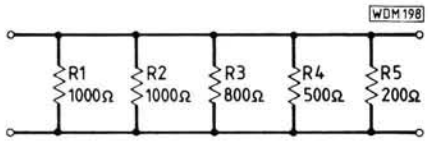

Fig. 2.1

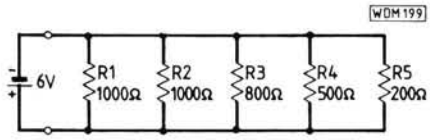

Fig. 2.2

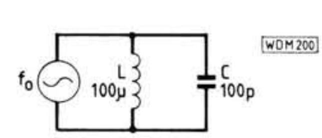

Fig. 2.3

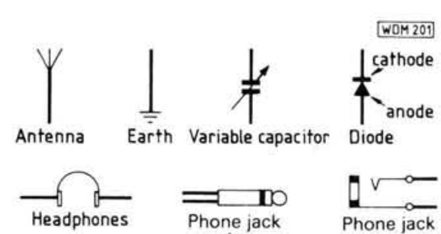

Fig. 2.4

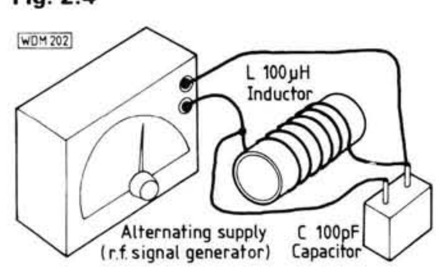

Fig. 2.5

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Circuit Diagrams

value of several resistors in parallel. This time, though, we must be very careful to remember to include the + and − signs.

So, remembering that inductive reactance is given by:

$X_L = +2\pi fL$

and capacitive reactance by:

$X_c = \frac{-1}{2\pi fC}$

we can take the values of XL and XC from our previous series resonance example (as they are the **same** components):

$$\frac{1}{X_t} = \frac{1}{X_L} + \frac{1}{X_C}$$

$$= \frac{1}{+1000} + \frac{1}{-1000}$$

$$= \frac{1}{+1000} - \frac{1}{1000}$$

$$= 0\Omega$$

Inverting both sides of the equation:

$X_t = 1/0 = \infty\Omega$

We have found that the parallel tuned circuit at resonance looks like infinity ohms, or in other words, an open circuit, explaining why at resonance the current drawn from the alternating supply (signal generator) was very nearly zero!

The Simple Crystal Receiver

Perhaps it's time to look at something a bit more interesting than components in series and parallel, something that has some practical (though limited) use. First we have some new circuit symbols to remember, so look at Fig. 2.5. Notice that the variable capacitor is similar to the ordinary capacitor symbol except for the arrow, which indicates that the component value may be varied.

Having got those into your head, refer to Fig. 2.6. Here is the circuit of the simplest of all radio receivers—the crystal set. This may seem to be a big step from the previous circuits, but it is a simple receiver which can be constructed as an exercise and also used to listen to nearby broadcast stations. The values of the components in Fig. 2.6 should enable signals in the medium wave broadcast band to be heard; but only from stations fairly close to you. No attempt will be made to give

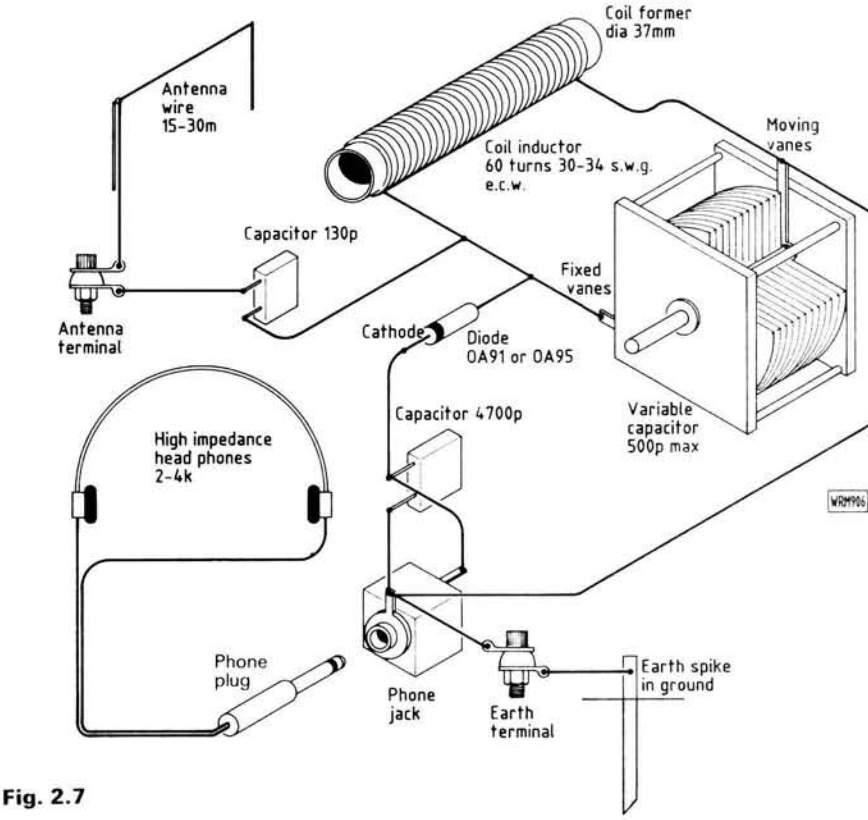

Fig. 2.7

any design information here, as the intention is primarily to assist in understanding what the circuit means in a practical sense.

Let us translate the circuit diagram of Fig. 2.6 into a more practical picture as in Fig. 2.7. The diode must be a germanium type because it is able to rectify smaller signals than silicon diodes, and the headphones must be the high impedance kind, **not** the modern 8Ω variety. The old type headphones have an impedance of 2000Ω to 4000Ω, and the reason for using them is that the diode load resistance (in this case the headphones) should be very high compared with the diode's internal resistance to provide high rectification efficiency, and thus more noise in the headphones!

An increase in sensitivity of the

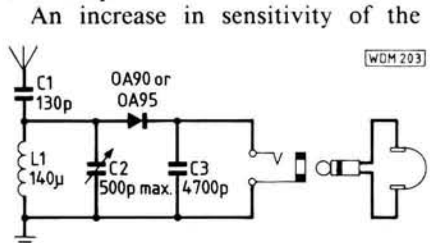

Fig. 2.6

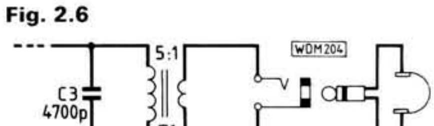

Fig. 2.8

crystal set can be obtained by adding a 5:1 (5-to-1 turns or voltage ratio) a.f. (audio frequency) transformer between the output of the set and the headphones. The transformer should be connected with its higher impedance winding, i.e. the winding with most turns, across (in parallel with) C3, and the lower impedance winding (with only a fifth of the turns) across the phone socket, as in Fig. 2.8.

This has the effect of increasing the effective load resistance due to the headphones to around 50 to 100kΩ. The bit of theory, for those who want to know is:

$R_{eff} = t^2 \times R_{load}$

where R_{eff} is the effective load resistance across C3

R_{load} is the actual load resistance (headphones)

t is the transformer turns ratio

$R_{eff} = 5^2 \times 4000$

$= 25 \times 4000$

$= 100\,000\Omega$ or $100k\Omega$

Any old type a.f. interstage transformer, ex-junk box, can be used for this purpose provided it has a turns ratio of around 3 to 7:1.

Even a mains transformer will provide good results if it has suitable windings, e.g. 350V-0-350V secondary and 100V (tap on main input winding) primary.

In Part 3 we'll look at transistors and transistor amplifiers.

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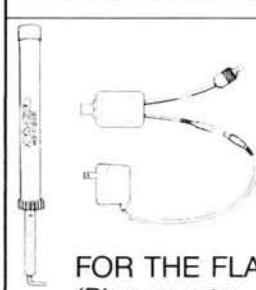

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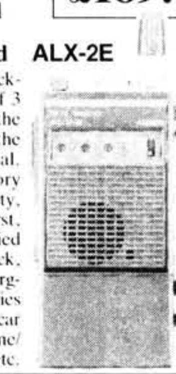

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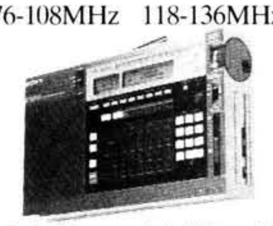

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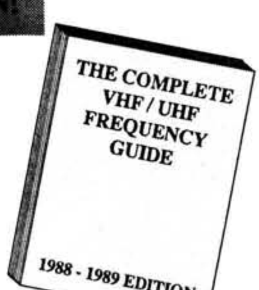

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The Schottky Diode

In the concluding part of this series, Brian Dance takes a look at applications for Schottky diodes

High Frequencies

The extremely fast switching capability of low-power Schottky barrier diodes combined with their lack of charge storage and low excess noise makes them very suitable for use at frequencies well into the microwave region. They may be employed for voltage clipping or clamping, sampling of fast pulses, fast gating, waveform generation and logarithmic conversion in the sub-nanosecond field.

Schottky diodes are very useful as microwave mixing devices where their low excess noise is a vital factor. The noise figure of the C206009 and of the C206516 Schottky diodes manufactured by Custom Components Inc. of Lebanon, USA, is shown plotted against frequency in Fig. 2.1. These diodes have been designed for use in narrow or broad band mixer assemblies for the 1 to 18GHz range or at even higher frequencies. These silicon planar epitaxial diodes are available as matched pairs for use when accurate tracking between circuits is required.

In mixer applications, the Schottky barrier diode will act as the non-linear element which produces the sum and difference of the two signal frequencies fed into the circuit. Although a single Schottky barrier diode can be employed as a mixer, it is normally advantageous to employ a number of the diodes in a balanced or in a double-balanced mixer circuit, since this reduces the effects of any noise from the local oscillator. An additional advantage of the use of balanced mixers is the reduction of the amplitude of higher order mixing products unrelated to the input frequency. A double balanced mixer circuit employing four diodes is shown in Fig. 2.2.

Microwave Detector

Low power Schottky diodes are very suitable for use as detectors at any frequency up to the microwave region. A very simple example is shown in Fig. 2.3 for the detection of the microwave radiation being emitted from a radar or other antenna or leakage from a microwave oven. It is wise to monitor the microwave radiation level in such situations for reasons of personal safety.

In Fig. 2.3 the Schottky diode is connected at the centre of a half-wave dipole antenna (which is very short at the frequencies concerned). The rectified signal is filtered and fed to a meter using a balanced circuit. The values of the resistor R1 and R2 should be equal and their total value will determine the sensitivity of the circuit.

A suitable Schottky diode is the 1N5711 which has a 70V reverse breakdown rating and a 0·41V maximum forward voltage rating at a current of 1mA. If used to detect any stray radiation from a microwave oven, the total length of the dipole for the radiation in the 2·5GHz band is only about 600mm. The simple circuit has the advantage of being passive and requires no source of power other than the incoming radiation.

Apart from monitoring large signals, Schottky diode detectors can be employed for the detection of small signals only just above the noise level. The diode is often fed directly from the antenna, although the use of a preamplifier may produce a better signal-to-noise ratio and improve the sensitivity. Such simple receivers can be used in short range radar and in military counter measures equipment when the sensitivity of the more complicated superheterodyne type of receiver is not required.

Schottky diodes are also very suitable for use in automatic gain control detector circuits including video applications.

Transistor Speed-up

When a transistor circuit is operated so that the transistor becomes saturated, the circuit turn-off times become large owing to the storage of charged minority carriers in the base region. A circuit such as that shown in Fig. 2.4 may be used to achieve higher speed operation. Diode D1 is a 5082-2811 Hewlett-Packard Schottky barrier diode connected between the collector and base of the transistor; an alternative type from the same manufacturer is the HSCH-1001. This diode is connected in parallel with the 5082-3077 *pin* diode (*pin* signifies that there is an insulating "*i*" layer between the *p*- and *n*-type material.)

If the collector current increases as a result of a change in the current gain of the transistor, the current through D1 increases so that some of the base

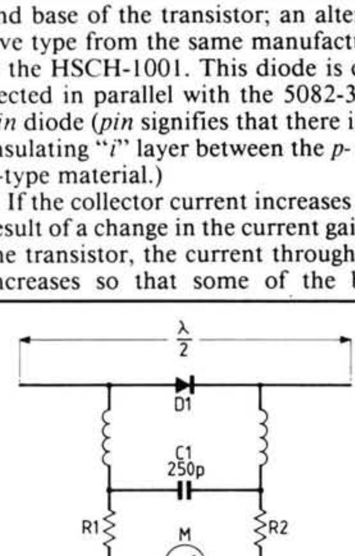

Fig. 2.3: A microwave radiation passive detector circuit

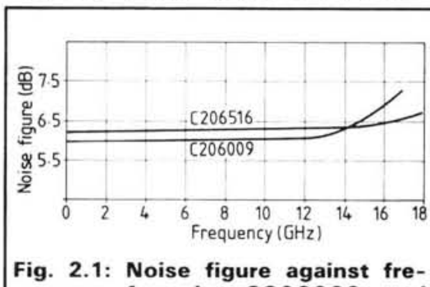

Fig. 2.1: Noise figure against frequency for the C206009 and C206516 devices

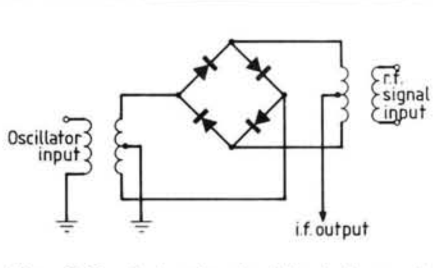

Fig. 2.2: A basic double-balanced mixer circuit

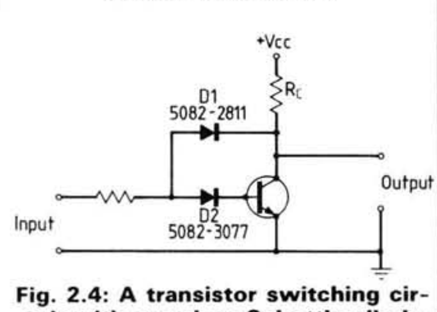

Fig. 2.4: A transistor switching circuit with speed-up Schottky diode

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current is diverted to prevent saturation occurring. The function of the *pin* diode is to allow the base current of the transistor to be channelled through D1 to the collector even when the collector and the base are at the same potential. Although this raises the collector voltage during conduction, the transistor switches rapidly to conduction.

Op-Amp Protection

A pair of Hewlett-Packard 5082-2835 low-forward-voltage Schottky diodes is used in the circuit of Fig. 2.5 to protect the input circuit of the operational amplifier from any high voltage spikes. The two diodes are connected back-to-back so that one of them will conduct whatever the polarity of the high voltage transient. Apart from providing transient pulse protection, this circuit will suppress spurious output and reduce the amplifier settling time by preventing excessive excursions of the input voltage. The diodes limit the voltage at the amplifier input to about ± 0·3V. The value of the input resistor should be adequate to limit the diode currents during any high level transients to under 100mA.

The 5082-2835 Schottky diode has been selected for this application because of its fast switching capability, its low forward voltage and low capacitance. It has an effective carrier lifetime of less than 100ps, so it can suppress transient voltage peaks with any duration greater than this value. The low capacitance of the diode (typically 1pF) ensures that the rise time degradation of the signal pulse is minimised.

Table 1: Some low-power Schottky diodes

Manufacturer Type No.	V_{BR} (V)	V_F at I_F (V)	(mA)	V_F at I_F (V)	(mA)	I_R at V_R (nA)	(V)	C_T (pF)	P_T (mW)	Max T_j (°C)	Remarks
Ferranti											
ZC2800	70	0·41	1	1·0	15	200	50	2·0	250	200	Effective minority carrier life-time 100ps, DO–35, SOT–23 & E line
ZC2810	20	0·41	1	1·0	35	100	15	1·2	250	200	
ZC2811	15	0·41	1	1·0	20	100	10	1·2	250	200	
ZC5800	50	0·41	1	1·0	15	200	35	2·0	250	200	
Hewlett-Packard											
HSCH–1001	60	0·41	1	1·0	15	200	50	2·2	400		Hybrid
5082–2301	30	0·40	1	1·0	50	300	15	1·0	100		Mesh diode
5082–2800	70	0·41	1	1·0	15	200	50	2·0	250		Hybrid
5082–2810	20	0·41	1	1·0	35	100	15	1·2	250		Hybrid
5082–2811	15	0·41	1	1·0	20	100	8	1·2	250		Hybrid
5082–2835	8	0·34	1	0·45	10	100	1	1·0	150		Passivated
5082–2900	10	0·40	1	1·0	20	100	5	1·2	100		Mesh diode
ITT											
SD101A	60	0·41	1	1·0	15	200	50	2·0	400	200	Hybrid
SD101C	40	0·39	1	0·9	15	200	30	2·2	400	200	Hybrid
SD103A	40	0·37	20	0·6	200	5000	30	50	400	125	Hybrid
SD103C	20	0·37	20	0·6	200	5000	10	50	400	125	Hybrid
Motorola											
MBD101	4			0·6	10	250	3	1·0			Maximum n.f. 7·0dB
MBD102	4			0·6	10	250	3	1·0			
MBD201	20			0·6	10	200	15	1·5			
MBD301	30			0·6	10	200	25	1·5			
MBD501/502	50			1·2	10	200	25	1·0			
MBD701/702	70			1·2	10	200	35	1·0			
Mullard-Philips											
BA481	4	0·40	1	0·55	10	2000	3	1·1		125	u.h.f. mixer
BAT81–83	40–60	0·41	1	1·0	15	200	30	1·6		125	Switching
BAT85	30	0·25	1	1·0	100	1000	25	10		125	Switching
(Mullard-Philips also offers a range of 25 microwave mixer and detector diodes)											
Siemens											
BAT14 series	5	0·41–0·465	1	0·63	10			0·12–0·38	200	150	Beam-lead for up to 40GHz
BAT15 series	5	0·26–0·30	1	0·37	10				200	150	
BAT16	40	0·70	1	2·2	30			0·4	250	150	Up to 1GHz

Optocoupler Speed-up

Many types of optocoupling device employ a bipolar transistor or a high gain Darlington circuit in their output stage. If the operation of the circuit causes the bipolar output device to saturate, the time required to switch to the non-conducting state will be unnecessarily prolonged.

