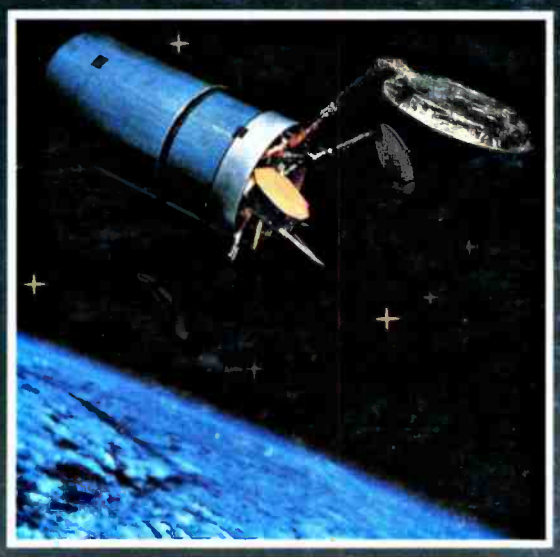
PRACTICAL WIRELESS

PW



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The FT-1000 is a new top of the range all mode h.f. transceiver that is the result of more than 25,000 hours of intensive research by Yaesu's top design engineers. They have adopted a completely new approach to the application of digital and RF technology. The extensive use of surface mounted components has allowed *six* microprocessors and *five* Direct Digital Synthesisers to be integrated with a simple to use operator interface to give a highly reliable full featured transceiver that has been optimised for serious h.f. applications. Please write or call SMC or your local authorised Yaesu dealer for the full specifications of this dynamic new transceiver and discover how you can open up the bands.

YAESU

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Eastleigh, Hants SO5 3BY
Tel: (0703) 255111

Prices and specifications are subject to change without notice

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Regular Features

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the Fairmate HP100E

packed full of the latest features

- 15 - 600MHz and 830 - 1300 MHz frequency coverage
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All this for under £300

Each Fairmate 100E comes complete with:

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- Two antennas (one VHF, one UHF)
- Carry case
- Shoulder strap
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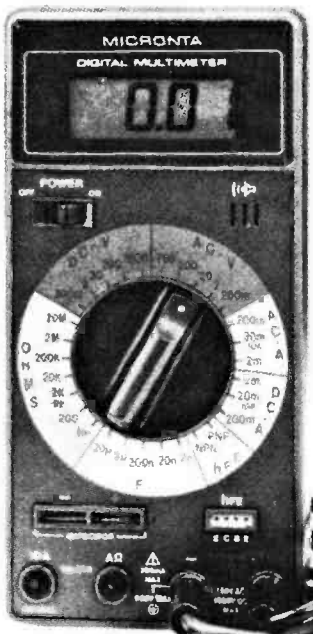

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£29.95

Data hold function enables you to freeze the display and to remove it from the circuit for more convenient reading.
Measures to 400 volts AC/DC and resistance in K-ohms up to 2 megohms.
Includes 2 button batteries. Overload protected. With carrying case **22-165**

Regulated Power Supply

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13.8 VDC Regulated Supply.
Ideal for use with HAM transceivers. 5A continuous. 12A intermittent. 15A surge. 240 VAC, 50 Hz.
Fused **22-7001**

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ICOM

Photograph shows IC-24ET life-size.

IC-24ET DUAL BAND FM HANDPORTABLE

COMPACT, DUAL BAND, AND MULTI-FUNCTIONAL

The demands from discerning Radio Amateurs throughout the world increase as technology breaks new barriers.

ICOM's answer to these demands is the new IC-24ET. One of the most compact dual band transceivers in the world. Designed to fit easily and comfortably in your hand, the transceiver weighs only 340g, and measures just 52(w) x 136.5(h) x 24.5(d) mm.

The IC-24ET is so lightweight but has many features not found in larger bulkier handportables. Make telephone-style calls by using the crossband duplex function, simultaneous transmitting on the 144MHz band receiving on the 430MHz band and vice versa.

Enjoy operating with the many other features which are easily activated via the convenient keyboard. Frequency setting, Band selection, Memories, simplex/duplex scan functions, priority watch clock/timer and many other settings.

By connecting a 13.8v D.C. supply to the transceiver directly a full 5W of output power is available on both bands. A reduced power output occurs when operating with the supplied BP-82 nicad battery pack.

A dual band function display shows operating band frequencies with a lighting function for night operation. The power saver circuit ensures lower current drain during standby conditions and can be programmed without internal modifications.

Options and Accessories:

BA-11	Bottom cap
BC-72E	Desktop charger
CP-12	Cigarette lighter cable
HM-46	Speaker/Microphone
HS-51	Headset
MB-30	Mounting bracket
UT-50	Tone squelch (C.T.C.S.S.)

A variety of battery packs and carry cases are also available to suit your operating needs.

For more detailed information on the IC-24ET contact your nearest ICOM stockist.

Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. Fax: 0227 360155.
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Count on us!

IC-726 HF/50MHz ALL MODE TRANSCEIVER HOT ACTION ON THE HF AND 50MHz BANDS

Now that the HF and 50MHz bands enter a period of intensity, conditions for long distance communcations have never been better.

The new ICOM IC-726 is a compact, easy to use transceiver which covers the amateur bands from 1.8 to 50MHz. It can be used in your home, car and in portable locations on SSB, CW, AM and FM modes.

With minimal switches and controls enjoy uncomplicated operating for beginners or veterans alike. And ICOM have incorporated their superior DDS (Direct Digital Synthesizer) system, a feature that enhances PLL lock up times. The same feature is built into ICOM's state-of-the-art IC-781 advanced H.F. Transceiver.

Other features include a general coverage receiver, dual VFO's, band stacking registers, attenuator, pre-amp, noise blanker, RIT, memories and much more. R.F. output is 100W on the H.F. band and 10W on 50MHz band from separate antenna sockets.

An optional AH-3 H.F. Automatic Tuner will allow you to operate on the H.F. bands in any location. Just push the tuner switch on the IC-726 and the tuner automatically adjusts for a minimum VSWR. The tuner can match a 12M longwire across the 160-10M bands. Use the weather resistant AH-3 in your car (with AH-2b mount and whip) boat, at home or in the field.

Options and Accessories:

AH-3	H.F. Automatic tuner
AT-150	A.F. Automatic matching tuner
PS-55	AC power supply
CR-64	High stability crystal
FL-100	CW narrow filter 500Hz
FL-101	CW narrow filter 250Hz
SM6/SM8	Desk microphones
SP7	External loudspeaker

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SCANNERS SCANNERS SCANNERS

SMC are pleased to be able to offer a wide range of receivers and scanners. We stock all the popular makes and models ranging from handhelds to dedicated bases. Shown below are a few from our selection.

YUPITERU

These are the latest wideband scanners to hit the market and are already proving very popular. With very wide coverage 25-1300MHz (except 550-800MHz) and a host of operating features they are proving to be the 'ones to beat'.

MVT 5000 Handheld Scanner **£299.00** inc. VAT
MVT 6000 Mobile Scanner **£345.00** inc. VAT

OTHER MAKES

The following scanners and receivers are normally available from stock (except R9000) and fully complement the rest of the range.

UNIDEN 200XLT Handheld Scanner	£ 229.00
JRC NRD525 HF Receiver	£1095.00
ICOM R9000 HF/VHF/UHF Receiver	£3995.00
ICOM R7000 VHF/UHF Receiver	£ 989.00
ICOM R71E HF Receiver	£ 855.00
AOR AR2002 VHF/UHF Scanner	£ 487.29

SONY RECEIVERS

SMC are pleased to be able to offer the SONY range of Multiband Receivers. They feature all the latest technology allowing unequalled coverage of both broadcast and shortwave bands, yet remaining both compact and easy to use. All the models illustrated cover VHF broadcast, SW broadcast and some SW or Air bands (only on certain models).

ICFPRO80	£299.00	ICF-SW1E	£149.95
ICF2001D	£299.00	ICF-7600DS	£159.00
	AIR7 £229.00		

YAESU

Yaesu receivers and scanners are designed and built to the highest specifications with meticulous attention to detail. This is borne out by the popularity of these two units, the FRG 9600 VHF/UHF scanner and the FRG 8800 HF receiver.

FRG 8800 0.15-30MHz Receiver	£849.00
FRV 8800 118-174MHz VHF Converter	£100.00
FRG 9600 60-950MHz Scanner	£509.00
FRG 9600 60-905MHz Scanner	£499.00
FC 965DX 0.15-30MHz HF Converter	£ 89.00
FC 1300 800-1300MHz UHF Converter	£119.00

SALE SPECIALS

REGENCY MX850E AM/FM 60-89, 118-136, 140-174 & 406-495MHz **£179.00**
VHF HANDY (RX40) FM 141-179.99MHz **£ 99.00**
SKYVOICE AIRHANDY (KE3000) AM 118-136MHz **£129.00**

Carriage **£2.50** extra

THE NEW FT1000

BRIEF SPECIFICATIONS

- ★ General Coverage Receiver 100kHz-30MHz
- ★ Ham bands TX 160-10m
- ★ Modes CW, USB, LSB, AM, FM, RTTY and PACKET
- ★ VFO steps 10Hz CW, SSB, RTTY, 100Hz AM, FM, PKT
- ★ Auto antenna impedance range 16.7 to 150 ohms
- ★ Selectable receiver band widths 2.4Khz, 2Khz, 500Hz, 250Hz
- ★ Dual band receiver tuning and monitoring with balance control
- ★ Power output up to 200 watts P.E.P. 50W AM
- ★ Sensitivity preamp on SSB/CW 0.25 micro volts 10dB S/N
- ★ D.D.S. Direct Digital Synthesiser
- ★ Dual selectable noise blankers with adjustable threshold
- ★ Frequency stability ± 20ppm (0 to +50°C) ± 200Hz F3 ± 0.5ppm (0 to +60°C), ± 150Hz, F3 with TXCO-1 fitted
- ★ 99 memories

ADDITIONAL FEATURES

Other features include adjustable IF width, IF shift, IF notch and APF controls. AGC presentable for fast, medium and slow + defeat, on/off selectable, preamp + adjustable attenuator -6dB, -12dB, -18dB,. Adjustable — mic gain, RF power o/p, processor and drive controls. Built in electronic keyer with adjustable speed control. Twin independent frequency displays with mode indication + much more.

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COMET & HOKUSHIN ANTENNAS

New from Hokuskin, an exciting range of high performance antennas, the WX1 has been a best seller for some time now, available are its bigger brothers the WX2 and WX4. Both are multi section 2m/70cm colinears and the mechanical construction the best we have seen yet. On the mobile front a new mini dual band mobile, the HS-727SS, very similar to the Comet CHL21J, and tests with our network analyser confirm its compatibility with our existing range of gutter and mag mounts. Also available a low profile hatchback mount and cable, the SS-B1, two new dual band antennas, the very slim VM-720SKR and the compact HS-727VMS. Both are suitable replacements for the 70N2M. For the HF enthusiasts a compact 10m HB9CV dual driven element antenna that is extremely light and very cleverly constructed.

WX2	WX4	HS-727SS	28HS-2HB
VHF/UHF Base	VHF/UHF Base	VHF/UHF Mobile	10m 2 ele HB9CV
144/432MHz	144/432MHz	144/432 mini	Dual driven element
6/8dB gain	7.8/10.8dB gain	1/4 5/8 wave	6dBi gain
200W max	200W max	100W max	500W PEP max
£75.00	£99.00	£16.95	£65.00

MOBILE ANTENNAS

2QW	2m 1/2 wave	£4.95
2NE	2m 5/8 wave folding	£13.25
78B	2m 7/8 wave	£15.00
78F	2m 7/8 wave folding	£21.50
88F	2m 8/8 wave	£24.10
258	70cm 2 x 5/8	£29.37
358	70cm 3 x 5/8	£33.73
268E	70cm 2 section colinear	£32.80

DUAL BAND MOBILE

CHL21J	Mini dual band mobile	£14.95
CHL23J	Small dual band mobile	£16.90
CA2X4KG	2m 2 x 5/8 70cm 4 x 5/8	£39.95
70N2DX	2m 6/8 70cm 3 x 5/8	£37.75
HS-727SS	Dual band mini antenna NEW	£16.95
HS-727VMS	2m 1/2 70cm 2 x 5/8 NEW	£25.95
VM-7020SKR	2m 1/2 70cm 2 x 5/8 NEW	£24.95

DUAL BAND BASE ANTENNAS

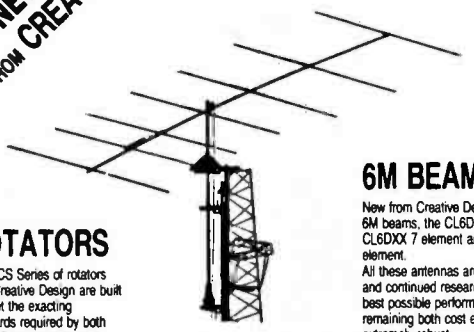
WX1	2m/70cm colinear	£54.99
WX2	2m/70cm colinear	£75.00
WX4	2m/70cm colinear, high gain	£99.00
CA2X4WX	2m/70cm colinear	£79.00
CA2X4MAX	2m/70cm colinear, high gain	£99.95
CF416MN	Duplexer 1.3-500/400-540MHz	£25.50
HS790DN	Duplexer less 1.6-150/410-460MHz	£25.50

ANTENNA MOUNTS

GCCA	Gutter mount and cable	£14.25
HDTMCA	S/S trunk mount and cable	£19.50
SOMM	Mag mount and cable	£12.75
TBR	S/S hatch back mount NEW	£11.25
RS17	Mini hatch back mount NEW	£12.50
RS16	Mini gutter mount NEW	£12.50
SS-B1	Mini back mount & cable NEW	£26.50
CK-3LX	Cable assembly for RS16, 17, TBR	£19.95

CARRIAGE BASE ANTENNA £7.50, MOBILE ANTENNAS £4.00, CABLES AND MOUNTS £3.50

NEW FROM CREATE



ROTATORS

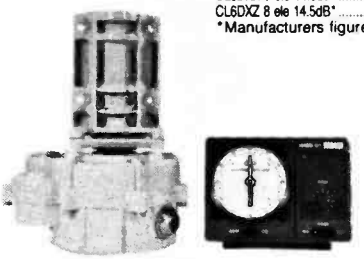
The RCS Series of rotators from Creative Design are built to meet the exacting standards required by both professional and amateur users. A range of methods is available designed to cater for medium to large shed antennas. All the rotators are manufactured with high quality components allowing continued and reliable operation.

RC5-1 ..... **£219.00**
RC5A-3 ..... **£425.00**
RC5B-3 ..... **£675.00**
CK-46 Rotary bearing **£34.95**

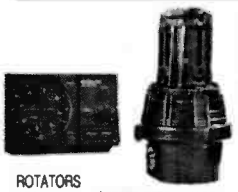
6M BEAMS

New from Creative Designs are a range of 6M beams, the CL6DX 6 element, CL6DXX 7 element and CL6DXZ 8 element.
All these antennas are the result of long and continued research to achieve the best possible performance whilst remaining both cost effective and extremely robust.

CL6DX 5 ele 13dB* £115.00
CL6DXX 7 ele 14.3dB* £168.99
CL6DXZ 8 ele 14.5dB* £225.00
*Manufacturers figures



ROTATORS



Superb engineering standards combined with pin sharp setting accuracy means new technology from Yaesu create Kenpro Hygain.

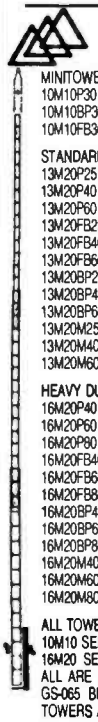
ROTATORS		
AR200XL	OFFSET TYPE 3 WIRE	£38.50
G-250	BELL TYPE TWIST/SWITCH CONTROL	£78.00
G-400	BELL TYPE METER CONTROLLER	£139.00
G-400RC	BELL TYPE ROUND CONTROLLER	£169.00
G-600RC	BELL TYPE ROUND CONTROLLER	£219.00
CD45	BELL TYPE METER CONTROLLER	£218.90
HAM1V	BELL TYPE METER CONTROLLER	£327.00
T2X	BELL TYPE METER CONTROLLER	£499.00
G-800SDX	BELL TYPE 450 DEG VAR. SPD	£325.00
G-1000SDX	BELL TYPE 450 DEG VAR. SPEED	£368.00
G-2000RC	BELL TYPE ROUND CONTROLLER	£445.00
KR500	ELEVATION METER CONTROLLER	£149.95
KR5400	AZIMUTH/ELEV DUAL CONTROL	£279.00
RC5-1	BELL TYPE ROUND CONTROLLER	£219.00
RC5A-3	BELL TYPE VAR. SPEED AND PRESET	£425.00
RC5B-3	BELL TYPE VAR. SPEED AND PRESET	£675.00

ROTATOR HARDWARE		
AR200AB	ALIGNMENT BEARING AR200XL	£17.50
KS505	ROTARY BEARING 1½" MAST	£19.95
GS-065	ROTARY BEARING 2" MAST	£29.95
GC-038	LOWER MAST CLAMP G-400, 600 etc	£16.95
9523	CHANNEL MASTER BEARING	£19.95
CK46	ROTARY BEARING 1.5–2.5 MAST	£34.95
MC1	LOWER MAST CLAMP RC5 SERIES	£25.00

ROTATOR CONTROL CABLE		
RC5W	5 WAY G-400RC, 800, 1000SDX PER MTR	£0.48
RC6W	6 WAY G-250, 400, 600, RC KR500 PER MTR	£0.66
RC8W	8 WAY HAMIV, T2X 2000RC RC SERIES PER MTR	£0.72

CARRIAGE:
ROTATORS FREE, ROTATOR HARDWARE £2.85, ROTATOR CABLE £3.50 UP TO OVER 20 MTS, OVER 20 MTS £5.00.

STRUMECH VERSATOWER



MINITOWER 10M10 Series		
10M10P30	30FT POST MOUNT	£530.76
10M10BP30	30FT BASE PLATE MOUNT	£562.11
10M10FB30	30FT FIXED BASE MOUNT	£522.49

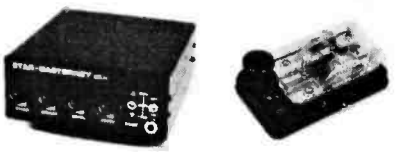
STANDARD 13M20 SERIES		
13M20P25	25FT POST MOUNT	£458.85
13M20P40	40FT POST MOUNT	£646.30
13M20P60	60FT POST MOUNT	£761.30
13M20FB25	25FT FIXED BASE MOUNT	£317.40
13M20FB40	40FT FIXED BASE MOUNT	£481.85
13M20FB60	60FT FIXED BASE MOUNT	£596.85
13M20BP25	25FT BASE PLATE MOUNT	£541.65
13M20BP40	40FT BASE PLATE MOUNT	£750.95
13M20BP60	60FT BASE PLATE MOUNT	£845.25
13M20M25	25FT MOBILE TOWER	£2179.25
13M20M40	40FT MOBILE TOWER	£2387.40
13M20M60	60FT MOBILE TOWER	£2557.60

HEAVY DUTY 16M20 SERIES		
16M20P40	40FT POST MOUNT	£802.70
16M20P60	60FT POST MOUNT	£910.80
16M20P80	80FT POST MOUNT	£1426.00
16M20FB40	40FT FIXED BASE MOUNT	£644.00
16M20FB60	60FT FIXED BASE MOUNT	£763.60
16M20FB80	80FT FIXED BASE MDUNT	£1219.00
16M20BP40	40FT BASE PLATE MOUNT	£851.00
16M20BP60	60FT BASE PLATE MOUNT	£952.20
16M20BP80	80FT BASE PLATE MOUNT	£1530.65
16M20M40	40FT MOBILE TOWER	£2847.40
16M20M60	60FT MOBILE TOWER	£2967.00
16M20M80	80FT MOBILE TOWER	£3680.00

ALL TOWERS EXCEPT MOBILES ARE AVAILABLE FROM STOCK. 10M10 SERIES SUPPLIED WITH STANDARD WINCHES. 13M20 & 16M20 SERIES ALL SUPPLIED WITH AUTO BRAKE WINCHES. ALL ARE SUPPLIED WITH H2R HEAD UNIT DRILLED TO TAKE GS-065 BEARING. HOLDING DOWN BOLTS FOR BP AND FB TOWERS ARE AVAILABLE AT £28.75 PER SET EXTRA.

ALTERNATIVE WINCHES AND HEAD UNITS ARE AVAILABLE AT EXTRA COST.
DELIVERY IS BY QUOTATION DEPENDENT UPON DISTANCE.

MORSE KEYS



MORSE KEYS			p.p.
HK702	STRAIGHT KEY	£42.75	£1.75
HK703	STRAIGHT KEY	£49.69	£1.75
HK704	STRAIGHT KEY	£26.35	£1.75
HK705	STRAIGHT KEY	£26.25	£1.75
HK706	STRAIGHT KEY	£28.95	£1.75
HK707	STRAIGHT KEY	£25.49	£1.75
HK708	STRAIGHT KEY	£26.45	£1.75
HK710	STRAIGHT KEY	£41.75	£1.75
HK711	STRAIGHT KEY KNEE MOUNTING	£41.75	£1.75
BK100	MECHANICAL BUG	£41.45	£2.00
MK701	SINGLE LEVER PADDLE	£38.35	£1.75
MK702	SINGLE LEVER PADDLE	£41.50	£1.75
MK703	SQUEEZE KEY	£37.00	£1.75
MK704	SQUEEZE KEY	£24.99	£1.75
MK705	SQUEEZE KEY	£32.78	£1.75
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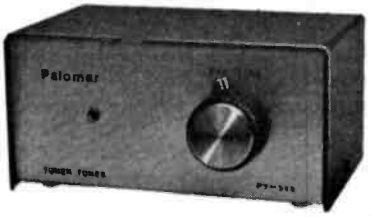

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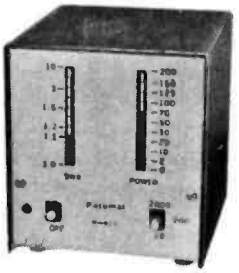

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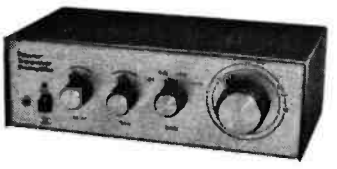

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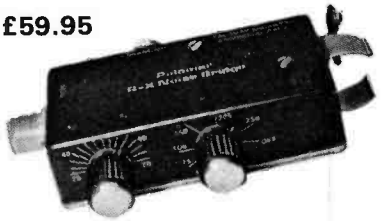

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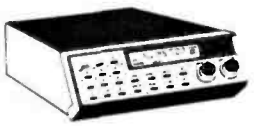

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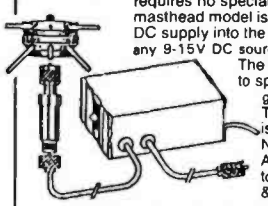
The basic specification of the products is similar: coverage 20MHz-1GHz, at 1GHz: minimum gain 13dB, noise factor 5.5dB. Choose from a mast-head version (PA3) or a standard die-cast box style (PA3I). Best results are normally obtained from the masthead model which gives a boost to weak signals which would otherwise have been lost in the feeder cable. Also feeder cable noise is not amplified which is the case if the amplifier is mounted at the base of the feeder. On the other hand, the die-cast box version requires no special installation and is readily taken out of circuit. The masthead model is supplied with a special power unit which feeds the DC supply into the antenna feeder. No psu is provided for the PA3I as any 9-15V DC source is suitable (current requirement about 25mA).



The PA3I finds application in instrument work, e.g. input to spectrum analysers, boosting the output from signal generators to give a low-power TX.
The standard version of the PA3I has BNC sockets and is designated "PA3I/B", available to special order N-type sockets ("PA3I/N") or SO239 ("PA3I/S").
A special feature of the PA3 series is a high-pass filter to attenuate frequencies below 20MHz; high-power HF & MF broadcast stations can be very troublesome!

PA3 Masthead, with PSU		PA31/B	BNC	**£35.50**
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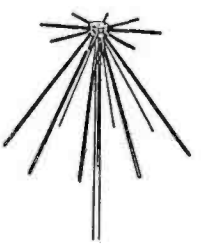
REVCONE



The UK's favourite discone composed of traditional British quality engineering.
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Another option is the N-type connector instead of the popular SO239. N-types give a better UHF performance, but they cost a bit more. The choice is yours.
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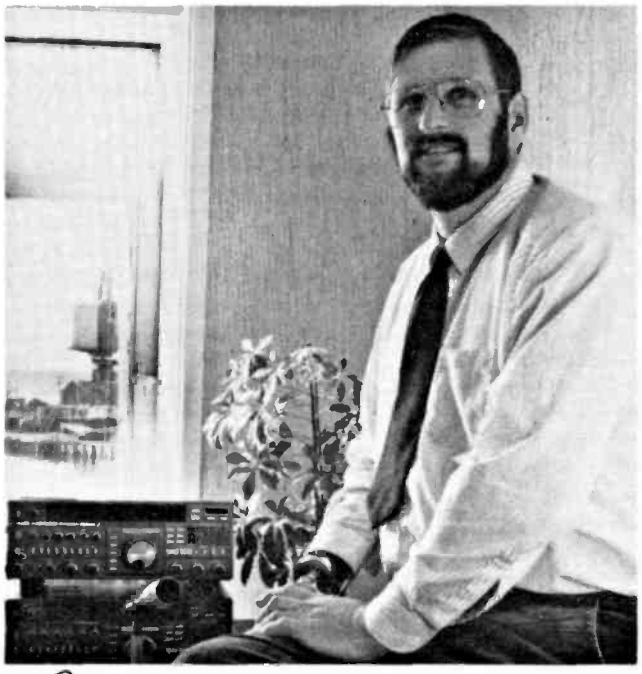


Rob Mannion G3XFD

Valves are here to stay - for the forseeable future - if the response to my February 'Keylines' is anything to go by! The replies from readers wanting more valve projects was larger than I had expected, and the tone of the average 'yes' letter was very keen to say the least. Your comments were very interesting and I thank those of you who took the trouble of jotting down ideas for suitable projects. One or two letters reminded me of the various pitfalls that await the constructor attempting to build valved equipment and, although I appreciate their comments, I'm fully aware of the biggest problem - that of obtaining special components, etc.

I have already looked into the valve-holder and valve supply situation and am pleased to report that they are freely available at a very reasonable price. However, to keep problems to a minimum any valve project in *PW* will use, wherever technically possible, one specific valve, in other words the same valve for r.f., detector and a.f. stages. This immediately removes perhaps the biggest bugbear to home construction, that of being stuck for one particular item on the shopping list. We shall also ensure as far as we can, that you can wind all inductors yourself, when they cannot be obtained from the regular mail-order sources.

Several readers took the obvious, and very sensible step of warning of the possible dangers to inexperienced constructors, when they have to work with relatively high voltages for the first time. Don't worry, our idea is to keep our readers and not to electrocute them! To this end we are working on a project that will satisfy as many needs as possible by using valves, lower voltages, simple construction and with the option of portability combined with a built-in budget price tag.

Box 88

It does not seem so long ago to me (I must stop using that phrase - even if it is true) that you could hear radio amateurs ending their CQ calls on the h.f. bands with 'No Box 88s please'. For the uninitiated I should perhaps explain that the famous Box 88 was the only authorised route into the USSR for QSL cards and was, for many years, the only way our fellow enthusiasts in the Soviet Bloc could confirm a QSO. In those days, anyone not wishing to work someone from behind the 'Iron Curtain' would often end a CQ with a 'No Box 88s'. How things have changed, and in such an incredibly short space of time! I've noticed for some time that QSOs to 'Iron Curtain' countries are now far more than the old 'rubber stamp' variety. The 'chattier' QSOs cannot just be attributed to a better understanding of English either, it's much more than that!

Nowadays you can learn a great deal about the amateurs who live in Eastern Europe and their approach to the hobby via the amateur bands themselves and through their various magazines. Every month the *PW* office receives magazines from Eastern Europe. They all looked very interesting indeed and I was particularly pleased to meet an interpreter who was able to make up for our lack of Russian, etc., and provide us with a complete run-down on their editorial content. It turned out to be a very worthwhile exercise indeed.

One very interesting parallel between 'us' and 'them', is that they are also suffering from a lack of young people taking up the hobby! This I found surprising, but the amount (and apparent good quality designs) of 'home-brew' equipment projects must surely reflect the almost total lack of imported professionally-built equipment in Eastern Europe. The various radio magazines, although printed on relatively poor quality paper, have a very good design format when you consider that they are all produced on a very tight budget.

In particular, the Czech amateur radio magazine is looking forward to a change in format and is asking readers for ideas, while clearly stating that they are stuck with the same paper and typeface for the time being. Reading through the transcription of this magazine, it is obvious that 'Glasnost' has truly arrived in Czechoslovakia and has been welcomed with open arms. However, an unwelcome import from the West (inflation of course!) arrived at the same time, forcing the publishers to raise their cover price. Oh well, we can at least all suffer equally and moan about the same problems now can't we?

Equality

Thinking about equality has brought a very strange form of discrimination to mind, and it's something British amateur radio could well do without as far as I'm concerned. We're all radio amateurs and we all take whatever road we wish in the hobby, to wherever takes our fancy. Some people, such as myself, enjoy working with low power and c.w. on the h.f. bands. Others enjoy v.h.f., u.h.f. and the microwave regions of the radio spectrum and concentrate on building and operating equipment suitable for their own needs.

Why discrimination of any sort exists in a hobby as diverse as ours is a question that I find difficult to answer. Unfortunately it is there and unless we take steps to rid the hobby of this unnecessary extra burden, it could taint amateur radio in such a way that it could discourage newcomers.

I am thinking about the very unfortunate attitude shown by a very few licensed amateurs, who - quite unjustly - look on B licence holders as being 'inferior'. I have also been told (by the victims themselves) that the discrimination is particularly unpleasant when it becomes known that a particular licensee has entered amateur radio via CB.

As is usual, whenever you look prejudice in the face as a rational individual - it can sometimes be seen to be operating in both directions. I know this to be true as some licensed amateurs have introduced themselves, as 'I'm only a B licensee' or 'I'm an A licensee and I don't like the B licence'!

Surely a bit of paper (or is it a computer print-out sheet nowadays?) proving that you can send and receive Morse at 12 words a minute, cannot make that much difference to people sharing the same hobby? During my working life I've met radio amateurs driving tractors on farms, working as postmen, designing broadcasting transmitters, working in the police, as doctors and so on. Surely then, if there is such a large cross-section of human life to be found in our hobby we must have a great deal in common whether or not we hold that precious Morse pass.

Let's see an end of this dreadful and totally unfair discrimination before we welcome the new novice licensees onto the airwaves. If we don't act now, the discrimination will be directed towards the very people who'll be the radio amateurs of the future. You can be sure that such prejudice will be self-perpetuating. Amateur radio took a long time to lose its reputation as an elitist activity and we should all work together to ensure that that particular label is never again pinned on the amateur radio hobby.

Receiving You...

Dear Sir

I express hereby my general appreciation for the electronic appliances reviews published regularly in *PW*.

The main principle for an honest review must be independence of the reviewer.

The review of the Yaesu FT-1000 h.f. transceiver by Chris Lorek G4HCL in *PW* January 1990 is very positive. Also the concluding paragraph contains the words "It was a pity to have to return the unit following review, even when it left me for one day for photography I started having withdrawal symptoms! Maybe I'll have to have a word with the bank manager...." Very suggestive, indeed!

But the last sentence mentioned that Chris Lorek is Head of Research and Development at SMC (in very small letters).

There we have it!

The reviewer is an employee of SMC, South Midland Communications Ltd, and SMC is the sole distributor for United Kingdom.

Conclusion: The personal integrity of Chris Lorek is not in discussion but the independence of the reveiwer is not present and the reliability of the review is substantial degraded.

Please, in the future independent reviewers! Furthermore, I request you to pay some attention to the circuitry, so publish at least the block diagram of the reviewed electronic appliance.

Frans Koop PA0FKP
The Netherlands

★★★★★STAR LETTER★★★★★

Dear Sir

Ok, enough is enough. Not only do you expect us to buy *Practical Wireless*, you also want us to take a pair of scissors to it, cut it up and then return it to you. This must be some sort of master plan to save money, by recycling all of the paper that is returned under the guise of competitions. Well, no way, I'm not going to be some sort of pawn in this game of yours. Couldn't you do the same as you did for the Wordsearch and put the competition on a separate piece of paper. This way, I get to keep my *Practical Wireless* intact, instead of losing a full page of very good information.

The other way, is to make sure that there are only advertisements on the reverse side of the competition.

Well, that's my grouch over and done with. Keep up with the competitions, my 16 year old daughter loves doing them. Just one other thing, please find my entry enclosed.

Dave McKay G6BTY
Redcar, Cleveland

Editor's reply: Fair comment Dave, we're looking into the possibility of putting the competition page on to a removable sheet along with other information. I'd be interested to hear from other readers with the same objection.

Dear Sir

In your editorial of the February issue of *Practical Wireless* you asked if anyone was interested in building thermionic valve gear.

I was first introduced to valves some fifty years ago and I have not lost my interest in them. Now retired, I still build projects but would love to build an 80/100W c.w. transmitter. Not separate units, but all in one case, preferably with v.f.o. control and digital frequency display.

I feel sure that some of us old timers would enjoy the challenge of a bit of 'metal bashing' again. The one problem that remains is the source of supply for the components, as they take a bit of finding.

David T. Busby G4HFL
North Harrow, London

Dear Sir

Just having the January 1990 edition of the *Practical Wireless*, I feel a need to congratulate you all for having made an excellent radio magazine even better. Rest assured, I certainly will renew my subscription. Besides, I do hope you will let the use of colour flow on to other pages but commercial ones.

Hermod Pedersen
Chairman SDXF
Sweden

Chris Lorek G4HCL replies to the letter from Frans Koop PA0FKP, The Netherlands.

"Whether the product is Alinco, Icom, Kenwood, Standard, Yaesu or whatever, it is true to say that any reviewer who demonstrates a favouritism for a particular make or model of equipment does not last very long! Hence, I take great lengths to judge equipment on its own merits. As a result all the major UK amateur dealers are more than happy for me to review their products, which I do so with pleasure.

All my reviews are done entirely in my own time, with equipment loan arranged either by myself or through a magazine. Taking the case of the Yaesu FT-1000, I first saw the transceiver at the Leicester Exhibition, the event where *PW* asked me to review it for them. At the event, *PW* arranged the loan of the set to me. I took it home from the exhibition and following my tests returned it when required by *PW* for photography purposes. The equipment supplier received a copy of the review script only on the same day as I personally gave my completed review script to *PW*.

In common with other reviewers, I am professionally engaged in the radio field, being the Head of Research and Development of the Commercial Radio Division of SMC Ltd (commercial radio accounting for the vast majority of this multi-national firm's business). Another well-known and respected UK amateur radio reviewer is indeed employed by the company who owns Standard, and I was employed by a different branch of that company when I commenced writing reviews several years ago.

Hence, rather then possibly casting incorrect doubts in some people's minds, I feel it would have been more correct following the FT-1000 review to state that although I am employed by the Commercial Radio Division of SMC Ltd, the review was done entirely independently, as many *PW* readers may quite wrongly associate the many SMC outlets throughout the world only with amateur radio products. As an analogy, a division of the *PW* organisation arranges advertising for some UK amateur dealers in competing magazines yet we all take great lengths to remain independent lest we demise.

In conclusion, after writing for many years my un-biased approach has been proved to hold true, and my enthusiastic style remains the same throughout different jobs, nothing has changed. After having over 300 published articles and reviews, the proof's in the pudding so to speak".

Chris Lorek G4HCL

Rob Mannion G3XFD comments:

The fact that Chris Lorek works for SMC was made very clear. It should also be noted that Chris does not work for the Amateur Radio retail arm of SMC. I take great care, and will continue to do so, to ensure that reviews are as honest as possible.

Receiving You...

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.
Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

Dear Sir

I should like to congratulate you on the new format of *PW*. I have been a reader since just after the War, when *Camm's Comic*, as it was affectionately called, cost 9d. In my opinion, the January and February 1990 issues are the best ever. The covers are attractive and eye catching and you have achieved just about the right balance regarding content.

I particularly like 'Key Lines' although I do not always agree with your comments!

Having been unable to find a clear frequency on 40 meters this evening, I have yet to be convinced that there is a real need for a novice licence. I am certain that the high cost of equipment deters many youngsters and indeed adults with family commitments, from taking up the hobby. It is up to enthusiasts to demonstrate to beginners the real thrill that can be achieved and the excellent results obtainable by using home-made equipment. Excellent reasonably priced kits are now available from a number of sources and the G-QRP Club, of which I am a member, provides plenty of ideas and encouragement for both the inexperienced and the more advanced constructor. Just after the War, when I first became interested in radio, all equipment used valves. When transistors became available, it was a long time before I was weaned away from valves. There was always something very satisfying about seeing the glowing filaments of a valve. At least we knew something was happening!

Transistors were always dull and have been called the fastest fuses on three legs. However, most of my projects now use transistors and transistorised rigs have the big advantage over valve gear in that they can be run off small batteries outside in the open and in other locations where mains electricity is not readily available.

However, I look forward to building many more projects described in the pages of *PW*, using both valves and transistors.

Keep up the good work!

M. J. E. Gater G4ICC
President ISWL

Dear Sir

I would like to take this opportunity to say how pleased I am with *PW* and *SWM*.

I am 19 years of age and an electronics apprentice. All the different projects printed provide me with a good practical understanding of circuit diagrams and help me to use my acquired knowledge from school and work in building my own projects.

What I like too is the article 'Practically Yours'.