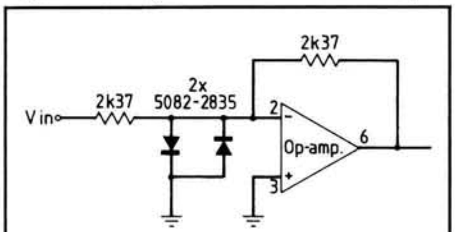

Fig. 2.5: Protecting an op-amp input with Schottky diodes

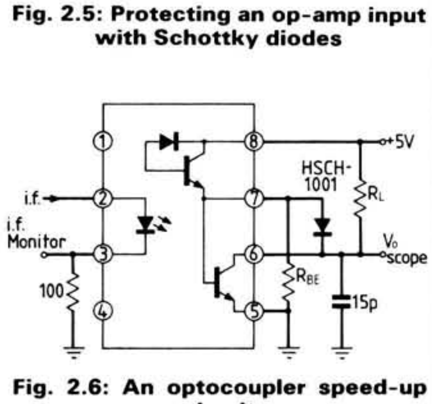

Fig. 2.6: An optocoupler speed-up circuit

As shown in Fig. 2.6, the economical Hewlett-Packard HSCH-1001 Schottky diode can be employed to reduce the saturation effects on the transistor turn-off time and hence to reduce the switching time. The HSCH-1001 is shown in parallel with the base-collector junction of the output transistor of a 6N139 optocoupler. This Schottky diode has a lower turn-on voltage than a silicon *pn*-junction, so when the transistor is driven into saturation, this diode bypasses the current which would otherwise enter the base-collector junction. The charge to be removed when the transistor is switched to the non-conducting state is reduced in proportion to the reduction in the current entering the base-collector junction in the conducting state.

Low Power Diodes

Various types of Schottky low power diodes are available from a number of manufacturers for specific applications. For example, Mullard-Philips produce a BA481 silicon epitaxial Schottky barrier diode with a low forward voltage especially for mixer applications at u.h.f. frequencies.

Hewlett-Packard produce 5082-2811 and 5082-2835 types in which different metals are employed in the Schottky barrier so that different turn-on voltages can be obtained. The 5082-2835 device has the lower value of turn-on voltage and can thus provide the better performance at lower local oscillator amplitudes. In addition, this type has the smaller junction capacitance and series resistance so that its use enables an improved noise figure to be obtained at higher frequencies. However, the 5082-2811 has the lower flicker noise and a higher break-down voltage so that it is preferred for Doppler applications and for phase detection. This device also provides better sensitivity as a detector at video frequencies below 100kHz.

In 1982 Siemens introduced beam-linked Schottky diodes using a guard-ring technology for microwave frequencies. The maximum noise figure in the C band is 6dB single sideband noise, including an i.f. noise figure of

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1·5dB. Lower leakage resistances are said to allow possible applications in mixers and detectors up to 4GHz. These beam-lead products are available as discrete components, as paired matched diodes and also in a four-diode-ring configuration for use as ring mixers to suppress unwanted spurious frequencies.

Microwave Schottky beam-lead devices are also available from Hewlett-Packard with a guaranteed maximum capacitance of only 0·1pF. These devices are produced in a pair configuration using a tri-metallisation process which enables closely repeatable characteristics to be obtained for devices operating over the −60°C to +200°C temperature range. The extremely low capacitance permits the user to achieve low noise figures at high frequencies, for example, 7dB at 16GHz has been quoted.

High beam strength in the leads has been achieved in these devices without sacrificing capacitance by the use of a glass-fill process yielding beam-pull results of 6g. This HSCH-5500 series is intended for use in balanced and in double-balanced mixers in the high performance market. A number of the beam-lead pairs can be assembled into a suitable configuration so as to produce bridge quads, star quads and ring quads for various classes of mixer circuits.

Table 2: Typical power rectifier Schottky diodes

Manufacturer Type No.	V_{BR} (V)	V_F (V) at	I_F (A)	I_R (mA)	Max. mean rectified current (A)	Peak surge current (A)	C_T (pF)	Remarks
General Instrument								
SB120/180	20/80	0·55/0·75	1	1	1	40	70	50°C/W
SB520/580	20/80	0·45/0·75	3	3	3	150	180	25°C/W
SB1620/80	20/80	0·55/0·65	8	10	16	250	900	3°C/W
SB3020/80	20/80	0·55/0·65	15	15	30	300	1200	1·4°C/W
International Rectifier								
11DQ03	30	0·55	1	6	1·1	48		
10TQ030	30	0·76	20	15	10	305		
20FQ045	45	0·68	60	180	30	680		
40CDQ45	45	0·91	40	20	40	455		
ITT								
1N5817	20	0·45	1	1	20	100	50	
1N5818	30	0·55	1	1	30	100	50	
1N5819	40	0·60	1	1	40	100	50	
Motorola								
1N5828	40	0·50	15		15	500		
1N6095	30	0·86	78·5		25	400		
BYS35–50	50	0·77	70		35	600		
1N6098	40	0·86	157		50	800		
MBR6045	45	0·80	157		60	800		
MBR7545	45	0·90	220		75	1000		
Mullard-Philips								
BYV20–30	30	0·60	15		15	300	520	
BYV21–45	45	0·55	30		28	600	1150	
BYV22–40	40	0·55	50		60	1000	2100	
BYV23–45	45	0·55	70		80	1500	2500	
Siemens								
BYS21–90	90	0·9	1		1	50		
BYS26–90	90	0·9	3		3	120		
BYS24–90	90	0·9	2×5		2×5	120		
BYS28–90	90	0·9	2×12·5		2×12·5	250		
BYS71	60	0·73	75		75	1000		
BYS76	45	0·66	75		75	1000		
BYS80	50	0·74	2×30		2×30	600		
BYS95	60	0·89	2×60		2×60	855		
BYS97	60	0·80	2×100		2×100	1425		
Unitrode								
USD1120	20	0·45	1	1	1	50		80°C/W
USD1140	40	0·50	1	1	1	50		80°C/W

Power Schottky Devices

In power applications requiring rapid switching and/or a low forward rectifier voltage, power Schottky devices may be selected. These characteristics are especially important in switched mode power supply units operating at relatively high frequencies to enable the transformer core size to be minimised and where a high power conversion efficiency is desirable. Frequencies of up to at least 200kHz can be employed in such circuits.

Power Schottky devices bear the same relation to low power Schottky diodes as conventional high power rectifiers bear to low power signal diodes. They contain a metal-to-semiconductor junction, but the junction area is much larger than in the case of low power devices and this results in a high value of the junction capacitance and hence a more limited maximum frequency of operation.

Many types of power Schottky diodes are available. Apart from differences in the power levels at which they can satisfactorily operate, different metals may be used to form the barrier with the semiconductor material; the latter is normally *n*-type silicon. Power Schottky diodes using chromium, platinum, molybdenum and tungsten as the metal side of the junction are readily available. As with normal power diodes, a wide range of current ratings is available with various junction areas, whilst the encapsulation must provide a suitable thermal resistance to the heat sink, if any.

Very low forward voltage drops can be obtained at moderately low forward currents by the use of chromium as the metal forming the barrier junction. However, the use of chromium results in greater reverse leakage currents than when certain other metals are employed.

In many applications it has been found that the use of platinum to form the barrier with the semiconductor material can result in the smallest power losses, since devices using this metal have a low forward voltage drop even at high currents (for example, about 0·7V at about 200A). In addition, the devices have a low leakage current. Use of molybdenum or tungsten as the metal forming the junction tends to result in Schottky rectifier devices which have a performance intermediate between devices using chromium and those which use platinum.

According to Motorola, tungsten barrier devices can have the lowest leakage current per unit junction area with platinum containing devices the second best in this report. However, the leakage currents of all Schottky devices tend to be considerably higher than in comparable silicon *pn* devices. Values of the order of 50mA can be found at 50V at 125°C. This implies that the power losses in the non-conducting part of the cycle may be quite high, although the power losses in the conducting part generally account for the major part of the losses.

Schottky barrier junction capacitance values are typically some four or five times that of comparable *pn* junction devices and this increases the switching time to the non-conducting state. Nevertheless, the switching time of the Schottky barrier devices is normally smaller than that for *pn*-junction power diodes.

One of the major technical disad-

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vantages of the use of Schottky power devices is the temperature dependence of the barrier voltage. However, Schottky power diodes tend to be more expensive than the ultra-fast recovery *pn*-junction devices which are in turn more expensive than the so-called fast recovery types. Many of the major semiconductor manufacturers produce Schottky power rectifiers with ratings of up to about 80V and mean forward currents of up to about 100A. Siemens offer power module Schottky rectifier units each containing two diodes with ratings of up to 2 × 100A and reverse voltages of up to 60V. They are mainly intended for use in switched mode power supply units. Amongst the advantages claimed for these units is the reduction of the wiring carrying high frequencies to a minimum and a corresponding reduction in interference from the switching frequency together with a reduction in equipment size.

Schottky power diodes are used in circuits which are basically similar to those in which high power conventional diodes are employed. ***PW***

Table 3: A comparison of typical Schottky diode characteristics when various metals are employed in the junction

	Potential barrier (V)	V_F @ rated I_F (V)	Leakage Current at max V_R (mA)
Chromium	0·58	0·8	250
Molybdenum	0·56	0·75	60
Platinum	0·85	0·8	10

BOOKSHELF

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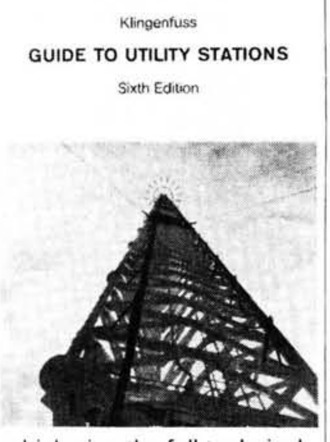
This annually updated 494-page book covers the reception of all types of utility station between v.l.f. and 30MHz. For those of you who want even more up-to-date information there is a supplement service available which gives you an update in April and the following August! The range of information included in this book is truly amazing making it the short wave listeners' "bible".



The first chapter deals with frequency allocations and covers the entire spectrum from d.c. to 150MHz. As well as the usual tabular representation of the spectrum, extracts from the international radio regulations are published which give the full technical definition of each allocation.

The main frequency list which is some 248 pages long lists 15802 frequencies between 9kHz and 30MHz. The format used for the display of the data is the frequency followed by the callsign, location including country, mode and any operational notes. As the list also includes voice transmissions the utility stations are highlighted by employing bold type.

A very comprehensive callsign list comes next which is very well presented in that against each callsign is the station name and location followed by all the frequencies used by that call. This is very useful for identifying new stations when all you have is the callsign. The chapter preceding the callsign list gives a selection of the regulations regarding the construction and use of callsigns which is very interesting.

Press stations are given a special mention starting with an alphabetical list of countries and their press agencies. This list also gives the transmission times and frequencies of all the stations mentioned. The next list I have found to be invaluable as it comprises a chronological list of press services. In order to find an active press station all you have to do is check against this list for the required time of day and you can instantly see which stations and frequencies are in use.

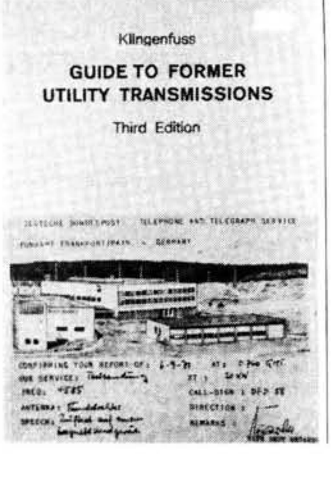
The next chapter is for the FAX operator and comprises a list of transmission schedules and frequencies for all the main FAX stations.

The final schedule concerns the NAVTEX navigational and meteorological warning service on 518kHz. Listed here are all the active stations along with their individual transmission times and identification details.

The remaining chapters cover the complete Q, Z and signal reporting codes along with a host of definitions and regulations, there are even two fold-out maps showing the world and regional air route areas. *G4WNC*

GUIDE TO FORMER UTILITY TRANSMISSIONS—
Third Edition
by Joerg Klingenfuss
Published by Klingenfuss Publications
Available from the Practical Wireless Book Service
170 × 240mm, 126 pages. Price £8.00 plus 75p P&P
ISBN 3 924509 43 3

This manual is built on receptions of utility stations from the sixties until the recent past. Listed are the frequency in kHz, callsign, name of the station and ITU country/geographical symbol and the types of modulation used. Both old and new callsign allocations or location names may be listed for several stations, this depends on the callsign or location name used during the last monitored operation on the respective frequency.



Nowadays virtually all overseas radiotelegraph and radiotelephone stations have disappeared from the bands. The technical details of these circuits have been deleted from official files and they are only reactivated if the satellite channel breaks down. On the other hand, frequencies used years and decades ago for overseas radiotelegraph and radio telephone traffic nowadays carry modern electronic communication. Thus, "historical" frequencies and callsigns listed can be a valuable source of information for the identification of "new" and "unknown" stations.

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Modular VHF Monitor Receiver

Without being too morose about the "good old days" of amateur radio, I do have fond memories of the 1950s when I first began my radio construction. It was the age of government surplus equipment: the vast junk yard of World War II was our playground. In those early days everything I owned in radio was either a piece of war-surplus equipment, usually modified for my own purposes, or built from components culled from surplus sources. Had it not been so, I may never have entered the hobby.

That particular period did produce a breed of radio constructors who were frugal and ingenious. They often adopted a back to front approach to construction. Rather than deciding what they wished to build, designing or choosing a circuit and then gather the required components, more often than not they began with a cheap piece of surplus equipment or set of components and then worked out what they could produce. Taking what was in hand and making it perform a useful function, or seeing if a need could be fulfilled from what was available, gave rise to all manner of interesting and innovative ideas.

These days it is more difficult to find useful "pickings from the rich man's table". Some component bargains can be had from radio rallies which are certainly gleanings from the electronics industry, but that industry does not often offer complete items or circuit boards which are easily usable in amateur radio. There is a vast radio industry supplying all manner of radio and entertainment electronic "bric-a-brac", but the gulf between the techniques used in entertainment radio and serious amateur radio is now wider than ever before. In the past I have modified cheap a.m. radios to receive 1.8MHz amateur band transmissions with almost acceptable results. Although by the time I had produced a satisfactory result it would probably have been as easy to build a simple direct conversion receiver.

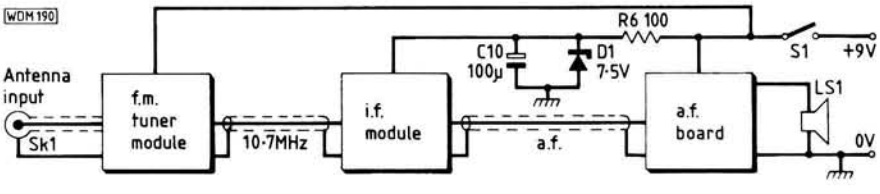

Fig. 1: Receiver block diagram

Two Useful Modules

This article does attempt to take a surplus item from the radio entertainment industry and turn it into a useful amateur radio item. In fact it takes two items, both of which are cheaply available modules, and with very little extra circuitry produces quite a decent little v.h.f. monitor receiver.

John Birkett, the radio component specialist in Lincoln, seems to hold large stocks of two modules which appear promising for the radio amateur. They are an f.m. tuner head made by Toko and a.m./f.m. intermediate frequency amplifier and detector module made by Mullard. Both of them, although slightly dated, seem to be above average quality for entertainment grade units.

As they are, the two used in conjunction with an audio amplifier would produce quite a good little mono f.m. tuner. When I first obtained them I did just that feeding them into my main audio amplifier with pleasing results. The interesting question for the radio amateur is—can the f.m. tuner front end module be modified to receive a more useful range of frequencies? This little module can be modified to receive higher frequencies and that modification is very simple. With the removal of three capacitors and a little realignment of the input tuning coils, the tuner module will cover about 110 to 150MHz. This is a very useful frequency range offering the 144MHz amateur band and airband frequencies. In short, it makes a very handy monitor receiver.

The complete receiver and intermodule wiring is shown in Fig. 1. The modified f.m. tuner module receives signals in the 110 to 150MHz and converts them to the intermediate frequency of 10.7MHz. A screened lead takes the 10.7MHz signals to the input of the i.f. module. The i.f. module provides amplification of the signal and demodulates the f.m. signal to produce an audio output. This module requires a 7 to 8 volt supply which is achieved with the 7.5 volt Zener diode D1. Resistor R6, in series with supply rail, limits the current to D1 and also forms a decoupling network with C10. Another screened lead takes the low level audio signal to the audio amplifier module. This provides the final amplification, including a volume control, and drives a small loudspeaker.

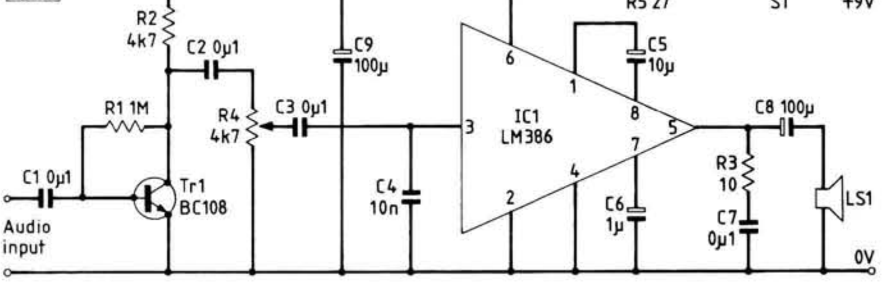

Fig. 2: Audio amplifier circuit diagram

The Audio Amplifier Module

It makes sense to build receivers in reverse, that is, to begin at the audio stages and work towards the antenna input. Adopting this method, the constructor begins with an audible signal, making it possible to check the stages as the construction proceeds.

The audio module is the only one of the three modules that requires the building of a circuit board. The circuit for the audio amplifier module is shown in Fig. 2. The circuit is simple and based around the popular and

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inexpensive audio device, the LM386. This is a small but useful audio amplifier in a 8-pin d.i.l. package which is capable of delivering around half a watt of audio power to an 8 ohm speaker. It has the advantage of a low quiescent current, making it suitable for use with a battery supply. The receiver is powered from a 9 volt, S106 (PP6), battery. The level of audio output from the i.f. module is such that extra amplification is required. This is provided by a single pre-amplification stage (Tr1). Potentiometer R4 is a volume control which includes the On/Off switch (S1).

The audio amplifier is built on a small circuit board, the layout of which is shown in Fig. 3. The prototype amplifier was built on a piece of perforated circuit board with a 0.1in matrix of holes: this is often called "Perf Board". The method of mounting the finished p.c.b. is somewhat unusual. Four short lengths of tinned copper wire (about 22 s.w.g.) emerge from the ground connection points around the board and these are bent into an "L" shape to provide legs to support the board. These wires fit neatly along the edges of the i.f. module to mount the a.f. board above the screening box of that module. The result is neater than it sounds and does enable a tight layout and short leads between the two modules.

There are two coupling capacitors C2 and C3 between the amplifier and the pre-amplifier stages. The cautious constructor could well build the audio module from C3 to the speaker output and test the amplifier first. Connect the speaker and the 9 volt battery supply and a slight hiss should be heard from the speaker. Touching the input side of C3 ought to produce a distinct buzz from the speaker. The rest of the circuitry around Tr1 can be completed and the volume control R4 added. Screened wire is used for the leads to and from R4. The complete audio amplifier module can be powered up and touching the input side of C1 should produce a very loud buzzing sound. Check that R4 has been wired the correct way round and a clockwise rotation of the control increases the gain of the module.