Perhaps at this point, I should mention how impressed I was with the 'Computing Corner' by Paul Newman. I realise that this series appeared quite recently (1988 infact) and therefore can hardly be reintroduced in the magazine so soon afterwards. However, a similar series would be almost welcomed by most readers I am sure, and in my opinion would offer a greater range of subject matter for your subscribers. Hope you can come up with something in this direction.

In the meantime, all best wishes for a successful and prosperous 1990 for both magazines.

Clive Thomas HB9EAL
Switzerland

Competition Corner

How many English words of four or more letters can you make up using only the letters in the phrase

PRACTICAL WIRELESS

You score one point for words of four to seven letters, two points for words with eight to twelve letters and three points for words containing thirteen or more letters. Plurals do not count as separate words. Words having a radio connotation will score double points. Only words to be found in the *Chambers 20th Century Dictionary (New Edition 1983)* will be allowed.
List the words on a separate sheet of paper, complete the form below, including the points total claimed and send **both the list and the form** to: **Practical Wireless, How Many Words Competition April, Enefco House, The Quay, Poole, Dorset BH15 1PP** to arrive not later than Friday 13th April 1990. The reader with the highest score will be awarded, **First Prize** the winner can choose either a one year subscription or £20 in vouchers for the book service. The **two runners-up** can choose from either a six month subscription or £10 in book vouchers. The Editor's decision is final and no correspondence will be entered into.

☐ Subscription
☐ Voucher

*My total number of **points**, using the formula above, from words made up from the letters in* 'Practical Wireless' *is:*

Name .....
Address .....
.....
.....
Postcode .....

Newsdesk '90

Poles Apart

South Midlands Communications Ltd are providing virtually all the radio communications equipment for the most exciting expedition of 1990.

North Pole 90 is the first Anglo/Soviet unsupported expedition to walk from the tip of the USSR to the geographic North Pole, a journey of 900 gruelling miles.

Two British explorers, Dr Mike Stroud and Sir Ranaulph Fiennes, who will be pulling sledges each weighing some 300lb, will be monitored on their mission by two experienced British radio operators, Laurence and Morag Howell, no strangers to working in the extreme climatic conditions they are about to face.

SMC is providing both highly sophisticated commercial communications, ranging from ultra compact handhelds through to point-to-point communications as well as amateur radio equipment, all of which will be rigorously tested by the couple. Reliability of radio equipment and clear communications are vital to the success of the mission and the husband and wife team will be in constant contact with the expedition.

Laurence Howell is to be situated at the base camp Shredny Island whilst Morag will be located on a small tented camp some 960km north of the Arctic sea ice.

In use will be FT-757 and FT-747 h.f. transceivers which have already been well proven at temperatures of -60°. The expedition hope to have a GB/UA0 callsign on all bands, inlcuding 50MHz. The station will comprise an FT-960R with companion amplifier. There will also be Morag's FT-726R fitted with the 144 and 430MHz bands plus satellite boards to facilitate diverse communication operations, and all stations are expected to be activated from the first week in March for approximately two months.

Laurence intends to continue his extensive research into radio anomolies in polar latitudes and will be using SMC's equipment to the full. He will also be contacting his amateur radio links throughout the world, in order to raise money for the Multiple Sclerosis Society which the expedition is supporting.

Morag expalined, "It is, of course, imperative that we maintain a 24-hour a day radio watch, this is in addition to carrying out daily scientific activities. We have to be alert to every sound and this can be mentally strenuous. Although we will be geographically separated for some time, Laurence and I will be in constant radio communication."

North Pole 90 is sponsored by Damart - warming news for our radio operators?!

TX Enhancer

Housed in a small shielded attractive enclosure, the TX Enhancer simply plugs inbetween the microphone and the mic jack of the radio. For use in a.m., f.m. and s.s.b. operation, on h.f., v.h.f. and u.h.f. radios, it contains a status l.e.d. and a two-position. centre-off switch.

One position keys up your transmitter and injects a short duty pulsed tone into the mic audio. This provides a pulsed drive in s.s.b. for safe, no-rush tuning of your linear amplifier while allowing more accurate tune-up than can be had by tuning up in the c.w. mode with a reduced carrier, because each pulse will provide 100% peak output, but the average output will be approximately 25%. The other position provides a short beep transmitted at the end of each of your transmissions, telling the station you're in contact with that it is his turn to talk.

Useable in the p.t.t. mode (and VOX mode with almost all Icoms and most Kenwood), it is especially useful in roundtables or just plain ragchewing. Requires one battery supplied. Price $62.00. Specify version when ordering. Add $5.00 shipping and handling USA and Canada, $13.00 elsewhere. Version K8-200 works with all Kenwoods that have an 8-pin mic jack. Version I8-346 works with all Icoms that have an 8-pin mic jack.

For information contact:
International Radio and Computers Inc.,
751 S Macedo Blvd.,
Port Street Lucie,
FL 34983.
USA
Tel: 1-(407)879-6868.

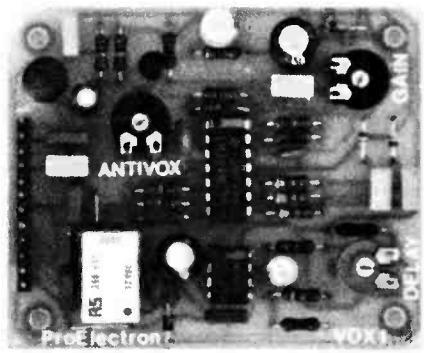
Add-on VOX

Proelectron have extended their range of assembled and tested p.c.b. modules to include a transceiver VOX unit.

Originally developed for use with budget h.f. transceivers such as the FT-77, the VOX1 will also find many applications with v.h.f. and u.h.f. mobile rigs rarely fitted with this feature.

Pre-set controls are fitted for Gain, Antivox and Delay and the on-board relay provides full TX/RX change-over as well as switching for the microphone line. Assembled on a high quality CAD designed p.c.b. measuring 72 x 60mm, the unit is simply wired between the microphone and transceiver, requiring no mods to either.

Priced at £30 inclusive, the VOX1! is available Mail Order from:
Proelectron, 35 Cromwell Road,
Cheltenham GL52 5DN. Tel: (0242) 571223.



Wanted List

The Vintage Wireless Company Ltd have just published a new 'Wanted List' for 1990. The 28-page book has a comprehensive listing of their stock requirements for 're-distribution' to enthusiasts world-wide.

If you are interested in this kind of wireless equipment, you may like to know that their showrooms are now open every Saturday to callers on a casual basis from 10am to 3pm.

The Vintage Wireless Company Ltd.,
Tudor House,
Cossham Street,
Mangotsfield,
Bristol BS17 3EN.
Tel: (0272) 565472.

ARROW — FOR THE BEST DEAL IN AMATEUR RADIO!!

TH75E KENWOOD DUAL BANDER

with receive
140/169 & 430/460 Mhz
Nicad & Charger
£398.00

NEW! C528 STANDARD DUAL BANDER

with receive 130/172
350/470 & 890/960 Mhz!
£369

NEW! IC-24E

ICOM mini dual bander
2M & 70cms FM
DISCOUNT PRICE £349
incl. nicad, charger

TS440S KENWOOD

HF Base Station
with Internal ATU
Please Phone for Price

NEW ICOM IC-R1

Micro-size handheld
scanner 150Khz/
1300 Mhz
£399

TS140S or TS680S with 6M

Phone for
Best Price

NAVICO SPECIAL!!!

Try the best performing 2M FM mobile in your own vehicle for a week FREE OF CHARGE.

Contact any ARROW BRANCH for details:

AMR1000 £247.25 AMR1000S £299.00

TR751E — *FREE CREDIT*

EXCELLENT 2 Metre performance from this great allmode rig.
Dep: £199 + 9 payments £44.44.

NEW!! AR1000

SuperScanner
1000 Channel memory
& 15-1300Mhz.
£249.00

HP100E

NEW HP100E from FAIRMATE, 25/1300 Mhz
1000 channel memory
£279.00

NEW IC-R72 RECEIVER

General coverage
100Khz/30Mhz,
compact size
£599

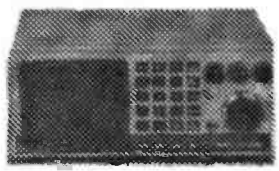
IC-2SE

A 2M micro Handy & a SCANNER! Comes complete with nicad, charger & receive.
Extended 80-190Mhz!
DISCOUNT PRICE £249

IC-4SE

Amazing micro 70cms handy with nicad + charger. Receives 380-500 & 800-950 Mhz!!
DISCOUNT PRICE £279.

ONLY £499!!



The most remarkable Scanner yet. AX700 with Panoramic Display.

JUPITER SCANNERS!

25-1300 Mhz with exceptional performance (really sensitive at 900 Mhz!)
MTV5000 Handheld £275
MTV6000 Base/Mobile £339
Incl. FREE nicads, DC. Lead & case £275
(Super slimline design)

R-7000

ICOM's superb VHF/UHF/ SHF receiver

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NEW SHOWROOM IN N. WEST OPEN!!

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Ashton-in-Makerfield, Wigan,
Lancs. Tel: 0942 713405
Jim Cook, G6TYB is at your service Mon-Sat

IC735 STAR BARGAIN

IC-735,
Microphone,
30 Amp. PSU
£995.00
THE PACKAGE!!

Finance arranged subject to status. APR typical 34.4%. Written quotations on request.
If you would like data sheets on any item(s) please send a Stamped self-addressed envelope.

COMET PRICE LIST JANUARY 1990

NON RADIAL: Mobile antennas independent of vehicle ground plane
CHL21J 144/432 Mhz, Unity/2.15dB,100W Only 29cms long £15.95
CHL23J 144/432 Mhz 2.15dB/3.8dB 100W Only .44 metres £17.95
CHL24J 144/432 Mhz 2.15dB/5 dB 100W 0.8 metres long £25.30
CHL250H 144/432 Mhz 3.0dB/5.5dB 200 Watt 0.95 metres long £32.80

2x4 Series + Trifoam mobiles and base station antennas
2x4M 144/432 Mhz 4.5/7.2dB 150 watt 1.53 metres £37.65

2x4 SERIES & DUAL BANDERS featuring the unique super linear converter system
2x4MAX 144/432 Mhz 8.5dB/11.9dB 200 Watt 5.4 metres "N" G. Fibre £125.00
2x4WX 144/432 Mhz 6.5/9.0dB 200W 3.18 metres Glassfibre £79.95
2x4SUPER II 144/432 Mhz 6.0/8.4dB 200W 2.43 metres Glassfibre .. £77.35
2x4FX Compact 144/432 Mhz 4.5/7.2dB 200W 1.79 metres £55.80

DUPLEX & TRIPLEXERS Zinc alloy diecast
CFX5140 50/144/432 Mhz 800/800/500 Watt PEP 55dB isolation £38.10
CF413N 432/1296 Mhz 500/200W PEP 55dB Isolation "N" £36.85
CF416 144/432 Mhz 800/500 W PEP 60dB isolation £26.80

SR Series to order only. MONO BANDER MOBILE ANTENNAS
CA285 5/8 wave 3.5dB 300Watt 1.32 Metres Base loaded £15.80
CA287C 7/8 wave 5.2dB 200W 1.89 metres double co-phase £22.50
CA430TM 3 x 5/8 wave 432 Mhz 6.8dB 150W 1.47 metres £29.95

MONOBAND BASE ANTENNAS
ABC21 5/8wave Ground Plane 144 Mhz 3.4dB 200W 1.4 metres... £24.50
ABC22A 2 x 5/8 wave 144 Mhz 6.5dB 2.87 metres £36.00
ABC23 3 x 5/8 wave 144 Mhz 7.8dB 200 W 4.5 metres £50.50
ABC71 5/8 wave ground plane 432 Mhz 3.4dB .54 mtrs £21.50
ABC72 2 x 5/8 wave GP.432 Mhz 200W 5.8dB 1.07 metres £34.65
CA712EF 432 Mhz Twelve x Half wave! 9.5dB 3.10 metres £55.00

HF & 50 MHZ
CHA-5 Vertical with Loaded Radials for 80/40/20/15/10 M 200W SSB 5.29 Metres. Features trifilier wound toriodal core £210.95
52HB4 4 El.HB9CV Beam 10.4dB for 50 MHz 400W SSB 3.2M ... £87.00
CBL30 HF 1.7 — 30 Mhz Balun 1:1 1kw £20.85

CRZ/DISCONE & HANDHELD ANTENNAS
CRZ12DB A Unique wide band Active antenna 500Hz to 1500 Mhz 1.24 Metres with controller £96.30

ARROW RADIO LTD.
5 The Street. Hatfield Peverel. Chelmsford. Essex CM3 2EJ.
Tel: 0245 381626/381673 Fax: 0245 381436
Hours: 9-5 (Closed Thursdays)

GLASGOW SHOWROOMS:
Unit 17, Six Harmony Row, Govan, Glasgow,
Scotland G51 3BA. Tel: 041 445 3060.
Hours 8.30-5.30 Mon-Fri. (Closed Saturday).
AGENT
LEICESTER — DAVE FOSTER Tel: 0533 608189
Latest calls 8.30pm please!

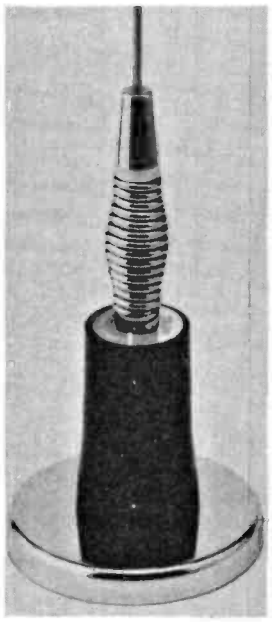
VISA RSGB

YOUR ORDER CAN BE TELEPHONED WITH CREDIT CARD DETAILS & DESPATCHED IMMEDIATELY!

FREE FINANCE ON MANY MAJOR ITEMS AT RRP. (Ask for details of qualifying items — see examples above).

Newsdesk '90

28MHz Cushcraft



The ideal companion for that new 28MHz band mobile transceiver could be the CS28M (magmount) antenna.

The CS28M is a new adaptation of the popular Cushcraft/Signals mobile antennas recognised by professional users around the world for their rugged looks and dependability.

The antenna comes with a 1.25m stainless steel whip and spring, a standard 19mm (brass base) 40kg pull, chrome plated magnet, Mylar pad and 4.5m RG58AU with PL259 connector.

Converting CB Rigs

"Since the Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988 (SI 1988 No 125) came into force on 8 August 1988, we have been issusing authorities to licensed amateurs on request, allowing them to possess non-approved (ilegal) 26.1MHz to 28MHz CB sets for the purpose of converting them to operate on the amateur frequency band 28MHz to 29.7MHz. Such CB sets are of course any which do not conform to the Department of Trade and Industry Performance Specification MPT1320 or MPT1333.

"We have been willing to issue these authorities so as not to restrict the legitimate activities of amateurs who may already be in possession of such sets for conversion purposes. However we have always envisaged that we would issue these authorities for a limited period only. It is, of course, our intention to remove non-approved CB sets from circulation and we do not wish to inadvertently encourage people to acquire them by continuing to issue authorities for an unnecessarily long period. The sale of illegal CB sets is of course retricted under the Order and therefore any person who sells such a sets to another commits an offence under the Wireless Telegraphy Act 1949.

We therefore propose to cease issuing authorities for the possession of non-approved CB sets after 31 December 1990. This will not affect sets for which amateurs already hold authorities - these will remain valid. We will also continue to issue authorities to amateurs who purchase sets from other licensed amateurs where the set is already converted by an authority we have issued."

The Department of Trade & Industry

Unusual Requests

We often get asked to publicise some very odd radio events, but I think this is the most unusual to date.

Can you help track and monitor seals in the wild? No it's not an April Fool either. The Sea Mammal Research Unit of the Natural Environment Research Council is currently monitoring the movements and behaviour of the grey seals that range along the east coast of England and Scotland. A group of these animals have been caught on the Isle of May in the Firth of Forth, fitted with radio tags and then released. The data collected from these and other tagged seals will help us to answer questions about how these seals interact with their marine environment.

The tags transmit in the telemetry frequency band of 173.2 - 173.35MHz, 10mW e.r.p. The transmission is a pulse of approximately 40ms once a second and can be detected by listening to constant wave or side band on any appropriate receiver or transceiver. The resulting audio tone is easily detected over the noise within a range (from a good vantage point) of 8-16km. The Unit has four automatic recording stations situated along the east coast at St Abbs Head, Crail, St. Andrews and Montrose. These stations monitor the movements of the tagged seals continuously.

Each station consists of a commercially available receiver connected to a three element Yagi antena tuned to the appropriate bandwidth and mounted as high as practically possible. The receiver is controlled by a computer which tunes each specific frequency in turn and monitors it for a set period of time. Detection is achieved by monitoring the audio output of the receiver which is a tone in the range of 1 - 2kHz (if the receiver is tuned properly). Using this technique, the station is extremely sensitive and has very good noise rejection. The receiver sends an RS232 output to the computer which summarises and stores the data for each frequency. The computer is programmed to reject as interference any spurious signals received much quicker than once a second.

With these stations we can tell which seals are in the area and whether they are swimming or on land, because the transmitter is fully attenuated when the antenna is submerged in sea water.

Although the results from these stations are excellent, additional information will expand our coverage as well as indicating any gaps. If you think you can help by listening for seals on a regular or opportunistic basis, please contact:

Sea Mammal Research Unit.
c/o British Antarctic Survey,
High Cross,
Madingley Road,
Cambridge CB3 0ET.
Tel: (0223) 311354.

Competition Winners

The winners for the February 1990 'Spot the Difference' Competition have been drawn from the hat.

The 1 year subscription goes to Mr. W. Stanley in Co. Down.

Six month subscriptions go to Dario Laurenti in Italy and G. ten. Veen from The Netherlands.

YAGIS

No, not antennas, it's the Young Amateur Group in Scotland. They are intending to work through all the Scottish repeaters, although the locations make this a formidable task. They will be undertaking this sponsored event on March 10 and operating under the club callsign GM0MVZ/M.

If you hear them, please answer, especially on the least used Scottish repeaters.

QSL Address

Would radio amateurs who work the Cyprus station ZC4AK please note that R.A. Evans G3VHE is not his QSL manager. He used to hold this call as a club callsign nine years ago, but when the club closed down it was re-allocated at a later date to the present holder.

In the past few years I have received many QSL cards for this station, but the correct address is:

ZC4 Bureau,
JSB,
BFPO 53.

Services

Queries
We will always try to help readers having dificulties with a Practical Wireless project, but please note 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 IRCs for overseas readers).
4: Make sure you describe the query adequately.
5: Only one query per letter please.

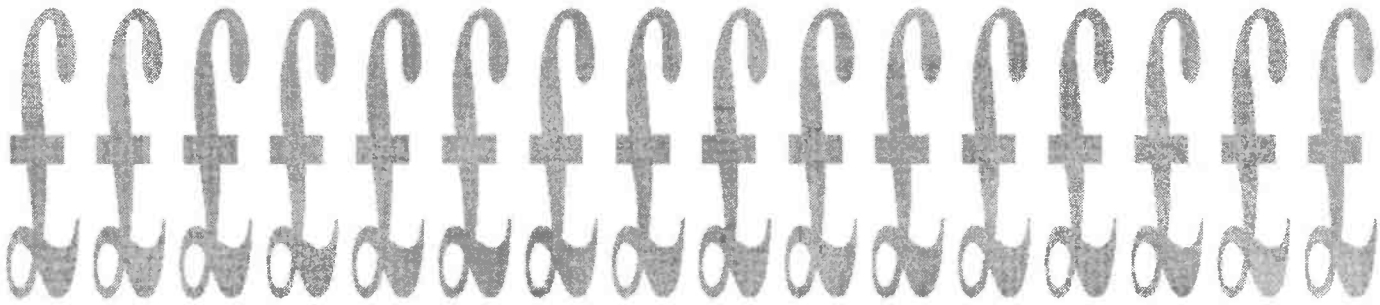
Back Numbers & Binders
Limited stocks of many issues of PW for the past years are available at £1.80 each including post and packing.
Binders, each aking one volume of PW, are available price £3.50 each (£1 P&P for one, £2 for two or more).
Send all orders to the Post Sales Department.

Subscriptions
Subscriptions are available both in the UK and overseas. Please see current issues for the latest prices.

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an experience constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP kits, both of who advertise in the magazine.
The printed circuit boards are available, mail order, from the Post Sales Department - see page 59 for the latest prices.

Mail Order
All PW services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.

Wireless Line
This is *the* information service for the radio enthusiast, updated each Friday. Calls cost 38p per minute peak time and 25p per minute off-peak. The number to ring is: (0898) 654632.



Cut out this coupon and bring it with you to any of the rallies that Practical Wireless is attending and you can save 5% on goods bought from our stand.

If you collect the coupon from two separate months of Practical Wireless you can save 10% on goods purchased from Practical Wireless at the rally.

If you don't want to cut up your magazine, bring the whole issue along and we will validate the coupon without removing it from your magazine.

Offer limited to a total of two coupons per transaction

PW DISCOUNT VOUCHER 1 APRIL 1990

MORE BARGAINS FOR N.E.C.

Brenda
G4VXL

Both Brenda and Bernie will be pleased to welcome you to our stand at the N.E.C.

Bernie
G4AOG

ICR7000HF Receiver 500kHz — 2GHz

YES, 500kHz to 2GHz CONTINUOUS receive in one unit. Using the ICR7000 multimode facilities, this probably makes the "2 in 1" ICR7000HF Receiver the most versatile scanner available today. Because of the enormous frequency coverage, the ICR7000HF has 200 mode sensitive channels for increased flexibility.

NO DEPOSIT

Now available on A.R.E. super credit terms. 48 monthly payments of £33.22 A.P.R. 29% Cash/cheque/credit card price

£989.

The R-5000 from Kenwood
100kHz-30MHz. SSB/AM/CW/FM/FSK

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Feature

Satellites Mean Business!

For the past few years, business communications systems have been enhanced considerably by the use of satellites. One example has been two-way data links, available by using Data Earth Stations (DES). W. D. Higgins thought it may be useful to people new in the field of DES to know what it's all about, how DES work and will they work for them?

Satellites have inherent advantages and disadvantages over fixed link communications systems. DES, or Data Earth Stations, make full use of the advantages, they include:

(a) Ease of access/connection
(b) Mobility of communication set up
(c) Interface with existing equipment
(d) Reliability

Data output from a computer, (in the form of a digital signal of so many bits per second) has to be converted into a form acceptable for transmission on satellite links. The interface equipment normally includes modems, multiplexers and r.f. amplification systems. A few words about these components may be of use to those unsure of their meanings.

Modem

A modem converts a binary digital signal of 1s and 0s at a certain voltage level into an analogue audio signal consisting of two tones. One tone represents logic 1, the other logic 0.

A modem is normally able to convert in both directions, i.e. digital to analogue and analogue to digital. Modem derives its name from the two functions that it performs (MODulation and DEModulation).

Multiplexer

To make full use of available bandwidth in communications systems, equipment has been designed to 'multiplex' signals, i.e. enable more than one signal to be sent over a communications channel.

One multiplex technique is **frequency shifting**. A signal (be it audio or data) is converted to a signal at a different frequency and combined with other similar shifted signals. The complete 'package' of signals is fed over a comms link and unravelled at the other end.

RF Equipment

When various signals have been processed correctly and combined to form a radio frequency signal, various things happen to it as it is processed by different pieces of the r.f. equipment.

Processing includes up/down conversion of frequency by converters, amplification of r.f. signals in low noise amplifiers and travelling wave tube systems and combining of r.f. signals by r.f. combiners.

Access

Time Division Multiple Access (TDMA) techniques make it possible for different satellite users to access a satellite, in different locations of its footprint. This can make systems more efficient and increase availability.

TDMA works by a process of enabling each earth station to send its signal in bursts. The gap between each burst is used by other earth stations.

Frequencies

DES systems tend to make use of frequencies in the C Band of the radio spectrum (about 4GHz). It has advantages over the Ku Band (11GHz), in the form of the cost and error rates due to environmental conditions.

Future Trends

More users than at present may be connected to DES/satellite systems. This would increase demand on satellite time. If demand increased significantly, new satellites and new satellite systems may be manufactured to satisfy the increased demand.

Improvements in different parameters of satellite systems may be discovered by research and development establishments around the world. Improvements could include new light-weight alloys for use within the satellites, increased efficiency solar cell operation, refinements of the electronics components, etc.

Additional uses for DES/satellite systems could include communications for remote areas around the world (e.g. data links to hospitals, educational establishments, etc.). They could become a 'lifeline' to villages in peril due to natural disasters.

Conclusions

In the past few years, use of Data Earth Stations employing satellite technology has increased. Two-

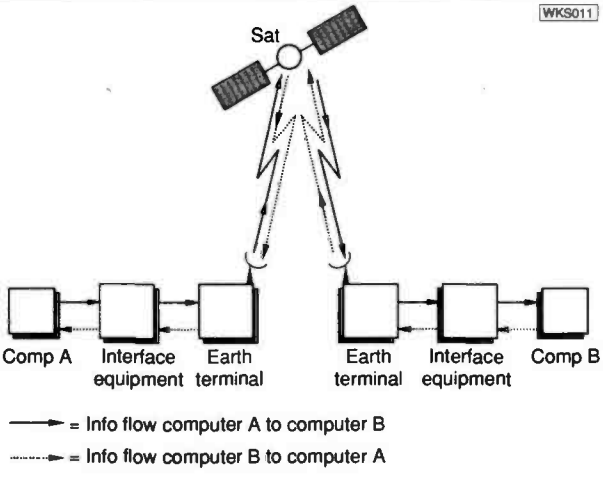


Fig. 1: Principle of DES operation (two-way data information flow)

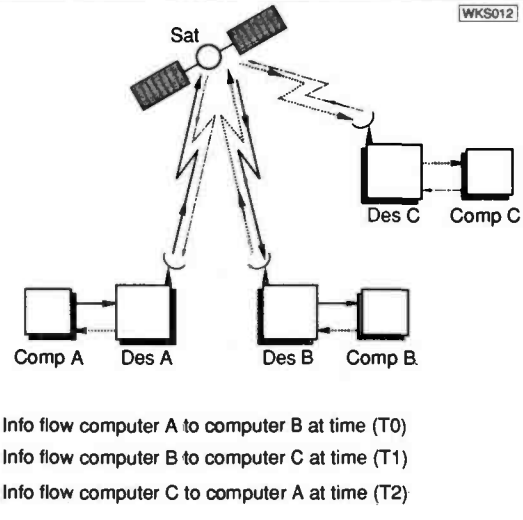


Fig. 2: Multiple access techniques increase efficiency and availability

Things to Consider	Advantages	Disadvantages
Location of users of the computer 'network'	Ease of connection of each user	Security of information. (Effectively, anyone within the footprint, with the correct equipment and access codes can receive data)
Can connection be made by one satellite?	Independence of users (A fault somewhere should only be local to that particular user)	A 'window' unobstructed to the satellite is required
What satellites will be used?	Possible mobility of users	Useful life of satellites is only about seven years
Up link and down link parameters (frequency, power, TDMA)	World-wide reliable communication	Initial costs may be expensive
Interface parameters (acceptable signals, format, speed, voltage)	Wide bandwidth transmissions	
Physical size (antenna, equipment, etc)	Remote/rural areas can have access to modern technological communications systems	
Environmental conditions (temperature, humidity, etc.)		
Ease of operation (who will actually use the equipment)		
Costs (capital, satellite time, systems cost, etc.)		

A summation in tabular form. If advantages and other considerations outweigh disadvantages then satellites could be the answer.

way data communications around the world is now a common occurrence for multinational companies. For each user the basic pieces of equipment are (a) computer (b) interface equipment (c) earth terminal.

The main advantages of DES/satellite systems are (a) ease of connection (b) mobility of users (c) world-wide access (d) wide bandwidth transmission.

The main disadvantages include (a) the security of the information (b) an unobstructed 'window' to the satellite is required (c) the useful life of a satellite is only about seven years (d) the initial capital costs may be high. **PW**

Amateur Satellites - Our Business!

Feature

AMSAT is into the business of Amateur Satellites, and is providing futuristic space age communication techniques for the world community of radio amateurs. Pat Gowen G3IOR, looks back on the history of AMSAT and brings us right up to date on this fascinating aspect of amateur radio.

Early Space Experiments

Over thirty years ago, Perry Klein W3PK, had thought about the possibilities and probabilities of reflecting v.h.f. amateur radio signals off those early low earth orbiting '*Discovery*' satellites. Calculations based on path loss and satellite cross sectional area reflectivity showed that it could not be done, but radio amateurs are world renowned for achieving the impossible. So the experiment was attempted. Needless to say, it seemed to work, as QSOs were made between Perry and stations in W0 as the satellite passed above the intermediate path. We now know that in fact, the path was due to the ionised trail left behind the satellite.

Amateur radio employment of the infamous copper needles experiment and the 'ECHO' balloon were not found to be really possible. The tiny signals reflected from the maximum possible amateur licensed power permitted and the then limitation of v.h.f. and u.h.f. receiver sensitivity, plus the restrictions of pre-transistor signal to noise ratios, were not condusive to success.

OSCAR-1 - The First Amateur Satellite

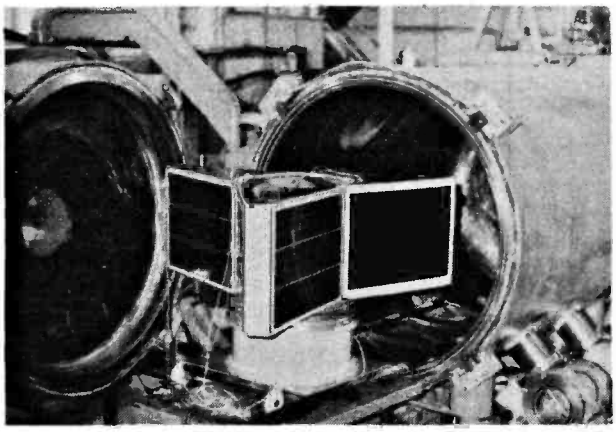
In 1960, an American amateur half jokingly wrote in *QST* that an amateur radio satellite might be a good idea. In reply, one of the readers working for an aerospace contractor, indicated that spare payload was often available on satellite launches. Negotiations for carrying an amateur satellite 'piggy back' with the main payload might prove to be fruitful.

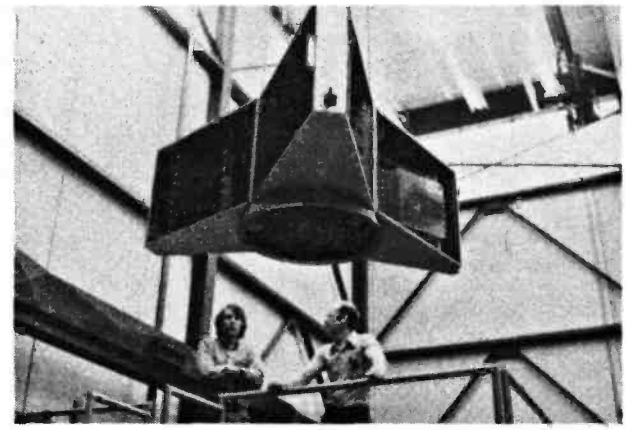
Thus, project OSCAR was born, 'OSCAR' being an acronym for 'Orbital Satellite Carrying Amateur Radio'. The next stage was building a satellite for launch, and this was undertaken by a dedicated group of amateurs on the west coast of USA. They designed and built OSCAR-1, which was a lightweight, strangely curved package that had to be matched to the 10lb additional weight restriction permitted, and tailored to fit the curved space available in the top of the Thor-Agena launcher. It flew into a 92 minute period 82 degree inclination orbit on 12 December 1961. OSCAR-1 didn't do too much - it was merely a primary battery powered 0.1 watt 144MHz beacon that transmitted its allocated W3OHI callsign as an abbreviated HI, but the number of HIs sent out per minute could be related to the spacecraft temperature. Throughout its short 18 day life, the satellite was followed by over five thousand enthusiastic radio amateurs throughout the world, and provided the first space experiment and a valuable guide to tracking and Doppler shift changes to boot.

Following Amateur Spacecraft

The success of the project promoted the building of OSCAR's 2, 3, 4 and 5. OSCAR-2 was a clone of OSCAR-1. It was launched on 2 June 1962, and also lasted for 18 days before incineration as it re-entered into the earth's upper atmosphere.

OSCAR-3, the world's first free access active communications satellite, followed on 9 March 1965. It was placed into a far higher 975km orbit. It contained a translator, with both uplink and downlink in the 144MHz band, which because of





The picture on the left shows the huge area of solar panels on OSCAR-10 as it is prepared for thermal and high vacuum testing.On the right now shown minus solar panels, OSCAR-10's balance is discussed by Dick Daniels and Jan King (W3GEY).

desensing only permitted contacts between highly powered stations. Its silver-zinc primary batteries lasted out for 15 days, but in that time 176 two-way QSOs were reported as having been made through it, including the first transatlantic satellite contacts. The three channel solar powered telemetry beacon was also very successful and continued sending down voltage and temperature readings for several months.

OSCAR-4 was launched from Cape Kennedy on 21 December 1965 by a *Titan III-C*, but sadly, the rocket's third stage failed to ignite, placing the satellite into a highly elliptical 18 200 x 105 nautical mile orbit. It lasted only a short time, but permitted a number of good two way contacts, including the first W/UA 144MHz/432MHz satellite QSO.

A new amateur satellite group came into being, consisting of students at Melbourne University. They built OSCAR-5, which was launched by ITOS-1 into a 1500km orbit under the auspices of AMSAT in the USA on 23 June 1970. It carried no translator, but tested various concepts used in later AMSAT and other satellites. This satellite used bar magnets to pull it into stabilised alignment with the earth's magnetic field, and it could be controlled by signals sent up from earth-bound command stations. The 7- channel 28MHz beacon giving telemetry and the transmitter sending it out lasted for 6 weeks, until the primary cells became exhausted. Many interesting and new propagational studies resulted, all of which were to be put to good use with the next satellites.

OSCAR-6 was built by AMSAT and launched by NASA with the NOAA-2 satellite on 15 October 1972 from Lompoc, California. It was a real winner, and was the first satellite that could be easily be used by any amateur with a low power 144MHz transmitter and a normal 28MHz communications receiver. The 1460km 102° inclination orbit gave world coverage, and a mutual inter-station coverage radius of some 8 000kM. A number of amateurs, including the author, made the first satellite DXCCs using it. It had 24 channels of meaningful telemetry, highly sensitive receivers, a.l.c. controlled strong output, good magnetic stabilisation, and even a 'codestore' that could re-transmit stored 18 word messages sent up from earth. Using solar cells to charge the NiCad on board battery, the spacecraft had a long and successful lifetime.

OSCAR-7 had a similar basis to OSCAR-6, a comparative 144MHz to 28MHz transponder, and an additional 432MHz to 144MHz transponder. It went aloft on 15 November 1974 and was also highly successful, being used by many thousands of world amateurs. Major contributions to this satellite came from AMSAT-DL in Germany and groups formed in Hungary, Australia, Canada and Japan, thus demonstrating the international aspect of the world amateur satellite building community. There was an added extra bonus with this satellite because the solar cells continued to supply power long after the battery had open circuited which resulted in a very extended active life for the spacecraft.

OSCAR-8 flew on 5 March 1978. It was primarily funded by a donation from the ARRL and was built by AMSAT. It too had a 144MHz to 28MHz transponder, and could be easily employed by all world amateurs. This satellite did not fly so high as OSCAR-6 or 7, but provided excellent communications to an ever increasing band of satellite users. The second phase of satellites was complete, and higher (*sic*) ambitions were now sought.

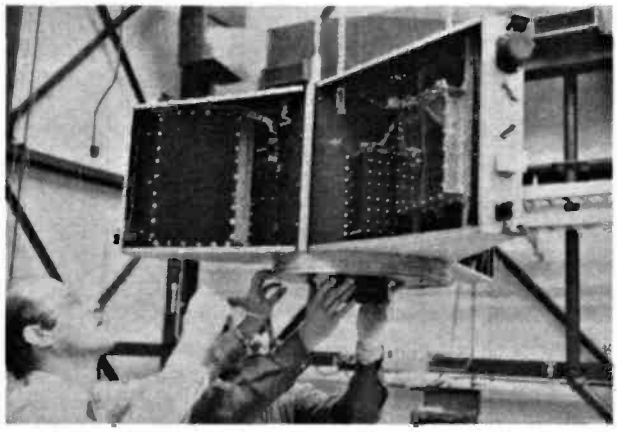
Phase III satellites

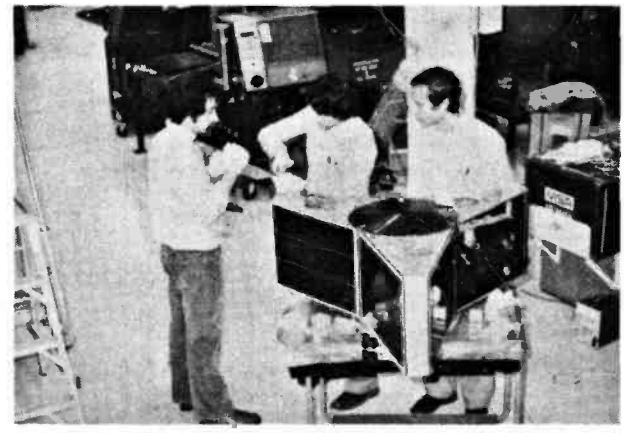
For communications over the wide area of the Soviet Union, the MOLNIYA orbiting satellites are employed. They are in highly elliptical orbits, which, whilst hugging the earth at the southern perigee point for a short pass period, ascending as they go north to hover around apogee for long periods of time. AMSAT also planned for a satellite in such an orbit, which would then provide long periods of effective communications for the majority of world amateurs by using a regular u.h.f. uplink and a v.h.f. downlink.