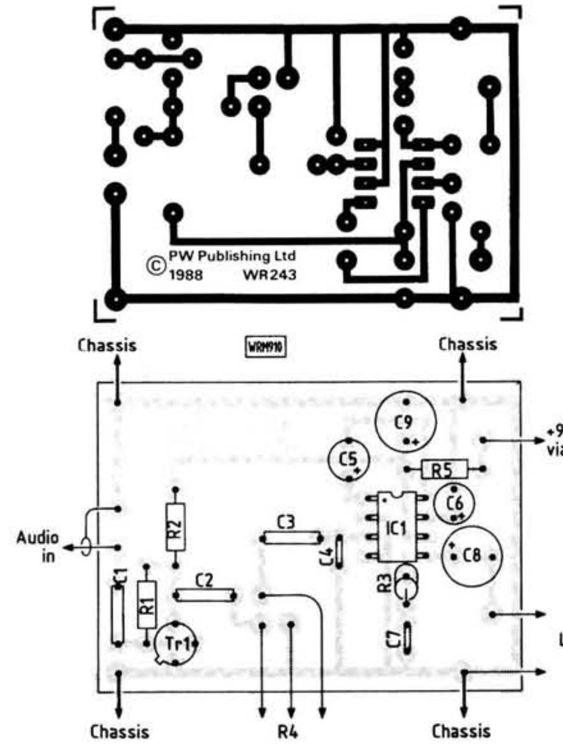


Fig. 3: Full size p.c.b. track pattern and component placement diagram of audio amplifier stage

It helps to mount the audio amplifier on to the i.f. module casing before any connections are made. The audio module is placed above the side of the i.f. module casing which has the connection wires. This, in fact, is the underside of the module as it was originally designed to fit onto a larger circuit board with the wires providing connections. The wire tags on the audio module, which have been bent down at right angles to the board, should fit down the sides of the i.f. module case. These are soldered to the sides of the i.f. module case raising the underside connections on the audio module board clear of the case. The end of the audio module bearing the input connections faces towards the audio output pin on the i.f. module (see Fig. 4), a short screened lead joins these two points together.

The i.f. module supply components, R6, C10 and D1 are "hard wired" to the modules. Capacitor C10 and D1 are grounded directly onto the casing of the i.f. module. Use a little solder to tin a small area of the case first and the leads from C10 and D1 will easily solder onto the metal case. Resistor R6 is soldered to the junction of C10 and D1 the bent back to suspend on its

The I.F. Module

The Mullard LP1171 i.f. module is supplied already aligned and ready for use. It is housed in a tinplate casing and has a series of terminal wires arranged at either end. The layout of the module is shown in Fig. 4.

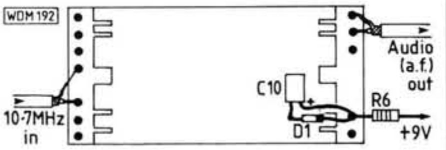
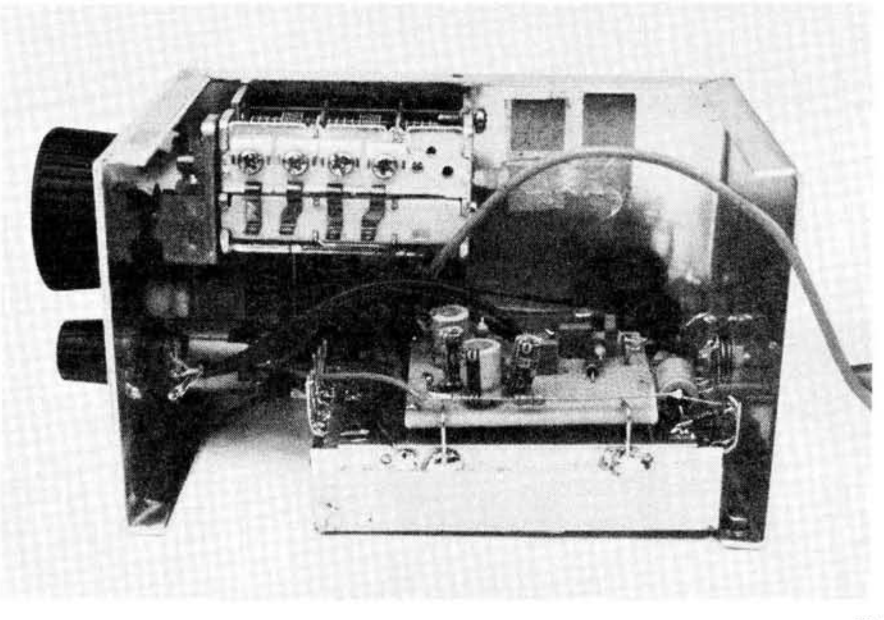


Fig. 4: External connections to i.f. module



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leads and make a connection to the 9 volt input connection on the audio module. The wire lead between R6 and the audio module 9 volt input point may require a short extension wire.

The combined modules can now be tested. Apply power and check with a voltmeter that 7.5 volts is present on the supply lead of the i.f. module. Touching the input connection of the i.f. module (10.7MHz in Fig. 4.) should produce a noise from the speaker. If an external antenna is available, connect this to the input lead and quite a lot of noise will be heard if the modules are working.

The FM Tuner Module

The circuit of the Toko f.m. tuner module is shown in Fig. 5. It has three stages: an r.f. amplifier (TR101), a mixer (TR102) and the local oscillator (TR103). The three stages are tuned by a three-gang variable capacitor (C101/C105/C116). These variable capacitor sections each have a trimmer and another fixed, parallel, padder capacitor. Removing the three fixed capacitors changes the frequency coverage of the tuner. The capacitors in question are C103, C104 and C115. Removing these capacitors and re-aligning the input tuning trimmers allows the f.m. tuner module to tune around 110 to 150MHz.

To allow this modification to take place the tinplate screening box fitted over the top of the f.m. tuner module must be removed. This screen is held in place with large blobs of solder and these must be removed. A solder suction pump is helpful but melting the solder and gently easing the screen from its mounting points is not too difficult.

When the screen has been removed the f.m. tuner module board is exposed as shown in Fig. 6. The capacitors for removal are easily located as they are the three disc capacitors mounted closest to the variable capacitor. They are in a row almost up against the body of the three-gang variable capacitor. Removal is easy, with or without a desoldering pump.

The connections to and from the f.m. tuner module are shown in Fig. 6. A screened lead is required for the 10.7MHz signal path between the f.m. tuner and i.f. modules in addition to the antenna input leads. It is a good idea to wire up the tuner to the other modules before the final mounting into a case.

Connect the f.m. tuner module with temporary leads to the i.f. module, battery and antenna. In most areas a piece of wire a metre or so long can be used as a testing antenna. If a suitable external antenna exists this can be used. The f.m. tuner module input tuned circuits can be peaked for the new frequency coverage.

The two screw adjustable trimmers nearest the shaft end of the variable capacitor are those which affect the input tuned circuits. These are designated as C102 and C106 and shown on Fig. 6. Rotate the tuning control and listen for weak signal. When a signal has been found, adjust C106 and C102 to peak the signal to maximum strength. Once the first adjustment has been made, other signals will probably be heard and it is a good idea to peak signals at either end of the tuning range to obtain the best compromise.

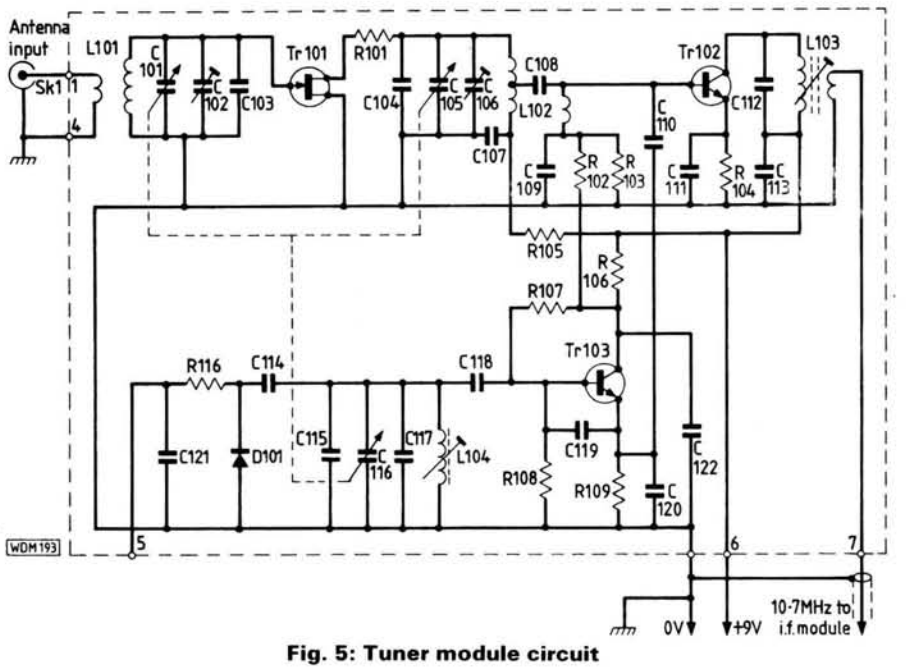

Fig. 5: Tuner module circuit

Sometimes the method above has to be rather a hit or miss affair as most airband and amateur signals are rather short in duration. As this can be a frustrating process a telephone call to a friendly local radio amateur may prove useful. It should be possible for him or her to put out a CQ call on the 144MHz amateur band, providing a longer test signal to peak your receiver. If a signal generator for the frequencies in question is available, the peaking up process is much easier.

Casing the Receiver

The prototype receiver was mounted in a Minffordd Engineering aluminium box, Type A45. The whole receiver, including a small loudspeaker and a S106 (PP6) battery fit into this case.

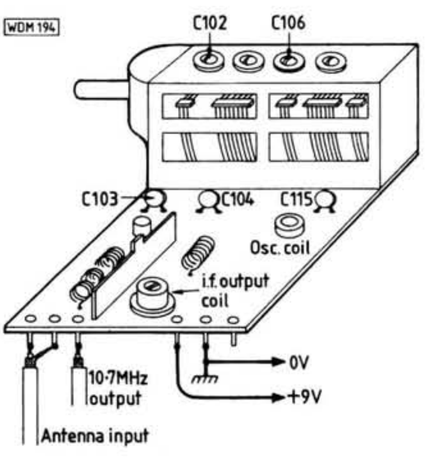

Fig. 6: External connections to tuner module

The fit is a little tight but the photograph shows how it was achieved. It would be possible to use other boxes which might give more working space for mounting the modules but the A45 case offers a compact, self-contained receiver.

The first stage is to fit the f.m. tuner module. To do this, drill two mounting holes in the tuner printed circuit board. When doing this take care not to destroy any of the tracks on the board. I drilled one hole near the outer edge of the board between the 9 volt and 0 volt tags. The other hole was drilled at the opposite end of the board as close as possible to the variable capacitor housing. The holes take 6BA bolts which, with stand-off sleeves, hold the tuner module above the bottom of the case with the tuning shaft emerging through a hole drilled in the front panel. The tuner board nicely fills the whole width of the case and the volume control potentiometer (R4) is placed to the right of the tuning control on the front panel.

The mounting of the audio and i.f. modules is somewhat unusual, if not makeshift, but works out well in practice. The back of the case has a turned in lip and this is used to attach the top of the i.f. module casing to the case. The top of the i.f. module casing, which has a series of holes (these are for peaking the i.f. module coils), takes two solder tags to provide anchorage points for the module. The two solder tags are soldered at either end of the short edge of the i.f. module casing at the a.f. output end. The rings of these solder tags can take two 6BA countersunk bolts to attach the module to the lip at the back corner of the case. The bolts point inwards and the countersunk heads allow the side of the case to slide into place if the holes in the lip have been countersunk.

The battery fits behind the variable capacitor. It can be held to the bottom of the case with double-sided Sticky Fixers. A 50mm diameter loudspeaker

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will just fit onto the lid of the case over the variable capacitor. Holes are drilled in the lid of the case to release the sound and the speaker is held to the underside of the lid with a little epoxy resin.

Finishing off the case is largely a matter of taste and facility. I used my simple but effective method of having a thin card false front. The card is marked with the required legends and covered with transparent sticky backed plastic film for a durable finish. The lid of the case, which is the top and sides, is covered with black sticky backed plastic.

Using the Receiver

Unfortunately the receiver, as described does not have a tuning scale. This is because there is a built in slow motion drive on the tuning control shaft. It is difficult to translate the rotation of the capacitor vanes into movement on the front panel but doubtless other constructors will manage it. I have used the receiver with a v.h.f. amateur band vertical antenna mounted on my roof, and the results have been surprising for its simplicity. I have heard many local amateurs, including the two closest repeaters plus air traffic signals from Ringway Airport. ***PW***

SHOPPING LIST

Resistors

0.25W 2% Carbon film		
10Ω	1	R3
27Ω	1	R5
100Ω	1	R6
4.7kΩ	1	R2
1MΩ	1	R1
Potentiometer with s.p.s.t. switch		
4.7kΩ *Log*	1	R4

Capacitors

Monolithic ceramic		
10nF	1	C4
0.1μF	4	C1-3,7
Electrolytic p.c.b. type 16V		
1μF	1	C6
10μF	1	C5
100μF	3	C8-10

Semiconductors

Transistors		
BC108	1	Tr1
Diodes		
BZY88C 7V5	1	D1
Integrated circuits		
LM386N	1	IC1

Miscellaneous

LS1 8Ω 50mm speaker; Toko f.m. tuner module(1); Mullard LP1171 i.f. module(1); Aluminium box type A45(2); Knobs; 6BA nuts, bolts, washers and solder tags; Miniature screened cable; Sticky fixers; Stick on feet; Sticky back plastic; 6-F22 type battery clip; coaxial socket; p.c.b.

(1)J. Birkett, 25 The Strait, Lincoln LN2 1JF. Tel: (0522) 20767

(2)Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd LL41 4NE. Tel: (0766) 762572

How Much? & How Difficult?
£26
Beginner

Constructional

Kitchen Konstruktion

This time, in No. 4 of his occasional series, Richard Q Marris G2BZQ has some helpful hints on drilling those difficult holes.

If you are a home constructor in electronics, then from time to time you may wish to drill a hole part-way through a thickish piece of material such as metal, Perspex, wood, etc.

So what happens? Well, with your wheelbrace or electric drill and a small sharp (?) drill bit, you anchor the job in question and drill away with enthusiasm. Then, depending on your enthusiasm and the sharpness of the drill bit, you drill right through the target material and probably through the table underneath; or, if you're too careful, chances are the hole will not be deep enough. So you have another go, and this time you go right through; sounds familiar doesn't it!

Answer

Why struggle, when the answer to this problem is so simple. Just put your selected twist drill into the drilling machine chuck; carefully measure the length of drill visible, and then the depth of the hole required. Subtract the hole depth from the visible length of twist drill, take the resultant measurement and cut a spacer to that length. The spacer can be made from either metal or plastics tubing, old telescopic antennas sections are one source or the shells from discarded ball point pens are another. Take the spacer and place it over the twist drill, and there you have it. The length of twist drill left showing below the spacer is the exact amount needed to drill the depth of hole you require (Fig. 1.).

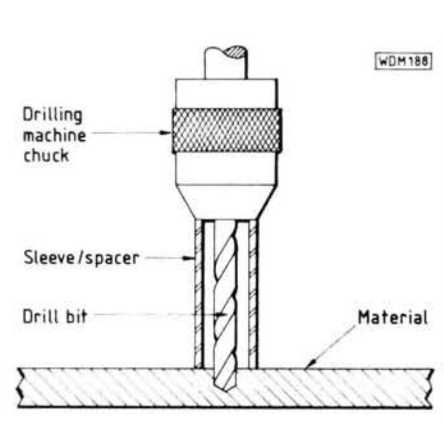

Fig. 1

Both of the materials suggested for use as spacers are easily cut with a Junior hacksaw, and should be easily obtained from your treasured collection of household and workshop junk.

ERRORS & UPDATES

PW "Orwell" Medium Wave Receiver February/March 1988

The pin-out detail on Tr2 in Fig. 2.1 is incorrect, the base and collector should be transposed. Resistors R24, 27, 28 are a log law type.

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On The Air
On The HF Bands

Reports to Paul Essery G3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1AR.

No doubt about it, I must watch what I say; after commenting about the winds and my mast last time, came a night when I got back from the club—a lovely evening—and turned in. Next morning the snow was thick and, in the absence of wind, my longwire had succumbed to gravity. A grounded antenna, covered by a foot of snow, doesn't seem to load up quite the same, somehow!

The bands have very definitely had their good days—and by the same token, the bad ones. Certainly, things are livelier than they were a year ago.

The Bands

Something for everyone, but I wish that more people would get on c.w. and reduce the phone QRM.

The 1.8MHz Band

By the time you receive this, the winter contesting season will be all but over. I have been off the band for some time as my home-brew a.t.u. didn't seem to want to play on this band. Eventually, I dug out an old Joystick a.t.u.—the Joymatch—intended for reception only. Slowly and cautiously I loaded it up and got an s.w.r. down to about 2:1, while I cautiously raised the power. Great stuff, the signal was heard from several miles away—but a couple of days later the snow took the antenna away! However, I'll be back!

Turning to **G2HKU**, Ted notes ON7BW and ON4CW on s.s.b., plus GM3PPJ, OK3KFP, ON4CW and OZ1W all worked on c.w. Ted now has a Butternut HF6 up and trimmed correctly, so he is now comparing its performance against the G5RV.

Next we have **G3BRD** (Seaford) who has now proved his antenna system is a winner, 105 countries worked in under one year. It comprises some 28m, vertically polarised, and operated against fifty carefully tuned quarter-wave radials. As John says, the secret of success is to use perseverance and practice the art of hearing the stuff through loads of static. Of course if you have the "real-estate" to play with, horizontals such as Beverages are much easier on the ears. New Year's Day was a cracker for G3BRD with ZL2BT at RS58, HH7PV, TG9NX and XE1HHA on s.s.b., plus c.w. to HZ1HZ, HK7AMV, CO2CB, OX3CS, 6W6JX, UG6GCK, UF6FDR, UI8BGS, UM8MLA, UH9BWD, UA0FM, RA9SSN, UA9NN, UA9YAJ, RA9CTK, 16 W States and thirty Europeans, including 4U1ITU.

GW0IER also likes Top Band. He has a 60-metre end-fed wire for all bands, and has now managed some 41 countries on the band. Three new ones were LZ1, EA6 and YO2 and lots of Europeans were raised, in the middle of which I noted K2RIH. Calls like 6W, 4X4, UL7, UO5, and various Ws were all noted but not raised.

The 3.5MHz Band

As far as I am concerned, the band these days is only used to listen to the QRP boys on the one hand, and for the Sunday-morning natter routine. However, when the better weather supervenes, perhaps I will find time to get outside and lay out a decent earth mat. Right now if I went on the lawn, I'd sink without trace.

G0HGA (Stevenage) managed 3.5MHz c.w. QSOs using QRP with DL9YA, GM3TMK and IK2HLB.