A very advanced, wide bandwidth satellite, with its beam antennas kept correctly orientated towards the earth by magnetic torquing of the satellite's attitude was evolved. Flight hardware for the project came from Canada, Hungary, the USA, West Germany and Japanese AMSAT groups. The Phase III development was the AMSAT flagship, and every available source of expertise, energy and funding went into the project, with no remaining funds available for insurance cover.

The mission lifted from the Kourou ESA launch pad at 1430UTC on Friday 23 May 1980, a day now known as 'Black Friday' in AMSAT circles. Sadly, the Ariane launcher hit a major problem, and the range safety officer had to destroy the rocket soon after lift off and that Phase III project is now resting in 300 feet of water off the coast of Devil's Island. As well as the satellite, AMSAT was now broken and effectively drowned, and future business looked very bad indeed.

As in all times of trouble, friends, fellow amateurs and world radio societies came to the rescue. Many life members of AMSAT sent in generous contributions as well as re-renewing their all-time membership subsrciption. AMSAT was





Visible in the picture on the left is the fitting, by Dick Daniels and Jan King,of OSCAR-10's apogee kick motor.In the right hand picture the team members of AMSAT install and check out the electronics of OSCAR-10.

rescued from the deep by its supporters, and work started on a similar spacecraft that was later to become the currently operational OSCAR-10.

The UoSATs

OSCAR-9 lifted off on 6 October 1981. Like OSCAR-11 which flew later, this satellite was built by the University of Surrey, and provided the first full scientific amateur spacecraft. The beacons transmitted in Morse c.w. and digital format messages, news and many more channels of telemetered data that could be read out by earth-bound amateurs using modems and computers. Round the world, readings could be stored as whole orbit data and transmitted down in bulk, and the first amateur digital communications experiment commenced.

RS & ISKRA Satellites

In the meanwhile, a USSR based group of enthusiasts built and arranged with the COSMOS launch agency the the joint launch of RS-1 and RS-2 on 26 October 1978. Both satellites provided very high circular polar orbiting 145MHz to 29MHz transponders. The satellites were equipped with highly sensitive 144MHz to 28MHz transponders which gave strong downlinks enabling amateur stations up to 9 600kM apart to communicate with the simplest of antennas. They also carried high capacity codestores and ROBOT transmitters that could automatically respond and reply to stations calling the satellite.

On 17 December 1981 there followed the USSR COSMOS mass multi-satellite launch of RS-3, 4, 5, 6, 7 and 8, providing a multitude of amateur interest around the world. Later still came the launch of RS-10/11, two currently operational transponders that use the power supply of a combined COSMOS navigation satellite. In addition to 144MHz to 28MHz, transponders, a codestore, ROBOT facilities etc, the satellites can also provide 21 to 29MHz and 21 to 145MHz transponding capabilities. RS-12/13, which will be similar to their predecessors, and RS-14, which is to be a 432MHz to 144MHz transponder satellite incorporating the AMSAT-DL RUDAK digital communications experiment are planned to be placed in orbit during 1990.

The Soviet amateur spacecraft programme included the building of the ISKRA satellites by students from many countries at the Moscow Aviation Institute. These were 21 to 29MHz transponders, with a beacon, telemetry system, command and codestore. They were 'launched' by merely being placed out of the SALYUT-7 manned space station by hand, and consequently, being placed into a very low orbit at a time of high solar flux, overheated and had rather a short life.

FUJI Satellites

Japan and its advanced electronics technology was not left out, as after contributing to earlier AMSAT orbiters, JAMSAT and JARL combined with NASDA to fly JAS-1, a 144MHz to 432MHz mode 'JA' analogue plus a mode 'JD' digital transponder, in FUJI-OSCAR-12. This spacecraft was too small for a full complement of solar cells, and consequently had limitations of power supply. It commenced operations well, and was avidly used by many amateurs. It continued operations intermittently until late 1989, by when the cataracting solar cells and reducing NiCad battery storage capacity called for it to be abandoned. JAS-1-b is a much improved version of the earlier version, with more and better solar cells and improved antennas. It was placed into orbit at 0135UTC on February 7, at the same time that this article was being written. By the time you are reading these words, it will be on, and actively stabilised as FUJI-OSCAR-20, uploaded, and fully operational on both modes.

Phase III - at Last!

OSCAR-10 and OSCAR-13, both currently operational, are in highly elliptical orbits that place the spacecraft at an apogee of some 35 000km for six hour periods twice daily. These satellites were launched on Ariane rockets from the ESA pads in South America. The rescue mission of contributions and donations mounted by amateur radio enthusiasts throughout the world permitted the relaunch of the first rebuilt and further improved Phase III satellite from Kourou on 16 June 1983. This time, apart from a collision with the Ariane third stage which damaged the antennas, and a misfire of the kick motor which resulted in a non ideal orbit, all went well.

The use of both OSCAR-10 and 13 transponders permit almost world-wide mutual communications between radio amateurs covering nearly half of the earth's hemisphere at any one time. Such ultra-DX QSOs are little affected by propagational and solar disturbances. OSCAR-10 takes an uplink of 432MHz to give a 144MHz downlink, but OSCAR-13 gives this plus 144MHz to 432MHz, 1296MHz to 432MHz and 432MHz to 2300MHz transponder modes of operation as well. Any amateur equipped with nominally powered 144MHz and 432MHz

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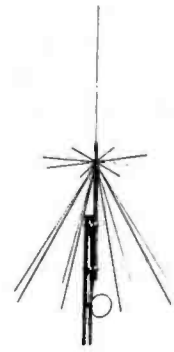

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transceivers and/or a 1296MHz transmitter and 432MHz receive plus suitable beam antennas can use them.

The Newest Satellites

The latest satellites put up in late January this year are the six 'Microsatellites' placed in orbit by the Ariane rocket from the ESA French Guiana launch site. They emanate from design and building projects of the University of Surrey in England, AMSAT in North America and Weber State College in Utah, AMSAT-Argentina and AMSAT Brazil. They are mainly packet radio store-and-forward orbiting mailboxes, but have a few extra delights, such as a Morse c.w. 437MHz beacon on LU-SAT, and the spoken message facilities being transmitted from the DOVE Brazilian satellite on 145.825MHz. Details on space operations will be found in past, current and future issues of *PW* under the 'Amateur Satellites' column of 'Backscatter'

Ham-in-Space Missions

The present day use of satellites for global communications and television is mainly thanks to the work done by all members of AMSAT throughout the world. With their work and dedication they demonstrated that the man in the street could also benefit in day-to-day life from satellites.

Additionally to all of the launched satellite projects, AMSAT is closely involved with other space related activities. Radio amateurs regularly crew the Russian MIR space station and also the American Shuttle missions, and they often come up with amateur radio activities to communicate from space with their colleagues on earth. The numerous modes used, and intended, include speech f.m. on 144MHz, SSTV, WBTV, packet radio, propagational experiments, auto-record sessions, with quite a few others in the pipeline.

Spin-Off

Many productive experiments have been conducted by numerous radio amateurs, astronomers, scientists, as well as many universities, colleges, schools and other educational establishments. The UoSAT satellites have researched digital communication techniques and have worked with scientific institutions in providing solar and magnetic data and as a source of inspiration to the study of many inter-related subjects. They are used by many teachers as an exciting and stimulating path into geography, physics, mathematics, trigonometry, geometry and many other subjects.

Research into the use of ever increasing and lowly populated u.h.f. and s.h.f. amateur allocated frequencies has brought the u.h.f. and microwave bands into the domain of reliable world-wide communications.

Early findings on inverted Doppler were discovered with OSCAR-7. Many propagational abnormality studies have been effected and are on-going using the signal sources outside the ionosphere for investigation into the auroral zone and solar effected paths. As a result of early work by AMSAT amateurs, the COSPAS and SARSAT (Search And Rescue SATellites) used for the detection and location of downed aircraft by measurement of the Doppler rate and curves produced from emergency location transmitters picked up by the orbiters, are now a regular joint Soviet-American feature.

All of these efforts and findings, plus many more, help to demonstrate to the wider community that amateurs are playing a valuable role beyond that of the 'Hancock' image, which is often applied to amateur radio. Recognition of achievements and results, and the frequent application of the found technologies to applications, all help to safeguard our allocated bands from the greed of those who would take and exploit them for commercial and military deployment. When the WRC meet to allocate future bands and frequencies that are now in great demand, our amateur bands may be safeguarded by the very fact that they are seen to be used to good purpose and to good effect.

The Future

Plans are now well underway that will provide an AMSAT-DL 1269MHz to 435MHz satellite that should provide easy round-the-world mobile and even possibly, contacts from hand-held transceivers Additionally, AMSAT North America are working on a geostationary satellite that will be accessible from low power equipment without the need for tracking, rather like the existing TV direct broadcast satellites.

The International AMSAT organisations are now not too far from providing functional interlinking geostationary satellites that can give continuous whole earth communications to amateurs using the smallest, lightest portable equipment, such as the 'Dan Dare' wrist watch type communicators that were once only in the realms of science fiction.

Other missions under current investigation include a solar sail spacecraft and a lunar beacon or transponder. These are technically feasible, but are dependent upon the goodwill of the various launch agencies and the funding that can be found for them. Groups are now evidenced in many countries all around the world that are anxious to design and promote the launch of futuristic spacecraft for use by all radio amateurs, but we have come a long way from the free 'piggy back' rides of the early days, as satellite launches are now big business. They need the support, funding and contributions and utilisation of the world community of radio amateurs, to be able to succeed in the endeavours to provide such advances to all the potential users.

Starting on Satellites?

You may think that using and enjoying the advantages that satellites provide is a complex, uphill and advanced subject, and that the cost of operating your hobby through the space medium is prohibitively expensive, but be assured that this is not necessarily so. You probably have the apparatus required already, and a few hints and tips are all that you need to get started. Whilst the cost of building satellites and having them launched can seem a fortune, when the cost is shared out among the many thousands of users it comes to a fractionally small contribution of that which you allocate to your own station.

If you are keen to help, and would like to have more information on getting aboard and using the spacecraft, your local AMSAT organisation is there to help you. It also helps to build and launch the satellites that you may enjoy. Send a large s.a.s.e. to Ron Broadbent G3AAJ, at 94 Herongate Road, Wanstead Park, London E12 5EQ, and you will receive a bumper bundle from him all about AMSAT-UK, information on your local organisation, input on the amateur radio satellites, advice on how to use them, and the availability of all the helpful accessories you may need. Although non-profit making, and run by radio amateurs for radio amateurs, amateur satellites are AMSAT's business! **PW**

An Inexpensive Product Detector for SSB or CW

Feature

There are many i.c. product detectors available 'off-the-shelf' from the leading semiconductor manufacturers nowadays. In spite of that, Adrian Knott G6KSN felt that it would be a useful exercise to build a cheap alternative.

The prototype product detector described in the following article, was built from parts found in the 'junk-box' and proved easy to construct.

Why Use It?

There are many receivers currently on the market covering the short wave bands. They have great sensitivity on broadcast stations, but fail to resolve the type of transmissions to be found in the h.f. amateur and utility bands. The predominant mode of operation in these bands is, for spectrum and power efficiency, the single sideband mode.

This mode (s.s.b.) is a comparatively narrow band mode of working in which the transmitted energies are concentrated, by using filters, in the sideband above or below the carrier frequency. Also to reduce the overall power requirements of the transmitter itself, the carrier frequency is also suppressed by as much as 60dB (one millionth). This reduces the power required, as r.f. energy is only produced when there is speech or other signal to transmit. This efficiency of power has one major disadvantage for the listener with an a.m. only receiver, on their set the signal will sound like 'Donald Duck' but is not as intelligible.

To enable these emissions to be understood, the signal must have the carrier reinserted before the detection stage. For absolute clarity the carrier must be reinserted exactly, in both phase and level, but as long as the frequency is almost correct the results will be more than adequate. The missing sideband need not be regenerated, as it would be merely a complete but mirror-imaged replica of the remaining sideband. When trying to listen to c.w. it is only necessary to add a b.f.o. to cause an audio heterodyne. This unit was built to cope with both types of signals with only a slight change in the way they are resolved.

The Circuit

The circuit shown in Fig. 1 was evolved to remove the receiver deficiencies mentioned, and has subsequently been found to give excellent results with receivers with an i.f. in the range if 450 to 470kHz. Transistor TR1, and its associated components, form a Colpitts type oscillator tuning over the range of 450 to 470kHz. The coil L1, along with capacitors C2, C5, C6 and the diode D1, determine the exact frequency of oscillation. Diode D1, although normally thought of as a power rectifier, is acting as a Varicap diode in this instance. The potential picked off by the wiper of R2 is used to vary the capacitance of the diode and make it act as a fine tuning control once the centre frequency has been set. To reduce loading on the oscillator transistor, TR2 buffers the output from TR1. The Zener diode, D2, regulates the supply to the fine tuning control network R1-3, to 5.1V. This will minimise variations of the nominal 12V supply altering the oscillator frequency.

The final stage, transistor TR3 is the product detector, which mixes the output of the buffer amplifier stage TR2 via capacitor C8, with the i.f. input signal fed in via R12 from socket SK1. The resulting audio frequencies, along with the original input frequencies, appear slightly amplified at the collector of TR3. Capacitors C11 and 13 form, along with resistor R17, a low pass network. The audio signal is passed out to the audio stages via Capacitor C14.

Construction

The construction of the project should cause no real problems, with the possible exception of the coil, L1. This is 90 turns of 0.2mm enamelled copper wire, pile wound on a 6.3mm former with

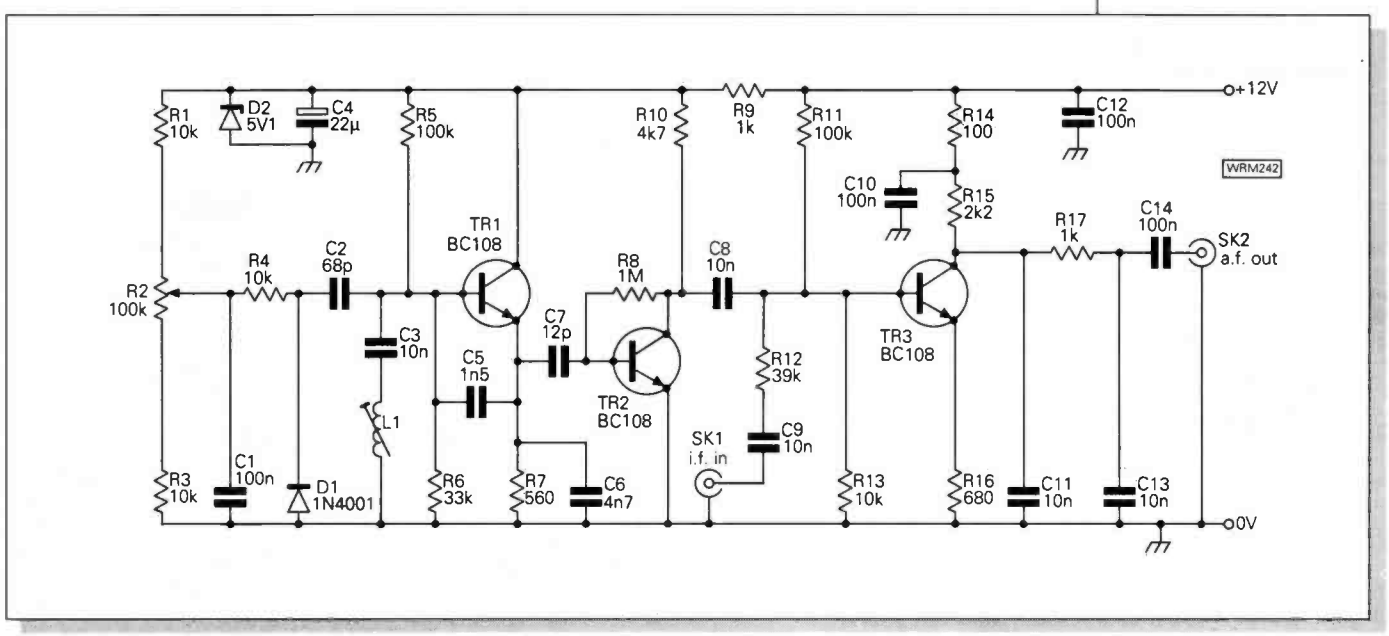

Fig. 1: The circuit diagram of the product detector

ferrite core. There are few restriction on the gauge of wire used. A fine enamelled wire in the range of 0.25 to 0.1mm (30 to 42s.w.g) may be used in winding this component. Mount all other components on the board with the minimum lead length following the component layout shown in Fig. 2. The prototype was built from parts found in my 'junk-box' and cost very little to make, but even using new parts the cost should not be too great. When completed, mount the board in a suitable (metal) screening box and connect the sockets to the correct places on the circuit board using coaxial cable.

Evidently, some modification will have to be made to the receiver. How much and what those modifications are, will depend on the receiver in use and whether the product detector is to be fitted internally or externally.

Basically speaking, an output must be taken from the final i.f. amplifier stage, buffered and coupled using coaxial cable to the input SK1. The recovered audio signal, available from SK2 has to be amplified by either an external unit, or by using the receiver audio stages themselves. Make the necessary alterations according to the situation.

Setting Up

This little unit can bring a new dimension to a receiver without a b.f.o.

Setting the product detector up is comparatively simple. First set the fine tune control R2 to mid position and tune the radio to a good strong a.m. signal, then using a non-metallic adjustment tool, trim the core of L1 to zero beat with the a.m. signal. That completes the setting up.

Incidentally, RAF VOLMET transmits digitised weather signals on 4.772MHz 24 hours a day and has a good signal all over the UK. This may also be used to facilitate tuning. Finally I wish you all good DX and enjoyable listening with your new reception aid. **PW**

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Shopping List

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0.25W 5% Carbon film

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560Ω	1	R7
680Ω	1	R16
1kΩ	2	R9,17
2.2kΩ	1	R15
4.7kΩ	1	R10
10k	4	R1,3,4,13
33k	1	R6
39k	1	R12
100k	2	R5,11
1MΩ	1	R8

Potentiometer Rotary

100k	1	R2

Capacitors
Miniature Disc ceramic

12pF	1	C7
68pF	1	C2
10nF	5	C3,8,9,11,13
100nF	4	C1,10,12,14

Close tolerance polystyrene

1.5nF	1	C5
4.7nF	1	C6

Electrolytic axial lead, 16V working

22µF	1	C4

Inductor

L1	90 turns pile wound on a 6.3mm former with a ferrite slug

Semiconductors
Transistors

BC108	3	TR1-3

Diodes

BZY88C5V1	1	D2
1N4001	1	D1

Miscellaneous
Miniature coaxial cable, coaxial plugs and sockets as required, p.c.b., 6.3mm coil former and ferrite slug, a suitable screened box, Veropins as required.

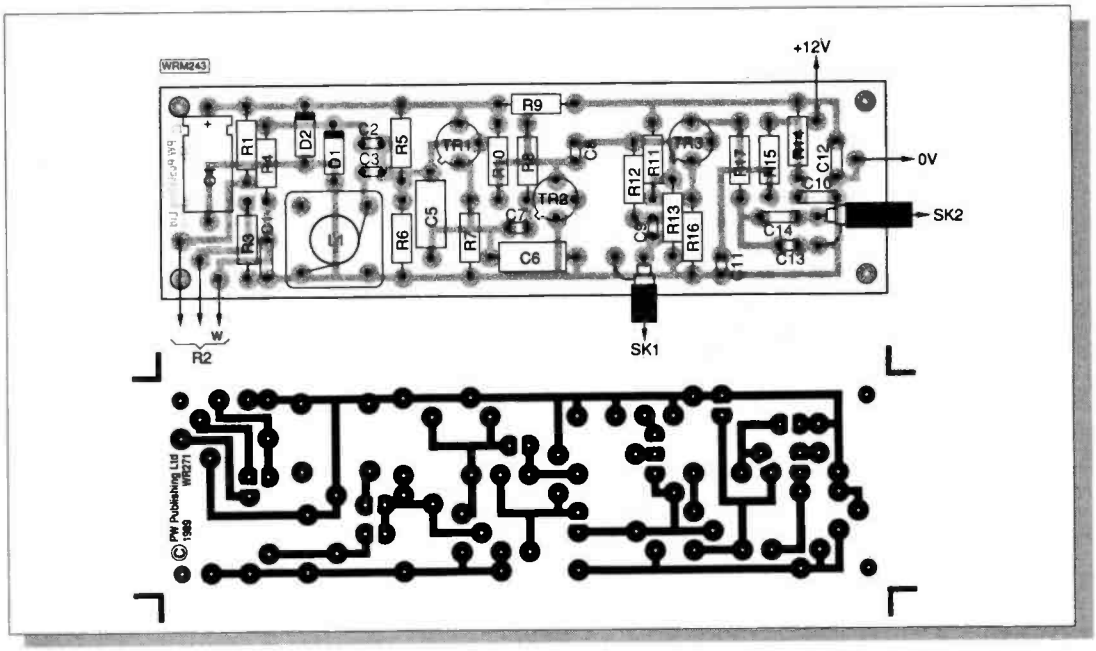

Fig. 2: The track pattern and component overlay of the unit

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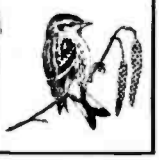

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The Standard C528 144/ 430MHz FM Handy Transceiver

It seems a very long time ago since I had anything to do with a Standard hand-held transceiver, that is in a servicing capacity. I used to marvel at their neatly designed internal workings, wondering how on earth they managed to cram a whole 5W six-channel marine band transceiver into such a small space. As you can imagine, my curiosity was greatly aroused when I was approached to review their latest creation, a frequency synthesised 144/ 430MHz transceiver in one small box! I just had to see it to believe it.

First Impressions

I have a gut reaction to most electronic equipment, I either loath it, or I instantly love it. I'm glad to report the latter as my first impression. The rig passed my acid test, I could actually pick it up and use it without having to consult the manual on how to switch it on and tune anything in. The rig came well packaged with a battery case to take six AA sized cells, a dual-band helical antenna and a very comprehensive manual including a circuit diagram. A belt clip and carrying strap came already fitted. Some of you may think that to supply a 'handy' with just a battery case is a bit of a handicap, but on reflection I didn't think so. NiCad AA cells are reasonably cheap on the surplus market and so are their chargers. Personally, I would much rather have a cheaper rig that I could add to later. Plus the fact it makes the XYL think you're being restrained in your spending habits.

Physical Attractions

Basically for your money you get two separate f.m. transceivers housed in one smart, black plastics case. The transceivers share things like the microphone, speaker, antenna, p.s.u. and control c.p.u., but that's all. The battery pack follows modern conventions and is a slide fit on the bottom of the rig. While on this point, I would have liked to have seen the battery clip assembly fashioned in metal, rather than being formed out of the same plastics moulding as the transceiver's overall case. This in my mind, would have made the rig a little bit more durable.

Like most hand-held transceivers these days the control panel layout is governed by the overall size of the equipment. As equipment gets smaller the best ergonomic layout of the controls gets more difficult. On the whole, I would say Standard have had a pretty good stab at the overall layout of the rig. The five main rotary controls, 144MHz squelch and volume, plus ditto for 430MHz and a frequency tuning dial are all laid out across the top surface of the rig.

Also located on the top control surface of the rig are sockets for v.h.f. and u.h.f. speaker outputs (3.5mm jack) as well as the antenna (BNC type); not to mention the microphone socket and a 2.5mm jack. All sounds a bit crowded doesn't it? Well to be honest, with fingers like mine I found the v.h.f. squelch a bit difficult to adjust, it being so close to the antenna and with a slippery control surface on the knob. This could quite easily be overcome, if some ridges were moulded around the

One of the top prizes in our recent Wordsearch competition was a dual-band hand-held from Standard. Richard Ayley G6AKG offered to check out just how good a prize we were offering.

circumference of the knob, as has been done to the rotary tuning control. The 144MHz and 430MHz volume and squelch controls, operate completely separate from each other and are of a concentric type.

All the controls including the key pad, are made from a hard wearing rubber compound. As well as the sockets already mentioned, there is one on the righthand side of the case for an external power source (Japanese coaxial type, outer +VE). The manual says the rig will operate on any voltage between 6 to 16V d.c. All the sockets with the exception of the antenna have sturdy weather-proof 'bung' type covers.

Button Punching

On the front surface of the rig is a numeric key pad, a speaker/microphone grill and a very busy looking l.c.d. operations display. The key pad is reasonably straightforward although it does have three levels of operation. The first is purely as a means of entering a number i.e., an operating frequency. Although personally I feel the rotary frequency control is far more convenient for this operation.

The second level of operation is to give control over such functions as dual-watch, TX power output, repeater shift and power save, to mention

just a few. These functions are accessed via a small button placed above the p.t.t. switch (the function button!). As the manual clearly explains, all the functions marked in blue legends above each numeric pad are activated when the function key is pressed.

Third level key pad operations are saved for those functions less used in everyday operating, like changing repeater offsets or enabling rotary frequency control while the key pad frequency lock is on. I feel that Standard's logical layering of key pad operation follows very closely to those of most users needs and no doubt contributes greatly to the rigs ease of operation.

Under Control

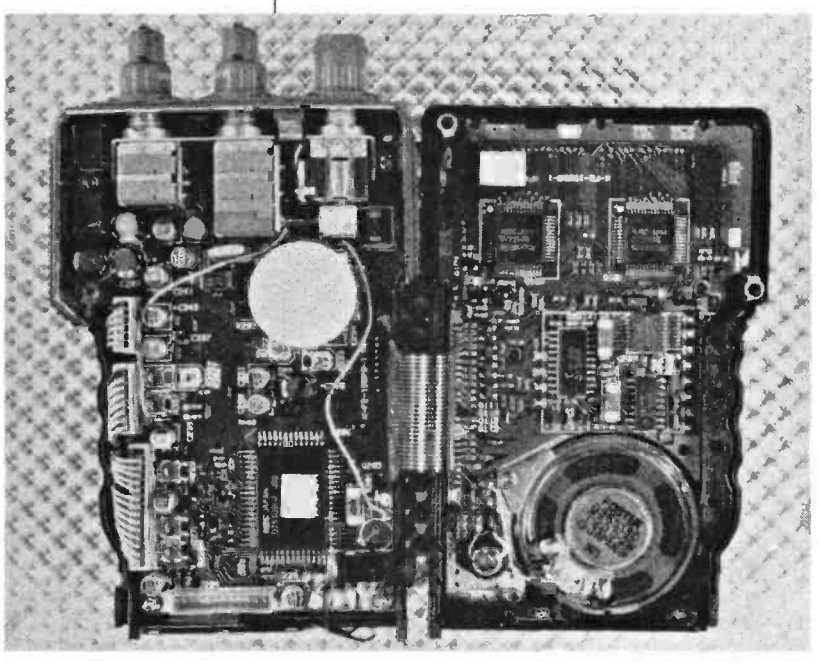
Two of the most important buttons on the front panel, not yet mentioned, are marked VHF and UHF. These two larger buttons govern which of the two transceivers are under control from the key pad and/or rotary frequency control. In addition to being able to enter frequencies via the key pad and rotary tuning control, it is possible to shift frequency by pressing one of two buttons which have a primary function as up/down keys. It would seem that Standard have covered all the options on this line of operation.

The five small buttons situated to the left of the key pad are as follows; CALL which sends a 1750kHz tone to the transmitter for repeater access, CL cancels down operations such as scanning and dual-watch etc.

For the uninitiated, dual-watch basically gives you the ability to flip between two channels on receive. One channel is in the memory (or on this rig if you like, memories being scanned) and the other on the dial, when a station is heard on the dial, it stops and listens for a moment then flips back to the memory. If on the other hand the frequency on the memory becomes busy then the rig will lock on that channel and will only revert to watching both frequencies when instructed. On some equipment this function is called priority watch, which I feel is a very apt name.

The next button has little or no relevance unless you have the tone squelch or paging options fitted. The final two buttons control memory scan and v.f.o. memory operation. The rig has 10 memories per band and each is capable of storing not only the frequency of operation, but also individual repeater shifts. The shifts are fully adjustable up to +/- 5MHz.

Finally, the two smallest buttons on the rig, one of which operates display illumination consisting two lamps either side of the display window. This button has a toggle action or if just pushed once the lamps stay on for approximately 5 seconds. The level of display illumination I found to be excellent, even on the darkest night. The other small button gives a very useful feature, that of being able to lift both squelches without adjusting either of the rotary controls. This I found particularly useful when operating mobile stations which intermittently lifted the user preset level of squelch.



Scanning

As the rig came, it was obvious by the repeater shifts and channel steps that the set had been initially programmed for US operation. Both these parameters are easily altered and saved to memory. The tuning steps that are available are 5, 10, 12.5, 20, 25, and 50kHz. I'm sad to report that only 25kHz channel spacing is supported by the relevant i.f. filtering. Still, what can you expect there's only so much room in one box!

Memories can be scanned individually on each band both for busy and clear frequencies, likewise with the v.f.o.s. The memories can also be flipped through via the rotary frequency control. All the memory settings are retained with an on-board lithium battery. All the memories can be reset without dismantling the rig.

Each band v.f.o. can be user-set to cover any 1MHz portion of 144MHz or 430MHz. Unlike most transceivers I have operated, this one had a function found more commonly on a scanning receiver; that of program scan. Where the user has the option to set limits between which the receiver can scan.

I liked the scanning function available on this rig, with one exception. That exception is the synthesiser on the review model which was pre-programmed to cover the US band allocations. This means you could, by mistake, stop the receiver scan, on what sounds like an open repeater and end up working your local police station!

Display Window

The liquid crystal display on this rig is amazing as it not only shows frequency, but also, in a bargraph fashion, signal strength on both bands and TX power out. The TX power can be set to three levels: high, medium and low, each setting being flagged up with either H, M or L. Memory numbers and the type of scan in operation, plus repeater offset and many other features are displayed e.g., dual-watch, power save, automatic power off, to mention but a few. In fact just about every aspect of operation is flagged up. At times it did remind me of one of those pocket space invader games.

I must admit that under everyday operation, the display was showing what seemed to be a spurious S or AP, and I had to refer to the manual to remind myself what they meant. This was caused mainly by the fact that neither function seemed to be having a visible effect on the operation of the transceiver.

Both functions, however, have a very dramatic effect on battery life. Function S cuts power consumption on receive (squelch closed) by approximately 30 percent, yet has no audible effect

Specification

General

Frequency ranges	
VHF	144-147MHz
UHF	430-439.995MHz
Modulation type	F3
Microphone impedance	600Ω
Speaker impedance	8Ω
Operating Voltage Range	6-16V (through supply jack)
Nominal input voltage	7.2V
Current drain	
During transmission 13.8V High (5W)	
UHF	app. 1300mA
VHF	app. 1100mA
Mid (2.5W)	
UHF	app. 1000mA
VHF	app. 900mA
7.2V High (2W)	
UHF	app. 1000mA
VHF	app. 850mA
Mid (2W)	
UHF	app. 1000mA
VHF	app. 850mA
13.8V or 7.2V Low (350mA)	
UHF	app. 480mA
VHF	app. 480mA
During Standby (twin-band mode)	
Mono band mode	app. 70mA
UHF	app. 45mA
VHF	app. 36mA
During Bat. save (twin-band mode)	
Mono band mode	app. 32mA
UHF	app. 18mA
VHF	app. 17mA
Auto Power Off (APO)	app. 1mA
Dimensions	55 x 157 x 31mm
Weight	450g (inc. antenna and batteries)

Receiver

Receiver type	Double-Conversion Superheterodyne
Intermediate Frequencies	
VHF	first 21.8MHz, second 455kHz
UHF	first 23.05MHz, second 455kHz
Sensitivity	-10dB (-16dB" with JAIA method) S/N at 1μV input 30dB or better
Squelch Sensitivity	-14dB
Audio Output Power	200mW (10% t.h.d. into 8Ω)

Transmitter

RF output Power High: with CBT 151 Bat. Pack	
UHF	2.0W
VHF	2.4W
with CNB 151/53	
UHF	2.5W
VHF	2.8W
with CNB 152	
UHF	5.0W
VHF	5.0W
Mid: with CBT 151	
UHF	1.8W
VHF	2.3W
with CNB 151/153	
UHF	2.5W
VHF	2.5W
with CNB 152	
UHF	2.5W
VHF	2.5W
Low	0.35W (UHF/VHF)
FM Method	Reactance
Max Frequency Deviation	+/-5kHz
Spurious emissions	-60dB or better
Built in Microphone	Electret

on the rigs scanning or receiving capabilities. While AP function stops absent minded people like myself walking away from the rig while it's quietly on receive, as it switchs the unused rig off after 30 minutes, but not before issuing 5 warning bleeps I might add.

Talking of tones, the rig issues one every time a control button is pushed. If you're programming a frequency, it issues a long bleep when the entry has been accepted, and a low frequency bleep is issued if a wrong button sequence has been entered. Fortunately all these tones can be muted, much to my relief!

What's in the Box?

Technically the rig is very advanced in design, much of the circuitry being contained in integrated circuits. Both receiver strips are double-conversion superhets, the v.h.f. side having a first i.f. of 21.8MHz and a second of 455kHz. The u.h.f. side has a first i.f. of 23.05MHz and again a second of 455kHz. Both the receivers are very sensitive, which is good, but I noted that the rig suffered from r.f. leakage around the antenna, making it impossible to effectively use an attenuator.

The audio output stage runs 200mW into 8Ω with 10 percent distortion. This I found to be more than adequate even in a noisy mobile environment. The rig's tiny speaker seems able to produce good quality audio right up to two thirds volume.

The transmitter, as expected for a rig this size, is very modular in construction. The transmitter line up for each band follows the same pattern. A simplistic view of each transmitter strip is the c.p.u. (main logic controller) programmes p.l.l. (phase lock loop) chip, which in turn drives a separate v.c.o. (voltage controlled oscillator) for each band. The TX v.c.o. on each band is where the audio modulation is added by means of a varicap diode. There are in fact four v.c.o.s, two of which provide the first local oscillator signal for each receiver. From the v.c.o. the TX signal goes through several stages of buffering and filtering before being fed into a modular power amplifier. With the rig running on 13.8V power source each module is capable of producing 5W of r.f. on its allotted band; not simultaneously I might add.

Hands On

With a dual-band rig of this size you really feel the need to be a person with a split personality, as it is quite possible to find yourself trying to listen to two QSOs at once.

I got very confused on several occasions, by leaving the volume up on the local 430MHz repeater, of which I was monitoring and then trying to make a call through its 144MHz counterpart. Half way through the QSO while TXing on 144MHz the 430MHz box chimed in, making me think I had dropped carrier on 144MHz. This uncanny knack of being able to transmit on one band while receiving on the other, brings me on to the most fun thing about this rig. It is possible to lock the 144MHz side on TX and allow it to repeat a signal originating on 430MHz or visa versa.

This must be the ultimate deception available to a fox in the local 144MHz hunt. Although I'm not sure about the legality of such a move with regards your licence so it might be wise to check first. There is of course some constraints on what frequencies can be used for full duplex cross-band operation. It is not possible to use a 430MHz receive frequency that falls on or near the third harmonic of the 144MHz transmit signal.

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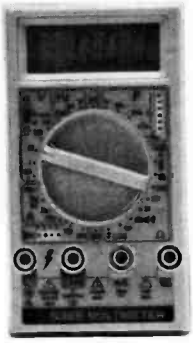

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ac current: 200uA-10A

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ac current: 200uA-10A

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Receiver Front-end Limitations

Feature

Following on from the article on receiver sensitivity, Gordon J King IEng AMIERE G4VFV now looks at the problems involved with the overloading of receiver front-ends

Although receiver fronts-ends are low-level stages (designed to work with very low signal levels) they do exhibit some of the characteristics of high-level power amplifier stages, especially in terms of input overload. If a power amplifier ('linear') is driven hard there comes a point as the drive is increased when the rise in output fails to correspond to the increase in input. Eventually, no output level change occurs as the drive is further increased (very severe overload). Thermionic valve amplifiers generally have a more gradual lead-up to the compression point than do amplifiers based on solid-state devices. Valve amplifiers tend to overload more gracefully!

Compression is the symptom of amplitude non-linearity, which is best shown by a curve, as in Fig. 1. Here, the full-line curve represents an input/output (transfer) characteristic. A perfectly linear transfer characteristic, as indicated by the broken line, would yield an output at C on the output axis. However, due to the compression, the output in reality rises only to point B.

Compression in itself is not really the problem since this could be calculated for. The primary problem is the effect that the amplitude non-linearity has on the spectrum of the signal emerging from the amplifier. Let us suppose that we drive an amplifier with a signal of frequency f at input level A. Now, owing to the non-linearity and hence the compressed output, the signal at output level B might well have the spectrum as shown at (a) in Fig. 2. Here, in addition to the fundamental signal f, we have a multiplicity of harmonics at 2f, 3f, 5f, 6f, etc.

Absolutely perfect linearity in any valve or solid-state amplifier is an impossibility. Thus, there is always going to be some harmonic production. With a sanitary drive, though, so that only the most linear part of the characteristic is utilised, the amplitude of harmonics and their numbers will be very small indeed. It is only when we start driving 'linears' and, indeed receiver front ends hard, that nasty things happen. The spectrum at (b) in Fig. 2 would be representative of a very linear transfer characteristic. Here, only very low-level harmonics are shown.

Looking again at (a) in Fig.2, we see that the odd-order harmonics (3rd, 5th, etc.) have a higher amplitude than the even-order ones. (2nd, 4th, 6th). Whether the odds or evens are of the higher amplitude depends essentialy on the mathematical nature of the transfer curve itself. Valves and field effect transistors have a curve which tends towards lower amplitude odd-order harmonics, while the converse is generally true for bipolar transistors.

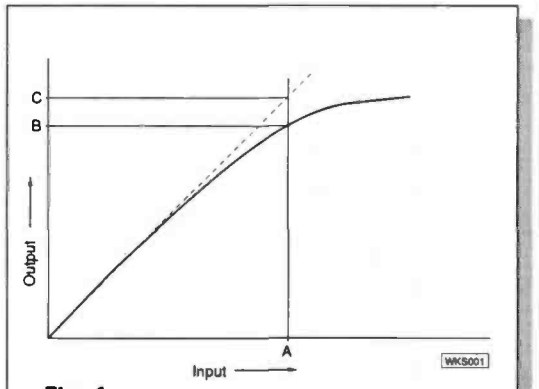

Fig. 1

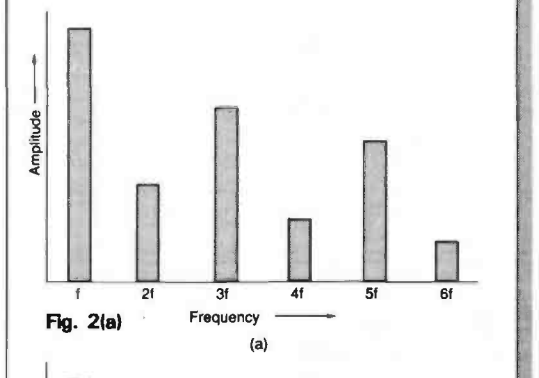

Fig. 2(a)

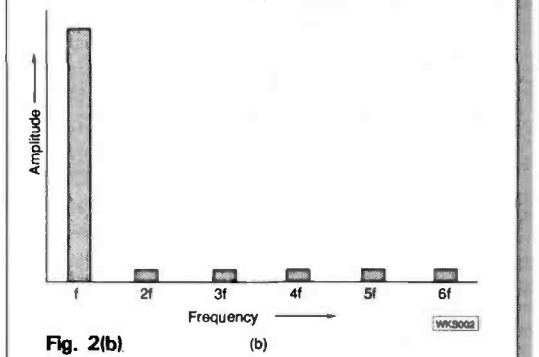

Fig. 2(b)

Fig. 1: Input/output transfer characteristic, showing non-linearity and ultimate compression which are responsible for r.f. intermodulation.

Fig. 2: (a) Harmonics to the 6th order resulting from amplitude non-linearity. (b) Very low amplitude harmonics resulting from more linear operation.

Harmonic Effect

The production of harmonics in power amplifiers can be easily understood to be an undesirable state of affairs, since we are then transmitting spurious signals as wel as the fundamental. A 144MHz band linear, for example, driven at say 144.5MHz would produce a series of harmonics at 289MHz, 433.5MHz, 578MHz, etc. The strength of the harmonics would increase with the increase of drive to the linear. How well they would be transmitted would depend on the linear's filtering, the antenna used and, indeed, on whether any bandpass filtering is used between the output of the linear and the antenna!

The effect of receiver front end overload is less apparent, yet it can be be mistaken for a transmitter shortfall, especially on the 144MHz band under conditions of high activity. One example of this is when a strong , local signal appears on several frequencies as well as on its correct frequency. The strong signal may also appear 'mixed' with weaker signals, an effect sometimes manifest on f.m. simplex channels when many stations are working simultaneously on the band and when an antenna pre-amplifier is in use. Similar symptoms can result, of course, if the transmitter producing the strong signal is generating spurious signals - but it is usually the receiver front-end overloading rather than the transmitter producing spurii.

RF Intermodulation

In addition to the creation of harmonics from a pure, single frequency signal, amplitude non-linearity can also produce inharmonious signals when two or more signals of different frequencies are applied to the input. These new signals are called intermodulation products, IPS for short. Let us consider what happens when there are just two signals on frequencies f1 and f2. First, two new signals are produced corresponding in frequency to f1=f2 and f2-f1. As an illustration let us make f1 144.500MHz and f2 144.51MHz. Thus the new signals correspond to 289.01MHz and 0.01MHz and, in this case, are so far removed from the 144MHz amateur band that they are generally insignificant. These are called second-order IPS. In addition to these, there are also the straight harmonics of f1and f2, such as 2f1, 2f2, 3f1, 3f2, etc., but again since these are well above the fundamental frequencies they are naturally filtered out by the circuit design.

Odd-Order RF Intermodultation

Odd-order harmonics include the 3rd, 5th, 7th etc., as we have seen. Now, odd-order r.f. intermodulation is a much bigger problem than 2nd or even-order r.f. intermodultation because the new frequencies produced can fall close to the originating frequencies, especially when the originating frequencies themselves are close together. The sum products such as 2f1 + f2 and 2f2 + f1 are not such a problem since, again, they are well up in frequency.

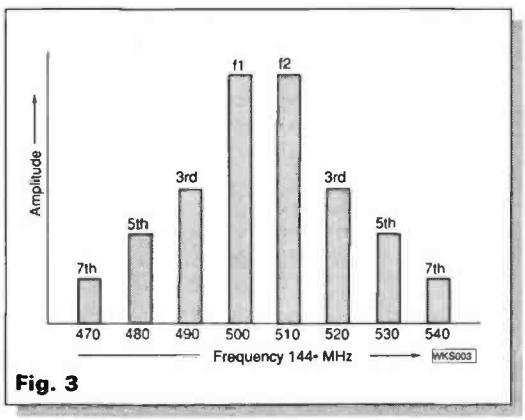

Fig. 3

However, let us consider the 3rd-order IPS which correspond to 2f1 - f2 and 2f2 - f1 using the two frequencies for f1 and f2 as just exampled. We then find that 3rd-order IPS are produced, separated by a mere 10kHz. This is better seen from the spectrum display in Fig. 3. This display also reveals other pairs of IPS, corresponding to the 5th and 7th orders.

The 3rd-order products result from the product of three signals, which can either be independent signals or just two signals as we have seen. The 5th-order IPS derive from 3f2 - 2f and 3f1 - 2f2, while the 7th-order IPS derive from 4f2 - 3f1 and 4f1 - 3f2. The even higher odd-order IPS continue in this sequence. In other words, each pair of IPS is separated evenly from its partner by a frequency equal to the difference frequency of the two originating signal.

The amplitude of the IPS depends on the amount of non-linearity involved, while the orders are influenced by the mathematical nature of the non-linearity. As already noted, valves and field-effect transistors generally produce lower amplitude odd-order IPS than bi-polar transistors, which is one reason why field-effect transistors are commonly employed in receiver front-ends.

All the IPS in Fig.3 would tend to find their way through the receiver circuits and give rise to spurious responses, assuming sufficiently large amplitudes. Remember, though, that it needs at least two signals to produce IPS, and that for significant response the two signals would need to be relatively strong. Under practical conditions, the effect on reception can change as different signals of varying strength come and go. With only one of the originating signals modulated, each response would carry that same modulation. With both modulated, however, each spurious response might well carry the modulation of the two (or more) signals.

When the modulation is single-sideband, severe 3rd or higher odd-order intermodulation has the effect of widening the bandwidth so that each signal of excessive strength appears to occupy a greater spectrum than normal. This is because an s.s.b. signal has its own range of audio sidebands, which themselves produce close-in IPS. Such apparent widening might also be accompanied by difficulty in achieving resolution of the s.s.b. signal.

When there is a multiplicity of strong signals, as there well might be under lift conditions during a contest, for example, the signals all tend to to add on a peak basis, so that ultimately the net signal level is

Fig. 3: RF intermodulation products arising from two parent or driving signals at f1 and f2. Each order yields a pair of products. The 3rd-order products are usually of greatest amplitude and are therefore more important than the others.

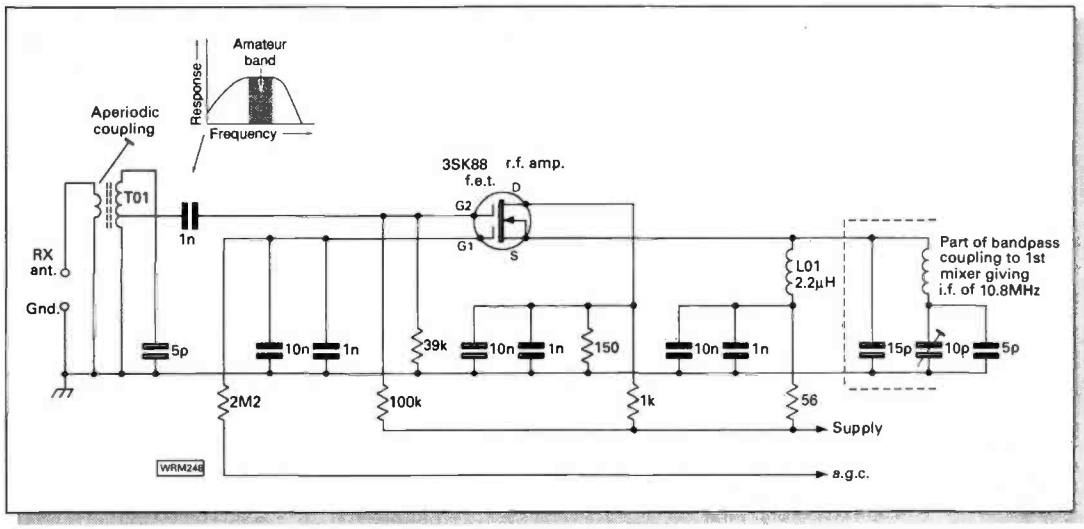

Fig. 4: The r.f. amplifier front-end of the Yaesu FT-480R, showing the aperiodic antenna coupling (fairly wideband) and part of the bandpass coupling to the mixer.

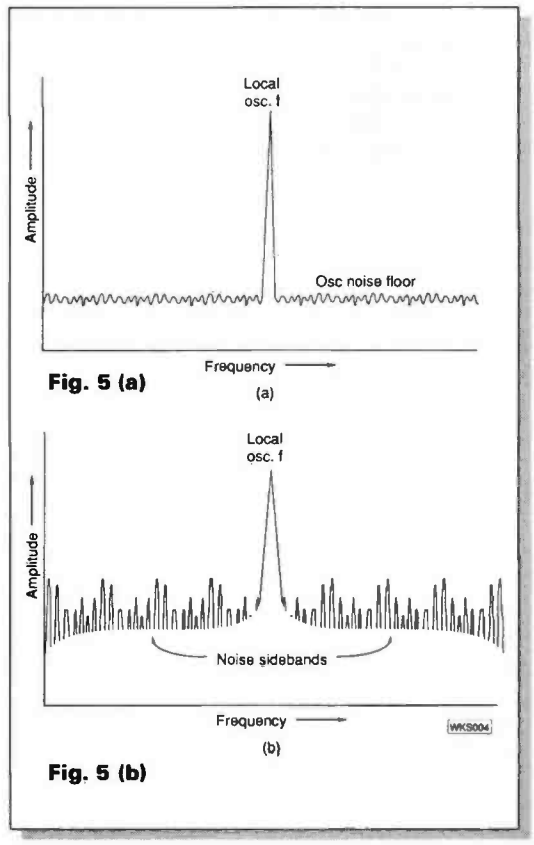

Fig. 5 (a)

Fig. 5 (b)

Fig. 5: (a) Spectrum of a very 'pure' local oscillator signal. (b) Spectrum of a local oscillator affected by noise sidebands. These can be transferred to a weak, wanted signal when a strong carrier occurs close to the weak, wanted signal. This is reciprocal mixing, as explained in the text.

such that even the best of of front-end designs commences to exhibit the symptoms of odd-order intermodulation. This is particularly likely when a fairly high-gain antenna preamplifier is connected between the receiver (or transceiver) antenna input. If such an amplifier has a gain over the passband of, say, 12dB, then the signal level applied to the front-end will be lifted by four times (12dB equals four times voltage ratio), which could be enough to push the receiver r.f. amplifier/mixer into severe non-linearity. Things can become pretty hectic when there are several very strong s.s.b. signals on the band, owing to the complex intermodulation of their sidebands!

Signals which are not actually within the 144MHz amateur band can sometimes evoke spurious responses, should they find their way into the front-end from the antenna at high level. For example, two very strong signals, one at 133MHz and the other at 278MHz, would produce a weak response at 145MHz (in band), even though the unwanted signals are outside the tuning range of the receiver. This would be a 2nd-order response at f2-f1 (278MHz-133MHz = 145MHz). Although the input selectivity of 144MHz transceivers is fairly flat over the band, there is generally a reasonable degree of band-pass filtering which should attenuate out-of-band signals (see Fig. 4). However, when a very strong signal falls just out of the amateur band, then it may be necessary to use additional filtering at the receiver input.

Modern h.f. transceivers are commonly equipped with a number of separate bandpass filters, providing both r.f. preselection and r.f. to mixer pre-selection, one set for each band, which are diode-switched. Triple or quadruple conversion is also common nowadays, with intermediate frequencies in the order of 40MHz, 9MHz and 455kHz. The high frequency first i.f. minimises 'image' responses by shifting them outside the response of the r.f. pre-selection

IF and Image Responses

The Trio TS-940S has quadruple conversion with intermediate frequencies of 45.05, 8.83MHz, 455 and 100kHz (the latter i.f. is not used on f.m.). The oscillator in this example would be running at 59.25MHz to yield the 45.05MHz first i.f. from a 14.2MHz incoming signal. (e.g., i.f. equals oscillator frequency minus incoming signal frequency). A signal arriving at the input around 45.05MHz would have to penetrate the pre-selection of the band in use to produce a response. The rig could be expected to have an i.f. rejection ratio of, at least, 100dB, which means that an antenna signal around 14mV at the i.f. would be needed to evoke a similar response as a tuned, in-band signal of 0.14μV.

Still assuming a local oscillator signal of 59.25MHz, the mixer would also produce the first i.f. of 45.05MHz from an input signal of 104.3MHz (e.g., 104.3 minus 59.25 equals 45.05MHz). This response, which occurs at the tuned frequency (14.2MHz) plus two times the i.f. (90.1MHz), is known as the second-channel or, more commonly now, the image response. Again, the degree of response is dependent on the attenuation provided by the r.f. pre-selection at the particular band. A rejection ratio similar to that of the i.f. should be expected.

Another spurious response not very often considered, is known as half i.f. response or repeat spot response. Let us still assume that the receiver is tuned to 14.2MHz and that a very strong signal at 36.725MHz is being picked up by the antenna. This signal could be strong enough to produce a second harmonic at the front end of 73.45MHz. Now, let us also suppose that the local oscillator is producing a second harmonic at 118.5MHz. Thus, from these two signals the mixer will deliver the i.f. (e.g. 118.5 minus 73.45 equals 45.05MHz). The repeat spot, then, is produced by a strong signal which is half the i.f. above the tuned frequency, when the oscillator is working the i.f. above the signal frequency. It usually needs a very strong signal to evoke a response, the suppression ratio also being dependent on the purity of the oscillator signal.

Blocking

Sometimes called gain compression, the blocking effect is very apparent when a strong carrier occurs somewhere within the passband (often close to the signal), since then the wanted signal falls dramatically in strength, just as though the strong signal has taken away the wanted signal. Blocking is caused by a stage in the front-end being driven so hard that it becomes saturated and then has difficulty in passing any further signal (see Fig.1). Blocking and intermodulation are somewhat related in terms of cause at least.

Reciprocal Mixing

Another large signal aberration is so-called reciprocal mixing, but unlike harmonic production, intermodulation and blocking it is not a direct result of non-linearity. Reciprocal mixing stems from the local oscillator which, instead of possessing an absolutely 'pure' spectrum, is endowed with undesirable noise sidebands. A pure oscillator spectrum would appear as at (a) in Fig. 5. Here the oscillator signal rises cleanly above the noise floor.

The spectrum at (b) shows an oscillator signal rising from a much higher noise floor which is, in fact, composed of a whole spectrum of 'noise

sidebands, clustering each side of the signal. Fig.5 (b) is the sort of spectrum that might occur from a particularly noisy frequency synthesiser, being very similar to that of tape modulation noise.

Let us suppose that our 144MHz band rig is tuned to a weak signal at 144.3MHz, that the first i.f. is 10.8MHz and that the frequency of the local oscillator is below the frequency of the incoming signal, therefore running at 133.5MHz. If a strong signal were suddenly to appear at 144.31MHz, 10kHz above the tuned frequency, it would arrive at the mixer and, in effect, tend to act as another 'local oscillator' signal, while the sideband noise from the real local oscillator would then seem to the mixer as another 'wanted' signal.

That sideband noise centred on 135.51MHz would thus appear within the i.f. passband along with the real wanted signal. In other words, the oscillator noise sidebands would be dumped on the weak 144.3MHz signal we are trying to receive, thereby further impairing its signal and hence readability noise ratio. In a severe case the noise sidebands might completely mask the weak signal. It is because of the reversed role of the mixer to the slightly off-frequency strong signal, acting as a 'local oscillator', and the noise sidebands acting as a 'wanted signal' that the term reciprocal mixing has been coined.

One of the purest oscillators is a crystal circuit with high *Q* tuning. It is almost impossible to measure reciprocal mixing accurately with a synthesised signal generator, but for this test I have found the non-synthesised Marconi TF995B/2 signal generator useful. This instrument uses valves and has a relatively clean spectrum.

The parameters discussed relate to the strong signal performance of receivers, that is, how strong a signal can be accommodated before the receiver badly misbehaves. The 3rd-order intermodulation performance is very important since it can set the upper side of the dynamic range sandwich (the noise floor and sensitivity setting the lower side). Poor 3rd-order intermodulation performance will also lift the noise floor under the practical conditions of many in-band signals and sidebands. The 3rd-order response increases by 3dB each time the r.f. is raised by 1dB (5th-order by 5dB per dB r.f. increase, and so on).

Intermodulation problems arise from any non-linearity, as already explained, so in the front-end the non-linearity can occur both in the r.f. amplifier (if used) and mixer. Of course, for a mixer to function it must have non-linearity to provide the i.f. from the 2nd-order product! The craft is to keep the odd-order products as low as possible, especially under conditions of strong input signals. Recent designs are focused on the attenuation of odd-order products, with a current lean towards the use of 'double balanced' mixers. For the sake of good, small-signal performance, the mixer must also have a low noise characteristic.

Testing For 3rd-Order Intermodulation

The outputs of two signal generators are combined for the least interaction and intermodulation and the signals are tuned to the particular band and spaced, say, by 10kHz. One generator is switched off, and the receiver under test is tuned to the remaining signal and the levels adjusted to provide a datum response corresponding to the receiver's sensitivity. Both generators are then switched on and the receiver tuned to one of the 3rd-order responses. For example, the tuning would be to 144.490 or 144.520MHz if the two input signals are at 144.500 and 144.510MHz.

The outputs of the two generators are increased in step so that their amplitudes correspond until a response signal equal to that of the datum sensitivity response is obtained. The 3rd-order intermodulation ratio can be expressed as the dB difference between the input required for the 3rd-order response and that for the on-tune datum sensitivity.

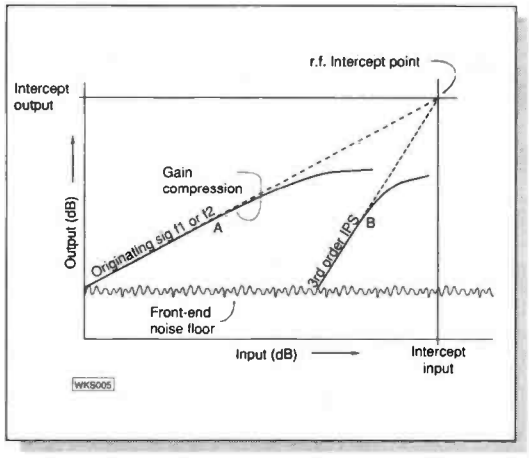

Fig. 6: A plot expressing the r.f. intercept point, which can be referred either to the input or output signal level. This is fully explained in the text.

RF Intercept Point

Another expression of 3rd-order (or higher odd-order) intermodulation is shown in Fig. 6. A plot (curve A) is made of the input/output power. Initially a 1dB increase at the input will give a 1dB increase at the output. The output slows and ultimately ceases at the gain compression point, and 3rd-order IPS rise from the noise floor. A plot (curve B) is then also made of this response.

Now, the r.f. intercept point is really an imaginary one which is obtained by extending the plots A and B until they meet or intercept. The parameter can then be then be expressed either as the input intercept or the output intercept. The appropriate signal level is generally expressed in dBm (dB above 1mW) The output intercept will always be higher than the input intercept by the dB gain of the device (e.g. front-end) under test.

This theoretical expression of 3rd-order intermodulation is handy because it can also be used to determine the effective dynamic range of a receiver.

As the 3rd-order response increases fast beyond gain compression, a good test is to switch off an antenna pre-amplifier if reception is marred by intermodulation problems. If the trouble clears up it is a sure sign that the front-end is being overloaded. Sometimes, just swinging a 144MHz band beam Yagi antenna off-beam, thus reducing a powerful signal coming from a particular direction, is enough to prove whether the trouble lies in the reciever or transmitted signal!

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The PW Badger Cub Part 2

Construction

The *PW* Cub is constructed on a double-sided glass fibre p.c.b. on which the top copper layer is used solely for 'earthing' components by a low impedance path to ground. A few general tips before beginning building can save time and money. You should, before handling IC1, take the necessary self earthing precautions as this is a c.m.o.s. device, and as such is sensitive to static discharge.

When fitting the transistors, push them as close to the top plane as possible without shorting any of the pins or cases to the earth plane itself. Transistor TR7 is fitted with its small heatsink and then mounted just above the plane but not in contact with it. The r.f. power transistor (TR7) has one anomaly, the pin-out configuration as shown in the *Towers Transistor Book*, update 3, is wrong (according to the manufacturers information). The emitter and collector connections are reversed on the pin-out shown. This transistor is not like most other ones in similar cans. Should you think of substituting the somewhat cheaper 2N3866, some modifications will have to be made to the board because of the differing pin-out.

Construction

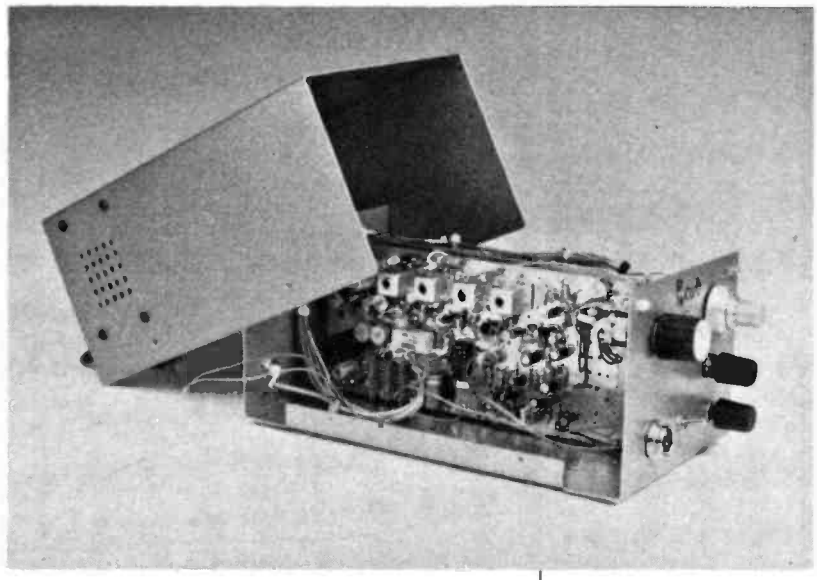
Let us start by winding the inductors L7-11, not forgetting to leave sufficient 'tails' to make the connections through the board. The inductor (L7) is the only one wound with a 5mm internal diameter. It consists of 3 turns of 0.71mm (22s.w.g.) enamelled copper wire wound using the shank of a 5mm drill as the former. The turns are spaced to cover a length of 10mm. Inductors L8-10 all consist of 4 turns of the same wire, but this time wound on a 3mm former.

Again, the coils should be wound to cover a length of 10mm. Inductor L11 is a single turn but is left unstretched and with long legs to allow connection to the board. Also wound on a drill shank is the heatsink for TR6, which is fashioned from a small piece of tinplate wrapped around a suitable drill as a former, to ensure a reasonably tight fit on the component.

Using the layout in Fig. 2.1 as a guide place and solder all resistors and capacitors. Then IC1. On the original unit, a holder was used for this last component as it can be sensitive to static build-up. The i.c. was fitted at the last moment prior to testing.

Using the correct S18 coil, mount and solder those in the correct locations on the board, again using the layout a r.f.c.s, taking care with the insulation when passing the wire through the ferrite bead as they have sharp edges. These consist of two turns each for both RFC1 and 2, not 22 turns as listed in the Shopping List in the last part of the article. For the 12V line filters FB1-3, feeding transistors TRs5-7. Each is a small length of 0.71mm wire passed through a ferrite bead before attaching the wire to the board. The r.f. connections to socket SK2 and the receiver should be made from good quality r.f. coaxial cable. The microphone connection from socket SK1 to the board, and the +12V feed from the board to the receiver, may be made from ordinary lightweight coaxial cable the outers of which should be connected to the earth plane.

Fit the relay RL1, followed by the cans over the S18 coils, then the Veropins as required. Now comes a slightly more difficult operation as screens have to be manufactured from either tinplate or some p.c.b. material. These screens consist of three 23x10mm pieces of either material mounted in the positions shown in the layout diagram. Whichever material is chosen it should be as thin as possible.



Check every other component for placing and orientation on the board and then finally solder the crystal or crystals into position with the minimum of heat and physical strain. Once again check for dry joints and or solder bridges. A check for shorts between the supply lines with an Ohmmeter completes the construction

Setting Up

The *PW* Badger Cub is a low power transmitter, but none-the-less as a rough guide, between one and two watts of r.f. power should be available when fully tuned.

Start the setting up procedure by turning all variable controls to about mid position in each case, if more than one channel has been fitted then choose a channel which is in the middle of the frequency range. Attach an r.f. power meter, able to read about 5W maximum, to the antenna output and key up the transmitter. A small power reading should be evident, if no power reading is obtained then a small r.f. probe may be required to measure each stage in following the circuit through. First tune C33 and C34 for maximum output from the board. This eleminates the possibility that TR7 could become hot due to complete output mismatch.

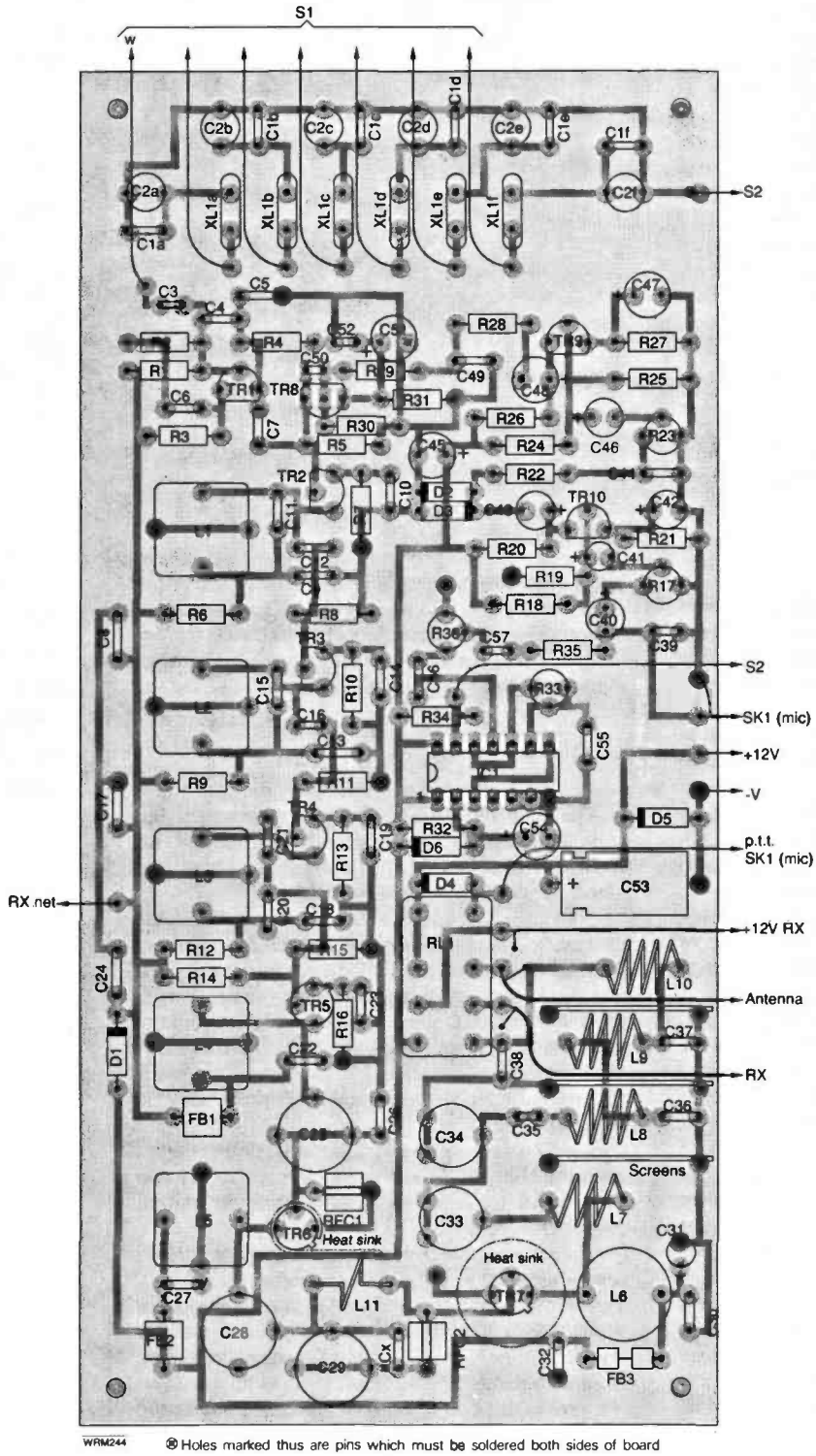
Then repeat the following actions sequentially several times to ensure maximum r.f. is being produced. Tune inductors L1, L2 and L3 for maximum output. When satisfied that no more is available, then adjust the capacitors C25, C28 and C29, again trimming them in sequence several times for maximum power. If it proves difficult to achieve maximum power and the vanes of C29 are fully meshed at any maximum produced, then a small 10pF may be added in the position marked Cx. This capacitor is shown in both the circuit diagram Fig 1.2 shown last month and the circuit overlay Fig. 2.1 on page 44 and 45.

On Air Tests

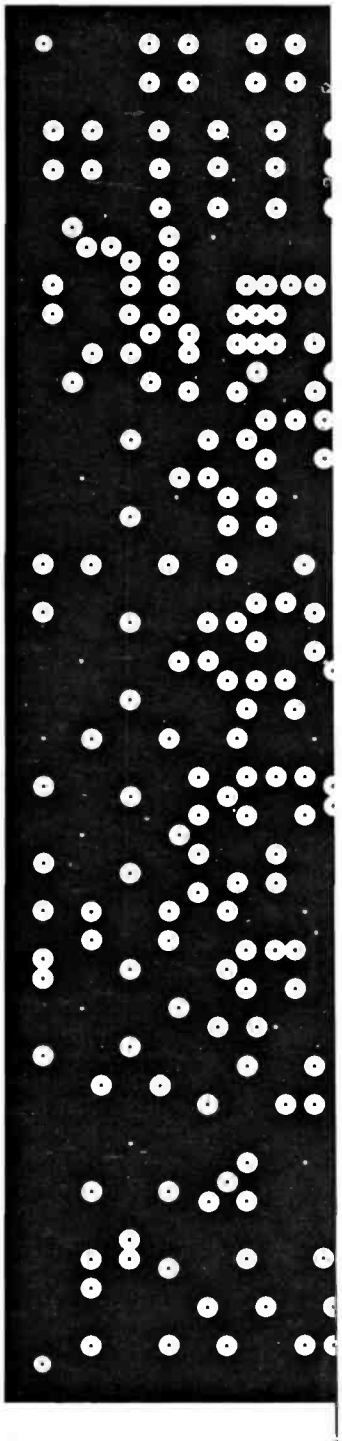
At this point the help of a fellow amateur is very useful in setting up both tone and microphone deviation and microphone gain. In the absence of test equipment an 'on-air' test should prove more than adequate for these pre-set controls. Finally, we come to setting up

Continuing in this issue, Mike Rowe G8JVE describes the construction and alignment to complete the PW Badger Cub f.m. transmitter.

Fig. 2.1: The Component overlay and



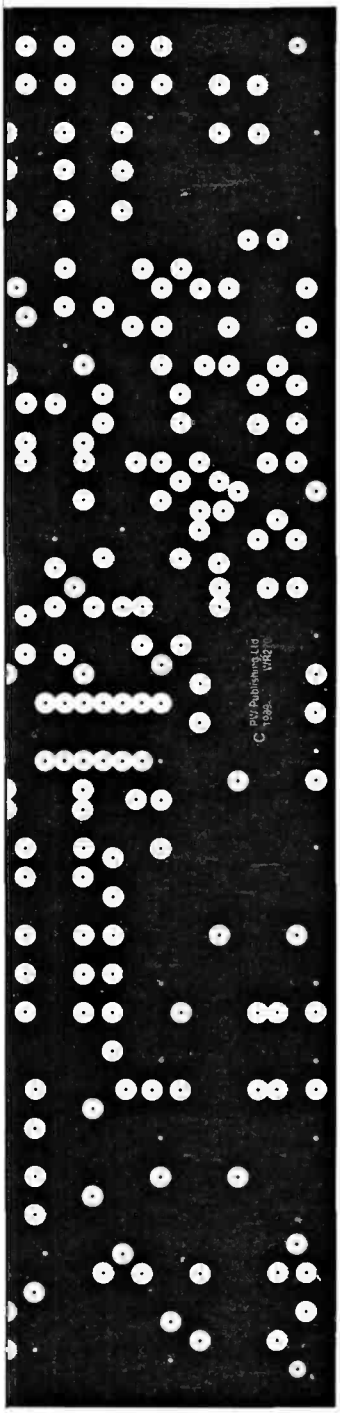
WRM244 ⊛ Holes marked thus are pins which must be soldered both sides of board

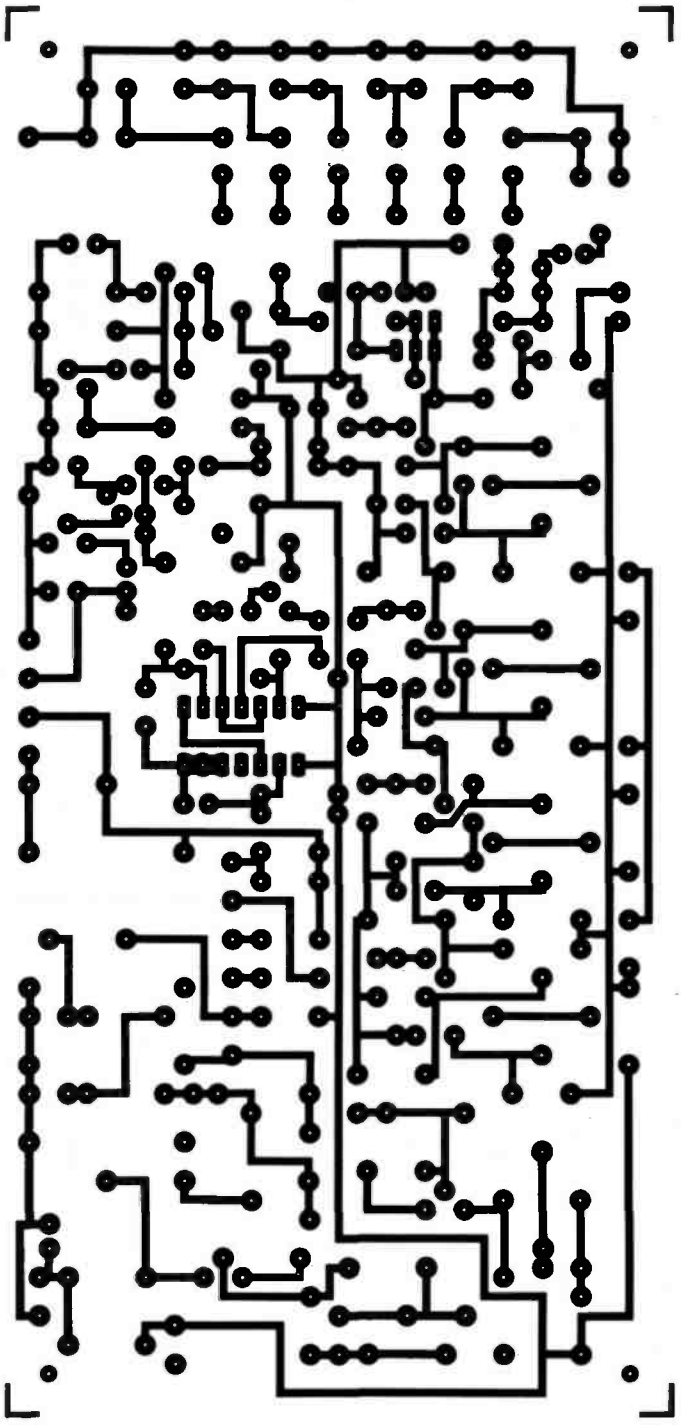


The PW Badger Cub p.c.b. will be available from our PCB Service.

Remember that when IC1 is placed onto the board, suitable precautions have to be taken against static damage.

track pattern of the *PW* Badger Cub.