GW0IER had his first c.w. contact with a YL when he raised Lindy G0GZN in Bognor Regis. Other c.w. contacts included UA9CM, WA8SWM and VE3BCH, not to mention joining the ISWL nets.

GM3JDR (Wick) offered his c.w. two-way contacts to RA9CQQ, UA9CM, VS6DO, W6TSQ, RA0FA, W200AVK, W200AW, ZL4IE, VU2TJW, UA0LCZ, VS6UO, UA9MZW, UM8MBX/UL7Q, 4K0E, ZL1AMO, VE5DX, FY5FE, 8P9HT, J6DX, UA0OA, all W call areas, plus some 79 JAs, during operating spells around 0800-0900Z.

The 7MHz Band

A band which is either loved or hated. GM3JDR loves it, his c.w. two-ways contacts included ZL2UV, VK3AWX, 9N5QL, 9N7YDY, FY5FE, BV2B, D44BC, PR7PO, RA0FA, VS6DO, YB3ASQ, UA0KBC, NC8Q/J6L, OF6XY/SU, 8P9HT, FM5ES, XE1FUX, J6DX, KG6DX, VK4XA, 9Q5NW, P40GD, PY6AN, TF6PS, AL7IF, 9M6ZR, 9Q5DA, VS6VT, PY1ILR, YB0ATA, PZ1AP, KL7XX, VU2VWN, VU2VPE, VS6UO, VS6UP, VK3XB, VK2FEX, YC8XV, HK1KXA, ZS6OU, BY4WNG (at 1420Z, January 7), 9M2FP, CM3JA, VU2JCE, some 200 JAs and 40 W6-W7 operating around 1400Z.

The half-loop at **G4XDJ** seems to be doing its thing well enough; Brian reports working UZ1, SM6, YU3, UB5, OH5, UA6, PA0, GM4, VK3, ON4, UL8, UA3, EA8, KD2, TA1, UY5 and GW3. Incidentally, Brian is looking for a 9Y QSO on any band—is there a reader who can help him set up a sked?

G3NOF (Yeovil) says he doesn't have a decent antenna for the l.f. bands, but nonetheless Don did make s.s.b. contacts with J56AS and 8P9AF.

On to G2HKU; Ted sent some c.w. out to UA9SAR, WA1LDP/CU2, UF6FBI, VU2SU and UY5TH.

The favoured mode for GW0IER was also c.w., he made it to Y24WA, YT2FU, K4MQG, RB5LVV, and UD6DFF, with GJ4JVP on s.s.b. for a little variety.

The 10MHz Band

Not many reports this time. First and last one is that from GW0IER, who went on 10MHz to find UQ2AS, HB9DMC, UP1BWW and UB4IA.

The 14MHz Band

This is where it all happens. G4XDJ found AL7, UA9, CU2, UG7, K3, W2, N0, N8, W1, OE6, HR1, CT4, OY7, UV3, UA1, TA2, UL8, UA0, VK3, VX1 and VU2.

G2HKU with his limited available time confined himself to his ZL skeds, with ZL3FV on s.s.b.

G0FUS found three of each; s.s.b. to OF8NKQ, IG9/IT9ONV and N4ZZ, while c.w. made out with UH9BWD/UH8Y, ZL3UA, and ZL1BLR.

GM4ELV also has three on offer; R1A for a special prefix, 4K0D at the North Pole and ZX8ET Sao Luis Is. (QSL via PR8ET, Box 6911, S. Luis 65000, Brazil).

G3NOF notes that the West Coast Ws peaked with him around sunset time, but no Pacific stations were heard. Contacts using s.s.b. were booked with AX2FRB, BY4RB, FT5ZB, HK1LDG, HL9CU, J50AS, J56AS, JY8VM, N7JD/KP5, OX3KM, VE8DX, VI88ACT (VK Centennial station), many other VKs, VK9AD (Norfolk Is), VK9NS, VK9ZR, VS6DO, YS9LG and 9Y4IBN.

The 18MHz Band

Just one report, GM3JDR worked VK4TL and FY5AU using c.w.

The 21MHz Band

GW0IER remarks a mite ruefully that with the number of EUs and Russians he has worked, the bands all seem full of "Eastern Promise"—but that being said on 21MHz c.w. he managed to repeat the pattern with QSOs with IS0IGV, UT5JCW, UL7AAC and WB2FXX.

G3NOF found the long path in January often open to VK and JA around 0830; the short path has been open between 1130 along with a few YB/YC signals. Asians were noted and heard in the mornings but nothing from the Pacific; North America was noted between noon and 1700, and South America around 1100 and again around 1700. January's s.s.b. crop included AX2PWI, BY5RA, CO1EG, CO7JC, FJ5BL, FR5DX, FY5EM, HK3JEI, HI8GMA, KC7UP and KW7J (Montana), HK1LDG, J20YD, J28EO, J37AE, J56AS, JH3RRP, KG4GN, KG4JO, KH6HBZ, OX3KU, many VKs, VK9YD, VP2E/HB9SL, VP2MDF, VP8BPZ, VU2XX, XE2BBD, W7ODP (Arizona), WA0JYJ (Colorado), WD0T (South Dakota), YC2DGI, 5H1HK, 5N0WRE, 5V7WD, 6W7OG, 6W100AD, 8P9AF, 8P9DX and 8P9EM.

For **GM4ELV** the QRP made it to CE and VP8BCQ. Dale incidentally is looking for details of the QSL route for TJ1AF; PO Box 2273 Doula was the address given but that route yielded nothing.

Now we turn to **G0HZL** (Blackpool) who normally is operational from G3IUB in termtime. From home, he has a VK2ABQ beam in the loft and an FT-101B. Apart from the DX listed, Martin has heard GMs and G stations far to the south, such as G3NOF, not normally audible in Blackpool. On the DX front, much has been heard, but contacts have been in the main with USA, Canada, and Russia, the pick of the crop being UA0ALG on phone. Gotaways included VP2EZ, KG4GN, XE, 8P9, YS9DB, TG9GI, WA200HUP, TI2JJP, FR5DX, CN2AQ, 9K2KW, HC1BX, N9CQX/VP2M, 5H3MI, 5X5GK, HI8GMA, J20YD, 9L1SL and 6W7OG, not to mention lots of VKs JA, PY and Ws. It seems as though the loft beam is directional enough but just doesn't lay down a good enough signal to crack the pile-ups. Calls don't result in replies, but frequently get comments about hearing just one or two letters with no solid contacts.

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G0HGA offers YU2DS, YU7ACH, UA1AJH and UW3QN with her QRP.

For **G0FUS** (Eastleigh) it was mainly c.w.; AY1ICX, HK4GGK, LU7AMU, LU9EQH, N4NES, PY2XZ, PY3DK, PP5DC, VK2VEW, VK5NPS, VU2BK and ZZ5VMC, while the s.s.b. hooked up with PT7DM and ZC4DX.

Clearly G4XDJ likes this band best; he managed W8, KI1, YV5, W3, W1, W4, NJ1, UZ3, HB9, AY9, YC3, CP6, YO4, PT2, VK6, PP2, UO5, 9H4, EC9, PY5, VP5, ZZ3, HJ1, VP2, FY5, ZP5, AA4, VE5, CU3, UA9, TA1 and WA6.

The 28MHz Band

G3NOF (Yeovil) had the odd African and USA opening, and CP8HD, FH8CB, J87CD, K200USA, KA1BFC/ZS6, NP4CC, S0RASD, VP2MDF, VP8BPZ, W200GSA, W200ZQ, 5H1HK, 5N3BHF, 6W6JX, 8P6JX, 8P6SG and 8P9AF.

G4XDJ (Billingham) has been changing the skywires around; Brian now has delta loops on 14 and 21MHz, plus a half grounded loop on 7MHz to play with, and into them go between 5 and 50 watts on c.w. or 60 watts s.s.b. on 28MHz, the 14MHz loop is forced to load by means of a home-brew Z-match. The results included contact with G0GKO, G0EEK, UW6, G4ZCN and EA8.

Turning to **G4HZW** (Knutsford), Tony sticks to his TS-820 plus quad. In January, auroral conditions were noted on 2nd, 14th, 18th. Interestingly there were weak GMs about by tropo, under the strong auroral stuff. It added to QSOs with 3C1MB, 4Z4MB, 5H1HK (Zanzibar Is), 8P9EM, 8P9GQ, FT5ZB (Amsterdam Is), GI4SNA, then LA6BBA SM2RHL, OX3SG in the Ar opening, NP4CC, OF1AF, W4s, TR8JLD, VP8BBZ and YV8CAX.

On to GM4ELV and his QRP. PT2ZDR, J28DN, Z23JO, UM8MIG, 5V5TS, ZS6AOT, TI8CBT (twice), FH8CB, ZS6AED, UI8FM, FR/F5QT, ZS6RM, TA3C, KP4JN, KZ9X, K2ZZ, K5KBQ, K5MS, HC1ATG, A22RB, N4NFS, PY1ZAK, UL7ACI, LU7E, LU8AJK, 5L2T, W3FYT/4X, FM5CY, VP2MU, NP4Z, HB9CUZ/5N9 and SV0FE was the listings.

Obituaries

First, Bill Bennett W7PHO, perhaps best known for the "Family Hour" DX Net around 14.226, and for his handling of QSL chores for many DX stations. Bill was also noted for his help in getting confirmations from the rare Russian republics and zones from contacts on the Family Hour Net. He is one who will be missed, but not forgotten, for we understand the call will be continued by the net, while KA6V will pick up the QSL side. Bill was 78, and we must say that even DXers who hated net operations such as me were always grateful to Bill for his promotion of the concept of DX and help of DXers.

Nearer to home now, Norman Horrocks G2CUZ died on January 6. Norman got his AA licence fifty years ago, and served in WWII in the technical side of RAF signals, serving in UK, in India and the Middle East. After the war, Norman obtained his full call, and was well known to amateurs in the North West; he was a founder member of Ainsdale club, later to be known as Southport and District RC, and served as Hon Sec and Chairman, as well as RSGB's AR. From 1981 onwards Norman suffered a number of strokes which incapacitated him to the point where operating was no longer possible, but he still attended meetings and showed a keen interest. Norman Horrocks will be missed by all.

The third one to pass on was Bill Hatch G0BKL, of Harlow. Bill was in my RAE class one year, but dropped out; several years later, word reached the locals by a roundabout route that Bill was now blind but still interested and eager; so with great help from RAIBC and local amateurs, Bill was eventually coached through the RAE. Then came the B licence, and in the fullness of time, with the help again of the locals, Bill passed the Morse test and got his full call. Alas, he never managed to actually operate on the h.f. bands although the ambition was always there; but at least he was able to enjoy a few years of amateur radio and indeed he was in QSO with G4ITL the day before his sudden passing. Those of us who knew this brave and modest man will miss him.

Happenings

Jim Smith notes that HIDXA's efforts on this Baker & Howland Is one seem to be bearing fruit; March 21-April 8 are the target dates. It had been hoped to operate from Sao Tome before this KH1 activity, but snags have cropped up and S9 will be activated later in the year.

KH5, Kingman Reef & Palmyra Is are in the pipeline according to a note in DX News Sheet, the target being for April.

Something a little worrying springs to mind when we hear that there is a proposal to activate Spratly in March; K6EDV hopes to pull this one off, but it should be remembered what happened to the DLs who tried to activate this one a few years ago.

The "proposed" operations from Marion Is. ZS8 due about now seem to have been hot air; up until December VE3FXT had not applied for a permission, and ZS6RM/ZS6BBY who have themselves applied, have been turned down on the grounds that the International Antarctic Treaty discourages any visitors not engaged in scientific research; and they have gone on record to say that if VE3FXT does apply, he will get the same answer.

Contests

The Biggie here is the CQ WW WPX Contest; s.s.b. on March 26-27, c.w. May 28-29. The rules are the same as for many years past, so all regular participants will know what's what. Single-operator stations can only take 30 of the 48 hours.

March 19-21 is down for the Bermuda Contest; 0001Z Saturday to 2359Z Sunday. You are limited to 36 out of the 48 hours of the contest. Contacts on 3.5, 7, 14, 21, 28MHz. While crossband or cross mode contacts are not allowed, the same station may be worked on each band, successively on phone and c.w. provided there is a thirty minute gap between QSOs on the same band. UK station work Bermudans, US and Canadian stations; exchange RS (T) and QTH. (county for UK). Separate log for each band, and a dupe sheet if you have more than 200 QSOs. First prize is a Trophy to be presented at the Dinner in October; winners will have roundtrip fares and accommodation paid to enable them to be there and collect. Certificates to top scorers as well. Logs to arrive by June 1, addressed to Radio Society of Bermuda, Box HM275, Hamilton HM AX, Bermuda.

The next three deadline dates are March 26, April 26 and June 1

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ

Apart from a few auroras, January 1988 was an uneventful month for v.h.f. operators. However, those indulging in meteor scatter work found the Quadrantids quite good.

Postal Delays

Several readers' letters arrived just too late for last month, probably due to the Christmas traffic. Consequently a few Annual Table scores could not be given in their final total.

The only significant change was to the c.w. ladder wherein **Ron Wilson's G4NZU** total of 339 would have earned him third place. In the v.h.f./u.h.f. table, **Ian Harwood G8LHT** ended with 155 points which would have put him in 9th position.

The deadlines given prominently each month really are the last dates for me to receive your letters and it seems prudent to allow two days for first class mail.

Awards News

Congratulations to **Martyn Jones G4TIF** (WKS) who is member number five of the 432MHz QTH Squares Century Club. His claim was processed on Jan 26. From ZM53e he was 101 squares confirmed out of 107 worked. All QSOs were on tropo s.s.b. mode with 18 countries represented.

Martyn started on the band in May 1981 using a Trio TS-700G and Microwave Modules 432/144R transverter, the antenna being a 48-ele Multibeam. His present station comprises a Kenwood TS-770E and SOTA 50W amplifier, the antenna a Tiger 14-ele Silver Seventy at 9m a.g.l. His QTH is 78m a.s.l. He is also member No. 17 of the 144MHz QTHCC, earned on 22 Jan 1982.

John Cornall G6IJM (LNH) was elected to membership of the 144MHz QTHCC on Jan 29. He has 101 confirmed from YN15d out of 134 worked. 22 countries were listed, 87 QSOs being on tropo, nine via Es and five by Ar propagation.

John was first licensed in 1982 and used f.m. till the start of 1985 when he came to s.s.b. mode. His initial station consisted of an Icom IC-211E and 100W to an 8-ele Yagi. His current equipment comprises a Trio TS-711E, also 100W but to a 17-ele Yagi by Tonna, 16m a.g.l. His Blackpool QTH is less than 8m a.s.l. He is a WAB square collector too.

Any reader wanting information on *PW* v.h.f. awards should send an s.a.e. to the Awards Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.

Worked All Britain

John Fitzgerald G8XTJ, the Publicity Officer for the WAB group, has sent details of proposed activity from area OV00. This is a small area of foreshore at

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the base of 150m cliffs near Ravenscar (YSN).

The date is April 3, the callsign GB1OVA manned by several operators including G1OVA. It is hoped to have 100W and a 13-ele antenna this trip. G1SGB will be located near the cliff top with 250W and two 13-ele Yagis to act as contact man. Listen out on 144.375MHz s.s.b.

Recent "firsts" in the awards programme include G6ZGO who worked 100 book holders on 50MHz and G6STI who has worked 900 third-series book holders on 144MHz.

Contest Information

March 13, 1300-1700UTC sees the Derby and District ARS 144MHz contest. This is all modes with fixed, /A and /P operation valid. Three sections, full legal power, low power (30W maximum output) and s.w.l. Usual RS(T) and serial number exchanges plus administrative county or Scottish region.

Each contact is worth two points but the club station G3ERD is 10 pts. Final score is QSO points times number of counties with overseas countries, such as ON, PA, regarded as extra counties. Entries to DA-DARS, 119 Green Lane, Derby DE1 1RZ to arrive by March 30.

The last two legs of the 70MHz Cumulatives are on March 13, 1000-1200UTC and the 27th, 0900-1100UTC. Thereafter entries to G5FRE at 15 Ferry Lane, Cavendish Park, Felixstowe, Suffolk IP11 8UR.

50MHz operators will have a short contest on April 2, 1800-2200UTC. Two sections here, F being single-op fixed stations, and O being all others. Radial ring scoring up to 650km, all contacts over that QRB being worth 25 pts. County and country multipliers apply in this event. One point for each different county or country. Because the Scottish regions are large, you can count up to three multiplier points per region. Final score is QSO points times multiplier.

Entries should go to G4NBS at 10 Quince Road, The Limes, Hardwick, Cambridge CB3 7XJ.

The 70MHz Fixed contest is on April 3, 0900-1400UTC and this is the same ruling as for the 50MHz event but with radial ring scoring throughout—no 25 pts maximum. Send your entries to G8HHI at 43 Bartons Drive, Yateley, Camberley, Surrey GU17 7DW.

April 9/10, 1400-1400UTC sees the 144MHz and s.w.l. contest which has three sections, S for Single-op, M for Multi-op and L for Listener. Again this uses radial ring scoring and the country/country multiplier scoring idea. Entries for it to G4JLG at 40 Edge Fold Road, Worsley, Manchester M28 4QF.

Note that all times given are in UTC and that Summer Time starts in the UK on March 27.

Moonbounce

Many stations should be able to hear signals off the moon thanks to modern technology. If you take the trouble to install a low-noise masthead pre-amp and are blessed with a reasonably good location, single Yagi stations can copy several of the big DX stations on 144MHz.

If you can elevate your antenna system your chances are much better as you will greatly reduce terrestrial man-made noise. If the DX station has a really big array it is possible to make a QSO without exceeding your licensed power.

Dave Dibley G4RGK (BKS) has sent me some details of the famous huge dish antenna at Arecibo in Puerto Rico, sent to him by KP4I. It is 305m in diameter built in a natural depression formed by collapsed sedimentary limestone. The dish is spherical, not parabolic, the centre of curvature being 265m above the bottom of the dish with the feed located halfway to the centre.

The antenna points along the line from the feed to the centre of curvature. Due to the spherical shape, rays reflected from the dish are focused along the length of the 29m line feed which is basically a tapered waveguide with radiating slots.

The system was used on Oct 17 and 18 last during part of the ARRL Moonbounce Contest. Since it can only be steered up to 20° from the vertical, only two hours per morning could be used.

A 60W solid state p.a. for 432MHz was used, its power fed to the feed platform through 305m of WR2100 waveguide with a loss of only 1dB. For reception a standard cooled GaAsf.e.t. RX was used, the overall noise temperature being about 60K equivalent to a noise figure of 0.82dB.

G4RGK wrote, "They sure were the biggest signal I have heard off the moon on any band". Hardly surprising when you realise that the beam diameter is just ten arcminutes or one-third the angular diameter of the moon.