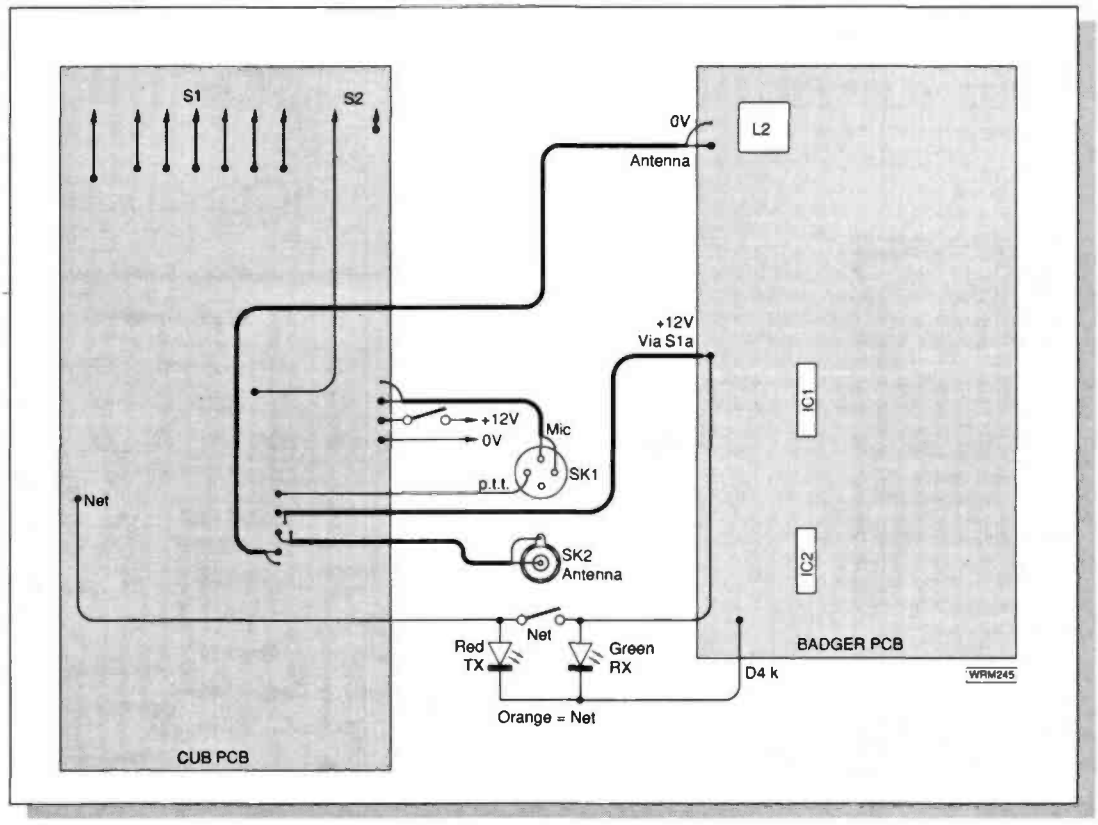


Fig. 2.2: The general inter-connection diagram, showing how the *PW* Cub board is wired into the existing *PW* Badger receiver, published in *PW* October 1988.

the exact transmission frequencies. The easiest method is with the use of a frequency counter. If you do not possess one and you do not have an acquaintance who has one then, again you may set it 'off-air' for the best quality. **PW**

Those not fitting the PW Cub into the Badger should refer to the original October 1988 article if in doubt.

☞35

The Standard C528 144/430MHz FM Handy Transceiver

REVIEW

I hope by now you have the impression I really liked using this rig. Apart from a few gripes here and there I found the rig very sensitive, easy to use in a hurry and relatively well laid out. I was particularly impressed by the display, it being very easy to use in all lighting conditions and from very oblique angles. Liquid crystal displays are notoriously hard to read at some angles. Standard seemed to have overcome this problem by making the clear plastics window over the display into a lens bending the image of the display around corners.

As far as the manual was concerned I found it very easy to use, enabling me to manipulate the equipment quickly and accurately. However, I did feel it a bit short of explanation on what some of the functions were actually doing.

The only other very small gripe I have to make is regarding the antenna, it's very riged in construction and one gets the feeling that if it were caught on anything it might be possible to break it's socket clean out of the rig. Having said that the antenna does a splendid job on both bands.

Options

The Standard C528 has a host of optional extras, four types of battery pack and chargers (normal, mobile and quick charge) for instance. The different sizes of battery provide options between high capacity or high voltage. Not to mention two types of speaker microphone and a head set with p.t.t. for mobile operation. I see also on the list, soft cases to take the rig and all its different size batteries, plus a mobile mounting bracket. Last but not least is a c.t.c.s.s. (tone squelch) unit; although I'm not sure if this is available in the UK, as this type of operating technique has not caught on here.

Summary

It's time to give it back I suppose, I shall be sad to see it go. Having used the rig while mobile/portable and as a base station I feel it is a light and versatile rig and well priced (£379) when all considered. Our thanks go to Norman at Lee Electronics for the loan of the review equipment. For further details contact: **Lee Electronics, 400 Edgware Road, London W2. Tel: 01-732 5521.**

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May we suggest a rig that offers the challenge and pleasures of low power communication, combined with the fun of building it yourself?

SINGLE BAND CW TRANSMITTERS

These little rigs are simple to build, but offer a nice sounding CW note that you can be proud of. Key shaping and output filtering are provided, as is one crystal to get you on the air. RF output power is adjustable with an onboard control. Provision is made for connecting a VFO (HOWES CVF range) for full band coverage, and you can also add a DcRx Direct Conversion receiver for transceive operation if you wish.

CTX80	(80M 5W)	Kit: **£13.80**	Assembled PCB: **£19.90**
CTX40	(40M 3W)	Kit: **£13.80**	Assembled PCB: **£19.90**
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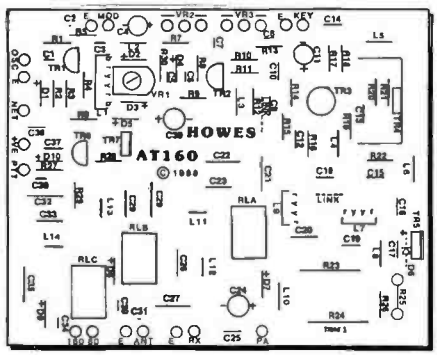
CVF VFO	(80, 40 or 20M)	Kit: **£10.40**	Assembled PCB: **£16.90**
50pF	Tuning capacitor to suit VFOs:		**£1.50**



Parts Location overlay on AT160 PCB

DUAL BAND AM/DSB/CW TRANSMITTER

The *HOWES AT160* transmitter is great for the 160M club net, local nattering on AM, and long distance working on CW. 10W PEP output is available on both 80 and 160M bands. Front panel controls are provided for output power and carrier level. Excellent modulation quality is provided by a low level balanced modulator, class A driver stages, and plenty of RF negative feedback. Full key shaping is provided. The transmitter is broadband with no tuned circuits to align. Harmonics are -40dB or better with relay switched output filters. One crystal (80M) is provided, as is PTT switching (including antenna relay).

Matching microphone amplifier and dual band VFO kits are available.

AT160	(Dual Band TX)	Kit: **£34.90**	Assembled PCB: **£53.90**
VF160	(Dual Band VFO)	Kit: **£19.90**	Assembled PCB: **£34.20**
MA4	(Mic Amp for TX)	Kit: **£ 5.60**	Assembled PCB: **£ 9.90**

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVERS

These receivers make a great introduction to amateur radio for the novice, besides being widely used by experienced QRP (low power) operators as part of a transceiver. Modes are SSB and CW, with up to 1W of audio output for 'speaker or 'phones. These are straightforward, single band receivers, and give amazingly good results. A "hardware" package to suit (case, dial, tuning caps, knobs, sockets etc) is available. There are versions for 20/30M, 40M and 80M amateur bands.

DcRx		Kit: **£15.60**	Assembled PCB: **£21.50**
DcRx	Hardware:		**£15.50**

DXR10 10, 12 & 15M COMMUNICATIONS RECEIVER

This three band receiver gives SSB and CW reception on the three highest frequency shortwave amateur bands. These are commonly known as "DX" bands, and you can hear stations from all over the World. You don't need a big antenna for these frequencies, and this set will give great results with a simple wire dipole (details in the kit instructions). Performance is excellent.

DXR10		Kit: **£24.90**	Assembled PCB: **£36.90**
DXR10	Hardware:		**£14.00**

ACCESSORY KITS

We have lots of add-on goodies to tempt you with. Could you fancy extra filters, or perhaps a digital frequency display? Need a good quality ATU?

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CSL4	SSB & CW Dual B/W Filter	Kit: **£9.90**	Assembled PCB: **£15.90**
DCS2	"S meter" for receiver	Kit: **£7.90**	Assembled PCB: **£11.90**
DFD5	Digital Counter/Display	Kit: **£39.90**	Assembled PCB: **£59.90**
SWB30	SWR/Power Indicator	Kit: **£12.50**	Assembled PCB: **£17.30**

All **HOWES** kits come with a good quality Printed Circuit Board, full clear instructions, and all board mounted components. If you would like more information, please send an SAE for a free catalogue or information sheets on any specific products. Technical help and Sales are available by 'phone during office hours.

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73 from Dave G4KQH, Technical Manager.

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What is Propagation?

Feature

Ron Ham concludes his explanation of meteors, with details of what to look for in the sky.

In the February issue, I showed that in 1972, my first full year of observation for 15 hours per day, that my equipment counted 1 299 587 meteor 'pings' and how good it was to see the numbers rise and fall as the earth passed through the major showers. The super resolution of the Quadrantids, Fig. 1, in January 1973 set the pace for the rest of 1973 and 1974 when a total of 1 607 918 and 1 551 354 'pings' were recorded respectively. I concluded the experiment at the end of 1974 because it was very time consuming and I felt that a three year consistent experiment was enough proof that the system worked and, if anyone was interested, a larger and more sophisticated radio observation was feasible. The total 'pings' counted over three full years amounted to 4 458 859. In that time the equipment worked for 14 845 hours (5137 (72), 4993 (73) and 4715 (74)) which gave a mean average for the whole period of around 300 'pings' per hour.

The project lay dormant until March 1984 when I had a visit from Dr Patrick Moore and Dr John Mason, joint authors of the book, *The Return of Halley's Comet* (ISBN 0-85059-667-X) and editorial consultants to the monthly magazine *Astronomy Now*. Although their visit was for a general discussion about solar and auroral activity, John asked about the meteor work because this was one of his specialist subjects. And after a short successful demonstration, with a dipole and a scanner, he decided to repeat and advance the experiment at his home near Arundel.

Room For Expansion

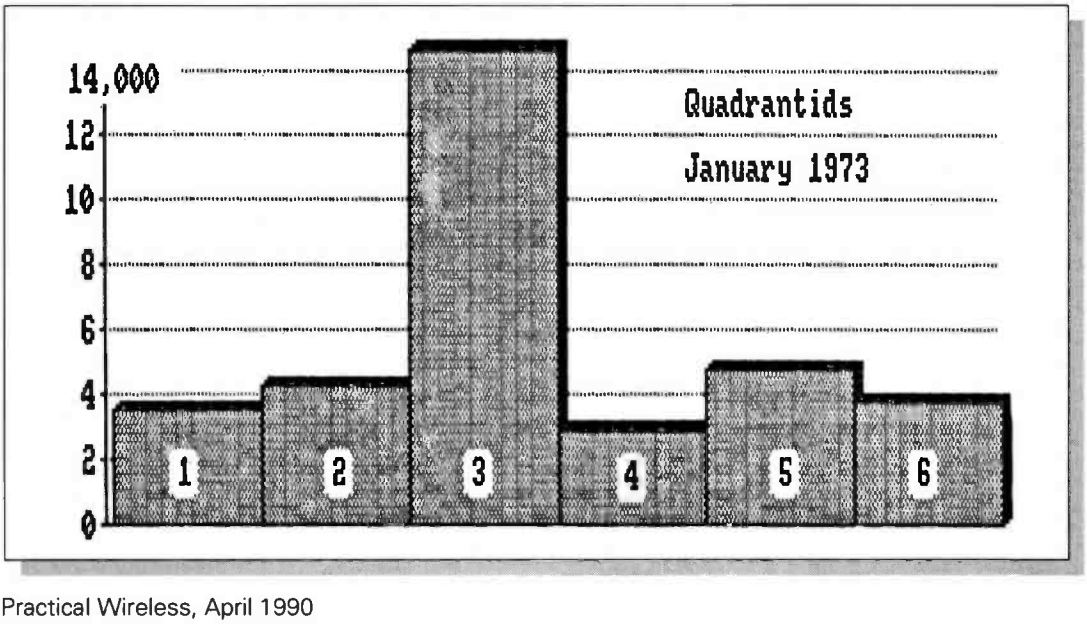
Being an electronics engineer as well as an astronomer and Public Relations Officer for the British Astronomical Association, John soon had his own system running and found that his early results were similar to mine. John, who has now done a great deal of work in this field, rightly suggests that further observations should be made trying a variety of highly directional antennas looking at different areas of the sky.

In addition, more sensitive equipment and filtering could be tried, plus an investigation into the possibilities of using transmissions from other broadcast stations to obtain alternative angles between the sources of the signal, decaying meteor trails and the observers location. In fact, there is a great deal of work, needing a lot of patience, still to be done.

Take A Look

To understand this subject better, take a look at the heavens on a clear dark night. It should not be long before you see a streak of bright light dart across the sky as a random meteor burns-up in the earth's atmosphere, a mere 70 to 130km above you. The trail you see is called the radiant and this is named after the constellation of stars, millions of light years away, from which it appears to come. For instance, an observer would look toward the constellation of Leo, between November 15 and 20, to see the earth's passage through the swarm of meteor particles known as the Leonids and so on for the Quadrantids (January 1-6), Lyrids (April 19-25), Perseids (July 23-August 20), Orionids (October 16-27), Geminids (December 7-16) and Ursids (December 17-25). Precise details are published annually in the Meteor Diary section of the Handbook of the British Astronomical Association.

Obviously this does not conclude the subject of meteors and in future, with the aid of this new column, I intend to keep you aware of developments in this fascinating field of astronomy in our 'back yard'. Next time, I plan to begin looking again at the real grass roots of the often hazardous medium through which all terrestrial radio signals must travel. Don't forget if you have any queries on propagation, do drop me a line at Faraday, Greyfriars, Storrington, Sussex RH20 4HE, and I will do my best to help. **PW**



Although the Quadrantid Shower is supposed to last from the 1st to the 6th of January, there is normally one peak as shown on the 3rd of over 3 times any other day.

Feature

Stabberies Not Included

More libelous make-believe from Peter Rouse GU1DKD

I must start this, the second, in these occasional jottings with an apology. I said at the end of the last article that I would be reviewing the new ICRKWFRG-7000000GTL Multi-Everything transceiver in this column but have since learned that this is impossible. Apparently the equipment is not yet in production and I had not realised that Yascom's advertising department works five years in advance of the production team.

Yascom were so horrified with the comments made in the last report that they even had their chief designer, Mr Itchitoe, write to me direct from Japan and warn that any further reference to the ICRKWFRG-7000000GTL would be met with a visit from the 'regal' department. I had the last laugh though because clearly Mr Itchitoe has not fully grasped our language and, in the best tradition of some instruction manuals from the Far East, made me laugh when he said, and I quote: "you kneecaps be rearranged and we no use anaesthetic". I assume this means that the tuning 'caps' need to be adjusted with a non-inductive trimming tool.

Crockett and Tubbs Lookalikes

I am glad, that at long last fashion designers have come to realise that Radio Amateurs are not a load of old fuddy duddies who do nothing but wear sensible pullovers and sandals. I was therefore delighted to receive an invitation to the first of Pierre Cardigan's (YF-RONT) fashion shows for those of our persuasion. The highlight was the 'Hamorak' in either Pye blue or real-ale brown. This stylish jacket was mottled with simulated silicone grease stains and soldering iron burns (beautifully styled holes that were delightfully crispy and brown around their edges). This must be ideal wear for a visit to the club or rally. Several sweatshirts were also on offer (this year's colours are 'Box Black' and 'Import Grey') and carried such logos as "Hams don't do it but they talk about it".

I was also impressed with his beard-boom-mic (it just clips on); the ideal accessory for those amateurs who work 144MHz at rallies and do not like things strapped round their head or attached to their glasses.

Pierre, of course, also provides a matching range of cosmetics. His E-layer friendly aerosols will come as a delight to amateurs young and old. There's the 'Speco-mist'; just a squirt (Roland Acne) makes the average lens look as if it has not been cleaned for weeks and as if it is covered in several greasy fingerprints (he's even working on pre-grimed sticking plaster for on-the-spot repairs that don't look as if they've just been done). However, the real show stopper was the 'bargain counter clearer'. Now, how often have you been to a rally and had to fight your way to the counter with the best bargains? It need be no more. Pierre's scientists have developed a special chemical spray based on a scent secreted by female pigs when they do not want to breed. (It is actually a synthetic substitute based on raw Garlic). A quick squirt on your 'Hamorak' is guaranteed to clear all space for a radius of about twenty feet. Finally, Pierre has perfected spray-on Dandruff which, I swear, looks just like the real thing and is guaranteed to stick to clothing for at least a fortnight.

Finally, like most Fashion designers, Pierre also includes accessories. I was particularly taken with his home-brew selection which included a set of six unmatched control knobs and a kit of blown fuses, which come complete with ready cut strips of cigarette packet foil (Galois appear to be just as good as the more familiar British brands).

Contest Rules

The Joint Advisory Council on Contests have now announced three new categories for awards which are as follows:

(1) **Best Microphone Processor.** Judges will be listening not only for gross distortion but also the microphone's ability to pick-up sounds from several miles away during speech pauses.

(2) **The Midas Certificate.** This is awarded to the station with the most expensive and powerful set-up for portable operation. Radios, towers, caravans, portable spa-baths, etc., can all be included in the value which must be signed by a certified accountant.

(3) **Plodblaster Cup.** This will be awarded to the station with a signal wide enough to fill most of the 2m band. In the event of a tie-break, the cup will go to the station that attracts the most written complaints from emergency services operating outside of the band.

More on SPROCKET

You may recall that the revolutionary (in more sense than one) new digital communication network called SPROCKET was described in detail in my last ramblings. Design team leader, Mike Beergut, now tells me that several new commands have now been added and are called version V1.03357 and are available on ROM (Rather Overpriced and Many-legged). They are:

LITHP Substitute "TH" for every occurrence of "S"

BURNPA Transmit a continuous sine wave for 2 hours

COCKSNOOK Precede all messages with "My gear's better than your gear" (also see SNEER).

THRUSHBLIP Transmit a quick burst and make Sparrows leap off your Yagi.

COOKTHRUSH See BURNPA

SNEER **Automatically** send COCKSNOOK to any station with less than two thousand pounds worth of equipment.

SLAGOFF Automatically simulcast to a Packet BBS and leave a message that is of little use to man nor beast.

Sordid Pictures

I sadly have to inform readers that a recent court case has brought our hobby into disrepute. A well-known kit manufacturer has been jailed for supplying indecent photographs. It appears that he not only had a stock of pictures showing Japanese transceivers with their covers off, but also some hard-core material which even showed parts of the r.f. circuitry with the screening cans removed.

In passing sentence, Justice Jasper Multi-Mode said, "I have never heard of the Rolling Stones nor a Mister Michael Jagger but I do know that this is a most serious crime. You did lewdly expose to young and impressionable people, material that could have led them into the disgusting habit of home-brewing. You are hereby sentenced to five years hard labour (working out the RS-232 pin-out connections between all known computers) and will live on nothing but bread and Belinda's coffee grounds".

Swap Spot

I have a CB radio with 'SWAR' meter, roger-bleep, burner and echo-mic plus Russian 35mm Grubbychef camera with spare lens-cap. Will exchange for all-mode h.f. rig such as Yaesu FT-One or similar. **PW**

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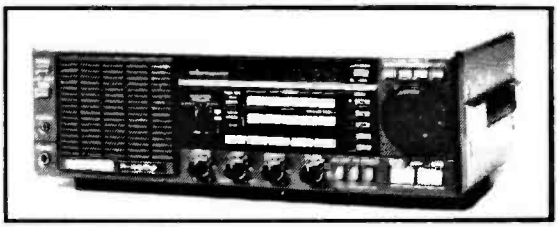

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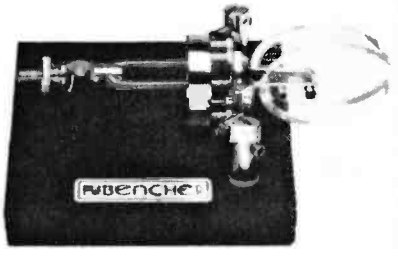

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Feature

The Windom Revisited

Is the Windom a dated antenna? Dick Pascoe G0BPS put forward this article to prove it isn't.

I returned from holiday (ex 9H3JX) to find my Top Band dipole had suffered the fate of all wire antennas. Yes it had broken, just by the feed point. It just shows what this modern wire is like. This script is the result of my search for the ultimate antenna. The amateur's dream, a simple antenna that costs pence (at most) to make, and yet can work world wide.

I started looking around to find something to replace the defunct dipole, and investigations showed that there was more to wire antennas than meets the eye. The abundance of information is demonstrated by the number of books available on the subject.

Fashion seems to have moved in many various directions over the years, so is it so strange to see the mini-skirt return, and that old shirt that I finally threw away last week, is now all the rage again. Strange innit???

Table 1.

A typical v.s.w.r. plot the New Windom antenna							
Frequency	1.8	3.6	7.0	14.2	21.2	28.5	MHz
v.s.w.r.	2.5	1.4	1.5	2.4	1.8	1.8	Ratio

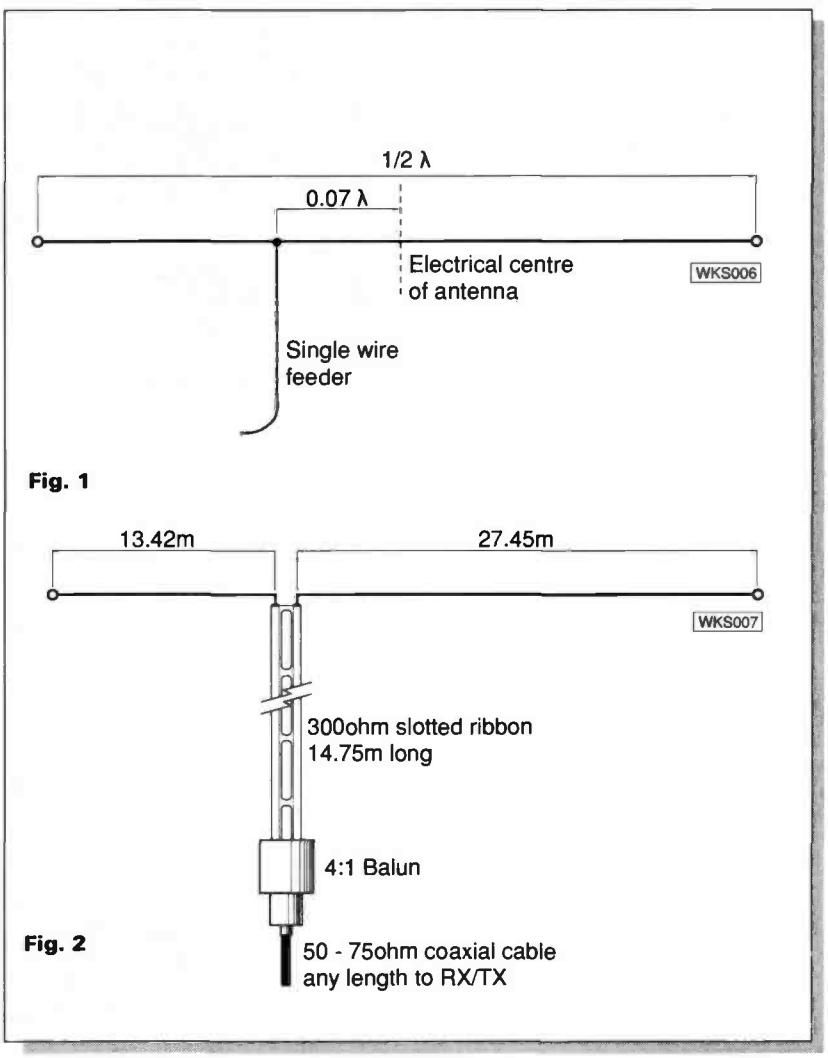


Fig. 1

Fig. 2

The Original Windom

Antennas, or is it antennae? (*not with us: Ed.*) are examples of those things that change with fashion. Today's rage is for the beam antenna, but not everyone has the room (or the bank balance) to fit one.

One of the most popular antennas is the G5RV invented by Louis Varney of the same callsign. Even this 'standard' antenna has, as with many other designs, several variations. I would wager that Louis would never had guessed that his antenna would prove so popular! Some time before Louis invented the original design of his antenna, many amateurs around the world were using something called a 'Windom' antenna.

The original antenna was designed back in the '30s by the late General Loren G. ('Windy') Windom W8GZ. There were some thoughts at the time that he had pinched the idea from earlier designs, two amateurs employed by the Bell Laboratories had in 1929 published a design using a single wire feeder. When cut correctly, the original Windom provided an acceptable match on all the harmonically related bands of 3.5MHz, 7MHz, 14MHz and 28MHz. Unfortunately the main problem is that the WARC bands of 10, 18 and 24MHz are not harmonically related. Recently an American amateur Bob Grove (WA4PYQ) has suggested a potentially better solution. He was searching for an 'all band' coaxial fed dipole for short wave listening but which would also give good performance on transmission. After many attempts Bob came up with a design which I have tried out with great success.

The original Windom antenna uses a single wire feeder as shown in Fig. 1. As pointed out by Les Moxon G6XN, we should avoid a single feeder because of the built in losses, as detailed in *HF Antennas For All Locations* page 222. We know that VS1AA has carried out several experiments using the Windom principal but with very long wires. It is understood that the feed point on this version is the Windom feed point of one third of the distance from one end, at the lowest frequency in use. I have not carried out any experiments on this system so I cannot comment.

Unforeseen Advantage

As mentioned before the original Windom, a simple 'flat-top', was fed at point 15% from one end

Fig. 1: Diagram of the original Windom

Fig. 2: The new Windom with balanced feed

of the top section. Over the years many variations have been tried using coaxial feeder or various twin feeder options. If we compare the original Windom, as in Fig. 1, and the latest version (Fig. 2) it may be seen that there are many differences. I cannot comment on the original, except to say that it must have worked very well to have remained popular. After using the modified Windom for some time now I can say I have no plans to revert back to any other form of antenna.

One unforeseen advantage of the antenna, came as I fed the short end over roof of the three storey house. With the short end attached near to the gutter, the feed point was right above the shack! (see Fig. 4)

First Venture

One day when chatting to an old friend he mentioned that at one time the balanced Windom was popular (see Fig. 5). As this is twice the standard length only those with a large plot of land would have the space. The feed point was fed with 600Ω twin feeder which does help to minimise the losses.

Looking at the new version of the antenna it may be seen that a 4:1 Balun transformer is now required. What is, and how do I make a 4:1 Balun? The answer is simple as long as you have a few cheap ingredients and the description below. You will need the following: A piece of ferrite rod, a length of enamelled or plastics coated copper wire about 1 metre long, and some insulating tape.

The piece of ferrite rod may be gleaned from a recently expired m.w. radio or purchased at a rally The wire should be a minimum of 1.25mm or 16s.w.g. and any insulation should be as thin as possible. Fold the piece of wire in two: leaving about 80mm free, wind both lengths tightly together for 10 or 12 close turns on to the piece of ferrite rod. Keeping a grip of everything wind the insulating tape over the windings to keep them in place. Referring to Fig. 3 identify the ends of the windings and connect them together as drawn. Then make up the complete antenna.

My first venture, using the new Windom, on 18MHz (just after it became available to us) brought LUs, Ws, VK, etc. all at the same time. When was the last time you heard of a G station under a pile up????

The version I use has 300Ω Bofa slotted ribbon for the whole feeder length, and with an a.t.u. I am convinced of its worth.

Why not change your dipole. The NEW WINDOM has some very distinct, not to mention hidden, advantages. **PW**

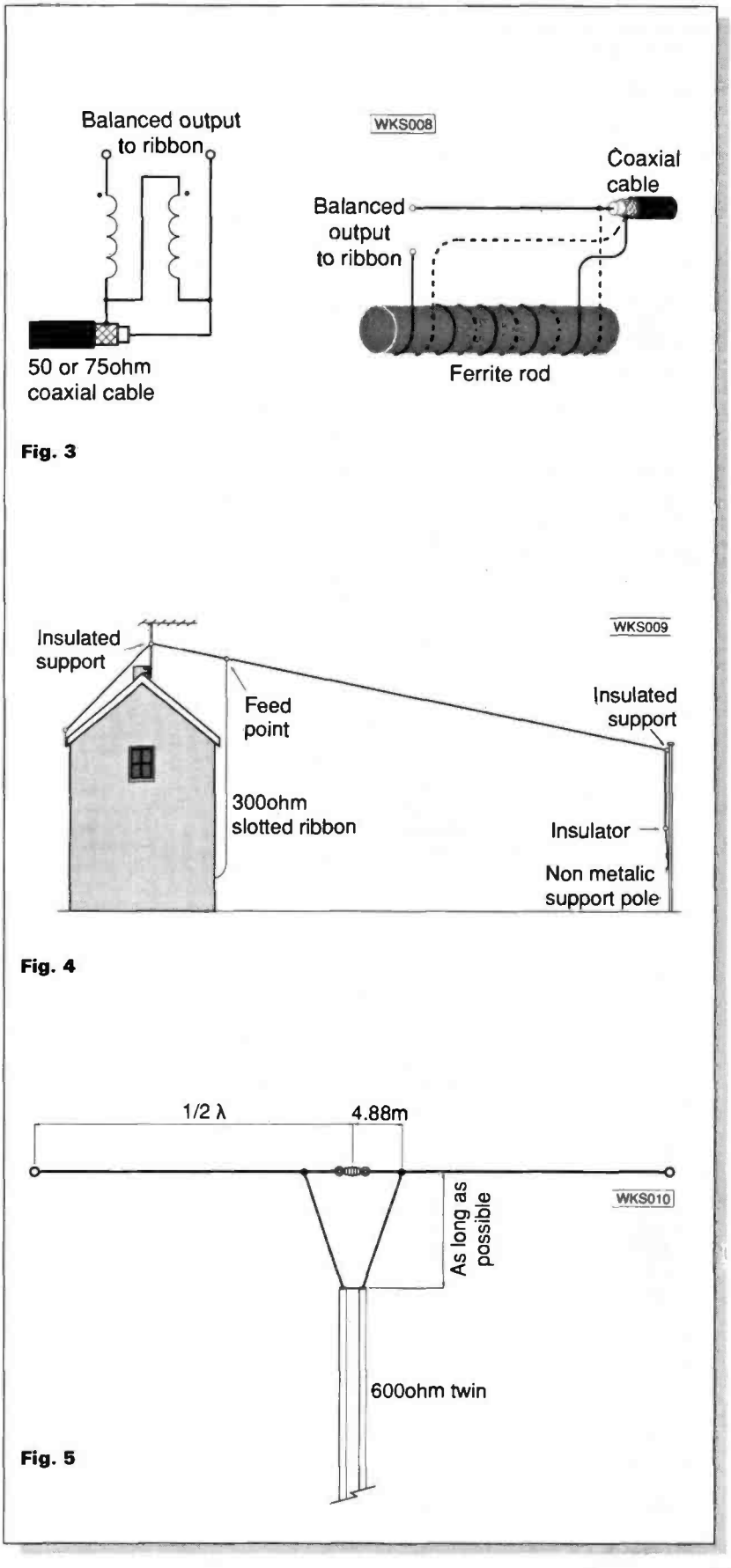


Fig. 3: The h.f. Balun transformer

Fig. 4: This was the unexpected advantage found in the installation

Fig. 5: The Balanced Windom antenna

Radio Diary

***March 9-10**: There will be an amateur radio show at Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9. Details from: **London Amateur Radio Show, 126 Mount Pleasant Lane, Brickett Wood, Herts AL2 3XD**.

***March 18**: The Norbreck Amateur Radio, Electronics and Computing Exhibition organised by the Northern Amateur Radio Societies Association (NARSA) at the Norbreck Castle Exhibition Centre, Blackpool. **Peter Denton G6CGF. Tel: 051-630 5790**.

March 18: The Wythall Radio Club will be holding their 5th annual radio rally at Wythall Park, Silver Street, Wythall, Worcestershire. That's on the A435 near junction 3 on the M42, south-west of Birmingham. Rally opens at 11am. There will be three halls plus a marquee, the usual trade stands, flea market, a large Bring & Buy, bar and snacks with talk-in on S22. Admission 50p. **Chris Pettitt G0EYO. Tel: 021-430 7267**.

March 18: The Tiverton Radio Club's Mid Devon Rally will be held at the Pannier Market, Tiverton. There's ample free parking, food and drink available, club-room open all day. Talk-in on S22 with doors opening at 10am. **G4TSW, Mid Devon Rally, PO Box 3, Tiverton, Devon EX16 6RS**.

March 25: South East Kent (YMCA) ARC are holding their first South East QRP Convention and Table Fair at the YMCA, Dover. Doors open from 10.30am to 4.30pm. There will be a lecture program on h.f. and v.h.f. QRP, plus traders and a Bring & Buy. Talk-in on S22. **Dick Pascoe G0BPS. Tel: (0303) 276171**.

March 25: The Cunninghame & District Amateur Radio Club will be holding their rally at the Magnum Centre, Irvine.

March 25: The Pontefract & DARS 11th Components Fair will take place in the Carleton Comunity Centre, Pontefract from 11am to 4.30pm. There will the usual stands, a bookstall, Bring & Buy and a licensed bar. Talk-in on S22. Admission free. **B. Atkinson. Tel: (0977) 704067**.

April 1: Bournemouth Radio Society will be holding its annual Amateur Electronics (Radio, Electronic & Computer) Bring & Buy Sale at Kinson Community Centre, Pelhams, Millhams Road, Kinson, Bournemouth. Doors open at 2pm. Admission is 50p including a prize draw ticket. Refreshments will be available. Talk-in on S22. **Vic G4PTC. Tel: (0202) 516593 after 1800**.

April 8: The 4th Launceston Radio Rally will be held in Launceston College. There will be the usual traders, Bring & Buy, hot snacks and a bar available. Doors open 10am with Talk-in on S22. **Maggie. Tel: (040921) 219**.

April 8: The Cambridgeshire Repeater Group Amateur Radio Rally will be held at the Philips Radio Communications - Catering Centre, St Andrews Road, Chesterton, Cambridge. Doors open 10.30am, auction items accepted from 9.30am. **G.M. Gardner G0HEM. Tel: (0799) 23689**.

April 8: The Swansea ARS are holding their 9th Amateur Radio Trade Rally in the Swansea Leisure Centre. This is situated on the A4067 Swansea-Mumbles coast road. There will be trand stands, catering facilities, a licensed bar, bookstand, Bring & Buy, etc. **Roger Williams GW4HSH. Tel: (0792) 404422**.

April 8: The Lough Erne ARC will be holding their annual rally in the Killyhevlin Hotel, Enniskillen.

April 15: The Centre of England Amateur Radio Rally will be held at the Motorcycle Museum, Bickenhill, near the NEC Birmingham. It's being held in three large exhibition halls and free ample parking. **Frank Martin G4UMF. Tel: (0952) 598173**.

***April 21-22**: The RSGB are holding their Convention and Exhibition at the NEC, Birmingham.

April 22: The Marske rally will be held in the Marske Leisure Centre, Marske by the sea. Doors open 10am. **Mr Phoenix G7CBR, 1 Conway Road, Redcar, Cleveland. Tel: (0642) 48005**.

April 29: The Bury Radio Society will be holding its annual Hamfeast at the Castle Leisure Centre, Bolton Street, Bury. Doors open at 11am (disabled at 10.30am). Talk-in on S22 and SU8. Catering facilities and a licensed bar are available as well as the giant Bring & Buy. **C. Marcroft G4JAG, Mosses Community Centre, Cecil Street, Bury**.

***May 13**: The VHF Convention will take place at Sandown Park Racecourse, Esher, Surrey.

***May 13**: The Yeovil Amateur Radio Club will be holding its 6th QRP Convention in the Preston Centre, Monks Dale, Yeovil. **D.J. Bailey G1MNM, 7 Thatcham Close, Yeovil, Somerset BA21 3BS**.

***May 20**: The 33rd Northern Mobile Rally will be held at the Great Yorkshire Show Ground, Harrogate. **Mike G0MKK. Tel: (0423) 564353/ 507653**.

May 20: The 7th National Amateur Radio Car Boot Sale will be held at the new venue of Stockwood Park, Luton. This is easier to get to (not far from junction 10 on the M1). Private sellers £7 in advance or £9 on the day, traders £20. **Clive G4ENB. Tel: Luton 27907**.

May 20: The Parkanaur Amateur Radio Rally will be held at the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. There will be the usual trade stands, Bring & Buy, bookstand, QSL bureau, etc., Talk-in on S22. The proceeds of this rally go to the Stanley Eakins Memorial Fund at Parkanaur near Dungannon. **Jim Lappin GI1YGS. Tel :(0762) 851179**.

May 20: The Cambridge & District ARC are holding their 5th Annual Rally & Radio Car Boot Sale at Coleridge Community Centre, Radegund Road, Cambridge. Doors open at 10.30pm. **Brian G4TRO. Tel: (0223) 353664**.

May 27: The 14th annual East Suffolk Wireless Revival will be held at the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. There will be a Bring & Buy, Car Boot Sale, a transceiver clinic, 50MHz demo station, all the usual traders and lots more including a children's play area. **Paul Whiting G4YQC. Tel: (0473) 642595**.