Annual v.h.f./u.h.f. table
January to December 1988

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1KDF	3	3	—	—	26	8	6	4	5	3	58
G3FPK	—	—	—	—	46	9	—	—	—	—	55
G4XEN	4	1	—	—	25	7	5	2	—	—	44
GW4FRX	—	—	—	—	36	7	—	—	—	—	43
G1IMM	5	4	—	—	7	3	6	1	—	—	26
G8XTJ	—	—	—	—	23	2	—	—	—	—	25
ON1CAX	—	—	—	—	13	5	—	—	—	—	18
G0HDZ	—	—	—	—	15	3	—	—	—	—	18
G0HGA	—	—	—	—	14	3	—	—	—	—	17
ON1CDQ	—	—	—	—	7	6	—	—	—	—	13

The 50MHz Band

The important news this month is that French amateurs with Class C, D and E licences may now apply for a permit to operate on 50MHz. This excellent, and quite unexpected, news came from Alain Puillandre F6HRP via Roger Thorn G3CHN (IOW).

The band is 50-51MHz and c.w., s.s.b., RTTY and packet modes are permitted, but there are several limitations. These include only fixed station operation, no operation within a 150km radius of Paris, Lyons, Amiens, Nice, Carcassonne, Besançon, nor anywhere in Corsica, nor within 150km of any Channel 2 TV transmitter.

Even so, 38 departments are unrestricted and two partly affected, of the 95. As for power, 3W e.r.p. is allowed between 150 and 200km from a Ch 2 TX and 10W if the station is more than 200km from such a TX. No antenna polarisation restrictions are mentioned.

F6HRP hopes to be QRV on the band by May and Joseph Cornée F6CTT is also interested. This is a most welcome *volte-face* by the French PTT which had previously seemed to have been very much against any European 50MHz amateur operation.

In his Jan 2 *VHF News*, Hal Lund ZS6PW included a list of 53 South African stations on the band. It gives their telephone numbers and Maidenhead squares such as JF95 and KG41, etc. They have adopted the 50MHz Worldwide DX band plan and beacon plan. The t.e.p. season is from March to October.

ZS beacons which could be heard in Europe include ZS2SIX in Port Elizabeth (JF25) on 50.005MHz and ZS6DN near Pretoria (KG44) on 50.05 and 50.055MHz both of which are beamed in different directions intermittently.

Back home **Dave Ackrill G0DJA** (WMD) is currently running 3W using a v.m.o.s. p.a. after his *PW* Meon transverter. A valve p.a. is planned for this year and a rotatable beam on the roof is likely to supplement the 30m long wire antenna. Dave hopes to run some packet radio too.

Adrian Gee G1IMM (CBE) uses a Spectrum transverter and a 10W Nevada amplifier, the "prime mover" being an Icom IC-271E. His antenna is a 3-ele yagi by M.E.T. 4.6m a.g.l. He has been on the band since last August.

In the aurora on Jan 14, **Bob Nixon G1KDF** (LNH) heard LA8OJ and GM3WOJ very loud at 2140. Welcome to **Peter O'Dowd G0HLT** (NOT) who has put in his first entry for the annual c.w. ladder and who operates on the band.

Ian Galpin G1SMD (DOR) uses a Yaesu FT-690 transceiver running 2W to a dipole. He plans to have a 40W p.a. soon and a 3-ele Yagi.

The 144MHz Band

Johan Van De Velde's ON1CAK letter was received in mid-January and he reports about the good tropo opening to Southern France and Spain in the Dec 20-23 period last year. He worked stations in AD, AE, XD, ZD and ZE squares. There were some Italians on from EE and EF but Johan missed them.

He did not find much activity in the Ar on Jan 2 but did work three GMs on s.s.b. GM, LA, SM4/5 and OH were heard on c.w. but his licence does not permit c.w. mode. He is looking for WR, WQ, XQ, XS and YS squares. GM8DFX is on s.s.b. from XS square, according to **John Eden GM0EXN** (HLD). Johan included a table entry from his brother ON1CDQ.

Another new Belgian contributor is **Guy Espreux ON5DG** (CK38c) from Boncelles. His list referred to the Nov 3-8 period last year already well reported. Guy has several transceivers and runs 100W on the band using a 17-ele Yagi antenna 16m a.g.l. His QTH is 240m a.s.l.

G0DJA's letter reviewed Dave's activity in 1987 in which he finally made c.w. contacts with 123 different stations. 14 per cent were made at 25W the rest at 2.5W. Best DX were OK2TU and OK1DEF. He uses packet radio a little too.

G0HLT asked if c.w. QSOs with B licensees count for the ladder which of course they do. There is no need, Peter, to list all the different stations but it makes for more interest if unusual contacts are mentioned and the longer DX worked.

G1IMM uses an Icom IC-271E at 25W

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Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G0HGA	—	—	75	—	75
G0HLT	1	—	31	—	32
G4OUT	—	—	19	—	19
G3FPK	—	—	8	—	8
GU4HUY	—	—	3	—	3

Number of different stations worked since January 1.

with a Jaybeam 8-ele Yagi at 6m a.g.l. By the way Adrian, you count your own country in the total so I have amended your figures. His best DX in 1987 was probably OY9JD.

G1KDF caught the Ar on Jan 2 and operated at 1700-1730. Bob worked GM8FFX (GRN), GM6RGN (SLD) on ZU square and GM0HBK (HLD) in XR. He heard GM4ZET (SLD) and GM0FET (WIL) too.

In the Jan 14/15 Ar, which was a very extensive event, he worked GM8YMK (OKE) in YT for a new square, GM8COX (SCD), GM0DRU (WIL) in WS, GM6RGN, GM8MJV (LTH), G1DXI (HBS) and GI6ATZ (ATM). Others heard included GM0HQG (OKE) and LA8OW. Bob was QRV from 1815 to 0050.

G1SMD uses a Yaesu FT-290 with 10W amplifier and a 6-ele quad antenna, 7m a.g.l. Ian's QTH is only 7m a.s.l. surrounded by hills. He lists some useful DX in the Dec 20-23 tropo opening.

Ian Cornes G4OUT (SFD) remarks on the poor tropo during January and has worked 19 stations on c.w. up to the 24th. He is having drift problems again with his IC-271E and hopes the dealer will have cured these in time for the contest on Feb 7. Failing this, he will use his FT-290R.

G4RGK spoke to some Scandinavian v.h.f. operators on the 144MHz v.h.f. net after the Jan 2 Ar. It seems that the SMs had worked very long distances to UA9FAD and other UA9s. QRBs of over 2000km.

Dave operated in the Quadrantids meteor shower with much success. He suggests the shower peaked early on Jan 4 this year. Over the past seven years he has recorded details of all his contacts, which coupled with a computer program has proved invaluable in enabling the optimum time for a schedule to be arranged.

G4RGK completed QSOs with SM3PXO (GX), IW1AZJ (DF), IW2BZY (EF), UT5DL (LI), SM3BIU (HX), LA1TV (ET) and HG7WJ/5 who was only using 50W to a 9-ele Yagi.

G4SSO (LDN) is quite pleased with his achievements in 1987 which brought Alan 34 new squares making his current total 193. He operates on m.s. and in the December Geminids completed with EA6FB (AY) for a new square and country. His station comprises a Yaesu FT-225RD with MuTek pre-amp, a p.a. with two 4CX250Bs and a 15-ele Cue-Dee Yagi which seems not to suffer from rain static. The antenna is supported on a 13.7m Altron mast and the feeder is the low loss LDF4-50.

G4XEN (NHM) completed a couple of random c.w. m.s. QSOs in the Geminids. These were F8OP (CF) on Dec 13 and SM4HFI (HU) on the 14th. On Jan 3 in the Quadrantids John's only QSO was with UT5DL, LI being a new square.

Arthur Hough G4YTR (YSS) is another reader whose last letter was delayed. He ended the year with 111 stations in the c.w. ladder and accumulated a few new countries and squares in the late-1987 lifts. His station consists of an Icom IC-251E, Belcom LA-106 amplifier and 14-ele Yagi by M.E.T. 11.6m a.g.l. his QTH being only 6.7m a.s.l.

G8LHT added 15 new squares in the late-1987 lifts and is now up to 99 on the band. Two new countries for Ian were SP and Y and he ended last year with 24 worked. He has made a new amplifier and plans to convert the old one for 70MHz.

G8PYP (DOR) comments on the December 19-23 tropo opening and reckons the conditions were at their best in the early afternoon of the 23rd. Steve concludes that some good quality DX was available but lacking in quantity. Two new squares were AE and DJ in France.

G8XTJ has found things rather quiet in January, having missed all the auroras. He has been gradually working towards his Diamond Award in the WAB programme and needed 37 areas to complete the 1500 required.

Irwin Brown GI1JUS (ATM) reports a couple of completed m.s. QSOs in the Quadrantids. These were s.s.b. ones with DL3AAL (FM) which went through in 26 minutes, and Y23NL (GL) completed in 32 mins. Apart from that, tropo conditions in GI have been as mediocre as everywhere else in the British Isles.

Finally to the far north of the mainland and John Eden GM0EXN (HLD). Auroras are frequent at his latitude so his several letters cover recent events.

Starting on Dec 21, 1210-1530, he worked 27 stations on c.w. and s.s.b. in D, G, LA, OZ, PA, OH and SM. The most easterly and northerly station was OH3EX (KV), the most southerly G6GN (AVN) and the furthest to the SE, Y23SB (FN). QTE was 30-40° for this event.

On Jan 2 the Ar lasted from 1200-2000 and 15 stations were worked on c.w. in the first $3\frac{1}{2}$ hours in LA and SM. The most northerly was SM3AZV (IX) and all were best at 30-40° again.

In his second period of operating John's best DX was OH5LK (NU) and DK0TV (GM) in Berlin. This session brought D, LA, OZ, SM and Ys as well plus assorted EI, G and GI contacts at QTE 300°. Nothing to the east was heard in the last 40 mins of this phase. The band was full of c.w. signals right up to 144.150MHz.

Now the event on Jan 14 which probably started at 1600 John thinks. The SMs were weak throughout but the German stations were up to S8 at times. No OH or Russian stations were heard and beam headings were from 280°, through north to 45° and beacons heard were DL0PR, Y41B, GB3LER, GB3VHF and SK4MPI. 18 c.w. and two s.s.b. QSOs were made up to 2300 when John closed down.

On Jan 18, John reports a visual aurora as a high white arc curling around the Arctic, fuzzy but clearly visible. Seven stations were worked on c.w., mainly at QTE 25-30° for LA and SM but DK1KO (FN) was at 60°.

GM0EXN also included details of John Lincoln's GM8DFX (XS) Ar activities. This is a renewed call and 'DFX can be contacted via 'EXN for the time being. He was in on the Jan 2 event working G, GI and GM stations on s.s.b.

March 26, April 26 and June 1 are the next three deadlines

QTH Locator Squares Table

Station	Band (MHz)			Total
	1296	430	144	
G3IMV	35	119	405	559
G4KUX	—	80	345	425
G8GXP	45	151	331	527
G4DHF	—	—	307	307
G4SWX	—	—	293	293
I4YNO	—	—	270	270
G4RGK	38	106	260	404
GJ4ICD	59	119	253	431
G4XEN	—	106	251	357
G4DEZ	44	38	246	328
G1EZF	32	93	237	362
G8XVJ	18	88	236	342
G3UVR	75	125	224	424
G3FPK	—	—	224	224
G4IGO	—	—	223	223
G4SFY	—	—	222	222
G6XVV	25	64	211	300
G4MEJ	—	—	211	211
G8LFB	—	—	202	202
G4SSO	—	78	193	271
G4TIF	—	107	187	294
G3COJ	44	102	186	332
G3XDY	81	137	185	403
G4MJC	—	33	184	217
GM4CXP	—	31	184	215
G6DER	76	110	183	369
G0DAZ	—	91	183	274
G4XEK	—	—	178	178
G6HKM	26	101	177	304
G4YUZ	—	—	177	177
G3JXN	82	129	175	386
G4DOL	—	—	172	172
G1EGC	—	74	171	245
ON1CAK	—	—	167	167
G1GEY	—	68	158	226
G4YCD	—	36	155	191
G3NAQ	—	75	154	229
G6DZH	—	87	149	236
GI1JUS	—	—	149	149
G8HHI	31	106	148	285
G1KDF	32	91	148	271
G4MUT	28	90	145	263
GW4FRX	—	—	144	144
HB9AOF	55	80	141	276
G6MGL	59	89	138	286
G8ATK	42	89	138	269
G8MKD	—	49	137	186
EI5FK	—	35	137	172
GM0BPY	—	57	129	186
G8ZDS	—	43	129	172
G8PNN	62	97	128	287
G6YLO	32	104	128	264
G1LSB	—	126	125	251
G6STI	21	58	124	203
G4TGK	—	—	118	118
G8XTJ	—	—	107	107
G4AGQ	1	41	103	145
GW6VZW	—	6	103	109
G4NBS	59	103	102	264
GW8VHI	—	48	102	150
G4CQM	—	52	100	152
G8LHT	2	58	99	159
G6AJE	5	57	95	157
G1IMM	—	11	91	102
G4FRE	63	136	84	283
GI4OWA	—	—	78	78
G1SMD	—	—	77	77
G4FVK	20	46	75	141
G0FEH	—	2	70	72
G6MXL	10	36	66	112
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
PA3EUS	—	18	57	75
GM0GDL	—	17	54	71
GU4HUY	—	—	54	54
G1DOX	28	34	53	115
G8PYP	—	2	52	54
G1NVB	—	—	49	49
G4ZTR	29	29	37	95
G1VTR	—	23	32	55
G2DHV	1	4	30	35

Starting date January 1 1975. No Satellite or repeater QSOs. "Band of the month" 144MHz.

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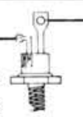

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EABC80	1.25	EZ80	1.50	PY500A	4.00	6AS6	8.66		10.00
EB91	1.50	EZ81	1.50	PY800	1.50	6AS7G	8.75	6SA7	3.00
EBF80	1.50	GY501	300	PY801	1.50	6AT6	1.25	6SC7	2.75
EBF89	1.50	GZ32	4.00	QQV02-6	38.00	6AU5GT	5.00	6SG7M	2.50
EC91	8.00	GZ33	4.75	QQV03-10	26.25	6AU6	2.50	6SJ7	3.25
ECC33	4.50	GZ34	5.00	QQV03-20A		6AW8A	3.75	6SK7	3.50
ECC35	4.50	GZ37	4.75		48.38	6B7	3.25	6SL7GT	3.00
ECC81	1.75	KT61	5.00	QQV06-40A		6B8	3.25	6SN7GT	3.00
ECC82	1.75	KT66	15.00		46.00	6BA6	1.50	6SS7	2.75
ECC83	1.75	KT77 Gold Lion		QV03-12	6.80	6BA7	5.00	6U8A	2.25
ECC85	1.75		12.00	R18	3.00	6BE6	1.50	6V6GT	4.25
ECC88	3.50	KT88	15.00	R19	9.24	6BH6	2.50	6X4	3.00
ECC91	8.93	N78	15.00	SP41	6.00	6BJ6	2.25	6X5GT	1.75
ECF80	1.50	OA2	3.25	SP61	4.00	6BN6	2.00	12AX7	1.75
ECH35	3.00	OB2	4.35	U19	13.75	6BQ7A	3.50	12BA6	2.50
ECH42	3.50	OC3	2.50	U25	2.50	6BR7	6.00	12BE6	2.50
ECH81	3.00	OD3	2.50	U26	2.50	6BR8A	3.50	12BY7A	3.00
ECL80	1.50	PC86	2.50	U37	12.00	6BS7	6.00	12E1	20.00
ECL82	1.50	PC88	2.50	UABC80	1.25	6BW6	6.00	12HG7	4.50
ECL83	3.00	PC92	1.75	UBF89	1.50	6BW7	1.50	30FL1/2	1.38
ECL86	1.75	PC97	1.75	UCH42	2.50	6BZ6	2.75	30P4	2.50
EF37A	5.00	PC900	1.75	UCH81	2.50	6C4	1.25	30P19	2.50
EF39	2.75	PCF80	2.00	UCL82	1.75	6C6	3.50	30PL13	1.80
EF41	3.50	PCF82	1.50	UCL83	2.75	6CB6A	2.50	30PL14	7.80
EF42	4.50	PCF86	2.50	UF89	2.00	6CD6GA	5.00	572B	65.00
EF50	2.50	PCF801	2.50	UL41	5.00	6CL6	3.75	805	45.00
EF54	5.00	PCF802	2.50	UL84	1.75	6CH6	13.00	807	3.75
EF55	3.50	PCF805	1.70	UY41	4.00	6CW4	8.00	811A	18.33
EF80	1.75	PCF808	1.70	UY85	2.25	6D6	3.50	812A	52.50
EF86	5.00	PCH200	3.00	VR105/30	2.50	6DQ5	7.50	813	65.00
EF91	2.95	PCL82	2.00	VR150/30	2.50	6DQ6B	4.75	866A	35.00
EF92	6.37	PCL83	3.00	Z759	25.00	6EA8	3.00	872A	20.00
EF183	2.00	PCL84	2.00	Z803U	25.00	6EH5	1.85	931A	18.50
EF184	2.00	PCL85	2.50	2D21	3.25	6F6	3.00	2050	7.50
EH90	1.75	PCL86	2.50	3B28	50.00	6Gk6	2.75	5763	4.50
EL32	2.50	PCL805	2.50	4CX250B	58.00	6H6	3.00	5814A	4.00
EL33	5.00	PD500	6.00	5R4GY	5.50	6HS6	3.77	5842	12.00
EL34	5.00	PFL200	2.50	5U4G	3.00	6J5	4.50	6080	14.00
EL36	2.50	PL36	2.50	5V4G	2.50	6J6	8.93	6146A	12.00
ELL80	25.00	PL81	1.75	5Y3GT	2.50	6J7	4.75	6146A	12.00
EL81	5.25	PL82	1.50	5Z3	4.00	6JB6A	6.50	6146B	12.00
EL84	2.25	PL83	2.50	5Z4GT	2.50	6JE6C	7.50	6550	12.50
EL86	2.75	PL84	2.00	6/3OL2	1.75	6JS6C	7.50	6883B	12.50
EL91	7.39	PL504	2.50	6AB7	3.00	6K6GT	2.75	6973	7.50
EL95	2.00	PL508	5.50	6AH6	5.00	6K7	3.00	7025	4.50
EL360	18.50	PL509	6.00			6K8	3.00	7027A	8.00
								7360	10.00
								7586	15.00
								7587	23.00

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On the 14th **GM8DFX** operated for an hour from 1800 and worked 14 stations, mostly Gs, but also GW4FRX, GI4OWA, GM8COX, GM1GGP and GM0EXW. John used 40W and a 6-ele Yagi beaming 35°.

The 430MHz Band

New contributor ON5DG operates on 430MHz. He uses a Yaesu transverter and Icom IC-745 transceiver with 60W to a pair of 21-ele Yagis. Guy listed many QSOs over 600km made way back in the early-November tropo lift.

G1IMM uses his Icom IC-271E and a Microwave Modules transverter and started on the band in mid-December. Adrian's antenna is a 19-ele Yagi from the Tonna stable 6.1m a.g.l. So far he has worked eleven squares.

G1KDF is still looking to make his first Ar QSO on 430MHz. It seems that unless there is a very intense event, everyone operates only on v.h.f.

G4SSO reports that 1987 produced another 26 squares. Alan was particularly pleased to work SP6GZZ on Nov 5, his best DX so far. He is finding QSLs from Gs just as difficult to acquire as those from overseas stations. He has sent three cards to one Cumbrian operator without response.

His station consists of a Yaesu FT-980 transceiver driving an FTV-107 transverter with a Tokyo 50W amplifier. At present Alan has a single HAG 22-ele Yagi on the Altron wind-up mast but plans to add another soon. As for 144MHz, he uses LDF4-50 coaxial feeder.

G4XEN reckons his only recent noteworthy QSOs were on Dec 22 with F1EZQ (CH) and on the 23rd with DF9CY (EL). QSLs for 144 and 432MHz from F1EZQ were incorrectly made out to G4EXN and both for 432MHz as well. John first worked CH square in 1982 and is wondering if he will ever get it properly confirmed.

One of G8LHT's plans for 1988 is to install a masthead pre-amp for the band. In 1987 Ian added 22 more squares and four new countries—OE, OK, SP and Y. His best DX on the band was SP9FG (JJ70b) at 1536km.

G8PYP has added a 430-440MHz transverter module to his Yaesu FT-726 so is now QRV on the band. So far he has only contacted a few local stations in two squares.

The Microwave Bands

In reviewing his microwave activity in 1987, G0DJA concludes it was "A bit of a poor year . . ." Just a few QSOs on 10GHz and little on 24GHz, mainly because he could not get out -/P very often. Dave reminds me that in the winter, the first Sunday each month is microwave activity day.

John Tye G4BYV (NOR) operated on 5.7GHz on Dec 23 and worked DC0DA (DL38e) for his best DX so far of 464km. He and Simon Freeman G3LQR were also heard by DF7VX (EL) but they could not find the German station. During this December lift John reports good conditions on 1.3 and 2.3GHz with German, Dutch and English stations in the south east working into ZD, ZE and ZF squares.

Keith Hewitt G6DER (YSS) made four contacts on 3.4GHz on Dec 23; PA0RDY, PA0EZ and PE1ALA all in CM square and DF7VX. If he can find a suitable coaxial relay at a sensible price he would like to mount the whole lot behind the dish. He reckons 400mW should be quite effective. Keith is now using two r.f. stages on receive, an MGF1402 followed by an MGF1202.

Meteor Shower Data

The next major shower is the Lyrids, the earth passing through the stream between April 19 and 25. The peak is usually reckoned to be the 22nd. The Right Ascension is 272° and the Declination +33° and the radiant is below the horizon between about 1400 and 1830UTC as far as British Isles stations are concerned.

Best times for skeds would be; NE-SW around 0200 and 0900, worst time 0530. E-W around 0430 with 1100 and 2100 as possible times, avoid 0030 and 0830. NW-SE around 0700 and 2300 but avoid 0300. N-S should be quite effective around 0000 and 0800 but avoid 0430.

These data were produced by my Sinclair ZX-81 programs which are based on DL5MCG's ideas as previously noted. The great circle bearing is also printed for the station you want to work, as is the antenna elevation for optimum efficiency and the distance.

Antenna Notes

In the previous paragraph I mentioned antenna elevation in connection with m.s. communication. Meteoric dust ionises in the E-layer of the ionosphere at about 100km altitude. Sporadic-E communication is also effected at this height. Some simple geometry will show that at a distance between stations of less than about 2200km there is merit in using some antenna elevation for m.s. and Es QSOs.

In round figures, over a distance of about 100km an elevation of 10° would be useful. For average m.s. skeds in the range 1000 to 1600km 6° of elevation would be appropriate.

Some operators without elevation rotators have adopted a permanent elevation of a few degrees. As far as line-of-sight paths are concerned, there would be no noticeable difference from a truly horizontal beam.

I use about 2-3° fixed elevation at G3FPK on 144MHz. This angle is that to my nearest local obstruction and it does not seem to adversely affect the tropo performance of the station in unobstructed directions. A few readers in poor locations have mentioned that they use permanent elevation. This is a useful ruse if you are an occasional satellite user and do not wish to buy an expensive extra rotator.

CW on 144MHz

G4SSO is one of an increasing number of s.s.b. users on 144MHz who are concerned at the amount of c.w. activity in the 144.15-144.50MHz section. He says it is quite commonplace to hear two A licensees on 144.225MHz for example, carrying on a c.w. QSO, then holding an inquest.

I would add that I was astonished to read in the January issue of *Radio Communication*, page 46, that the RSGB v.h.f. Committee agreed that slow Morse should take place on 144.250MHz.

I believe there are "official" broadcasts most weekday mornings. On Sunday mornings I can hear a couple of GB2RS news stations from other regions and a London slow Morse teach-in on '250. What a mess!

144.250MHz is the last place for either news or slow Morse broadcasts. Surely everyone appreciates that the section 144.15 to 144.40MHz carries most of the DX traffic during tropo and Es openings. Are DX fans supposed to refrain from replying to an LZ or SV station who appears on or near '250?

Nobody wishes to discourage B licensees from practising sending and receiving Morse on the air. However surely a more appropriate part of the band would be between 144.45 and 144.50MHz? This would be well out of the way of any DX and contest activity and should afford the net members a QRM-free part of the band.

Somewhat tongue-in-cheek, G4SSO writes, "Heaven knows what will happen to DX-peditions in the future. Perhaps they will need dispensation to operate s.s.b. below '150 where there is little c.w. activity any more."

I sincerely hope that the RSGB VHF Committee will reconsider this inappropriate decision and bear in mind the original concept that the bottom one megahertz of the 144MHz band was for non-channelised, non-net DX communication and the top half was for local, channelised f.m. mode operation.

Your views on this topic would be welcomed so that a considered argument can be put to the afore-mentioned committee.

Record Keeping

Many readers now keep all sorts of amateur radio records on computer. G6DER received a couple of G4HLX programs as a Christmas present and is very impressed with them. The first one is called SQUIF which he says is a squares collecting program. The other is called SPOT and is a distance and logging effort.

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

RTTY and AMTOR

Ian Baxter has written with details of his s.w.l. station which comprises a Yaesu FRG-7700 receiver, 20m long wire antenna and ZX Spectrum computer running the RX-4 program from Technical Software. Ian's station seems to be working very well with the best recent DX being 9N7YDY (Nepal).

For those of you on 10MHz two items of interest. First I have news of a new mailbox which will be operating on 10.140/10.145MHz using the call W8YFE. Reports on this mailbox will be very welcome.

I recently monitored a very interesting AMTOR QSO on 10MHz between HB9BJ (Switzerland) and 9K2EC (Kuwait). The antenna in use at 9K2EC comprised a 17 element log-periodic for h.f.! Now that must be quite a sight, enough to give the local planners a heart attack!

Another reader, **Dave Speechley G4UVJ** has sent me his station details via my Prestel mailbox. Dave operates mainly data modes including AMTOR, Packet, RTTY and ASCII. The computer and interface used comprises a Tandy 100 portable computer and the popular PK-232 terminal

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unit. For h.f. Dave uses a Yaesu FT-757 transceiver driving either an Altron AQ6 minibeam or an HF-5 vertical. When working on v.h.f. the FT-757 is used in conjunction with a FTV-901 transverter equipped with 50 and 144MHz modules. Dave's best recent DX was VK7AE (Tasmania) under apparently flat band conditions. Like many other amateurs, Dave reports that results using higher speed ASCII are often better than that obtained with RTTY. For my thoughts on this subject see my comments on ASCII vs RTTY elsewhere in this column.

A welcome return this month for **John Barber G4SKA**. John has been busy moving to a new QTH, so has had very little time for radio. The current project is to rebuild his home-brew terminal unit from its birds nest form onto a proper p.c.b. Hopefully he will be back on the air, at least with a temporary antenna system, by the time this is published.

FAX

How is the FAX activity night going? So far I have received plenty of encouragement but no actual reports. Would you like to see it extended to h.f. or have you any other suggestions?

For h.f. fans the best time to monitor still seems to be Sunday mornings where there are always German stations to be heard using 120 r.p.m. and an IOC of 288. Once again all reports for this fascinating mode are very welcome.

ASCII vs RTTY

Regular readers may recall that I mentioned the growing use of ASCII and higher baud rates in an earlier issue. In that issue I made reference to a QSO between HB9KU and OH2LU. Well, I received a QSL card for that contact the other day! The QSL card was accompanied by a very interesting letter from **Dr Luigi Valpiana HB9KU**. Luigi was asking the question why does 75 or 110 baud ASCII often seem to produce better copy than 45 baud RTTY? At first sight this seems to be a contradiction of accepted theory. When comparing two signals over the same quality path then conventional theory would expect that the signal using the lower baud rate will have the lower error rate. When comparing 45 baud RTTY to 100 baud ASCII however, the opposite sometimes appears to be true! Not being one to ignore established theory I set about finding a solution to this phenomenon.

I believe the answer lies in the code used rather than the transmission rate. When using RTTY the International Telegraph Alphabet No. 2 (ITA No. 2) is employed to convert the typed character into a 5-bit code for transmission. It doesn't take too much maths to realise that a 5-bit code with only 31 combinations cannot, on its own, handle 26 alphabetic characters, figures and punctuation. The trick used with the ITA No. 2 is to incorporate shift characters so that each transmitted 5-bit code has two possible meanings, the two shifts are known as letters and figures.

When a RTTY signal using ITA No. 2 is subject to interference one common result is that either a shift character is lost or an extra shift inserted. If this does happen then all the following characters will be printed incorrectly until another shift is received. From this description it can be seen that a single error in RTTY can result in a large amount of corrupted information.

When considering the performance of an ASCII transmission the situation is rather different as a 7-bit code is used giving 127 possible combinations. This means that a full range of alpha-numeric characters can be sent without resorting to the use of shift characters. Again, when considering an ASCII signal which is subject to interference, only the character that is directly affected by the interference will be corrupted.

From this analysis it can be seen that with a single character error RTTY can give more overall corruption on a link than an ASCII signal.

I think this explains the reason for the phenomenon observed by Luigi, but what solutions are there? Well, one solution used by some commercial stations is to abandon the shift characters altogether and spell out all the numbers and punctuation i.e. one, two, stop. Another partial solution which is incorporated in many RTTY programs is unshift-on-space. This forces a return to letter shift after receiving a space character and helps to minimise the number of corrupt characters.

If any of you have any alternative theories or solutions then please drop me a line.

Contests

The next main RTTY contest is the BARTG Spring v.h.f./u.h.f. event. This popular and friendly event takes place on the weekend of the 16/17 April and is open to all amateurs in Zones 14 and 15. The contest details are as follows:

Duration: 1800UTC 16 April to 1200UTC 17 April. A 4 hour rest period must be taken during this period.

Bands: 144MHz, 432MHz and 1296MHz. Repeater or satellite contacts not allowed.

Operators: Any licensed amateurs within Zones 14 and 15. Portable operation is allowed from one location or within 1km of that location for the whole of the contest. Contest logs from s.w.l.s very welcome.

Contacts: Stations may not be contacted more than once on any one band during the period of the contest.

Messages: a) Start time of contact in UTC using full four digit group, i.e. 0830.

b) RST report, three figure group.

c) Message serial number starting with 001.

d) Locator, which can be either Maidenhead locator, town or bearing from a town.

Logs: Separate A4 size log for each band, preferably BARTG. The log to contain: date, time, RST, message number, locator/QTH, estimated distance and points claimed.

Scoring: As per table for 144 and 432MHz. For 1296MHz contacts score 1 per km.

0–50km = 1 point
50–100km = 3 points
100–150km = 5 points
150–200km = 7 points
200–250km = 9 points
250–300km = 11 points

Pro-rata on 50km increments.

Awards: Certificates will be awarded to the top scorers and runners up in each section for each band.

1) Single operator stations.
2) Multiple operator stations.
3) Short wave listeners.

All logs to BARTG contest manager (1) postmarked no later than 21 May 1988.

RS232 and the Dragon 32

Jim Fuller has written to me with some good news for owners of this popular computer. Jim has been involved writing communications software for Dragon 64 computer but is often asked if the software will run on a 32K machine. Unfortunately the answer has usually been no, due to the lack of a suitable RS-232 interface for the Dragon 32.

Jim has now produced his own solution to this problem by designing an interface for this computer. The interface actually fits inside the computer leaving the expansion port free for other things which is a useful point. The fitting of the interface is quite complicated, so Jim has enlisted the help of his partner Chris Foster G4USU to provide a fitting service. The price is a very reasonable £29.98 including fitting but excluding post and packing. The use of this interface should enable Dragon 32 owners to take advantage of conventional packet radio TNCs and modems etc.

For further information please contact Jim Fuller (2) or Chris Foster (3).

That's all for this month but please keep those reports and comments coming either by post or via my **Prestel mailbox (425470071)**.

(1) BARTG Contest Manager, Peter Adams G6LZB, 464 Whippendale Road, Watford, Herts, WD1 7PT.
(2) Jim Fuller G4WPI, 42 Kitchener Road, Amesbury, Wilts, SP4 7AD.
(3) Chris Foster G4USU, 2 The Row, Berwick St James, Nr Salisbury, Wilts, SP3 4TP.

	Band (MHz)				
Prefix (Country)	**3·5**	**7**	**10**	**14**	**21**
A,K,W (USA)				APR	PR
A22 (Botswana)				R	
CT (Portugal)				P	
DA,F,J,K,L (W. Germany)		AR	R	APR	R
EA,C (Spain)			A	APR	
EA8 (Canary Is.)					R
EL (Liberia)					R
F (France)		R		PR	P
G (England)	APR	APR		APR	R
GI (N. Ireland)	R	R		R	
GM (Scotland)	R				
GW (Wales)	R	R		P	
HA (Hungary)				PR	
HB (Switzerland)			A		
HK (Colombia)					P
I (Italy)				APR	PR
LA (Norway)				APR	
LX (Luxembourg)				P	
OE (Austria)				PR	
OH (Finland)				PR	R
OK (Czechoslovakia)				R	
ON (Belgium)				R	
OZ (Denmark)				R	
PA (Netherlands)				PR	
SG,K,L,M (Sweden)				APR	
SO,P (Poland)				R	
SV (Greece)					R
SV5 (Rhodes)				R	
TA (Turkey)					R
T77 (San Marino)					R
UA,V (USSR)				R	
UT (Ukraine)				R	
VE (Canada)				R	PR
VK (Australia)					R
XE (Mexico)					P
YO (Romania)				R	
YU (Yugoslavia)				R	
Y (E. Germany)			R	AR	
ZS (South Africa)				R	
9K2 (Kuwait)			A		
9Q5 (Zaire)					R

Data communications table showing countries heard/worked during January

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Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD

OSCAR—10

The A-O-10 satellite, despite the limitations imposed by the "mono" antenna, has been behaving impeccably. Many thousands of international contacts have been effected during the periods of transponder permitted use either side of eclipse. Sadly, from February 14, it was again necessary to curtail all use of the transponder as the sun-angle to the solar panels from then on was so offset as to provide less than 50 per cent of the power required by the satellite to sustain operations.

This current state of power insufficiency will exist for the next two months, so we cannot expect to be able to use OSCAR-10 until at least the end of April, and possibly not until the second week of May. The exact date, determined after continuous and careful observation by the command stations, will be announced on the various AMSAT nets, so users are asked to carefully observe the limitations of zero use now, followed by low power employment only when it returns.

Quite apart from the problems of long duration eclipses at Apogee, incorrect antenna pointing coupled with bad sun angles to the solar cells, all of which were directly due to the insertion of OSCAR-10 into the incorrect inclination, the reason for its demise by the loss of the IHU memory brought about by intense radiation can be seen in Fig. 1. This is a "QL" computer derived high resolution plot of the Van Allen radiation belts around our earth, sent in by **John Branegan GM4IHJ**.

John states, "you can see the whole sad story of OSCAR-10 here. Had it been at sixty degrees inclination it would have skimmed the polar edge of the belts, and even its perigee at 60.5 degrees would have given relatively mild exposure. In fact, its 25 degree inclination put it right in the worst possible situation. When its perigee was over the equator, it was in the thickest part of the inner belt, shown by the shaded areas".

Although initially to be placed in a transfer orbit of low inclination, the kick motor firings of the coming OSCAR-13 is planned to boost the satellite to an inclination of at least 58 degrees, and a perigee of some 1500km, which will avoid this problem. To add a belt as well as braces, specially radiation hardened i.c.s will be employed, with additional shielding.

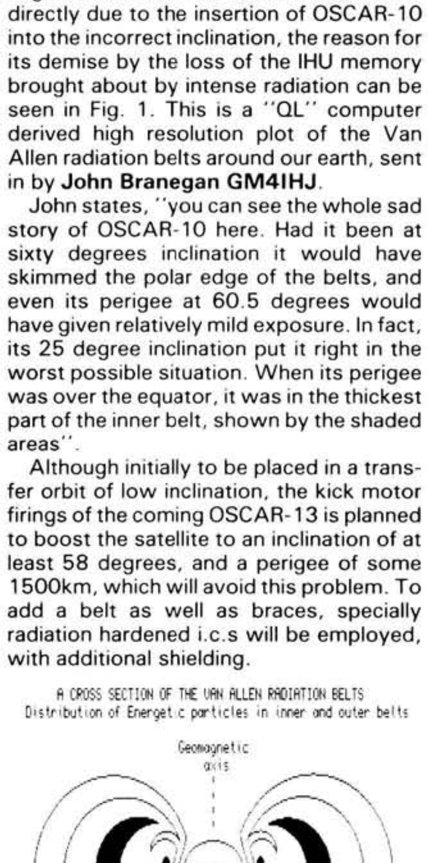


Fig. 1

Phase III-c

The postponed *Ariane-IV* V-22 launch from mid-March has itself been further delayed twice since the earlier date of April 4 proposed in our last column, to what is now currently scheduled as a "middle of May to beginning of June" lift-off from the ELA-2 launch pad at 1230UTC. At the time of writing, May 20 is favoured by AMSAT-DL and June 1 by AMSAT HQ. The date has yet to be firmed up, and a further slight delay may yet affect our anxiously awaited Phase III-c satellite.

The next *Ariane* mission, V-21, was due to take up the Spacenet 3-R and Telecom 1-C on March 4 this year, having been delayed since December 1987 due to the third stage problem. This launch, although not directly affecting our Phase III-c launch, which is from a new launch pad, may well suffer further postponement as a third stage check-out performed on January 11 did not come out at all well! Unfortunately, *Ariane-IV* is also dependant upon the success of this final stage reliability, hence the delay incurred to ensure this.

At the launch time and date proposed for converting Phase III-c into the orbiting OSCAR-13, propagation at h.f. should be excellent, and the "ALINS" (AMSAT Launch Information Network Service) should be heard well throughout Europe on both the 14 and 21MHz bands. **Ralph Wallio W0RPK**, AMSAT Vice-President of Operations, announces that he is now busy with the plans to carry the launch live to the world amateur satellite community, and the full coverage plan will be announced soon. AMSAT will undoubtedly be using 14.282MHz, from the Goddard Space Flight Center Amateur Radio Club WA3NAN, on 21.280MHz too, and even 28MHz too if the band is open. As well as the launch and post-launch ejection, transfer orbit burns will also be covered to allow oscarphiles to monitor each serially important calendar event leading to commission of the functioning transponders.