May 28: The 1990 Bircotes Radio Rally will be held near Bawtry, Doncaster. Doors open at 11am (10.30am for the disabled). Talk-in on S22. Details and or boking forms from: **Pat Smith, 23 Florence Avenue, Balby, Doncaster. Tel: (0302) 857526**.

June 2: The first Belfast Amateur Radio Convention, organised by the RAIBC (Northern Ireland Area), is being held in the Ormeau Park Recreation Centre, Ormeau Embankment, Belfast. All the usual convention attractions will be there plus demonstrations and talks on the hobby by local well-known amateurs. They are also trying to cater for the XYLs by having demonstrations on microwave cookery, crafts and first aid. The special event station operating on the day will be GB2BRC. **David Caldwell GI0HOW. Tel: (0232) 471370**.

***June 10**: The Royal Naval Amateur Radio Society Annual Mobile Rally will be held in the Sports Field, HMS Mercury, near Petersfield, Hants from 1000-1700.

***June 24**: The Annual Longleat Mobile Rally will be, as usual, held at Longleat near Warminster, Wilts. **Shaun O'Sullivan G8VPG. Tel: (0225) 873098**.

July 1: The Worcester & District Droitwich Strawberry Rally will be held at the High School, Droitwich. There will be the usual trade stands, Bring & Buy, family entertainment and strawberry fields (weather permitting). Gates open at 11am with free car parking and entrance. **Tony G4OPD. Tel Worcester 620507 or Derek G4RBD. Tel: Worcester 641733**.

* Practical Wireless and Short Wave Magazine in attendance.

MORE NEXT MONTH, RALLIES FROM JULY TO NOVEMBER.

Ten SpOt

This month John Petters G3YPZ, looks at CB rig conversions

Last month I mentioned a.m. in passing. This has proved an interesting mode over the last few months with strong signals from Stateside workable most afternoons.

There is something quite relaxed and different about a 28MHz a.m. QSO that those who were licensed before the 70s will recall from the heyday of 1.8MHz a.m. It is an almost unhurried experience, with attention being paid to hi-fi quality audio, and the art of rag chewing, with proper procedure rather than the snappy CB style, non callsign overs often associated with s.s.b.

The place to look is 29.0 to 29.1MHz after 1200UTC. A 'G' station calling CQ in that portion of the band is likely to attract a considerable amount of calls, and the chance of making some long term friendships.

Stateside stations are frequently bemoaning the fact that there are so few European amateurs still using the mode, despite good propagation conditions.

Many stations are using old DX100 or Viking Valiant transmitters, but a few such as Corky Crosby K1GWT are using recently made home-brew transmitters in the old tradition, which sound superb.

Pictured is the r.f. section of K1GWT's homebrew a.m. TX, which runs 170W input to a 4-125 p.a. which uses high level modulation.

Corky runs this into a 2-element quad which works very well into the UK. Other regulars in the a.m. section are K2UTC from White Plains New York, VE3OWL (ex G8ADZ) in Ottowa, W5PYT in Ozona, Texas and W7GTV in Arizona.

TA1AW, DL9EBO, VY2DG (Prince Edward Island) and G2DPQ have also been heard or worked on the mode, while ZS6BVY and LW2DBM have been worked cross mode (s.s.b. to a.m.)

Old a.m. rigs are often available very cheaply at rallies and can be a lot of fun. I recently bought a KW Vanguard of mid 50s vintage, which needed the screen grid resistor in the 6L6 driver replacing, but now produces about 30 watts of plate and screen modulated a.m. The only problem with the mode is that it does attract TVI, BCI and telephone breakthrough.

Low power from a modified CB rig will produce excellent QSOs into a simple antenna system when conditions are right, and with so many current multimode h.f. rigs around these days, many people could discover a whole new (?) mode.

The Society for the Promotion of a.m. - set up to keep the mode alive, can be reached at WB6TRQ, PO Box 27, Potrero, California 92063, USA.

Send a large self addressed envelope with some IRCs.

FM CB Rigs

Many of the legal CB rigs can be easily modified to 29MHz, others need a board such as that offered by Spectrum Communications of Dorchester, telephone (0305) 62250 to get them to shift. Spectrum also offer a service of fitting and aligning these boards to your rig as well.

The Icom ICB1050

Of the easily convertible rigs the Icom 1050 is perhaps the most popular.

Tony Jones G4IPR, has forwarded a series of ideas that were developed by a group of amateurs in the North London area over a period of years.

The r.f. amplifier m.o.s.f.e.t. is upgraded and the mixer is changed from a bi-polar device to a dual gate m.o.s.f.e.t. increasing sensitivity. A crystal filter is fitted in the last i.f. to improve selectivity, and the squelch and s-meter circuitry are substantially improved. The frequency coverage will be between 29.310 and 29.700MHz, with the option of repeater shift (100kHz offset) or an extra 10 channels using the existing high-low power switch.

The transmit audio stages are modified to provide a wider bandwidth for improved audio quality.

The transmitter is modded to give typically 6 to 7 watts output.

The first task is to check that the rig is performing where it is supposed to be, ie. on 27MHz CB. Checking the receiver should be straight forward, as local 27MHz signals should be in abundance. A dummy load on the TX with an s.w.r. meter in line, and monitoring on a general coverage RX should verify that the TX in functioning.

A binary adder is made up on a separate board which effectively increases the count of the binary channel switch. The circuit is shown in Fig. 1. S0 to S6 are the inputs from the switch, values being 2 to 127. D0 to D7 are the data outputs to the MC145106 p.l.l. chip on the main p.c.b. RS and LI are the repeater shift and reverse repeater shift (listen) respectively.

The drawings in Fig. 2 and Fig. 3 show the switch circuits for repeater shift and 100kHz TX and RX shift respectively. Reverse repeater can be achieved by connecting RS or LI via a switch (probably a 3 or 4 way in this case) to the RX + 9V rail, which is earthed on receive, on the main board. Note that the diode providing the LI input seems unnecessary. **PW**

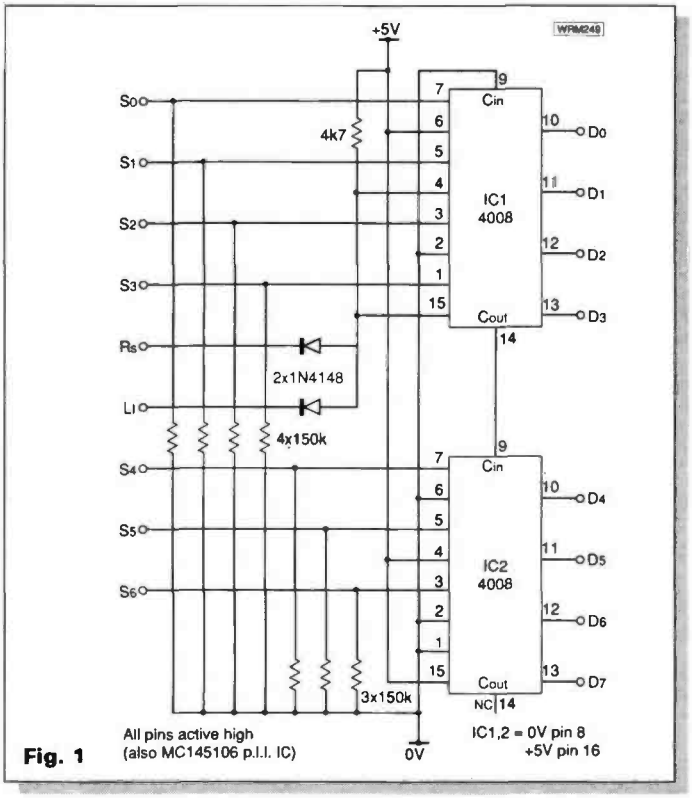
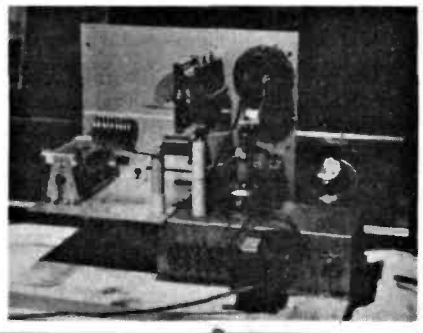


Fig. 1

Switch Psn	BCD Output	Original Freq	New Count	New freq*
1	40	27.60125	211	29.310
10	49	27.69125	220	29.400
20	59	27.79125	230	29.500
30	69	27.89125	240	29.600
40	79	27.99125	250	29.700

* These frequencies require the crystal frequencies to be lowered by 1.25kHz with their associated trimmers.

The additional count given is 171 (1.71MHz) or 161 (1.61MHz) on repeater shift.



K1GWT's home-brew a.m. transmitter.

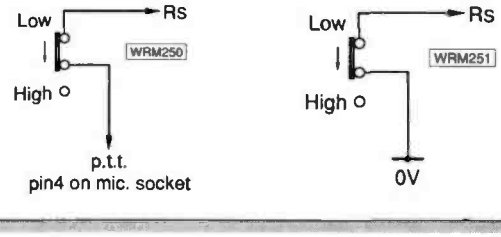
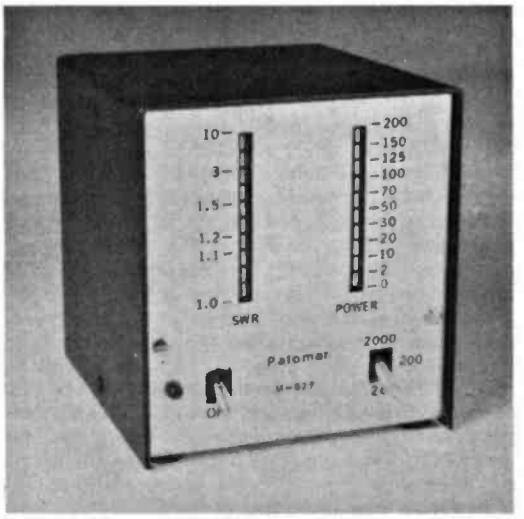


Fig. 2

REVIEW

The Palomar M-827 SWR & Power Meter

The M-827 automatic power and s.w.r. bridge from Palomar Engineers is unusual in its style and presentation and could prove to be very useful. Mike Richards G4WNC put the meter through its paces.



Power meters and s.w.r. meters are one of those items of essential equipment that many amateurs take for granted and the market tends to reflect this. The Palomar M-827 however breaks some of the trends mainly in its presentation and simplicity of operation. The first thing you notice is that there are no meters on the front panel but just two bargraph type displays, one for power and the other for s.w.r. So let's connect up and see just what this instrument is capable of.

Getting Started

Connecting-up, as with most s.w.r. meters, was actually very simple with two SO-239 sockets mounted on the rear panel for the connection of the transmitter output and the antenna or antenna tuner. As the M-827 is an active device a power source was required and the review model required 12V d.c. at a quoted consumption of 100mA. In fact, the consumption varied widely on the review model depending on the number of l.e.d.s illuminated. The range was measured as 41mA quiescent and up to 290mA with all l.e.d.s lit. The US version could be mains powered, but as far as I'm aware this 117V version is not available in the UK. The d.c. power connections comprised a single red wire for the positive supply and a ground post for the negative.

In order to minimise the amount of stray r.f. the positive lead was fitted with two ferrite rings, one just outside the case and the other immediately inside. With all the connections made, operation was just a matter of selecting the appropriate power range, switching on and firing-up! The power ranges provided were 20, 200 and 2000W for full scale deflection, the 2000 range reflecting the American origins of this unit. The s.w.r. range on the other hand was scaled 1.0 through to 10.0. The unusual point about both scales was that they were logarithmic. Although this might sound a little odd, it is in fact quite logical for this application. For example, the logarithmic s.w.r. scale meant that over half the scale was used to represent the range from 1:1 to 1.5:1. This was ideal because when adjusting an a.t.u. for optimum matching, this lower end of the range is the area where the final trimming is often so difficult to see on a conventional meter.

Moving on to the power meter, the logarithmic scale here was particularly well suited to s.s.b. operation. This is because the human voice has a very wide volume range during normal speech - a more appropriate technical term is wide dynamic range. This wide dynamic range means that for a transmitter set up for 100 watts output, the actual power level for large parts of the transmission will be around 10 watts or 20 watts. On a conventional linear meter this would be at the very bottom end of the scale and would be quite difficult to read.

The M-827, however, leaves these power levels well up the scale and very readable. In fact, it was quite possible to detect power levels of 20 watts even when set to the 2000 watt range which illustrates the value of logarithmic scaling quite well. Another important point about the power meter is that by employing an l.e.d. bargraph display, the response time limits are minimal so the display can easily follow voice peaks and hence give a clear indication of the peak power.

I'm sure you've all experienced the confusion caused when operating s.s.b. with a sluggish power meter - there's a great temptation to overdrive the transmitter in an attempt to get the meter reading closer to 100 watts on voice peaks! The M-827 encourages a much more controlled use of mic gain and compression by clearly indicating the r.f. output level.

The ability the read s.w.r. at any power level without having to fiddle with the usual 'set-s.w.r.' control was also very convenient. I found that the s.w.r. reading was pretty well constant for power levels between about 10% and 90% of the selected range. I initially had my doubts as to how useful a bargraph display would be for spotting the dips and peaks that occur when using an a.t.u. for matching between the transmitter and antenna. My doubts were unfounded as I soon became accustomed to the display. I found that the fast response of the display actually speeded up the tuning process. As to the overall accuracy of the M-827, I found it to be perfectly adequate for its main intended use of aiding the matching between transmitters and antennas. The obvious limitation to its accuracy was the use of only ten l.e.d.s for the displays, but as I have said this did not deter from its intended role.

Specification

SWR Range	1.0 to 10.0 (log)
Power Range	20/200/2000W
Frequency Range	1.7MHz to 30MHz
Power Supply	12 volts at 100mA (300mA peak)

Under The Bonnet

The standard of construction used in the M-827 was quite good with the case basically comprising two U sections of aluminium with just two securing screws. There was however, a lack of support at the top of the front and rear panels, which gave the whole unit a slightly flimsy feel.

Moving inside there were two good quality glass fibre printed circuit boards. One contained the r.f. bridge and was mounted on the rear panel immediately behind the input and output sockets. The second board was mounted on the front panel and contained two hybrid l.e.d. displays and drivers and an unmarked integrated circuit which was used to compute the s.w.r. from the two outputs of the r.f. bridge.]

As we were going to press Bredhurst Electronics have just sent us details of the latest SWR and Power Meter from Palomar. This meter has improved resolution, 30 l.e.d.s for power and s.w.r., four power ranges, 2 Watts full scale to 2000 Watts full scale and it can read s.w.r. with power as low as 0.1W. So the latest version seems to have answered the smallest criticisms about the M-827. **PW**

Summary

Although on first seeing the M-827 I was a little dubious as to its capabilities, I have been convinced that it is in fact a very useful and well thought out item of test equipment. I feel that it should find particular favour with s.s.b. operators as it completely overcomes the response time variations associated with conventional electro-mechanical meters. The Palomar M-827 is available from **Bredhurst Electronics Ltd., High Street, Handcross, West Sussex RH17 6BW. Tel: (0444) 400786** price £124.95. My thanks to Bredhurst for the loan of the review model.

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WR256	ACTIVE FILTER	AUG 89	6.96
WR254	TX CONTROL FOR MOBILE USE	JULY 89	5.08
WR253	TS940S MODIFICATION	JUNE 89	5.54
WR252	TWO TONE OSCILLATOR	MAY 89	6.52
WR251	RF OPERATED RELAY	FEB 89	3.80
WR250	DC/AC POWER CONVERTER	JAN 89	3.22
WR249	"MARLBOROUGH" MF CONVERTER	DEC 88	4.60
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WR245	STOPBAND FILTER FOR PW BLENHIEM	JUNE 88	2.90
WR243	VHF MONITOR RECEIVER (AUDIO)	APRIL 88	2.30
WR242	"ORWELL" VARICAP TUNE OPTION	MAR 88	2.90
WR241	"ORWELL" MED. WAVE RECEIVER SET	MAR 88	
WR240	.. ..	..	9.10
WR239	.. ..	..	
WR238	"OTTER" 50MHz RECEIVER	JAN 88	7.10
WR237	RTTY TUNING INDICATOR	NOV 87	5.20
KANGA	HIGH STABILITY VFO (see issue)	OCT 87	-
WR236	"BLENHIEM" VHF CONVERTER	SEPT 87	4.50
WR235	MAINS ON/OFF FOR BATT RADIOS	SEPT 87	3.00
WR234	SIDE-TONE OSCILLATOR	JUNE 87	2.70
WR233	"DOWNTON" F-V CONVERTER	JUNE 87	3.90
WR232	"AXE" SIGNAL TRACER	MAY 87	
WR231	.. ..	..	9.20
WR230	.. ..	..	
WR228	"BLANDFORD" RECEIVE CONVERTER	APRL 87	
WR227	.. ..	..	9.70
WR226	.. ..	..	

Board	Title of Article	Issue	Price £
WR298	"ITCHEN" LCR BRIDGE	APRL 87	3.40
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10
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WR224	"WESTBURY"BASIC WOBBULATOR	JAN 87	3.50
WR214	MOD SRX-30D (AUDIO)	DEC 86	3.00
WR223	HIGH-IMP MOSFET VOLTMETER	DEC 86	2.90
WR222	"TAW" VLF CONVERTER	NOV 86	2.80
WR216	LF BANDS ACTIVE ANTENNA	NOV 86	2.40
WR220	GET STARTED LOW-COST CONVERTER	OCT 86	2.40
WR217	AUTOMATIC NICAD CHARGER	OCT 86	2.40
WR215	SIMPLE 50MHz CONVERTER	SEP 86	3.60
WR213	MOD FRG-7 (CARRIER Osc)	JUN 86	2.70
WR210	"ARUN" PARAMETRIC FILTER	MAY 86	8.10
WR211	"MEON" FILTER (SMALL)	APR 86	3.10
WR209	SIMPLE AUDIO OSCILATOR	MAR 86	4.30
WR208	RF SPEECH PROCESSOR	MAR 86	4.10
WR207	CRYSTAL CALIBRATOR	JAN 86	2.10
WR206	RTTY/MORSE MODEM (Plug-in)	JAN 86	2.80
WR205	RTTY/MORSE MODEM	JAN 86	5.40
WR204	WQ MEDIUM WAVE LOOP	NOV 85	3.00
WR203	SIMPLE CAPACITANCE METER	OCT 85	2.80
WR199	"MEON" 50MHz TRANSVERTER	OCT 85	6.70
WR202	ECONOMY UHF PRE-SCALER	SEP 85	3.70
WR201	ADD-ON BFO	AUG 85	2.50
WR200	LOW-COST CRYSTAL TESTER	JUL 85	2.50
WAD302	BATTERY CHARGER CONTROLLER	JUN 85	3.00
WR197	"COLNE" (Osc/Converter)	JUN 85	3.90
WR198	"COLNE" (Product Det/Audio)	MAY 85	3.90
A005	"COLNE (VFO)	APR 85	3.10
A004	"COLNE" 3.5/114MHz RX (RF Amp)	APR 85	3.10
WAD249	MOD FRG-7 (BFO)	FEB 85	3.00
WAD280**	TRIAMBIC KEYER	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	4.30
WA001	"TEME" (VFO/DOUBLER)	DEC 84	2.80
WR178	DART (Audio / change)	DEC 83	3.00
WR177	DART (p.a.)	NOV 83	3.00
WR176	DART (v.f.o.)	NOV 83	3.00
WAD246	"DART" FOLLOW-UP	DEC 84	4.00
WR196	"TEME" 7/14MHz WRP (TX)	NOV 84	3.70
WR195	STABLE TONEBURST	NOV 84	2.60
WR194	MOD FRG-7 (FM/SQUELCH)	NOV 84	4.50
WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
WR190	MOD FRG-7 (SWITCHING)	OCT 84	4.50
WR187	MORSE SENDING TRAINER	JUL 84	4.50
WR185	AUTO-NOTCH FILTER	JUN 84	6.50
WR184	SIMPLE TOP-BAND RECEIVER	JUNE 84	6.50
WR183	TOP-BAND DF RECEIVER	APR 84	6.50
WR179	TRANSCEIVER VOX UNIT	MAR 84	7.50
WR161	"MARCHWOOD" 12V 30A PSU	JUL 83	4.20
WR165 ect set	"SEVERN" 7MHz QRP TX/RX	-	14.90
WR169	"SEVERN" (TRANSMITTER)	JUL 83	6.50
WR168	"SEVERN" (CH.OVER/SIDETONE)	JUL 83	6.50
WR166	"SEVERN" (RECEIVER/AUDIO)	JUN 83	6.50
WR165	"SEVERN" (VFO)	JUN 83	5.20
WR167	RTTY TERMINAL UNIT FOR ZX81	JUN 83	7.80
WR160	LMS REGENERATIVE RECEIVER	FEB 83	5.20
WR156	REPEATER TIME-OUT ALARM	NOV 82	5.20
WR143	ATV CONVERTER	APR 82	7.10
WR144	IAMBIC KEYER	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCEIVER	AUG 81	7.70
WR095	TRANSCEIVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

Between the deadline for your letters, and now, as I start this piece, there has been a slight breeze over most of the southern and western parts of the country. The result, as far as this column is concerned is that the antennas were, er - modified; the beam has a driven element with one end depressed and t'other in the air. As for the l.f. wire, while in the 1987 gale it was seen-off by a complete garden shed roof, this time it was assaulted by a flying chunk of roofing felt. At least, I suffered no other damage and there were no local casualties. Someone not so far from here wasn't so happy, though; he found his shed roof next morning - 20 metres up a tree!

Help!

This one is for an old-timer, **Cecil Runeckles**, who in pre-war days operated a station first as SU8RS from 1930 and a year or two later as G2YZ in UK. As he was never noted in any pre-war callbooks, what is needed is a QSL or other documentary evidence of his G2YZ activity to get him re-licensed. All offers of help from OTs or QSL-collectors to Jack Tootill G4IFF, QTHR, please. I have already mentioned to G4IFF that Cecil in fact was mentioned in John Clarricoat's book, *World at their Fingertips* but, alas, only in connection with his SU8RS activity.

Bands

Just how are they fairing? The general feel is that the peak is about due to coincide with you reading this column; but at least you'll have the consolation that while the rise from minimum is a matter of three years or so, the slower fall takes up the rest of the time to the next minimum. So - there's hope for you yet! Anyway, we won't be sure till six months or more after it happened, when the smoothed figures show the truth. Most of the operators who were around for the last peak are of the opinion that, whatever the figures may say, this cycle hasn't been as good as the last one.

Vale

Last time, I just had time for a brief mention of the death of Frank Anzalone W1WY; Frank was 87 when he passed on, and his *Contest Calendar* column in *CQ* Magazine carried details of all the significant and most of the minor local contests worldwide; and Frank passed copy galleys of his piece each month for more than 30 years to me, his predecessor G6QB, and many another DX columnist around the world. As for his operating skills, he was well-known on Top Band, and the big contests as well as DX. I am told that even in his last illness he wanted to leave hospital so he could be on the bands and work Rotuma for a new one!

Also in the past month I heard of the passing of Ronald Plant G4CP, who died on December 19; his last contact was made the previous day, after a half-century on the air. He was taken ill that night and died next day. G4CP was a past President of FOC, and in DX terms he has been heard to say that if Walvis Bay received approval that will take him up to 370 countries, which is a fine score. (Since writing the above, I have heard that Walvis Bay was indeed accepted.)

Reports

Thanks to everyone who has been so kind as to write, despite the lack of published deadlines. For the next few months, the deadlines are to reach me by March 26 and April 30. The address as ever, 287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA.

News

As always this comes from yourselves, from RSGB *DX News Sheet*, *The DX Magazine*, *The DX Bulletin of VP2ML*, *The Canadian Amateur*, *The Contest Calendar* now under K1AR and of course a pair of Mark One ears; my thanks to all these sources.

FJ/N0IMH will be active from St Barthelemy, on all bands s.s.b./c.w., March 15 to 31. This one counts as St Martin for DXCC purposes. QSL to N0IMH at his home.

FT4WB is a new call on Crozet; QSL via FD6ITD, Jean-Pierre Berthoumieux, 29 Rue du Cammas, F-31650, Saint Orens de Gameville, France.

There are now four amateurs on Kerguelen, FT5XA and FT5XH; QSLs for the former to FD6ITD as in the previous paragraph, while the latter's cards will be handled by F2CW, J Calvo, Le Bois de L'Essard, Nercillac, F-16200, Jarnac, France.

The VR6 gang have been joined by G3OKQ, who arrived on January 16; Jim was VR6JR back in 1985, and will be active during the forthcoming VR200 celebrations.

Around the CQ WW WPX SSB Contest time, three members of a group called the Pacific Association of Overpower Needers DX Club(!) will be operational from Ogasawara, between March 22 and April 1 as JK1ZNB/JD1. QSLs via JS1GHA, PO Box 24, Nakahara, Kanagawa 211, Japan.

Sad Tales

From *DXNS* I hear the saga of KH6JEB's attempts in response to a request from T77C to get a T32BF card from KH6GDR for I4SJZ. Compressing things a little, KH6JEB tried for almost a year by letter and telephone, and in the end actually paid a personal visit to KH6GDR before he succeeded. What a contrast - KH6JEB going to that trouble, and the couldn't-care-less attitude of KH6GDR.

I hear there are problems over the XW8KPL/XW8KPV documentation; it seems they were 'authorised' by the KPL News Agency following 'verbal permission' from the government. The 'documentation' so far, as I understand, was merely a piece of KPL News Agency headed notepaper setting this out. If in fact this is true, then it must throw reliance on to the XW8DX/XW8CW operation; but here I understand that the written authority for the operation is being translated for ARRL. Await developments on this one!

The 3A2AG who asks for QSLs via OH2DY is another Slim - don't waste a QSL on him.

Reports

Let me first say how pleased I am that despite the absence of given deadlines, many people have written in, making my work that much easier.

The 28MHz Band

As one would expect, the normal downturn in conditions due to winter has affected 28MHz more than the other bands; but that is not to say that there have been no pickings for the dedicated.

G0CKP (Tonbridge) says his interest in DX chasing went up several points when he changed from a four-element Minibeam to the present TH3, despite having hooked 240 countries on the Minibeam in one year. Since the TH3 has been up, Steve has managed 207 countries on 28MHz alone in a year. G0CKP is very much a c.w. addict and his crop for this period included XT2KG, AP2UR, BY1SK, 9J2BO, VP5P, P29PL, ZF2OA, XW8CW, HZ1HZ, CN8FC, TU2JT, J37AE, 9V1YC, 8P9EM, 6W1QB, V31AT, 8P9FF, XW8KPV, XV2A, 3Y5X, 8Q7BX, 3W5JA, BV2OA, 5Z4FN, 3DA0BK, 3C1EA, 7P8FC, JD1AMA, KH0/JF2SKV and V31TP.

GM4UQD operates both c.w. and s.s.b. from his mobile set-up, around the Livingston area; on 28MHz c.w. Alistair managed WB4FFW, VE1AID (Prince Edward Island), W7IR, WB8VP, NE3P, PY2CYE, RA3GD, PY2ACJ, K4FAD, PY1JE, PS7HMB, KA0O and VE3DXR who originally hailed from Glasgow. On the s.s.b. front K4PI/PJ7, V47KO (St Kitts, QSL via K3NZ), WA8HSV, W1EXC, LY2CL, K8KKK, AD3V, SV1YH, KA2YZW, WP4Q (Puerto Rico), XL32AR for a VE special-event, KA3TSN and KA3LOQ.

Next the letter from **G2HKU** (Minster), who stuck to the key 100% during the period, to manage WY0B, KN0V, NR7O, FH5EJ (Mayotte) and 3DA0BK for Swaziland.

Next we look to **GM3JDR** (Aukengill); taking the s.s.b. contacts first I note V47KO, K4PI/PJ7, YC1DYB, PJ7A, 8P9X, 4U1UN, VP2EXX, PJ8T, PJ1B, V47K, HL9OB, LU4YZ, YC1FCC, LU5DSE, VS6WS, 9N90ILY, PY3OL; on the c.w. front, I see 4M2BYT, HC8U, CE1LDS, FG5R, J79DX, LU4FD, HL1IE, HL1XP, PP7JR, PJ4/K3IPK, BY8AC, XW8CW, XW8KPV, PU1AAS, CN2OX, FR4FD, 9Y4H, YV5AE, UA0LT, UA0FDX, PY1AVZ/PR100, PR1VOY/PR100, 8P9HR, 5C2CW, 3C1EA, YV1FVU, 9J2BO, ZD8VJ, UA0ZWI, ZV7A, CW8B, JT1T, BY5RA, BZ1OK, PY0/PY1DFF, XF4T, 8J2DEP, FH5EJ, JW9XG, ZP0Y, TL8CM, 5U7QL and 8P9HT.

Turning to **G0HGA** in Stevenage, Angie says her friends just don't believe how many Ws she has raised; the list in front of me is too long to give in full, but let's just mention some 18 in W1, 12 W2s, 10 W3s, 25 W4s, 7 W5s, 5 W6s, 4 W7s, 13 W8s, 15 W9s and 5 W0s; not forgetting the other stuff, such as VE5ZX, VE3OXR, VE2GDI, VE3EAM, VP2MT, HK7/SM5SV, PY1BVY, HK1HHX, PY2GVQ, TF3EJ, UZ9WWB and 4Z4DX. These were all hooked on c.w., with around 50 watts to a vertical dipole; s.s.b. raised UA3LIL and 9H1HV when testing a microphone!.

Now to **GW0HWK** (Wrexham) who makes his first appearance; Mike operates from home with an Icom 720A and a TB2 at 10m, and from the work QTH in Ruthin where the antenna is a home-brew trapped dipole at 7m. Mike in fact has a mighty problem at the home QTH in that when beaming NW, he is looking straight at a mountain some quarter-mile away which rises another couple of hundred feet above the QTH, so all the contacts towards USA tend to be 7-9 S-points as compared with other stations a few miles east. Reception checked by substitution, no problem: what to do? Perhaps the only possibility, short of relocating much nearer the top, is to try lowering the beam to see if the power (and incoming signals) can be persuaded to at least launch over the top. However, as some consolation, the 28MHz signals noted included UA9LEH, AP5HQ, FC/G4CAJ/MM (British Virgin Is), NH6CJ/5 for Oklahoma, AK6T, N0DYY, N5LFT (Mississipi), NK5K, VK8UK (Darwin), N8IHS with 2W in Michigan, the 3 watt W1BDC and various smaller fry.

Next we have **ON7PQ** (Kortrijk); Pat sticks to his c.w. last, having made 5BDXCC, WAZ, 5BWAC this way, and for this time the results were XW8CW, FR4FD, XW8KPV, AP2UR, XV2A, 3Y5X, 3W5JA, FP5HL, EA9EA, VK6XA, A92QL, ZS8MI and TY0AS.

After an all-c.w. merchant, an all-s.s.b. merchant: **G3NOF** (Yeovil) noticed things were good to N. America but not-so-hot in other directions, until the last few days before he wrote. Single sideband contacts were made with BY5RT, BY8AC, HL2IVL, J79CH, JAs, TU2QQ, V31BB, VS6BX, WA7GIG (Idaho), WB9CQX/7 (Arizona) and ZS6UN/OH7NRW.

Now a young newcomer to the hobby makes his bow; **G0MFR**. Gareth makes his start in the hobby at the ripe old age of fifteen, and seems to be a 100% c.w. user. On 28MHz, he raised YV6AZC, VK6ASM, 3Y5X, UA0AAB, JA3VXH, PY1BVY, TR8JLD, XX9TDM, TZ6VV, V31AT, CO8LY, 3DA0BK and 9J2AL.

Finally, an old-timer; **G3BDQ** (Hastings) who sounds thoroughly fed-up with his results this time; be that as it may, 28MHz still yielded 3Y5X, UB4MZL/RL40, 5U7NU on s.s.b. for an all time new country, ZLs and VKs.

WARC Bands

My appeal for more news of the goings on has been heeded; special thanks to all who did so.

First a newcomer **G0BXQ/M**. Rod is a 100% mobile operator, but can only get on outside working hours. For the moment on 24MHz, Rod is chasing a WAS, for which at the time of writing only Idaho and Mississipi were still outstanding. Some 49 countries have been raised and there are regular contacts with VK and ZL.

Another newcomer is **G0GQK** (Newport, Shropshire), says he "inhabits 12 metres most days" and considers it a refuge for ragchewers and those who dislike contests. Mel reckons on almost daily contacts with N9DEO, W2FLK, W7ZJ, W1DW, W1KHL, W0ZFC, WA1FNU, KB9AA, WD0BRV, WA1QPE, W2EIY, WA6KEP, WB6JSB and W6SAI, on 24MHz; as for 18MHz, the most regular denizen of the band is W2FJ. Mel uses a TS-530 and a home-brew 2-element beam

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for 21MHz, which with the aid of a Capco a.t.u. is loaded on 10, 12, 15, 17 and 20m.

Yet another newcomer is **G5FF** (Stroud), who is also ex-G5AB and ex-SU1AB. Arthur follows 18MHz each day at 0900 and 1900Z, with an FT-102 and an 80m dipole fed with 72Ω twin feeder from a site around 240m a.s.l.

This set-up on c.w. managed JJ1NHY, JR7DPV, JA7SSB, JA3JM, JA1LFS, JA5NNS, JA3SRB, JA8LG, JJ1FSK, JA4VUQ, JA1DTC, JA1CBF, JA8GMZ, JR5JAQ, JA1VND, JA0VUQ, JA4CSH, ZL1ATZ, ZL1HY, ZL1FZ, ZM2AGY, ZL2UW, ZL1BEK, VK7AAQ, VK6AKG, VK6RQ, VK3OX, VK3MR, VK3DQ, W6QNA, WB6FKR, WB6LCV, WZ6C/ST4, W6SO, K6KEO, K6TL, KW5A, K6JFY, W6QV, KH6AQ, N6AR/P, K6VPN, KL7CYL, W7GB, KN7K, KL7RYL, KL7GU, KL7US, FY5YE, ZM1BSG, VE1, VE2, VE3, VE7, VY2 and lots of smaller fish.

All three WARC bands were tried by G2HKU; Ted mentions WB2QMU on 10MHz, while on 18MHz there was a QRP contact using four watts, with AA2U, and a normal-power one with W8IQ; and on 24MHz KJ6FY and KB7ECP/1 were raised.

Turning to GW0HWK, Mike found it very quiet when he got to checking it in the early evenings; GM4TYU was raised for a new county, and loads of USA and Russians 'working each other by the logbook full' - low signals to Mike. As for 24MHz, there was more activity, including QSOs with J37AJ, ZB2IT, WU6T, WB2YRL, N9DEO, W1KHL, N8KMW, W3ASA, KA5W, NA8D, W0SPF, KB8FEI, W2DV, KC1NO, WB1FDW, N2CTZ, W4EKQ, KD3JG, W3HAO, W9WPV, VE1HT, W1KAL, W2RVK, WX8Y, KA9CPU, W2WGL, W8MTC, N1GCQ and lots of Europeans and Russians, usually calling DX.

G3NOF almost forgot to mention his forays on 18MHz, but he does say that all he managed were the odd European and East Coast W contact.

The 21MHz Band

Space closes in upon me apace, so I will have to be brief. G3BDQ worked 3Y5X on c.w. and s.s.b., XV2A (c.w.), CE1HIK, HS0AIT and A43XA all s.s.b.

The c.w. from G0CKP went to VP2EM, XW8CW, HS0E, EL2FQ, 5H3ZW, VP5P, XW8KPV, A41JV, 3Y5X, 5Z4FN, FR5AI/G and XX900.

Leighton Smart GW0LBI (Trelewis) has a trap dipole and monoband dipoles for 21 and 14MHz at 4.5m a.g.l., fed from an FT-101E, but he prefers to stick to one watt or less QRP, and on 21MHz he was happy enough to raise UB5ZFN and HA9KRQ.

Contacts on 21MHz for G3NDF included s.s.b. with CE7ZK, DU9RG, ES5DE, HK4BHA, JAs, NH6HF, UD6DFF, UH8AAQ, UL8JJ, UL7GX, UW0MF for CQ Zone 19, VE1MIC (a special for the Curling Championship), VKs, VK9ND, VP2EXX, XT2BX, Y2/DL8NBJ/P, Y2/DL8NBJ both Ruegen Is, YI0AD, ZL7NAB, 3W3RR, 3Y5X and 8P9AF.

GW0HWK mentioned WA1N, W8LRH, KA5KBP, K4ROZ, KA4ETQ, VE7WES, N3FLU/M and various EU stations.

Turning to GM3JDR, Don mentions J79DX, PJ4/K3IPK, TU4B, 8Q7BX on c.w., while s.s.b. accounted for TL8WD.

Now to DN7PQ; Pat mentions 3Y5X, 3W5JA, 9N90ILY, FR4FP, 3D2XR, JT1CS, A43XA, ZS8MI, TY0AS and FW/SM7PKK.

The 14MHz Band

Let's first see how GM4UQD made out; c.w. to VE3BMC, VE2GNW, UA1ZY (Murmansk), VE3IVT, and on s.s.b. UW9AWZ, EA8/DK4KF, UL8LWZ, GM0IJY/P on Hutton Oil Platform, UL7OB, 4X1BD, 4X4FR, KD7N, VE7TB, W6RXF, VE6MV, VE7IG, VP5Q, HI3HBD (QSL via HI8LC), KD7TI, UL7FEC, VP2EXX, plus shoals of East Coast Ws and smaller fry.

G3BDQ offers just two; JA7GBS and WA7NXS, with just 100 watts to a sloping dipole.

G0CKP says his crop included XX9AF, 9M5HF, HS0E, 3D2WZ, FK8FG, 5H3ZW, XW8CW, XT2KG, 3D2XR, 3W5JA, G4WYG/ST2, 3W3RR, ZS8MI, FO0GMZ, T32BE and Z21CA, all on c.w.

GW0LBI deployed his one watt on this band for PA0HTT, DJ2ID, DK1DXK, IK1DHA, SM5LJB and 4N7N.

Still with c.w. G2HKU offers 4K3BB and UW1ZC/UA1O (Novaya Zemlya).

G3NOF left the band alone while conditions were better, so he only has A92QL, DK7UY/J6L, TU2QQ, VQ9HB, YJ8AB, 3W3RR and 9K2YA.

GW0HWK doesn't bother much on 14MHz either; 9Y4IBN, K1QXK/M, plus lots of East Coast Ws and Europeans.

For GM30DR it was LY38M, ZK2RY, J6DX, PJ4U and 8P9HT.

As for G0HGA, Angie managed various EUs with her long-wire, but the pick was a one-watt QSO with CT4CH who was himself using 5 watts.

DN7PQ says his log includes ZD7KM, 3Y5X, 3D2XR, 9J2AF, VQ9DX, FR4FP, ZD8VJ, K7SS/PTI (Puyallup Tribe of Indians), A92QL, 7X4AN, VP2V/W2GUP, TY0AS, ZF2OS, HP1AC, V2/G6QQ, PJ9JT and DK7UY/J8.

We close this section with G0MFR, who mentions KH6IJ, VU2AYB, ZD8VJ and KH6CTQ.

Top Band

G3BDQ had a single foray and managed 9H8B, and heard some SMs calling on sked for a VK5 one evening, fruitlessly.

GW0HWK is just getting going on the band and so far as worked a couple of locals and heard various G and GM stations.

G0HGA mentions many Gs, GM4SID, GD4BEG and PA0DWW from her 20m wire.

The 3.5 and 7MHz Bands

Alas, my space has run out, so I will have to pass up on these two. However, I acknowledge and thank GM3JDR, G0HGA, G0MFR, ON7PQ, G3NDF, G2HKU, GW0LBI, G3BDQ and GW0HWK for their notes covering 3.5 and 7MHz.

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Solar Data for January 1990

During the first two weeks or so of January there was a general decline in solar activity. In the first week sunspot levels were averaging around 190, and consequently flare activity was very low. The geomagnetic A index was quiet for most of the time, dipping down to 4 units on January 6. The solar flux level similarly fell, averaging 196, for the period up to January 7. The flux levels continued to fall during the second week, being 165 units on January 9. Only one small flare was noted during this period. This general decline was bad news for 50MHz enthusiasts. However activity started to pick up from January 15 and a considerable rise in solar flux levels was recorded. The level on January 21 was up to 265 units. Unfortunately these levels are way down on those forecast for this time of the year. The geomagnetic A index declined to quiet and on January 19 it only made 2 units. Between January 23-25 some very large sun spot groups were seen crossing the sun's visible disc. Numerous small flares were responsible for a number of ionospheric disturbances giving rise to a few auroral events towards the end of the month.

Radio conditions during January were pretty gloomy. If the wind didn't grind your antennas into the ground, then the heavy rain certainly helped to dampen any enthusiasm for 0Xing. All in all a pretty dismal month. Still, spring is on its way and hopefully many of you will be busy resurrecting the antenna systems ready for the Sporadic-E and tropo seasons.

The 50MHz Band

First up this month is a report from **John Heys G3BDQ** (SXE) mentioning that conditions on the band during January took a dive, and that 0X openings almost vanished. Before the band changed for the worst, John caught a brief 15 minute opening on December 27 in which a number of W1 stations were worked. Conditions on December 28 were much better with a good opening between 1345-1555UTC to VE1, W1, W2, W3, W8 and W0. KA0KK (Iowa) and K0IR (Minnesota) were particularly good contacts in this event. The first day of the new year saw an opening between 1520-1550UTC with stations in W2, W3 & W4. ON4ACO (JO10), worked at 1354UTC on January 4, was claimed by John as a new country. My understanding of the situation is that although ON stations obtained permission to operate on 50MHz, no permits had in fact been issued during January. Some Belgian stations were later quoted as saying they had come on the band 'inadvertently' without realising that permits were required! On January 15 there was an unexpected Sporadic-E opening to Scandinavia in which LA1YCA, LA2FGA, LA3HO, LA9BM, OH2TI, OZ4VV, SM6PU and SM0CHH were worked between 1929-2025UTC. John has now worked 40 countries on the band and has also obtained his final card, from Japan, for the WAC award.

Ian Galpin G1SMD (DOR) reports that the opening on January 15 had apparently started around 1530UTC but because of work he was unable to get on until 1815UTC. In the following three hours, contacts mainly on s.s.b. were made with LA9BM, OH1YP, OZ7DX, SM6ESG, SM6KJX, SM6PU and SM0CHH. Other stations heard but not worked included LA2FGA, OH2TI, OH5IY, OZ2OE, OZ4VV and SM6ESG. Ian wonders if any Es contacts were made on 144MHz around 2030UTC when, he noticed the skip on 50MHz shortening to about 800km.

At my QTH (HWR) I managed to catch two Es openings. The first occurred on January 1, between 2215-2245UTC. Contacts on c.w. were made with LA1MFA (JP99), OH2TI (KP20) and OH9SCL (KP26). The other opening, on January 15 between 1750-2040UTC, resulted in contacts with OH3MF and OH3XA both in

Back-Scatter

KP20, OZ1CFT, OZ4VV, OZ7DX, OZ7IS, SM6CKU and SM0CHH.

Ted Collins G4UPS (DVN) hardly misses any openings on 50MHz. In the first three weeks of January a sizeable amount of real DX was recorded. Contacts were made on January 1 with VE1YX, AA2U, K2UOP/4, WB4OSN (EL96), WB2PMP/4 (EL96), WA4OWC (EL97) and WD4IXD (EL98) with V31PC and KP4BZ being heard at 1545UTC. Nothing was heard on January 2 but the next day gave contacts with HC5K and W3EP/1. Ted reports that J37AE was heard working into G & GW at 1240UTC. On to January 4 with contacts being made with VE, W1,2,4 & 8. Stations heard included DL3ZM/YV5, YV4AB and YV5ZZ, all around 1245UTC. TI2HL was worked at 1423UTC on January 5, the FY7THF beacon heard at 1152UTC on January 7, VE worked on January 12 and W1 and W3 on January 16. On January 19 there was a good opening to the States with VE1BVL, VE1YX, K1TOL, WA1OUB, WA1T and K2QIE being worked on c.w. at strengths between S7-9. All excellent DX, just showing what can be worked if you are prepared to put the time into the band. Ted also worked the normal European theatre during the month, contacts being made two-way with CT, GM, LA, OH, OY, OZ, SM, SV, T77 and, via crossband, with OE and OK. A DL station also appears in the log but I think we had better ignore that one!

The 70MHz Band

Ian Wright GW1MVL (CWD) reports that he now has a Pye Westminster crystalled up on 70.450MHz and 70.475MHz and that a local station GW1LHV has a similar system.

Dave Brown GD4XTT (IOM) has plans to become active on the band. He intends putting up a 50/70MHz dual band antenna, 4-elements and 5-elements respectively. The intention is to convert his 50MHz Spectrum transverter to 70MHz and to this end Dave requires the circuit diagram of the Spectrum TRC4-10 (early type). Can anyone help to get GD4XTT on 70MHz? Send photocopies to Cleckheaton, Ballaragh, Lonan, Isle of Man.

Operators of the band may care to note that **Bob WA1OUB** has 70MHz receive capability and may wish to try for crossband contacts when F2 conditions look right.

The 144MHz Band

John Hoban G0EVT (YSW) reports that a good tropo opening occurred on December 2-3. Contacts on the 2nd were made with SM1ALH (JO97), SM6RTM (JO78) and SM7PXS/7 (JO86). Many SM's in JO57, 86 & 87 were heard, the best being SM0NMJ in JO88. The opening also extended to Denmark and East Germany. By December 3, propagation had shifted more to the east allowing contacts to be made with ON, OZ, PA and Y. Auroral openings on December 12 & 30 gave contacts with a number of Scottish stations, GM4IPK being particularly strong on the 30th. Results in both the Geminids and Quadrantids meteor showers seemed very poor. YU2EZA was the only station to be heard using random operation on December 13-14. A listening session on January 4-5, two days after the peak of the Quadrantids, gave short bursts of signals from OE5DLL, OK3LQ and I4XCC, but John was unable to complete with anyone.

Peter Hirons G1CEI (HPH) entered the 144MHz Fixed Station Contest on December 3 and was pleased to work G4KUX (DHM) for a new county. Best DX of the day was GM0GMD in Stirling. Conditions on tropo were found to be quite good on January 2. Contacts were made with EA3AWD (IN93), FC1GXX (IN95), FC1OQJ (IN96), FF1LEQ (IN97), F6HRE (IN93) and F9LB (IN96).

At the QTH of **Steve Damon G8PYP**, (DOR) the band has been remarkably quiet. Tropo lifts allowed contacts with PE1NCB (JO22) on November 29 and F6HRE (IN93) and FC1OQJ (IN96) on January 2.

YU2PHI was heard at 0115UTC on December 14 via the Geminids shower, and IK4DCX heard at 0227UTC on January 4 via the Quadrantids shower, but in both cases contact could not be completed.

The 430MHz Band

Paul Brocket G1LSB (LCN) managed to eke out what little tropo signals there were on the band. On December 2, contacts were made with SM6AFH (JO66), SM6CEN (JO57), SM6HYG (JO58) and SM7NNJ (JO86). Conditions into Western Germany were good on January 3 allowing Paul to work DF7VX (JO41).

Having experienced good 144MHz tropo conditions on January 2, Peter G1CEI moved up in frequency to 430MHz and was pleasantly surprised to observe that this band was also open. At 2214UTC contact was made with EA3AWD (IN93) for a new all time country. Within the hour, s.s.b. contacts were also made with FC1GXX (IN95) and F9NB (IN96). Peter mentions that the weather map had a high pressure area over France with the isobars running due north/south.

Over on the Isle of Man, GD4XTT, has been having a fair bit of success since upgrading to 30 watts and a 21-element Yagi. In fact, Dave reports that it has made a tremendous difference to the performance of his station since installation last November. During the latter part of November and early December, contacts were made with G1IWO (NOR), G1JYB (YSN), G3KBS (BRK) and G4JNZ (HPH), bringing the county score up to 34. The band was in particularly good shape on December 3 allowing numerous contacts to be made with stations on the near continent and south-east England. DL3KP (JO30), FC1LUW (JO10), 30 PAs and 10 ONs were worked. Most signals were at the S9+ level, even 1 watt stations in Holland were peaking around the 55 mark. Dave reckons he could have worked many more continental stations but he tended to concentrate on Gs in southern England. Dozens of stations in Buckinghamshire, Bedfordshire, Cambridgeshire, Suffolk, Hertfordshire, London, Essex, Kent, Surrey and West Sussex were worked. Dave was especially looking for G4BLX in East Sussex but couldn't hear him on. During the event GI0GDP (ATM) was contacted to bring the country score up to 12. The tropo conditions continued through to the next day, giving more contacts into DL and PA. County No 43 was notched up on December 8 by working G4MAP (HWR).

The Microwave Bands

Congratulations to **Julian Gannaway G3YGF** who won both the narrow-band and wide-band sections of the recent 10GHz cumulative contests. G3ZME and G4EFT came second and third respectively in the n.b. section, whilst G0KZP and F6DPH obtained silver and bronze positions in the w.b. section.

VHF News

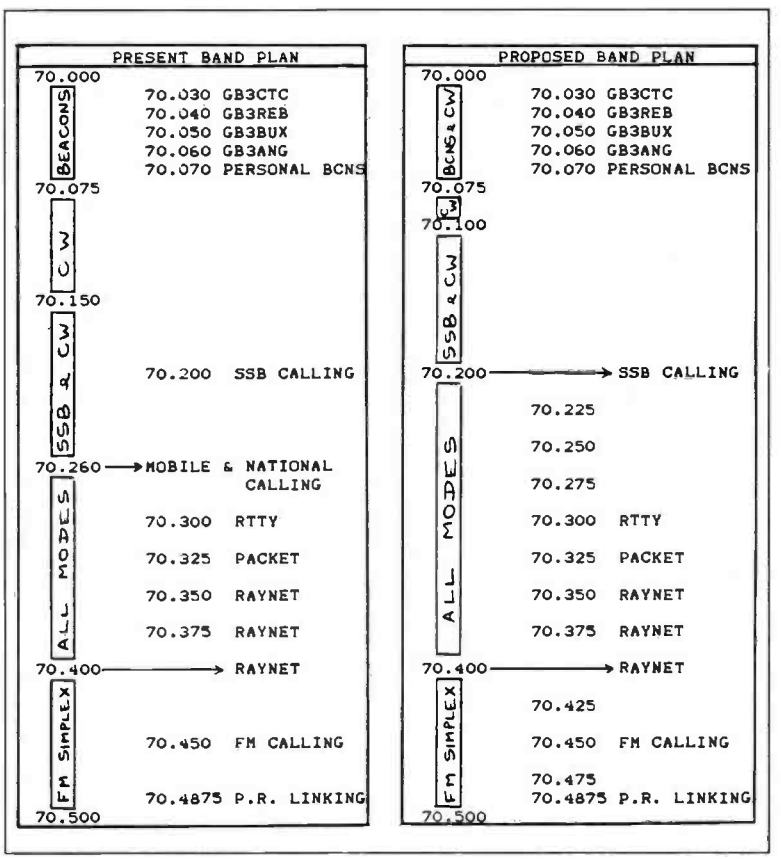
Detlev Y22HA has recently changed sides and is now living in West Germany. He sends his 73s to all radio amateur friends and hopes to be active someday with a new callsign.

A few months ago I mentioned that **Mark Salorskis GM6TKS** was being posted to Gibraltar. He has now been issued with the callsign **ZB0T** and should be active on both 50MHz and 144MHz. Watch out for Mark during the Sporadic-E season.

Bo OZ1DJJ returned to Greenland during February. He is active from various squares on 50MHz and 144MHz using the callsign **OX3LX**. QSLs go via Uffe Lindhardt OZ1DOQ, Ostrigade 49, 2tv, DK-2300 Kobenhavn S, Denmark.

New Countries on 50MHz

Last month I reported that Denmark has obtained 50MHz operating privileges. Further details have been obtained from Ivan Stauning OZ7IS. All classes of amateurs, with a valid licence, are allowed to use the band 50.0 - 52.0MHz on the following terms. The band is primarily reserved for broadcast and television purposes as well as land mobile services. In case of interference the use of the band will cease immediately. The relevant power limits are 100 watts input for



Proposed 70MHz Bandplan

Back-Scatter

Annual v.h.f./u.h.f. table
Final Positions for 1989

	50MHz		70MHz		144MHz		430MHz		1296MHz		
Station	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Total points
G1SWH	68	33	71	7	93	24	60	9	—	—	375
G6HKM	57	46	—	—	82	29	50	18	36	10	328
G8LHT	64	19	35	5	81	32	56	15	12	5	324
G4ZTR	30	17	49	8	73	27	25	8	23	5	265
G0IMG	69	29	41	5	56	12	27	5	—	—	244
G1DOX	36	18	49	6	66	18	29	6	16	7	241
G6NB	70	44	—	—	56	17	26	4	—	—	217
GW6VZW	72	33	—	—	75	21	—	—	—	—	201
G4LDR	43	12	—	—	61	16	52	12	—	—	196
G8PYP	34	29	1	1	59	26	29	11	—	—	190
GM1SZF	40	26	—	—	71	21	17	8	—	—	183
G1LSB	28	11	—	—	47	27	47	18	—	—	178
G4XEN	21	9	13	2	63	21	33	9	—	—	171
GD4XTT	34	9	—	—	58	15	43	12	—	—	171
G0EVT	28	29	—	—	40	29	6	7	—	—	139
GM4CXP	28	11	4	1	61	19	4	2	—	—	130
G0EHV	—	—	44	5	62	16	—	—	—	—	127
G0FYD	3	5	—	—	88	23	4	2	—	—	125
G8XTJ	40	14	—	—	54	13	—	—	—	—	121
G3EKP	25	15	27	6	25	7	5	4	—	—	114
G4VOZ	—	—	64	8	—	—	31	7	—	—	110
G1VJP	15	4	—	—	74	12	—	—	—	—	105
G1CEI	5	5	—	—	60	14	12	5	—	—	101
G3FPK	—	—	—	—	72	27	—	—	—	—	99
G1TCH	21	23	—	—	38	15	—	—	—	—	97
GW4HBK	—	—	61	7	—	—	24	4	—	—	96
GW1MVL	—	—	—	—	56	22	3	4	—	—	85
G7CLY	—	—	—	—	58	14	4	1	—	—	77
G7CFK	43	33	—	—	—	—	—	—	—	—	76
G1GEY	4	2	—	—	—	—	34	8	2	2	52
G4AGQ	—	—	16	3	14	8	9	2	—	—	52
GM1ZVJ	3	4	—	—	26	16	—	—	—	—	49
G0HGA	—	—	—	—	32	12	—	—	—	—	44
G6MXL	2	1	4	1	7	4	8	5	—	—	33
G0HOZ	—	—	—	—	25	4	—	—	—	—	29

licence classes B, C & D and 500 watts input for A & E licence classes. This arrangement will run until 31 December 1990, when it will be reviewed. The Danish PTT announcement also covers the Faroe Islands. OY9JD is active and has already worked a number of UK stations. Catch him via aurora or Sporadic-E.

Belgian amateurs have also been given permission to operate on 50MHz, although at the time of writing no permits had been issued. They are allowed, on a secondary basis, to use the band 50.000-50.450MHz with a maximum transmit power of 30 watts. Note that the band is not likely to be available to UK amateurs operating in Belgium under the CEPT agreement.

The January issue of the Swiss Radio Society's magazine *Old Man*, indicates that permission to operate between 50-52MHz has been granted. Again, at the time of writing no permits had been issued.

Among those known to have applied for permission are HB9CRQ, HB9DBM and HB9QQ. The maximum power allowed is 100 watts e.r.p.

The initial permits run for 12 months, ending on 31 December 1990.

A letter from the Austrian PTT, dated January 14, mentions that Austrian amateurs may use the band 50-52MHz from February 1, for a preliminary period of 12 months. Fixed stations will be limited to 25 watts into antennas of horizontal polarisation. No mobile or portable operation is allowed. There is a geographical protection zone within which operation is not allowed during TV hours, approximately 0900-2400UTC. Call areas OE2, OE5 and part of OE6 are allowed 24 hour operation.

Luxembourg amateurs should be allowed access to the band fairly soon. They are awaiting written permission from the authorities.

All this progress is very good news. Excluding LX, I note that 29 DXCC countries in Europe now have permission to operate on 50MHz. I'll give you one month to work out which they are!

Proposed 70MHz Bandplan

Over the past 12 months or so there has been a considerable increase in the number of stations using the channelised area of the band. Recently the RSGB VHF Committee looked at ways of modifying the existing bandplan to create additional channels in the all mode and f.m. simplex sub-bands. It must be stressed that the proposed plan is exactly that. It is a proposal open for discussion. The VHF Committee require your views before any moves are made to alter the 70MHz bandplan. Study of the proposed bandplan shows that none of the sub-bands are disadvantaged. The exclusive c.w. allocation is reduced by 50kHz but at the same time the beacon band will not be an exclusive allocation, the same situation incidentally as 50MHz. The s.s.b. sub-band is reduced from the existing 110kHz down to 100kHz, hardly much to complain about. The s.s.b. calling frequency on 70.2MHz is retained. The only move that may cause inconvenience is the move to phase out the National and Mobile calling frequency on 70.260MHz. It may be possible that crystals can be tweaked up/down to 70.275MHz or 70.250MHz and that one of these frequencies eventually becomes the calling frequency. Can operators with p.m.r. equipment see if there is any difficulty in shifting 10kHz or so? I would be interested to see if you can accomplish this. With the proposed plan a number of All Mode and f.m. channels will become available for use. If you can think of any alternative plan let me know. Before you go moving the packet radio channels around, you should remember that the DTI have only given clearance for 70.325MHz and 70.4875MHz. New frequencies would have to be negotiated, and this can take some considerable time. What do you think? Contact me with your views now, before it is too late!

Help Wanted

Jim Smith G1DWQ is appealing for help regarding r.f.i. problems he is experiencing. The interference is coming from an Amiga 2000 computer located extremely close to his shack. This machine totally wipes out 50MHz and to some extent 144MHz. Although it is mounted in a metal case nothing seems to reduce the problem. Ferrite rings around the mains lead and various forms of earthing have been tried. Jim has tried running his station from batteries but to no avail. Does anyone have experience in tackling this type of problem? If you can provide a solution contact Jim Smith, 61 Mallard Road, Colehill, Wimborne, Dorset.

A slightly unusual request insofar that GD4XTT wants some of you to stop sending certain items to him. I refer of course to stamped addressed envelopes. They are simply not valid in the Isle of Man, or in the Channel Islands for that matter. Dave apologises to all those who are sending QSL cards to him and are not receiving direct replies. Since making improvements to his station the number of cards received has increased greatly and he cannot justify buying stamps on a continual basis. Dave recommends that it is worthwhile joining the RSGB just for the bureau facility alone. It is more cost effective than sending out QSL cards via alternative methods.

Expeditions

Want Lord Howe Island on 50MHz? Steve Gregory VK3OT and Joel Paladino N6AMG will be signing **VK9LE** from March 25 to April 8. QSL's go via VK3OT.

If you really want to be imaginative, try listening for Kerry Mundell ZL2TPY who will be activating Kermadec Island (AF09). He will be using the callsign **ZL8TPY** between March 29 - April 8. Equipment will run between 300 to 400 watts into a 5-element Yagi.

Another New Zealander, Ted Barnes ZL2TAX, will use the callsign **ZL7TAX** when he activates Chatham Island (AE16) between April 2 and April 9.

Richard LaChance AH6IO and Bert Ingalls KH6HI are planning to operate from Central Kiribati (T31) and Kingman/Palmyra (KH5) on 50MHz sometime during March or April.

Another expedition planned for the same time frame is by Jim Treybig W6JKV. He is hoping to be active on 50MHz from Wallis & Futuna Islands (FW). It is also possible that Easter Island (CE0) and San Tome & Principle (S9) may also be visited during 1990.

Jim Russell G3OKQ will be operating from Pitcairn Island for at least 3 to 4 months with the callsign **VR200JR**. He has a TS-680S and 3-element Yagi, plus 3 big 'lorry' batteries which he should be able to charge up each evening when the Pitcairn 240VAC generator is on. Although Jim has been on Pitcairn before, this is the first time that the Island has been activated on 50MHz.

Towards the end of May, G4ZUR, G8BFL and G8UUR will be attempting to activate the 3 peaks, Ben Nevis, Snaefell and Snowdon on 50MHz and 144MHz. The group also wish to warn those of you thinking of mounting an expedition to Sark during July. Don't! They plan to go there between July 21-28 with equipment for h.f., 50MHz, 70MHz and 144MHz.

Another team visiting the Channel Islands will be the Northant's Expedition Group. They will activate the Island of Herm, between May 1-8, on all h.f. bands and 50MHz. Further details next month.

Wet Squares

Last month I gave details of the survey trip that the Royal Research Ship *Challenger* was carrying out in the Atlantic Ocean. Andy Adams GW0KZG/MM has sent me modifications to the previous schedule and an update on the second leg of the journey. The R.R.S. *Challenger* sailed from Barry, South Wales on February 26 to carry out equipment trials in the Irish Sea, arriving at Ardrossan (IO75) on February 28. The first part of the scientific cruise started from Ardrossan on March 1, going to the working areas described last month. There will be port calls at Oban (IO76) on March 10, Torshavn (IP61/62) on March 19 and Torshavn again on March 28. R.R.S. *Challenger* will sail from the Faroe Islands to Dundee on March 29 arriving in IO86 on March 31. Previously the North Sea cruise was to have started from Great Yarmouth but to rationalise between the two trips and to avoid unnecessary steaming the start will be from Dundee on April 4. There is some uncertainty as to the direction Andy will take on leaving Dundee, or the daily programme, but there will be a short port call on April 15, in Den Helder, Holland (JO22/23). *Challenger* is scheduled to arrive in Great Yarmouth (JO02) on May 3. I can supply, on receipt of a stamped addressed envelope, a locator map giving plots of both proposed cruise tracks.

Further information has been received regarding LA0DT/MM. Damion will be active from February 5 to March 5, then off for one month and active again from April 5 to May 5 and so on. When he is active, between April to September, Damion will sail from Bergen (Norway) to Spitzbergen (Svalbard). He normally puts calls out at 0030UTC on 144.300MHz and then moves up to 144.315MHz. When Damion is not sailing he is active using his home call GM4JEF from IO89.

Back-Scatter

Beacon and Repeater News

GB3NGI, the beacon on 50.057MHz, is off the air following damage to the antenna system.

Terry Cooper G4XOP, the secretary of the Mid-Cornwall Beacon & Repeater Group has passed on information regarding the 50MHz beacon **GB3CTC**. Because of inter-modulation problems the beacon is temporarily off the air. Although spectrum analysis shows the transmitted signal to be clean, it appears that the signal is mixing with a commercial station on site and causing problems with another receiver. Filters have been inserted but the problem still persists. If you want any further details regarding any of the beacons or repeaters under the group's care you should contact Terry G4XOP, 55 Meadway, Parkway, St Austell, Cornwall PL25 4HT.

A new 10GHz beacon, **GB3CMS**, on 10368.960MHz, recently became active. Located near Chelmsford, Essex, it presently runs 2mW into a slotted waveguide. Reports would be most welcome. **Dick Merrell G4GUJ** is the man to contact. He will also give you details of further improvements planned for this beacon.

The Ipswich v.h.f. repeater **GB3PO**, located for 16 years at the BT Research Laboratories, Martlesham Heath, has moved and is now co-sited with the group's u.h.f. repeater GB3IH. It has also changed frequency and cannow be found on channel R2.

The West Sussex v.h.f. repeater **GB3WS** has also moved to a new site. It is still operational on channel R6. Reports would be welcomed by **Mike Senior G4EFO**.

144MHz QRB Table
Distance in kilometres

Station	Tropo	Aurora	Meteors	Sporadic-E
G0CUZ	2943	1758	1996	2943
G0DAZ	1251	876	2026	2249
G0EVT	3080	1640	1808	3080
G0FYO	1315	1624	——	2019
G0ISW	1059	566	——	2057
G0LBK	3060	1755	1876	2350
G1DWQ	1454	1812	——	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	——	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	——	2372
G3FPK	1835	1686	——	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2068
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	——	1978
G6DER	1834	997	1957	2068
G6DZH	1357	711	——	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	——	2265
G6LEU	2620	910	——	2430
G8HHI	1742	——	——	2058
G8JDX	2667	1368	——	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1083	1451	——	2318
GD4XTT	3053	——	——	1700
GI1JUS	3067	1614	1507	2216
GI8YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW6VZW	2830	1473	——	2236
DN1CAK	1420	1166	1948	2725
DN1CDQ	1420	1166	1948	2124

Annual c.w. ladder
Final Positions for 1989

Station	Band (MHz) 50	70	144	430	Points
G4ASR	121	7	386	1	515
G4OUT	-	31	240	-	271
G4NZU	7	19	236	3	260
G0HGA	-	—	192	-	192
G4XEN	7	—	144	9	180
GM4CXP	29	1	114	1	145
G0FYD	-	—	117	-	117
GW4VVX	-	—	73	-	73
G4AGQ	-	15	53	-	68
G4VOZ	-	46	—	8	54
G3FPK	-	—	41	-	41
G0FYD	-	—	31	-	31
GD0ELY	1	—	27	-	28
GW4HBK	-	22	—	-	22
GW4VVX	-	—	9	-	9

Number of different stations worked since 1 January 1989

The Stornaway v.h.f. repeater is undergoing modifications to its control gear. **Revd Bennie GM4PTQ** can supply further details.

In a move to improve incoming signals, the receive antenna of the Cornish repeater, **GB3NC**, has been changed to a collinear.

The Guernsey packet repeater **GB7GP** on 144.650MHz, which recently returned to service, now has a port on 70.4875MHz. Further information should be available from **GU4YMV**. Unfortunately, his particulars are withheld in the latest callbook!

The Scottish packet repeater, **GB7SP**, recently located at Paisley, is off the air as some miscreant has stolen the equipment.

The Amateur Television repeater, **GB3RT**, located at Rugby, has been switched off following a need to change sites. It is likely to be off the air for some time. **Mike Wooding G6IQM**, the editor of *CQ-TV* magazine, can give you further information.

A new ATV repeater, **GB3TG**, located near Milton Keynes, is now operational on 10150MHz. Running 1 watt e.r.p. it is beaming 315 degrees. Already P5 signals have been received 6km away. Reports would be welcomed by **Dave McQue G4NJU**. He might even tell you about the plans to link this 10GHz unit with the group's 1.3GHz repeater.

RF Software for IBM Compatibles

Despite my promise last month not to turn this column into a computer buff's corner I couldn't resist mentioning a new release of software that may be of interest to some of you. **Roger Blackwell G4PMK** has written ASTER, primarily aimed at the amateur astronomer, but also of great use to those whose interests are influenced by astronomical phenomena, in particular radio amateurs. Individual ASTER modules feature; Moon, Sun, Planets, Comets, Stellar objects, Jovian Moons, Meteor Showers, Sun and Moon Calendar and Astronomical Conversions. The program performs positional astronomy calculations and predictions. Outputted tracking data gives the azimuth and elevation of objects at specific time intervals. ASTER runs on a PC or compatible, including PC1512/1640 machines. It is available on 5.25in or 3.5in disk and comes with a 42-page user manual and two year support of any upgrades. Further details can be obtained from Roger Blackwell, 57 Station Road, Scholes, Leeds LS15 4BY.

An upgrade is available to the US/UK RF library of BASIC programs which I covered in detail last month. The changes only effect the program file SAT.BAS. It is a new version and now includes Kepler elements for the sun and moon.

The circuit analysis program MACE has also been upgraded. If you want these upgrades or the VK3UM e.m.e. planner, also mentioned last month, send me three 5.25in disks plus return postage and packing.

QTH Locator Squares Table

Station	1296	430	144	Total
G3IMV	48	124	429	601
G4KUX	—	120	372	492
G3UVR	82	135	246	463
G4RGK	50	124	284	458
G3XDY	91	148	206	445
GJ4ICD	59	119	263	441
G0DAZ	27	128	277	432
G3JXN	87	134	179	400
G0LBK	46	89	254	389
G1EZF	—	93	263	388
G4XEN	—	111	274	385
G6HKM	46	109	217	372
G6DER	78	110	183	371
G4DEZ	49	49	249	347
DN1CAK	7	53	277	337
G4RRA	—	80	255	335
G3CDJ	44	103	186	333
G4SSD	—	93	229	322
G4FRE	72	146	102	320
G1KDF	37	102	180	319
G1LSB	—	143	172	315
ON1CDQ	7	54	251	312
G4TIF	—	110	200	310
G4DHF	—	—	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G8PNN	64	99	129	292
G8LHT	14	93	185	292
G6MGL	59	89	141	289
G4NBS	63	105	119	287
DL8FBD	—	—	280	280
G8ATK	45	91	143	279
G4MUT	31	93	153	277
G0EVT	—	57	209	266
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G6STI	24	69	152	245
G6DZH	—	87	154	241
G3FPK	—	—	241	241
G4IGO	—	—	238	238
G0EHV	—	75	160	235
GM4CXP	—	31	198	229
EI5FK	—	56	172	228
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G1SWH	—	53	149	202
G8MKD	—	49	150	199
GJ6TMM	—	48	151	199
G4YCD	—	—	197	197
GI1JUS	—	—	192	192
G4DOL	—	—	186	186
G4ZTR	30	50	97	177
G7ANV	—	—	153	153
G6MXL	16	45	91	152
GW6VZW	—	6	143	149
G4FVK	21	49	78	148
G4AGQ	1	42	104	147
G0FYD	—	1	142	143
G1DWQ	—	—	142	142
G8PYP	—	31	105	136
GW1MVL	—	22	109	131
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G8XTJ	—	—	116	116
G1IMM	—	17	98	115
GM0HBK	—	—	107	107
G1SMO	—	—	106	106
GI4OWA	—	—	103	103
GM0GDL	—	22	81	103
G1TCH	—	6	95	101
G1SWH	—	53	148	101
G1DOX	8	16	73	97
G1CEI	—	18	77	95
G6MEN	4	26	63	93
G7ENF	—	19	70	89
G4WHZ	7	—	76	83
G0ISW	—	17	59	76
G0HEE	—	—	73	73
GU4HUY	—	—	73	73
G0HDZ	—	—	64	64
G1NVB	—	—	58	58
GM1ZVJ	—	—	48	48
GM0JOL	—	—	47	47
G2DHV	2	7	33	42
G7CLY	—	2	40	42
G7AHQ	—	—	34	34

No satellite or repeater QSOs Starting date January 1 1975

QRZ Contest!

Operators of the 70MHz band should note that the last two cumulative contests of the current series will be run from 0900 to 1100UTC on March 11 and March 25. The Fixed station contest will run concurrently on March 25. Contestants may enter both sessions, using the same contacts, but with separate logs.

Don't forget that the Derby and District Amateur Radio Society 144MHz contest will be held on Sunday March 11 between 1300 to 1700UTC. Further details can be found in the February issue of *PW*.

If you want to increase your table score on 50MHz then the RSGB Trophy contest scheduled for Sunday April 8 should be an easy way of picking up some of the rarer counties.

If working Scandinavians is your forte then you should remember that an activity contest has been arranged to promote activity from OZ, OH, LA & SM. Contest activity periods are between 1800 to 2200UTC, 144MHz on the first Tuesday of the month, 432MHz on the first Thursday and Microwave bands on the first Monday.

The Danish Society (EDR) will present a contest diploma to the winning station in each country. I can supply a full set of rules on receipt of a stamped addressed envelope.

VHF Tables

Congratulations to **Gerry Schoof G1SWH** who topped the 1989 v.h.f./u.h.f. table. Second and third positions go to **Ela Martyr G6HKM** and **Ian Harwood G8LHT** respectively. I wonder what the positions would have been if Ela was QRV on 70MHz?

Modesty forbids me to say who came top of the c.w. ladder. It may be of interest to know that virtually every contact made was via aurora whereas those of the runner up, **Ian Cornes G4OUT**, were predominantly via tropo in a 'real' QSO environment. I have had seconds thoughts about removing the c.w. ladder after receiving a number of letters on the subject. If there is sufficient support then it will continue. Send your scores to me now.

Remember that the new 5 band locator squares table, covering 50MHz through to 1296MHz, will commence from the May issue.

Deadlines

I made an error last month giving details of when letters should be sent to me. As a generalisation correspondence should arrive to me no later than the last week of the month. More specifically I require letters to me by March 26, April 30, May 28. The March deadline is particularly important as the IARU Conference in Torremolinos takes place throughout the first week of April, and time to write the column is therefore very limited.

Back-Scatter

RTTY

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

FAX for IBM PCs

I recently discovered, via a readers letter, the program PC-HFFAX which provides comprehensive FAX reception facilities for IBM PCs and compatibles. At the time I was not aware of any UK sources of the program, but this has now been corrected. Comar Electronics now handle this package and recently sent me a demo disk for evaluation. I can report that the results on my Amstrad PC2086 were very impressive and I intend to take them up on their offer of a review copy. For those of you who may not have heard of this package here are a few of its main features:

False colour and greyscale display.
Storage and retrieval from disk.
Image zoom.
Image reversal.
Image pan.
Contrast control.
Tuning oscilliscope.
IOCs - 60, 90, 120, 180 and 240.
Automatic image capture.
Automatic Frame sync.

Although receive only, the facilities provided are very comprehensive and it is likely to appeal to the amateur as well as the short wave listener. So, if all goes well, you should see a review of PC-HFFAX in this column over the next few months. However, if you can't wait for the review, Comar Electronics will be delighted to help and can be contacted by phone on 0983-200308 and their address is 1A Birmingham Road, Cowes, IOW PO31 7BH.

PC-RTTY

The equipment review for this month is the PC-RTTY program from BARTG. The program was actually written by Mike Martin G4VRQ, but the sale and distribution are handled by BARTG. Let's start with the hardware requirements which are: IBM PC/XT or 100% compatible (Amstrads are fine).

At least one floppy drive.
One or more RS-232 ports.
Mono or colour monitor.
RS-232 compatible terminal unit.
DOS Version 3.2 or greater.

The features provided are quite extensive and include contest mode and c.w. ident. Installation of the program was very straightforward and simply involved either making a back-up copy of the supplied disk or transferring the contents to your hard disk, depending on what system you had. As with a lot of modern software the instruction book was provided on disk in ASCII form, for the user to print out. In my case I chose to load the document into a word processor and reformat it to fit my preferred A4 size paper. This resulted in an instruction manual of some 11 pages.

These instructions were perfectly satisfactory and covered all aspects of the program operation well. With the software ready to run and the instructions read and understood the next step was to sort out the interfacing between the computer and terminal unit! The important point to remember here is that the computer uses RS-232 levels, so if your terminal unit is not designed to work with these levels you will need to build a simple level converter before you can start. In addition to the normal transmit and receive data connections p.t.t. control was provided via the Request To Send line (RTS) on the RS-232 port. Again this was at RS-232 level so it could not be connected directly to the p.t.t. line on the transceiver. Fortunately help was at hand as the instruction book contained a simple single transistor and relay circuit to provide either 12V or ground for transmit.