John Lindholm W3XX, who is the American Radio Relay League Membership Communications Secretary, says that additional to the stations already participating will be the ARRL HQ station W1AW, using their long-established frequencies on many bands. **Ron Broadbent G3AAJ**, secretary AMSAT-UK, said on the AMSAT-UK net that they are planning a direct line from the launch site via the University of Surrey, and plans to broadcast the launch live on 3.780MHz via GB0AUK.

Work on the new Phase III-c elliptical orbiter is now complete, and it has passed all systems tests to perfection. The satellite on its last vibration test at Marburg in December 1987 is shown in Fig. 2. The Mode "L" transponder has been proved to have a sensitivity and gain far greater than its OSCAR-10 predecessor, which, due to a bias failure putting the receiver into class "C", needed some 10kW minimum of effective isotropic radiated power to even get a signal through it. OSCAR-13 will need only 25dBW (ca. 350 watts e.i.r.p., or 10 watts to a 14dB gain antenna, or a single 19dB quad loop Yagi if allowing for a typical 4dB of feeder loss) to give an adequate signal of some 10dB over noise. On Mode "JL" some 1 to 2kW e.i.r.p. will be required (30-33dBW e.i.r.p., e.g. 10 watts of transmitter output to a 19dB uplink antenna, such as a single long quad-loop Yagi) to produce a 10dB signal to noise ratio on the downlink.

To help OSCAR-13 planners, (and also to attempt to educate those who persist in using excessive power to our existing satellites), Figs. 3 and 4 graph out the multiplier to be used on one's transmitter output power when using antennas of gain in dB isotropic (dBi) or dB over a dipole (dBd) respectively. The calculated or measured feeder loss, in dB, should first be subtracted from the antenna gain. It should be noted that 1 watt to a 20dB gain system, 5 watts to 13dB, or 10 watts to a 10dB system, is the MAXIMUM power required for OSCAR-10, JO-12, or RS-10/11, and any deficiencies at these levels should be made up by improving the receiving system only.

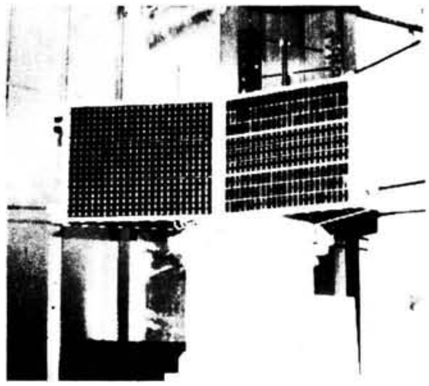


Fig. 2

It is expected that 1269/435MHz activity will become a very popular mode, with many more participants than those we earlier listed, who wrestled hard with OSCAR-10 Mode "L" despite the attenuation discovered.

Phase III-c is next to be shipped to Paris for a flight to Cayenne in French Guiana, from where it will travel with special transport by road to the Korou launch site in a jungle clearing by the Atlantic coast. The entire cost of the shipping of the satellite, two metric tonnes of associate equipment, including a whole amateur radio station and two technicians, is being met by AMSAT-UK, who have generously raised £13 500 to pay for the transport from membership funding.

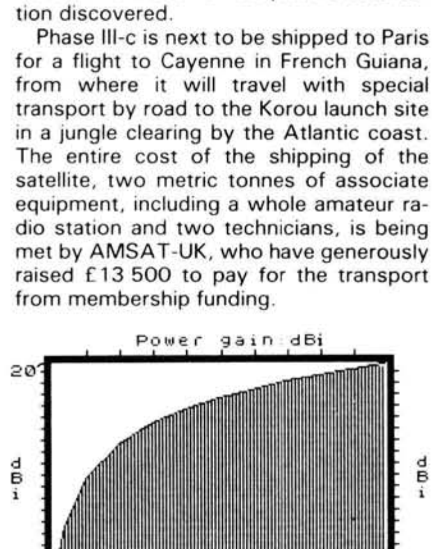
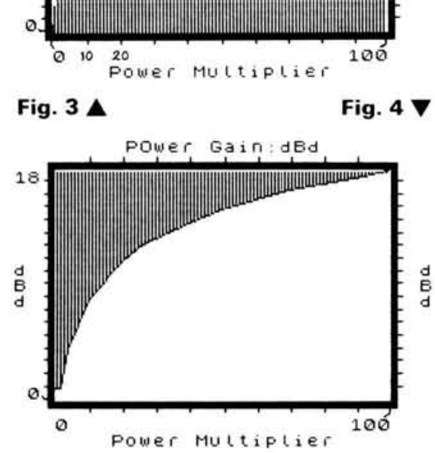


Fig. 3 ▲

Fig. 4 ▼



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Upon arrival at Korou the fuel tanks of the kick-motor will be filled with the very toxic and corrosive unsymmetrical dimethyl hydrazine (UDMH) and nitrogen tetroxide oxidiser, blanketted, and round-the-clock monitoring will be carried out by a special team of AMSAT volunteers until, during and following integration with the launch vehicle.

Despite confidence, the insurance fund, already over the half-way mark thanks to generous contributions from both individual and AMSAT organisation donors will be topped up by AMSAT general funds to give full coverage of any loss or damage. As we said last month, if any supporters wish to contribute they may send donations via AMSAT-UK, G3IOR, or direct to AMSAT, P.O. Box 27, Washington DC 20044, USA.

Phase III-c TLM

The preliminary telemetry channel allocations for our coming satellite have now come in from AMSAT President Vern ("Rip") Riportella WA2LQQ. For BCR read battery charge regulator, IHU internal housekeeping unit, He Helium, UDMH Unsymmetrical Methyl Hydrazine fuel, N202 oxident, etc.

Channel	Function	Equation	Units
00	Solar panel output and BCR input volts	n×150	mV
01	70cm TX average power output	$(253-n)^2/2000$	W
02	70cm RX temperature	(n-127)/1.82	°C
03	Unallocated		
04	BCR output and main battery voltage	(n-10)×75	mV
05	Special Purpose		
06	2m TX p.a. temperature	(n-127)/1.82	°C
07	+14V rail current to transponder	(n-15)×20.64	mA
09	+10V regulator voltage	(n-12)×50	mV
0A	IHU temperature	(n-127)/1.82	°C
0B	+14V magnotorquer & relay current	(n-15)×4.128	mA
0C	BCR Oscillator 1 status	O=off, n>10=On	
0D	He tank low side press. control V.	To be determined	
0E	BCR temperature	(n-127)/1.82	°C
0F	+10V regulator current	(n-15)×4.128	mA
10	BCR oscillator 2 status	O=off, n>10=on	
11	N202 oxidiser tank pressure	To be determined	
12	SEU temperature	(n-127)/1.82	°C
13	Battery charge current	(n-15)×10.32	mA
14	Top (+Z) photocell sun sensor to Z (spin) axis	65=sun normal 20-30 nominal	
15	Motor valve status	To be determined	
16	Auxiliary battery 1 temperature	(n-127)/1.82	°C
17	Active BCR output current	(n-15)×20.64 20-30 nominal	mA
18	Bottom (-Z) photocell sensor	65=sun normal 20-30 nominal	
19	S-band TX power output	To be determined	
1A	Auxiliary battery 2 temperature	(n-127)/1.82	°C
1B	Active BCR 28V line input current	(n-15)×10.32	mA
1C	Spin rate	If n<139,r=(139n)×0.8+20 or if n=>139,r=508/ (n-116)-2	r.p.m.
1D	24cm RX a.g.c.	if n<100 a.g.c.=0 if n>=100 a.g.c.=$(n-100)^2/189$	dB

The rest of the telemetry will be given next month

RS-10 & 11

The daylight openings of the 21MHz band have continued to give high levels of attenuation due to high power terrestrial stations operating in the satellite uplink band, and the same solar flux improvement has given up to 15dB of downlink attenuation due to the passage of the signal through the dense layers. The one advantage was the appearance of some excellent sub-horizon in mid-January, with the 29.407MHz TLM and ROBOT being heard well when the satellite was over ZD9 Gough and ZD8 Ascension Island. Sadly, the transponder passband was empty! Your scribe made a few DX QSOs within the mutual footprint with UA0BDW, UA0DQYD, WA1JVV, KC2FD and C30LEV for new ones. The effectiveness of the individually a.l.c. controlled 4kHz passband segments was well demonstrated when on one occasion the G3IOR 50W e.i.r.p. signal was wiped out *en toto* by an ultra-high powered station coming up from 21MHz only 3kHz away. A QSY of only 2kHz brought back an adequate RST 579 downlink again! On darkness paths, the signals are very strong, often peaking well over S.9 on the G3IOR IC-720A S-meter.

Fig. 5

Fig. 6

OSCAR—9 & 11

The UoS, as optimistically predicted, found a way out of the problem caused by faulty loading of the FORTH language, and the downlinked information all makes good sense again. It took time and effort, as control had to be effected using the less-amenable u.h.f. command uplink, with very careful procedure needed.

A further blow (literally!) hit the UoS when the second winter gale arrived in early January, again damaging the mission control station antennas. Slim and Brian worked bravely in the high winds to complete the dish refit, and again brought back the UoSAT pair to useful service. Prior to this event, Christmas greetings came via satellite with the DIGITALKER playing the first bar of "Jingle Bells" followed by the spoken message "A great Noel from all at UOS". The DIGITALKER has not got the world "Christmas" in its vocabulary, so the words "No" and the letter "L" were cleverly junctioned for the desired sound. Well-designed greetings cards, depicted by Figs. 5 and 6, appeared on the bulletin.

UoSAT-3 is now under way at the University of Surrey, with a launch planned for late 1988. It will contain the University built VITA PACKSAT experiment, for which frequency authorisation is now being sought. An interesting job opportunity exists there for an experienced r.f. engineer to work on UoSAT-c as it will be termed until launch.

Keplerian Elements

Our Keplerian elements are the first set out for this year, sent in from AMSAT via the AMSAT-UK hot news service. Remember that "MIR" is firing its motor to re-orientate and changing its orbit regularly, and may not be the same when you receive this. Also, it will be noticed that the sudden surges of Solar Flux we are now experiencing are intermittently increasing the drag factor (decay) of OSCAR-9, so this may need a regular update too. Remember that you can get updated predictions for OSCAR-9 by 'phoning the UoS dedicated line on 0483 61707, and for OSCAR-11 on 0483 61202, but MIR updates will be dependant upon the regular trackers, both visual and radio, who give their information on the various nets.

It would appear from incoming correspondence that the rounded-up satellite equator crossing times and the add-on values, given to only one decimal place, are insufficiently accurate for our more demanding customers, who find that two weeks of accumulated approximations produce passes wandering out more than they would desire. For this reason, we give below precise known crossings for just the amateur satellites, with the exact period and longitude increment also supplied for calculating later crossings.

UoSAT-OSCAR-9: Period 94.10700 min-

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utes. Longitude Increment 23.523863 degrees. Ascending Node equator crossing for Friday January 22, 1988, 00 hours, 07 minutes, 4.7 seconds, at 71.73 degrees west equator longitude.

UoSAT-OSCAR-11: Period 98.53960 minutes. Longitude Increment 24.635352 degrees. Ascending Node equator crossing for Friday January 22, 1988, 01 hours, 34 minutes, 36.3 seconds, at 55.93 degrees west equator longitude.

FUJI-OSCAR-12: Period 115.65317 minutes. Longitude Increment 29.239313 degrees. Ascending Node equator crossing for Friday January 22, 1988, 00 hours, 29 minutes, 11.9 seconds, at 55.22 degrees west equator longitude.

RADIO 10/11: Period 105.02386 minutes. Longitude Increment 26.381765 degrees. Ascending Node equator crossing for Friday January 22, 1988, 01 hours, 14 minutes, 49.8 seconds, at 242.69 degrees west equator longitude.

Project NORDSKI-COM

Following our last month's information on how to follow the all-amateur radio and satellite communication based North Pole joint UA/VE expedition, **Dick Ensign N8IWJ**, AMSAT Science Education Advisor, has produced an information pack for students. This contains a basic map, a three month prediction sheet, and a full set of required information suitable for overhead projection conversion for classroom use. Please write to Richard C. Ensign, AMSAT Science Education Advisor, 421 Military, Dearbourn, MI 48124, USA, or telephone USA 1 313 278 0900 during the American school day, or 1 313 274 1718 evenings and week-ends for your copy. The trip should commence on March 1.

Satellite	MIR	SALYTUT-7	AJISAI	OSCAR-12	RS10/11
Catalogue No	16609	13138	16908	16909	18129
Epoch Year	1988	1988	19871988	1988	
Epoch Day	11.88147077	11.88337302	306.47344065	9.65181271	10.81955379
Element Set	15	930	62	76	233
Inclination	51.6259°	51.6137°	50.0146°	50.0155°	82.9264°
RAAN	158.3609°	328.9252°	320.1689°	110.6867°	264.6944°
Eccentricity	0.0016529	0.0000193	0.0011300	0.0011217	0.0013281
Arg of Perigee	324.2678°	254.4030°	277.2304°	91.1586°	64.4775°
Mean Anomaly	35.7078°	105.6854°	82.7245°	269.0533°	295.7769°
Mean Motion	15.74235821	15.31859863	12.44369614	12.44394684	13.71886122
Decay Rate	$2.0490e^{-04}$	$2.849e^{-05}$	$2.5e^{-07}$	$-2.5e^{-07}$	$9.0e^{-08}$
Orbit Number	10901	32796	5561	6409	2763

Satellite	NOAA9	NOAA10	METEOR 2-14	METEOR 2-15	METEOR 2-16
Catalogue No	15427	16969	16735	17290	18312
Epoch Year	1988	1988	1988	1988	1988
Epoch Day	04.41281172	6.54644685	9.73102420	11.03327249	10.18403848
Element Set	223	108	208	132	77
Inclination	99.0780°	98.6951°	82.5412°	82.4645°	82.5580°
RAAN	337.0412°	39.6379°	303.2801°	213.3147°	274.6474°
Eccentricity	0.0016259	0.0013488	0.0015858	0.0011958	0.0010762
Arg of Perigee	3.4334°	342.9792°	47.0934°	289.5289°	223.2931°
Mean Anomaly	356.6944°	17.0931°	313.1566°	70.4582°	136.7385°
Mean Motion	14.11542380	14.22537363	13.83769119	13.83576441	13.83333695
Decay Rate	$9.0e^{-07}$	$2.04e^{-06}$	$6.0e^{-08}$	$6.0e^{-08}$	$8.9e^{-07}$
Orbit Number	15770	6765	8192	5127	2006

Satellite	OSCAR-9/UoSAT-1	OSCAR-10	OSCAR-11/UoSAT-2	METEOR 3-1
Catalogue No	12888	14129	14781	16191
Epoch Year	1988	1988	1988	1988
Epoch Day	9.26122218	9.09680313	9.20080544	9.59217197
Element Set	132	324	282	725
Inclination	97.6311°	27.4358°	98.0797°	82.5495°
RAAN	37.4965°	343.7837°	75.7606°	246.6699°
Eccentricity	0.0001898	0.6025702	0.0013000	0.0019038
Arg of Perigee	177.4528°	270.9897°	167.3707°	166.0385°
Mean Anomaly	182.8754°	24.9971°	192.7829°	194.1272°
Mean Motion	15.31087661	2.05882880	14.62212586	13.16924429
Decay Rate	$4.958e^{-05}$	$-6.0e^{-07}$	$1.93e^{-06}$	$4.4e^{-07}$
Orbit Number	34825	3440	20580	10647

The next three deadlines are March 26, April 26 and June 1

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE

After 18 years of using a simple radio telescope, I have learnt that the sun is full of surprises. I have come to the conclusion that it is almost impossible to predict what future events this variable star has in store. However, it is well known that sunspots, and the complex activity surrounding them, have a considerable influence over the stability of the earth's ionosphere. Therefore, by publishing regular reports from astronomers and radio enthusiasts, we can learn more about the interesting effect which random solar activity has on the paths of terrestrial radio signals.

Solar Observations

At his observatory in Selsey, **Patrick Moore** made drawings of the sunspots which he located at 1355 on December 27 (Fig. 5(a)), 1020 on January 4 (Fig. 5(b)) and 1015 on the 21st (Fig. 5(c)).

The detailed report on sunspots and filaments seen by **Cmdr Henry Hatfield** (Sevenoaks) with his spectrohelioscope are listed in Fig. 1. "Activity has clearly increased. Some plages are beginning to look quite active," commented Henry about the period from the 4th to 17th.

"The mean sunspot number for December was 26.5 and the daily figures ranged from 17 on the 5th to 52 on the 8th," wrote **Neil Clarke G0CAS** (Ferrybridge). He enclosed his computer print out, Fig. 2, indicating the daily solar flux which varied from 88 to 97 s.f.u. with peaks of 106 s.f.u. on the 26th and 28th.

Fig. 1

Date	Spots	Groups	Flares	Filaments
23.12.87	1	—	—	14
25.12.87	2	—	—	13
31.12.87	1	1 (4 spots)	—	6
4.1.88	2 (double)	—	—	8
7.1.88	3 (1 double)	1 (7–8 spots)	—	3
11.1.88	3 (1 double)	1	—	16
17.1.88	2 (1 double)	2 (5 spots each)	—	6
21.1.88	2	2 (4 & 7 spots)	—	16
22.1.88	—	2 (6 & 7 spots)	—	17

Terrestrial Effects

"Owen Pearson (Edinburgh) reported that his jam-jar magnetometer recorded storm-type activity on December 10, 21 and 22 and January 2 and 16," wrote **Ron Livesey** from Edinburgh. Ron is the auroral co-ordinator for the British Astronomical Association. He told me that the magnetometer used by Karl Lewis (Saltash) was unsettled for periods on December 4, 9, 10, 15, 16, 17, 21, 22 and 23, very unsettled to storm on days 3, 11, 12, 15, 16 and 17 and at storm level from 1400 to 2100 on the 10th.

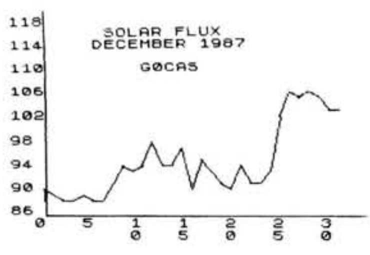

Fig.2

Ron also received reports of auroral glow from observers in Shetland, Orkney and Alness for the nights of December 10/11, 17/18, 19/20 and 23/24 and arcs and rays from Edinburgh and Helsinki. Strong aurora was seen from Edinburgh on January 14/15 and a lesser event on 6/7 was reported from Finland and south Scotland.

"There was a magnetic storm on the night of January 14/15, but it did not seem to effect radio," reports **Ted Owen** from Maldon.

Henry Hatfield recorded radio noise from the sun, at 136MHz, on December 28, 29, January 1, 10 and 21. **Andy Steven** and **Roger Stapleton** noted radio aurorae on December 21/22, January 2/3 and 7/8.

"On January 14, whilst tuning around, I observed some tone-A signals on the 15MHz broadcast band," wrote **Dave**

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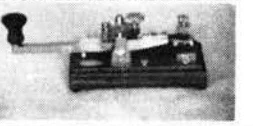

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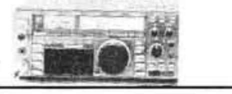

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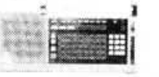

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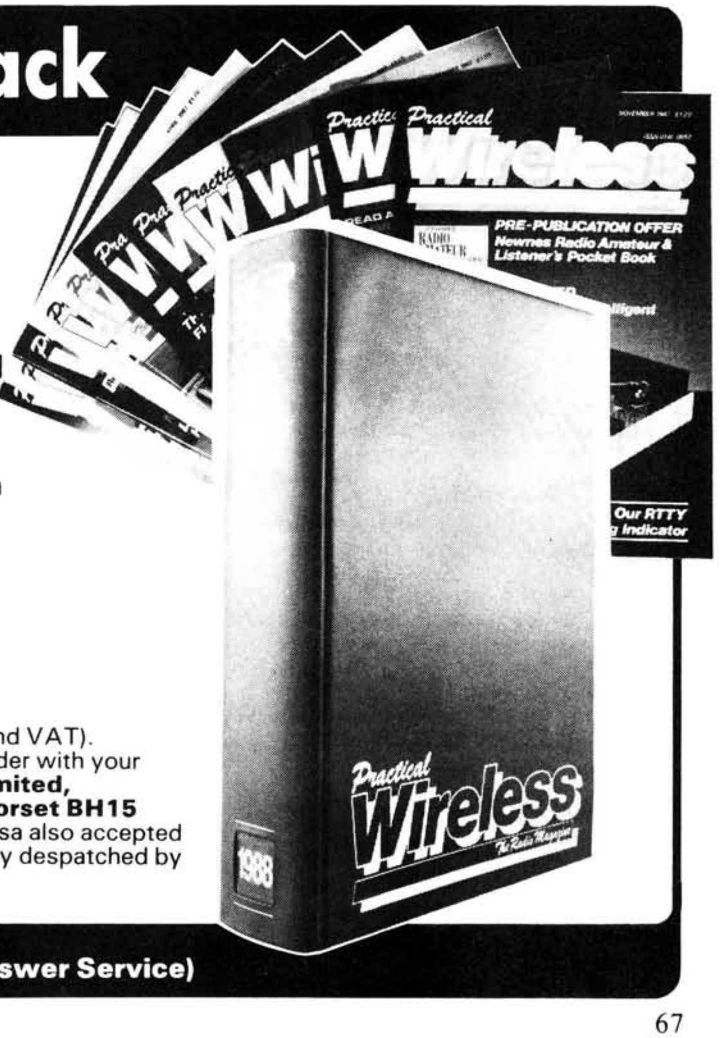

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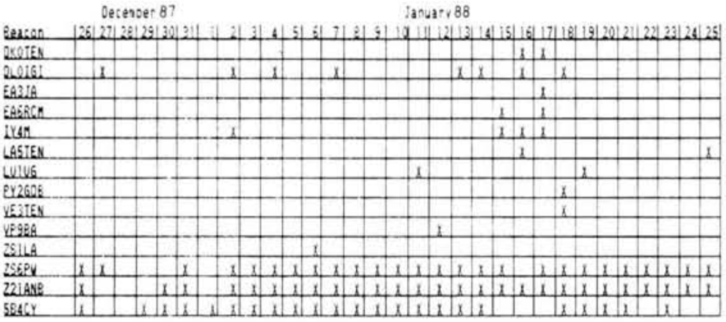

Fig. 3

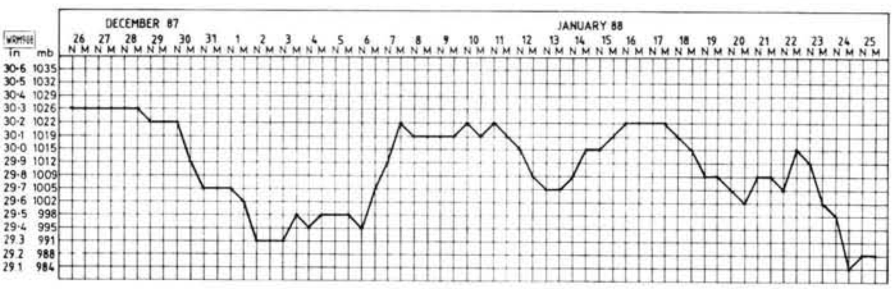

Fig. 4

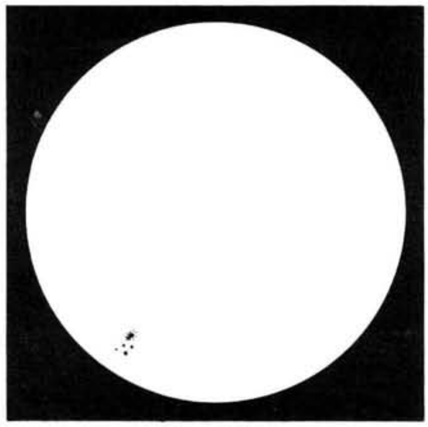
Fig. 5(a)

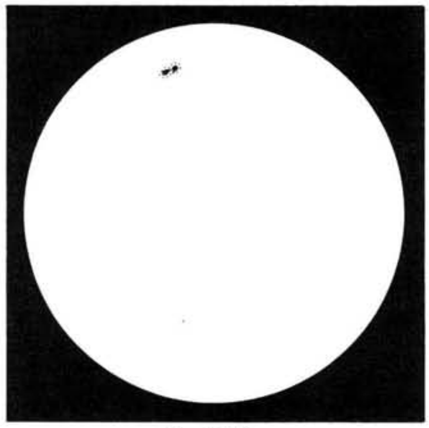
Fig. 5(b)

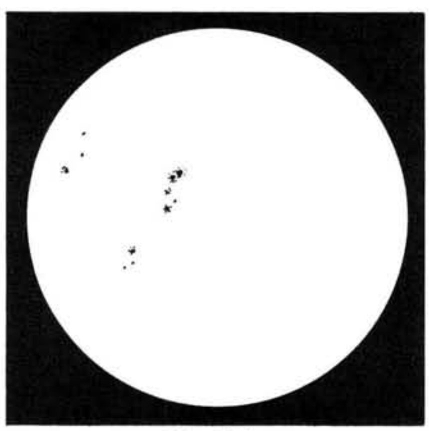
Fig. 5(c)

Coggins (Knutsford). His more detailed check revealed that a large number of stations, ranging from medium-wave to 30MHz, had a rough note. Dave logged signals from Finland, Greenland, Ireland and Scandinavia. He listens to Radio New Zealand on 15.150MHz most early evenings, but noted that this station was inaudible the day before (13th) and the day after (15th) the aurora. He also noticed Radio Norway's signal on 25.730MHz had a slight echo at 1242 on the 13th.

During this event, **Tony Usher G4HZW** (Knutsford) worked into Greenland on 28MHz.

I am advised by the London Solar Society that, owing to illness, they cannot meet the demand for their jam-jar magnetometer kit which I referred to in a recent issue, so please readers, no more requests.

The 28MHz Band

In Bransgore, **John Levesley G0HJL**, using a temporary antenna, received signals from CU, FY, HA, TA and 9Q5 on December 12 and plans to replace it with a multiband vertical.

"Very poor conditions on the high bands this period," said **Bill Kelly** (Belfast). "Things have been pretty well down this last month on h.f.", remarked Dave Coggins on January 22, although, in addition to auroral propagated signals, he managed to find stations from Greenland and Norway on January 2, Cyprus, France, Israel, South Africa and Zambia on the 3rd and Nigeria on the 17th. **Don Hodgkinson G0EZL** (Hanworth) heard FH5EF on Mayotte and VP8BPZ in the Falklands on the 17th.

Propagation Beacons

First, my thanks to **Chris van den Berg** (The Hague), Dave Coggins, Henry Hatfield, Don Hodgkinson, Bill Kelly, **Greg Lovelock G3III** (Shipston-on-Stour), Ted Owen and **Fred Pallant G3RNM** (Storrington) for their continued monitoring of the 28MHz beacon channels which enabled me to complete the chart in Fig. 3. Apart from the South African beacons ZS6PW and Z21ANB which were well represented in most logs, the final chart is a bit thin. However, the highlight of the month for Don Hodgkinson was hearing VK6RWA for the first time at 1324 on January 12. He also heard KD4EC and VP9BA on the 12th and OH2TEN on the 24th. Greg reports that the German beacon DK0WCY was audible, on 10.14MHz, during daylight hours on most days.

Tropospheric

In Maldon, Ted Owen's barometer showed peaks of 30.35in on December 28, January 16 and 17; lows of around 29.15in on the 2nd and 29.2in on the 3rd, 4th and 22nd. The daily variations in the atmospheric pressure, recorded at my home in Sussex, are shown in Fig. 4. Unfortunately the sample taken for this chart, at noon and midnight, can overlook sudden short lived troughs like the one of 29.3in between midnight on the 21st, when my barograph was reading 29.8in and noon on the 22nd when it was back up to 29.7in.

934MHz

"At 2100 on December 18, Ralph Rowlett GR-587 (Upper Caldecote) found conditions favourable for working stations in Birmingham and Eastbourne," wrote **John Raleigh** from Bedford. John is the secretary of The Four County 32cm Club, and reports that he watched the atmospheric pressure fall from 30.5in at noon on the 22nd to 30.3in at noon on the 23rd. "With the pressure still falling during the evening I worked stations in Bath and Southampton and around 0030 on the 24th, I had contacts in Birmingham, Portsmouth, Reading, Salisbury and Winchester," said John.

"Very little to report under flat conditions with best contacts to Portsmouth, Southampton and Yeovil, all line of sight," wrote John Levesley UK-627. He told me that MR-05 operating from Portsdown Hill, a high spot overlooking Portsmouth, had members of a local scout troop with him and was helping them to gain their communications badge. John reports hearing GY-186 (Guernsey) on December 12, 18, 22, 23 and 24 and managed to exchange the season's greetings with him on Christmas Day.

Broadcast Round-up

Peter Shore

The news here in Europe during recent weeks includes the changes to long wave broadcast station frequencies on February 1. A listing of the stations affected is contained in the European news section.

New transmitters will be springing up during this year: the Israeli Cabinet has ratified the agreement with the US government for the construction of Voice of America transmitters in the Arava region of Israel; Deutschlandfunk is to have three new f.m. transmitters and Deutsche Welle is planning additional transmitters in Africa, Asia and America. The Asian transmitter is needed to replace the Sri Lanka relay station, inactive for many months as a result of the Civil War in that country.

Africa Number One, in Moyabi, Gabon,

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has a new fifth transmitter. The new 500kW transmitter is to improve audibility in Africa.

Radio Canada International has received approval for the construction of four new 13MHz band antenna arrays at the Sackville transmitter site in New Brunswick. These antennas will be used for broadcasts to Europe, Africa, Latin America and North America. Work has started on the project and it is expected to be operational by July next year.

Europe

Note: all times are UTC (GMT)
Long wave frequency changes
200kHz becomes 198kHz
BBC Radio Four & WS (Droitwich 400kW)
Warsaw 200kW
Mayak (Leningrad 150kW)
209kHz becomes 207kHz
DLF (Munich 500kW)
Kiev 500kW
Morocco (Azilal 800kW)
218kHz becomes 216kHz
Norway Programme One (Oslo 200kW)
(Radio Monte Carlo, Roumoules, due to change on February 1, still on 218kHz at February 8)
227kHz becomes 225kHz
Warsaw Programme 1 (Konstantinow 2000kW)
236kHz becomes 234kHz
RT Luxembourg (Junglister 2000kW)
Frequencies above 234kHz will change in 1990.

Programmes in from Radio Culture on f.m. are now in stereo throughout the country.

Radio Polonia in Warsaw has an English schedule to Europe and Africa:

0630–0700 on 15.12, 7.27 and 6.35MHz
1200–1230 on 7.285 and 6.095MHz
1230–1300 on 15.12, 11.84 and 9.525MHz (Africa)
1400–1430 on 7.285 and 6.095 MHz
1600–1630 on 9.54 and 6.135MHz
1630–1700 on 11.84, 9.525 and 7.125MHz (Africa)
1730–1800 on 9.54 and 6.135MHz
1830–1900 on 11.84, 9.525 and 7.125MHz (Africa)
1830–1900 on 7.285, 6.135, 5.995 and 1.503MHz
2000–2030 on 9.525, 7.145 and 7.125MHz (Africa)
2030–2100 on 7.285 and 6.095MHz
2230–2300 on 7.27, 7.125, 6.135, 5.995 and 1.503MHz

Polish for seamen and Poles abroad is aired on: 0000–0200 on 15.12, 11.815, 9.525, 7.27, 7.145, 6.135 and 6.095MHz (seamen)

0400–0600 on 15.12, 11.815, 9.525, 7.145 and 6.095MHz (seamen)
0600–0700 on 9.525, 7.285, 7.145, 5.995 and 1.503MHz (abroad)
0700–0800 on 15.12, 7.285, 7.27, 6.135, 6.095, 5.995, and 1.503MHz (abroad)
1230–1300 on 9.54, 6.135 and 1.503 MHz (abroad)
1300–1400 on 7.285, 6.095 and 1.503MHz (seamen)
1300–1400 on 9.54 and 7.125MHz (abroad)
1500–1600 on 9.54 and 7.125MHz (abroad)
1630–1730 on 9.54, 6.135, 5.995 and 1.503MHz (abroad)
1900–1930 on 7.285 and 6.095MHz (abroad)
2100–2130 on 7.285 and 6.095MHz (abroad)
2200–2300 on 9.525, 7.285 and 6.095MHz (seamen)
2300–2400 on 9.525, 7.285, 6.095, 1.305, 1.08MHz and 819kHz

Radio Portugal's broadcast to Europe in the evening from 2000 to 2200 including English programming, is now on 11.74MHz, replacing 7.155MHz, with 9.74MHz in parallel. The English language broadcast at 1600 is often well received in Europe, although it is beamed to the Middle East and Asia. The frequency is 15.25MHz.

English language programmes from Radio Bucharest in Romania:

1045–1100 on 15.405, 11.94 and 9.69MHz
1300–1330 on 17.72, 15.405, 11.94 and 9.69MHz
1930–2030 and 2100–2130 on 7.195, 7.145, 6.055 and 5.99MHz

Radio Sweden International has changed its name: it is now known simply as Radio Sweden. The alteration has been made necessary because of the difficulty in translating "International" into some languages.

Moscow's Domestic Services are carried on frequencies in the 18MHz band at present, coincidentally either side of the long-established BBC World Service frequency of 18.08MHz. Moscow's Second Programme, Mayak, is on 18.18 in the mornings between 1000 and 1200, whilst one of the Moscow First Programme channels uses 18.03 from 1000.

Middle East

A new clandestine radio station calling itself "Al Quds, the Palestinian Radio on the way for the Liberation of the Land and the People" sprang up early on New Year's Day and is still going strong. It seems that the transmitter, on 702kHz, originally thought to be from Southern Lebanon, is probably located inside Syria. The station exhorts the population in the West Bank and Gaza Strip to keep up "the popular uprising", and sounds professionally run. Israel was, at one point, considering jamming the station, but transmissions appear to be unimpeded at the present time.

Another clandestine station in this area is Iran's Flag of Freedom radio, heard with good reception in the United Kingdom between 1630 and 1830 on 9.045MHz. The station is hostile to the Khomeni regime in Iran, and the transmitters for these Persian programmes are believed to be in Egypt.

Meanwhile, Libya has begun s.s.b. transmissions, possibly to Egypt, heard some days between 0720 and 1350 on 18MHz, and on others between 1000 and 1150 on 13.5MHz. The programmes carried on these frequencies are not in parallel with the normal Voice of the Greater Arab Homeland transmissions.

UAE Radio in Abu Dhabi has been heard on a new channel of 17.995MHz with news at 1000, and at 1245 the station can be heard on 15.385, 15.135, 11.94 and 11.815MHz. All of these transmissions are in Arabic.

Africa

The International Service of Radio Nacional de Guinea Ecuatorial is on 9.552MHz around 1700–2200, with the exception of Sundays. Radio Mozambique from Maputo is heard on new 9.052MHz at 1800. Radio Tanzania is on 9.685MHz at 1700.

At the beginning of the year, Radio RSA started a new morning German service to Europe on 21.59MHz at 1000–1100. English to Europe continues to be heard:

0630–0730 on 17.825, 17.78, 15.125 and 7.295MHz
1100–1200 on 21.59, 15.39 and 9.75MHz
1300–1600 on 21.59, 17.81, 15.125 and 9.75MHz
2100–2200 on 11.9, 9.58 and 7.295MHz

The DX Corner programme from Radio RSA is on the air Sundays at around 0640 and 2140.

Asia and the Pacific

Domestic stations in Australia were audible in the UK during late January: at around 2000 until fade-out at just after 2100, ABC Tennant Creek on 2.35MHz and ABC Katherine on 2.485 were heard. On Australia Day, January 26, the stations linked up with all the other ABC stations throughout the country and Radio Australia, the overseas service, for a live celebration from Sydney Harbour. Reception of the two 50kW stations in the Northern Territories was fair, with some QRM from utility stations. However, with both those frequencies nearer the medium wave band than short wave, it is remarkable that they should be heard here at all!

Meanwhile, Radio New Zealand has been heard here on 15.15MHz at around 2000, proving that this must be a good time to listen to stations down under.

KTWR in the Mariana Islands is heard at around 1500 on the new frequency of 9.87MHz.

The relay of Radio Beijing by Radio Exterior de Espana has been heard with English in the mornings at 0500 on 9.69MHz.

The Voice of Free China is heard through the facilities of WYFR in Okeechobee, Florida at 2200 to Europe on 7.355, 9.955 and 11.805MHz.

Radio Ulan Bator in Mongolia can sometimes be heard on 12.015 at 1200 for the English programme.

North, Central and South America

Radio Canada International will commence relays during February on the transmitters of Radio Japan in Tokyo. English will be broadcast at 1200 on 15.29 and 17.81 and at 2200 on 17.885MHz. The transmissions will be for thirty minutes each.

WCSN from Boston is now heard:
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1600–1800 on 21.515MHz
2000–2200 on 15.23MHz
2200–2400 on 9.795MHz

WHRI in South Bend, Indiana is on the air at 1500–1700 on 21.64MHz.

RAE in Buenos Aires has added a new Spanish language transmission on Mondays, Wednesdays and Fridays at 2100 on the usual frequency of 15.345MHz.

HCJB in Ecuador has added 11.79MHz for the programmes at 1900 and 2130, with 15.27 and 17.79MHz in parallel. For the morning programme to Europe at 0645–0800, 11.835, 9.675 and 6.205MHz are used.

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