One point you may like to note is that if you leave your rig and terminal unit connected to the computer when running other programs you may find that you inadvertently key the transmitter. This is in no way related to this RTTY program but is a simple fact that some software packages address the RS-232 port and may send the RTS line high causing the transmitter to be keyed. In view of this it may be worth installing a switch in the p.t.t. line so it can be disabled when running other programs. The program is started by typing PC-RTTY which runs a batch file which first prompts you for the time in GMT before entering the main screen of the program. The main screen layout was fairly conventional for RTTY programs and used a split screen with the top half (14 lines) used to display all received text.

Transmitted Text

In addition transmitted text was also displayed in the top section, after it had been transmitted. This gives a full picture of the QSO in this section of the screen and was in fact used to build the QSO review buffer. At the very top of the display was the parameter line which indicated the mode, time, operator call, port, baud rate and the memory left in the QSO buffer. The lower part of the screen was used for the type-ahead buffer. This was capable of storing up to 5000 characters, though only 395 characters in five lines were actually displayed on the screen.

In order to keep the maximum amount of information on screen, carriage returns were displayed simply as a small triangle and preset messages were indicated by the message number in inverse video. There were a number of other useful features associated with the transmitted text designed to simplify operation. There was a call capture feature which allowed the operator to store the other station's callsign in a temporary buffer. This was achieved simply by typing the call in square brackets e.g. [G4WNC]. Once this had been entered the standard sign on and sign off message of "other call" DE "your call" was automatically sent whenever F8 was pressed. In addition to being able to imbed an "auto return to receive" character in the type-ahead buffer you could also force a c.w. ident by keying in Ctrl X and add a time stamp and a bell character - all useful features.

Contest Mode

One area where this program scores over many others is in the provision of a contest mode. This facility has been included fairly obviously to ease operation when working contests. In essence it is an automatic serial number generator which increments every time the program switches from transmit to receive. Obviously a manual override is essential for those times when you need to repeat the serial number. This is provided with the facility to manually increment or decrement the number or even select a new start number.

Split Operation

This latter feature was handy when operating a contest with split operating periods as you could confidently turn the computer off during break periods and then manually set the serial number to the new starting point when operation was resumed. The facility to send prepared messages from disk files was a great benefit and the program allowed ten such messages to be available at any one time. These files must be simple ASCII files terminated by and end-of-file (ctrl-Z). The program could handle prepared messages up to 10K long and automatically inserted a line feed and carriage return at the first space after the 60th character. The program also filtered and converted all incoming characters so you didn't have to remember to use only upper case etc. If any unrecognised characters were encountered in the message, they were replaced by a single hyphon. The combination of prepared messages and contest mode meant that the program was a joy to use under contest conditions.

I mentioned the QSO buffer earlier and this could be reviewed during normal operation by presssing the HOME key followed by PAGE DOWN to scroll through the contents. The ability to review the QSO buffer may at first seem a little pointless, but I can assure you it is often extremely useful especially when the operators name disappears off the screen and you find you have forgotton to write it down! When you exit the program you are given the option to save print or abandon the QSO buffer.

Summary

I found the PC-RTTY program to be very effective with no real problems. The contest operator will find the contest mode particularly useful, especially when combined with the prepared message facility. Personally I was disappointed to find that the program only supported a monochrome display and baud rates of 45 or 50 baud.

This latter point does rather restrict operations as there are now some RTTY bulletin boards that support the faster baud rates. It also restricts its use for the short wave listener as they really need the full range of baud rates from 45 to 110 baud. However, all is not lost as Mike Martin sent me a copy of version 2.0 of the program which rectifies these points. The new version supports colour monitors with the default colours as white on blue, though these can all be changed within the program if required.

There have been a number of other modifications which really amount to a general refinement of the original program. An example of this is the change to the 'auto return to receive' character which is now displayed as R using inverse video whereas the earlier program used a double arrow. Another useful extra was the provision of a printer echo allowing QSOs to be recorded on the printer as they happened.

The BARTG PC-RTTY ver 1.53 is available from Peter Adams, 464 Whippendell Road, Watford, Herts WD1 7PT. The current price for this version is £9.95 inclusive. Readers interested in version 2.0 will have to wait a while as the program is still being tested and a release date has yet to be set. However, I have been assured that users of the earlier versions will be able to upgrade at a reduced price. One important point to note is that the program is currently only available on 5.25in disks, so 3.5in users will have to arrange their own transfer.

BARTG VHF/UHF Contest

This annual spring time contest takes place between 1800UTC on Saturday April 14 and 1200UTC on Sunday April 15. As is usual with this type of contest, a four hour rest period must be taken and declared during the contest. The bands used are 144MHz, 432MHz and 1296MHz, but of course repeater and satellite contacts are not valid! The contest is open to all operators in zones 14 and 15. Although portable operation is allowed, this must be from one location or at least within 1km for the entire contest period.

Contacts:
Stations may not be contacted more than once on any one band.

Messages:
1) Time of start of the contact in UTC which must comprise the full four digits.
2) Normal three figure RST report.
3) Message number, which will be the normal three figure number starting at 001 and incrementing by one for each contact.
4) Locator, which should ideally comprise the Maidenhead system or the QTH given as either a town or as a bearing and distance from a town (25km limit).

Logs: Each band must be recorded on a serarate A4 size log, preferably BARTG type and be acompanied by a cover sheet similar to RSGB form 427. The log must contain: date, time, RST sent, message number sent, locator, estimated distance and points claimed. Scoring: All two-way RTTY contacts on 144MHz and 432MHz score in accordance with the distance chart whilst 1296MHz contacts score as one point per km.

Distance: For 144MHz and 432MHz contacts score one point for contacts up to 50km and an additional 2 points for each 50km increment.

Sections:
1) Single operator.
2) Multiple operator.
3) Shortwave listener.

All logs for this contest should be sent to BARTG Contest manager, c/o Mr J. Alderman, 38 Greenacres, Shoreham by Sea, Sussex BN4 5WY.

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MVT5000	25-1300Mhz handy	299.00
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JUP2	DC cigar lead	4.95
JUP3	Set of 4 nicads	6.00
JUP4	Mains adapter	14.50
DA900	Flexible antenna	9.00
MVT6000	Base/Mobile Rx	379.00

ALINCO

ALD24E	2m/70cm mobile	399.00
DR110E	2m fm 45W mobile	299.00
DR410E	70cms fm 35W mobile	375.00
DR510E	2m/70cm mobile	549.00
ALX2E	2m micro handy	169.00
EBP3N	NiCad 450 mAh7.2V	28.95
EBP2N	NiCad 160 mAh7.2V	23.00
EDH10	DC to DC ALX2E	16.95
ESC5	Case/belt clip	14.00
DJ100E	2m handy tevr.	219.00
DJ100EX	Extended rx	229.00
DJ500E	Dualband hand	375.00
EBP9NAZ	Nicad 7.2V 500mAh	35.95
EBP6NAZ	Nicad 9.6V 450mAh	29.95
ELH230D	2m amp. 1-5W/10-30W	75.00
ELH260D	2m amp. 1-3W/50W	119.00

AZDEN

PCS6000	2m mobile	329.00

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SX600	Vswr 1.8-525 MHz	119.00
SX1000	Vswr 1.8-1300 MHz	159.00
P300	30 Amp psu	149.00
W510	Vswr 1.6-30 MHz	79.00
W520	Vswr 1.8-200 MHz	59.95
W540	Vswr 140-525 MHz	63.00
W544	Vswr 140-460 MHz	119.00
W570	Vswr 1.8-1300	119.00
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EL2E	2m 7/8th PL259	32.95
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DP-GL	Gutter mount	10.00
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AT440	Internal auto atu	144.75
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TM531E	23cms FM mobile	385.00
SP40	Mobile Speaker	21.00
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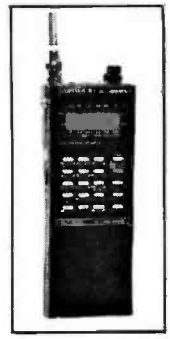

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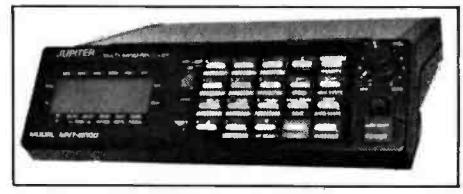

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The Jupiter has struck a realistic balance in the number of memories and banks. 100 memories is more than enough for most mortals. And conveniently they are all empty when you get the receiver! What is more, you can empty all memories in one go or just empty them one at a time. Check the competition on this!

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Whatever frequency you last listened to is remembered by the Jupiter and it will be there again when you switch back on. Imagine the frustration with some models that insist on re-setting the frequency every time you switch off.

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If you have ever owned a scanner that does odd things or performs functions in a most complex way, then you will know how tempting it is to throw it across the room! The Jupiter never invites such harsh treatment. It does everything in a most sensible and easy to understand manner. The fact that it is extremely sensitive is also rather comforting. Of course we can supply almost any scanner from stock. The choice is yours. But we have this old fashioned idea that our customers should be happy with their purchase. With Jupiter we have no such worries!

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PRO-32	Handheld VHF/UHF Good	129.00	DJ100E	2m Handheld Mint	179.00
PRO-34	Handheld VHF/UHF Exc	199.00	DJ500E	2m/70cm Handheld Mint	319.00
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WATERS & STANTON

Back-Scatter

Amateur Satellites

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

This month's column will concentrate primarily on a great event in amateur radio history, the new AMSAT Microsats, though we shall try to keep a little space for some other news as well.

ARIANE V-35 Cargo

Thanks to a totally successful launch, the number of active amateur radio satellites has now jumped from four to ten. The ESA launch, which was the first multi-amateur satellite emplacement since the USSR launch of RS-3, 4, 5, 6, 7 and 8, could have taken even more, as 800lbs of lead ballast was flown to compensate the thrust to the low capacity loading!

After many changes, the $100 000 000 French SPOT-II imaging satellite and the far less expensive multi-amateur radio microsatellite ARIANE V-35 launch date was finally mated to January 21 at 0135UTC, the 20th anniversary of the first AMSAT organised launch of OSCAR-5. The countdown got to lift off minus six minutes before it had to be stopped due to the presence of a large highly charged cloud over the launch site. The launch range safety officer was obliged to continuously postpone lift off, until it was beyond the short launch window period, due to the possible hazard of a lightning strike. The count resumed to re-attempt launch in the next window, at the same clock time the following evening.

ALINS BC

The AMSAT Launch Information Network (ALINS) got into gear, with relays to the whole world by stations on the f.m. repeater network, the OSCAR-13 satellite and all the main amateur bands. For those with access, it was on TV from SPACENET-1 on Transponder 4, channel 7. Full details of the history, building, purpose and function of the six international amateur satellites was provided in sequence as the launch countdown proceeded by W3IWI, W3GEY, G3YJO, G0/K0KA, NK6K, N4HY, LU7JC and N5BF, leading to the lift off at 0135:30.395UTC broadcast direct from the bunker of the Kourou ESA French Guiana launch site by WD0HHU/FS7.

Tracking station relays followed by giving each sequential stage of the orbital injection process. At launch plus 2:39 we saw first stage separation, then 2nd stage ignition 3 seconds later. Following fairing separation and 2nd stage separation, the 3rd stage ignited at at +4:53, separating at +16:49. At ignition plus 17:06, SPOT-II was launched. UoSAT-D became orbiting Uo-14 at launch plus 20:06, then off went UoSAT-E to become Uo-15 at +20:07 just one second later. At +21:01 PACSAT-1 was put out to give PO-16, one second later DOVE was DO-17, WEBERSAT was WO-18 in the next second, finalising with LU-SAT to commence as LO-19 at lift off plus 21 minutes and 4 seconds.

Many thousands of AMSAT and general space enthusiasts became overnight insomniacs while they listened to the superbly structured and well presented commentary relay, and were ready to look for the first signals as the satellite telemetry systems were commanded on by ground stations over the next few hours. After only a few hours sleep, European followers were up again to monitor the first pass.

The New Satellites

The microsats, like the SPOT-II, are in a sun synchronous ca 800km orbit at 98.7 degrees to the equator. This means that they will pass over roughly the same spots at the same equivalent solar time daily. If you calculate the pass times for one day, then the next days passes will all come over some 28 minutes earlier.

Initially, all the satellites were in very close proximity, and were first heard by those still awake after having stayed up for the launch, in a collective huddle as they came over the UK NNE horizon at 0900 later that morning. All signals from all microsats were present, and all at good strength apart from a few brief fade outs as the spacecraft tumbled giving end-on antenna nulls. The Brazilian AMSAT OSCAR-17 DOVE on 145.825MHz was particularly strong, and was noted as fully quieting on a hand held TR-2400 using the 'rubber duck' antenna.

Within a week discernment between the orbiters by sharp lobe Yagi users was possible, as the bunch slowly separated into their own discreet orbits. This was accomplished by a slightly different spring tensility on each spacecraft, aided and abetted by Newtons third law. Separate Keplerian elements will be evolving for each satellite, and will be published as soon as necessary and when the full set of accurate evidence is gathered. See under 'Keplerian Elements' for the latest group set.

Frequencies and Modes

As previously explained, the various frequencies, modes and formats of the new satellites needs some degree of versatility. To simplify the process, here are the findings and the basis of requirement.

OSCAR-17

The DOVE DO-17 f.m. spoken messages will later be heard on 145.825MHz with a normal unmodified 145MHz f.m. base station, mobile or hand-held receiver, but the initial and alternate 1200baud a.f.s.k. AX.25 f.m. transmissions using the same frequency, will require an unmodified TNC-2 (or clone) with the same 145MHz f.m. transceiver. Such a system was used to good effect on the first day by **Tony Gould G4UAM** of Lingwood, Norfolk, who listened to the signal on a 'Slim Jim' antenna on his IC-2E, connected to his TNC using a Commodore-64 with the Digicom 4-01 program. **Ted Double G8CDW** of Swaffham, Norfolk, picked up the signal by accident on his loft installed dual band collinear feeding a 12dB gain pre-amplifier and FT-480R on Wednesday January 23 at 1331UTC. Using a TNC-320 set to a 1200 baud rate, he had perfect copy. A section of his printed output is shown in Fig. 1. To explain this telemetry, its decode and parameters of study, see Fig. 2. The DOVE OSCAR-17 telemetry content, was written and provided with that of the three other American micro-satellites by AMSAT's Bob McGwier N4HY, and sent along for our digestion by Vin G4ULS. Bob is writing and uploading a program soon that will decode all the TLM from all the satellites.

DOVE has a 1 watt r.f. 2401.207MHz 'S' Band beacon. Watch out for over 100kHz of doppler shift on high angle elevation passes!

The other microsats, PACSAT PO-16 on 437.025MHz, WEBERSAT WO-18 on 437.075MHz and LU-SAT LU-19 on 437.150MHz digital system all employ 1200baud p.s.k. AX.25. They will all require an s.s.b. receiver and a TNC with a 1200baud demodulator, e.g. compatible with the Fuji-OSCAR-12 and JAS-1-b system, and NOT the 400baud p.s.k. demodulator as used with the digital telemetry from the elliptical orbiters OSCARs 10 and 13.

OSCAR-18

The content details of the telemetry coming down from WEBERSAT OSCAR-18, from which update news, findings and received telemetry print out is awaited, is given in Fig. 3.

OSCAR-16

PACSAT-OSCAR-16 telemetry is shown in Fig. 4. The telemetry is sent once each 10 seconds. The time message is the first in each cycle, and the 'wash' message is last. Note that the 'wash' message does not contain a trailing carriage return. Like others, the TLM block entries are in the format CC:NN where CC is the channel number in hexadecimal, NN is the telemetry count for that parameter, also in hexadecimal, with a range of 00 to FF (0 to 255 decimal). A copy

```
DOVE-1>WASH:
wash addr:0ec0:0000, edac=0x7d
DOVE-1>TIME-1:
PHT: uptime is 039/23:02:38.  Time is Tue Jan 23 13:31:32 1990

DOVE-1>WASH:
wash addr:1580:0000, edac=0x7d
DOVE-1>TIME-1:
PHT: uptime is 039/23:02:58.  Time is Tue Jan 23 13:31:52 1990

DOVE-1>TLM:
00:59 01:58 02:8A 03:34 04:5A 05:58 06:6E 07:40 08:6E 09:5F 0A:A4
0B:F0 0C:E8 0D:DB 0E:4C 0F:24 10:D2 11:B0 12:00 13:DE 14:B2 15:AB
16:90 17:BB 18:86 19:8B 1A:84 1B:84 1C:8D 1D:89 1E:CE 1F:66 20:CD

DOVE-1>TLM:
00:5A 01:59 02:8A 03:34 04:58 05:58 06:6F 07:40 08:6E 09:60 0A:A2
0B:F0 0C:EA 0D:DB 0E:32 0F:24 10:D4 11:B0 12:00 13:DE 14:B1 15:AD
16:89 17:BB 18:89 19:8A 1A:85 1B:80 1C:8E 1D:82 1E:CE 1F:69 20:CD

DOVE-1>TLM:
21:B2 22:6D 23:3D 24:2F 25:24 26:98 27:00 28:01 29:58 2A:00 2B:00
2C:00 2D:97 2E:65 2F:9F 30:CD 31:A0 32:CD 33:10 34:AA 35:A8 36:A8
37:9E 38:B4 39:9D 3A:01

DOVE-1>TLM:
21:AB 22:6F 23:3D 24:31 25:26 26:00 27:3A 28:02 29:3F 2A:00 2B:70
2C:00 2D:94 2E:64 2F:A0 30:CD 31:9E 32:D0 33:10 34:A9 35:A7 36:A8
37:A0 38:01 39:9C 3A:00

DOVE-1>STATUS:
 00 00 00 79 B0 18 CC 01 00 B0 00 00 B0 00 00 00 00 00 00 00
```

Fig. 1.

```
DOVE-OSCAR-17:     Equations are in the form Y = A x N² + B x N + C where:-
N = Telemetry Count (00-FF).     A, B, C = Equation coefficients.
Y =  Result (In specified Units).

HEX   Descripion:        C:              B:              A:          Units:
                         cccccccccc      bbbbbbbbbb      aaaaaaaaaa  uuuuuu

 0    Rx E/F Audio(W)+0.000          +0.0246         0.000       V(p-p)
 1    Rx E/F Audio(N)+0.000          +0.0246         0.000       V(p-p)
 2    Mixer Bias V:  +0.000          +0.0102         0.000       Volts
 3    Osc. Bias V:   +0.000          +0.0102         0.000       Volts
 4    Rx A Audio (W):+0.000          +0.0246         0.000       V(p-p)
 5    Rx A Audio (N):+0.000          +0.0246         0.000       V(p-p)
 6    Rx A DISC:     +10.427         -0.09274        0.000       kHz
 7    Rx A S meter:  +0.000          +1.000          0.000       Counts
 8    Rx E/F DISC:   +9.6234         -0.09911        0.000       kHz
 9    Rx E/F S meter:+0.000          +1.000          0.000       Counts
 A    +5 Volt Bus:   +0.000          +0.0305         0.000       Volts
 B    +5V Rx Current:+0.000          +0.0001100      0.000       Amps
 C    +2.5V  VREF:   +0.000          +0.0100         0.000       Volts
 D    8.5V BUS:      +0.000          +0.0391         0.000       Volts
 E    IR Detector:   +0.000          +1.000          0.000       Counts
 F    LO Monitor I:  +0.000          +0.0000037      0.000       Amps
10    +10V Bus:      +0.000          +0.05075        0.000       Volts
11    GASFET Bias I: +0.000          +0.0000026      0.000       Amps
12    Ground REF:    +0.000          +0.0100         0.000       Volts
13    +Z Array V:    +0.000          +0.1023         0.000       Volts
14    Rx Temp:       +101.05         -0.6051         0.000       Deg. C
15    +X (RX) temp:  +101.05         -0.6051         0.000       Deg. C
16    Bat 1 V:       +1.7932         -0.0034084      0.000       Volts
17    Bat 2 V:       +1.7978         -0.0035316      0.000       Volts
18    Bat 3 V:       +1.8046         -0.0035723      0.000       Volts
19    Bat 4 V:       +1.7782         -0.0034598      0.000       Volts
1A    Bat 5 V:       +1.8410         -0.0038355      0.000       Volts
1B    Bat 6 V:       +1.8381         -0.0038450      0.000       Volts
```

Fig. 2.

Back-Scatter

of a section received by John Branegan **GM4IHJ** is shown in Fig. 5. John says: "PACSAT-1 is sending clear readable copy, but deep fading makes narrow beam aerials essential. I used either a 21-element or a 48-element multi-beam with AZ EL control, as I found that the omni and collinear antennas were unable to cope with the fades". GM4IHJ employed his Icom-451 and a FUJI modem modified TNC-320. He found that the signal must be clear of noise, and that the receive system must be clearly able to recognise a PACKET, otherwise no printing occurs. He advises: "If you use a FUJI modem, switch to 'Lock AFC' and then watch the OCO light on the TNC. If this is flickering, no printing will result, but, if the light is steady it will print". Over the pass he monitored, three drop outs occurred due to deep fades, but between 0939 - 0941, 0942 - 0944, 0945 - 0947 and 0948 to 0949 he printed well. It is hoped that stabilisation will reduce this problem with time.

Like DOVE, PACSAT has a 1 watt r.f. output 'S' Band beacon, but on 2401.117MHz, which will be commanded on soon. Listen from 2401.220MHz at the start of an overhead pass down to 2401.000 at LOS to follow it.

OSCARs 14 & 15

Both UoSATs, Uo-14 on 435.070MHz and Uo-15 on 435.120MHz, although initially on 1200bauds, can employ 9600baud a.f.s.k. AX.25, which may be compatible with the K9NG and other similar 9600baud modems now in common use on terrestrial packet applications. It is very likely that UoSAT-E OSCAR-15 may be kept to the 1200baud rate, but UoSAT-O OSCAR-14 will go to 9600baud when the programs have been written and loaded up to the satellite. As yet, we do not even know the connect callsign, and the whole scene is rather a mystery tour. Because of the huge work load in having to prepare two satellites, the UoSAT team have been as yet unable to provide the information required, and the channels and decoding of the telemetry are so far unknown but it is hoped to include these in future columns.

Although putting out excellent signals for the first two days in orbit, OSCAR-15 has, as far as can be determined, been totally silent since. It is not yet known if this absence of signals is a problem, an intermittent fault or the result of an uplink command mis-interpretation. The University of Surrey is investigating and urgently want to know if anyone hears the satellite downlink come up on the assigned primary or secondary frequency allocated. They ask any positive observers of the signal to ring the UoSAT/AMSAT Department on Guildford (0483) 509141 or at the University of Surrey on (0483) 571281 or telex them on 859331.

Please try to report any content that was heard, from when to when, and if possible the AOS, TCA, LOS and any known tracking position made.

Another potential problem is that all the packet satellites (or should we call them 'datellites') have been noted as suddenly dumping a massive 68K of telemetry down. This is not intentional, and AMSAT would like to know when and where this is happening. If this artifact is observed, please contact AMSAT to let them know the details of your observation.

OSCAR-19

LUSAT alias OSCAR-19 puts out its 1200baud b.p.s.k. digital telemetry on 437.150MHz, the content of which is shown in Fig. 6. John Branegan, using his antenna and apparatus as for PACSAT finds it to be signing 'LUSAT-1>STATUS <U1> 00 00 00 7C B0 18 22 02 00 00 00 00 B0 00 00 00 00 00 00 00'.

The LUSAT c.w. telemetry has its own separate format and frequency, and will come down as Morse code at 12 words per minute on 437.125MHz with up to plus or minus 10kHz doppler shift. It will thus only need a conventional receiver with a smooth fast tuning knob, ears, a pencil and a calculator or Morse reading computer program to resolve. Signals are noted as being S.8 using only a 8in wire to a simple receiver inside the shack. The great advantage of LU-19 is that the 0.5 watt LUSAT beacon on 437.125MHz c.w. is readable by all without special equipment. Please note that this is a unique experiment of LU-SAT LU-19, and is not the same format as that transmitted as 1200baud p.s.k. on 437.150MHz.

LUSAT 12w.p.m. Morse c.w. telemetry transmissions will be in the format "E LUSAT HI HI NL 111 222 333 444 555 666 777 888". The initial 'E' is an artifact of processing for the purpose of power measurement, 'LUSAT' is the spacecraft identifier, and 'HI HI' is the international identifier for OSCAR spacecraft. 'N' indicates which version of the code is running from the EPROM. The firmware is stored 7 times in the EPROM to protect against environmental degradation, so the range is 1 - 7; the lowest non corrupt version number is executed. 'L' is '0' for '6805 OK' and 'E' for '6805 ERROR' where 6805 is the internal functioning RAM microprocessor.

To save vital transmitter power and so maintain battery charge, all numerals are sent in the abbreviated Morse code form with superfluous dots or dashes suppressed, known as 'reduced c.w. as often partially employed in DXpeditions and QRQ c.w. contests.

Thus A = 1, U = 2, V = 3, 4 = 4, E = 5, 6 = 6, B = 7, O = 8, N = 9, and T = 0. We then use the following equations to convert the readings discovered to the actual engineering units, as:

Channel Parameter	Formula	Unit value
1 = N1 + 5 Reg.Voltage	636/N1	= volts
2 = N2 + 10 Volt Battery	0.064xN2	= volts
3 = N3 c.w. TX Temp	0.354(134.7-N3)	= Deg. C
4 = N4 c.w. TX Power O/P	(10.9+N)2/40.1	= mW
5 = N5 Box no.4 Temp.	0.356(136-N5)	= Deg. C
6 = N6 +10 V current	0.7xN6	= mA
7 = N7 Panel +Z volts	0.15xN7	= volts
8 = N8 Reg.+8.5 volts	0.056xN8	= volts

For those who would like to practice a real decode, the first audible frame of LUSAT-OSCAR-19 c.w. telemetry heard from the UK at 0900 on January 22 read "E LUSAT HI HI AO AUD ABU AVA AD4 AU4 A6D A4N AE6". There follows each frame a long silent pause, during which one needs to be careful not to let the signal frequency slide out of the receiver passband. The doppler shift on a high angle elevation pass is quite substantial, up to plus and minus 9.7kHz of the nominal frequency, e.g. up to almost 20kHz in the course of an overhead pass. This seems little when compared to the PACKSAT OSCAR-16 2401.115MHz and DOVE OSCAR-17 2401.209MHz beacons, which can travel over 100kHz in the course of a similar overhead pass!

WEBER-OSCAR-16: Equations are in the form Y = A x N² + B x N + C where:-
N = Telemetry Count (00-FF). A, B, C = Equation coefficients.
Y = Result (In specified Units).
ADC Equations: V = 0.01016 N - 0.05080. N = 98.43 N + 5.000

HEX	Description:	C: cccccccccc	B: bbbbbbbbbb	A: aaaaaaaaaa	Units: uuuuuu
0	Rx D DISC:	+11.087	-0.08949	0.000	kHz
1	Rx D S meter:	+0.000	+1.000	0.000	Counts
2	Rx C DISC:	+10.322	-0.09448	0.000	kHz
3	Rx C S meter:	+0.000	+1.000	0.000	Counts
4	Rx B DISC:	+10.348	-0.09004	0.000	kHz
5	Rx B S meter:	+0.000	+1.000	0.000	Counts
6	Rx A DISC:	+11.387	-0.09535	0.000	kHz
7	Rx A S meter:	+0.000	+1.000	0.000	Counts
8	Rx E/F DISC:	+10.746	-0.09348	0.000	kHz
9	Rx E/F S meter:	+0.000	+1.000	0.000	Counts
A	+5 Volt Bus:	+0.000	+0.03523	0.000	Volts
B	+5V Rx Current:	+0.000	+0.0002034	0.000	Amps
C	+2.5V VREF:	+0.000	+0.0133	0.000	Volts
D	8.5V BUS:	+0.000	+0.0524	0.000	Volts
E	IR Detector:	+0.000	+1.000	0.000	Counts
F	LO Monitor I:	+0.000	+0.0000033	0.000	Amps
10	+10V Bus:	+0.000	+0.0767	0.000	Volts
11	GASFET Bias I:	+0.000	+0.0000026	0.000	Amps
12	Ground REF:	+0.000	+0.0100	0.000	Volts
13	+Z Array V:	+0.000	+0.1023	0.000	Volts
14	Rx Temp:	+100.01	-0.5980	0.000	Deg. C
15	+X (RX) Temp:	+100.01	-0.5980	0.000	Deg. C
16	Bat 1 V:	+1.8292	-0.0037196	0.000	Volts
17	Bat 2 V:	+1.8282	-0.0036943	0.000	Volts
18	Bat 3 V:	+1.8050	-0.0036721	0.000	Volts
19	Bat 4 V:	+1.8576	-0.0038979	0.000	Volts
1A	Bat 5 V:	+1.8095	-0.0037439	0.000	Volts
1B	Bat 6 V:	+1.8979	-0.0041754	0.000	Volts
1C	Bat 7 V:	+1.8246	-0.0038126	0.000	Volts
1D	Bat 8 V:	+1.7486	-0.0030475	0.000	Volts
1E	Array V:	+8.292	+0.06196	0.000	Volts
1F	+5V Bus:	+1.838	+0.0312	0.000	Volts
20	+8.5V Bus:	+5.793	+0.0184	0.000	Volts
21	+10V Bus:	+7.650	+0.0250	0.000	Volts
22	BCR Set Point:	-3.6934	+1.1277	0.000	Counts
23	BCR Load Cur:	-0.0405	+0.00620	0.000	Amps
24	+8.5V Bus Cur:	+0.00384	+0.000830	0.000	Amps
25	+5V Bus Cur:	-0.00763	+0.00394	0.000	Amps
26	-X Array Cur:	-0.00140	+0.00210	0.000	Amps
27	+X Array Cur:	+0.00946	+0.00226	0.000	Amps
28	-Y Array Cur:	-0.01018	+0.00224	0.000	Amps
29	+Y Array Cur:	-0.01168	+0.00239	0.000	Amps
2A	-Z Array Cur:	-0.01516	+0.00237	0.000	Amps
2B	+Z Array Cur:	-0.02111	+0.00239	0.000	Amps
2C	Ext Power Cur:	-0.02000	+0.00250	0.000	Amps
2D	BCR Input Cur:	-0.02189	+0.00332	0.000	Amps
2E	BCR Output Cur:	-0.03019	+0.00327	0.000	Amps
2F	Bat 1 Temp:	+100.01	-0.5980	0.000	Deg. C
30	Bat 2 Temp:	+100.01	-0.5980	0.000	Deg. C
31	Baseplate Temp:	+100.01	-0.5980	0.000	Deg. C
32	PSK TX RF Out:	+0.2104	-0.01203	+0.0001786	Watts
33	RC PSK TX Out:	+0.0340	-0.00969	+0.0002198	Watts
34	PSK TX HPA Temp:	+100.01	-0.5980	0.000	Deg. C
35	+Y Array Temp:	+100.01	-0.5980	0.000	Deg. C
36	RC PSK HPA Temp:	+100.01	-0.5980	0.000	Deg. C
37	RC PSK BP Temp:	+100.01	-0.5980	0.000	Deg. C
38	+Z Array Temp:	+0.0000	+1.0000	0.000	Counts

Fig. 3.

DOVE and Educational Newsletters

For those who are using or intend to use the educational aspects of DOVE OSCAR-17, Richard Ensign N8IWJ, the AMSAT Science Education Advisor reports that the DOVE Newsletter has now been taken over by Doug Loughmiller KO5I. If you need the regular supply of updated information to apply to your work, which is free to such users, please write to him at Douglas Loughmiller KO5I, President AMSAT-NA, 620 Fairway Drive, Paris, Texas, TX 75460, USA. He may be called on (USA) 214-784-3740.

Richard is now editing the self-supporting *AMSAT Educational News*, and produced three pre-launch issues of these, giving a total of 36-pages with information on DOVE and all the other microsats. They contain complete tracking information, simple non-computer tracking aids for both the northern and southern hemispheres, reception information, a comprehensive look at the launch site, the launch campaign and sequence, a complete and detailed guide to the microsat telemetry and the DOVE packet radio telemetry reception, and a look at one of the science education experiments on board the Weber State College OSCAR-18 microsat. This latter exercise , may be of great interest to those teachers and students who wonder if our satellites are hit by meteoroids, as the WEBERSAT impact detector experiment is designed to confirm the possibility If anyone would like to have the set of three issues write to Richard and send him $5.00 or the equivalent to cover postage and production costs. Bank drafts or cheques should be made out in Richard's name, as he will be sending these, plus some additional surprises directly to you. His address is: Richard C. Ensign, AMSAT Science Education Advisor, 421 N. Military, Dearborn, MI 48124, USA, and his home telephone number for any queries, questions or advice is (USA) 313-274-1718.

Future issues of *AE News* will commence from launch to give monthly updates. An overseas (to USA) subscription for ten issues in the year is $10.00 in US funds made payable to 'AMSAT' and sent to AMSAT-NA, at Box 27, Washington DC 20044, USA. These issues will cover the sharing of classroom facilities involving satellites, student projects, US Space Shuttle experiments, tracking, night time viewing of large satellites, other satellites with educational potential, and a whole lot

Back-Scatter

more including satellites still in the development stage. Contributions are also welcome.

Advice to Users

For the general non-specialised listener, there is no doubt that DOVE and LUSAT-CW are the winners. They are both receivable and translatable without specialised equipment, and lend themselves to a whole series of interesting and educational aspects. Doppler effects, polar front propagational abnormalities, eclipse and temperature variables, and a whole lot more experiments are possible. What is more, the signal strengths are such that the simplest of receivers and antennas can be used. WEBERSAT and PACSAT give a few more problems, and the need for more outlay. The UoSAT pair, although better in signal strength, are as yet an unknown entity, as we have yet to learn of any specialised programmes required to be able to read the information coming down.

It is not known that all the new microsat commercial modems will work on all modes, and it is strongly recommended that unless evidence of full function can be demonstrated, users stick to G3RUH and 9600baud FUJI modems, as they are known to perform perfectly.

John Branegan has pointed out that a.f.c. is vital, as if a p.s.k. or b.p.s.k. signal is more than 50Hz mistuned, no printing will evolve. The Doppler shift is considerable, so, for this reason, the receiver must be fitted with up/down frequency scanning. In addition, it is necessary to modify your TNC so that the received data signal from the FUJI modem bypasses the existing TNC, using a modification recommended by G3RUH that comes with his FUJI modem. Should you wish to use the set-up for terrestrial p.s.k., you will need to fit an additional DCD output from the FUJI to your TNC to tell it when the channel is blocked by another signal. John also points out another hazard to the casual reader, and a further threat to the earth's depleting tree situation. "Beware - it eats printout paper!" he warns. " A wall to wall pass consumes a lot of fanfold!".

Now back to the regular and less foreboding earlier amateur satellites.

RS-10/11

With the decay of the powerful auroras, and the consequent attenuation and tonal degradation, paths to and from the constantly active RS-10 transponder

PACSAT-OSCAR-16: Equations are in the form Y = A x N² + B x N + C where:-
N = Telemetry Count (00-FF). A, B, C = Equation coefficients.
Y = Result (In specified Units).
ADC Equations: V = 0.01026 N - 0.02055. N = 97.31 N + 2.000

HEX	Description:	C: cccccccccc	B: bbbbbbbbbb	A: aaaaaaaaaa	Units: uuuuuu
0	Rx D DISC:	+9.202	-0.08990	0.000	kHz
1	Rx D S meter:	+0.000	+1.000	0.000	Counts
2	Rx C DISC:	+9.179	-0.09277	0.000	kHz
3	Rx C S meter:	+0.000	+1.000	0.000	Counts
4	Rx B DISC:	+9.837	-0.08838	0.000	kHz
5	Rx B S meter:	+0.000	+1.000	0.000	Counts
6	Rx A DISC:	+9.779	-0.09144	0.000	kHz
7	Rx A S meter:	+0.000	+1.000	0.000	Counts
8	Rx E/F DISC:	+10.817	-0.09911	0.000	kHz
9	Rx E/F S meter:	+0.000	+1.000	0.000	Counts
A	+5 Volt Bus:	+0.000	+0.0305	0.000	Volts
B	+5V Rx Current:	+0.000	+0.000250	0.000	Amps
C	+2.5V VREF:	+0.000	+0.0100	0.000	Volts
D	8.5V BUS:	+0.000	+0.0391	0.000	Volts
E	IR Detector:	+0.000	+1.000	0.000	Counts
F	LO Monitor I:	+0.000	+0.000037	0.000	Amps
10	+10V Bus:	+0.000	+0.0500	0.000	Volts
11	GASFET Bias I:	+0.000	+0.000026	0.000	Amps
12	Ground REF:	+0.000	+0.0100	0.000	Volts
13	+Z Array V:	+0.000	+0.1023	0.000	Volts
14	Rx Temp:	+101.05	-0.6051	0.000	Deg. C
15	+X (RX) temp:	+101.05	-0.6051	0.000	Deg. C
16	Bat 1 V:	+1.8225	-0.0038046	0.000	Volts
17	Bat 2 V:	+1.9418	-0.0046890	0.000	Volts
18	Bat 3 V:	+1.8699	-0.0041641	0.000	Volts
19	Bat 4 V:	+1.7403	-0.0032880	0.000	Volts
1A	Bat 5 V:	+1.8792	-0.0042492	0.000	Volts
1B	Bat 6 V:	+2.0499	-0.0054532	0.000	Volts
1C	Bat 7 V:	+1.9862	-0.0045331	0.000	Volts
1D	Bat 8 V:	+1.7536	-0.0033192	0.000	Volts
1E	Array V:	+8.855	+0.06790	0.000	Volts
1F	+5V Bus:	+2.035	+0.0312	0.000	Volts
20	+8.5V Bus:	+5.464	+0.0184	0.000	Volts
21	+10V Bus:	+7.650	+0.0250	0.000	Volts
22	BCR Set Point:	+1.385	+1.1270	0.000	Counts
23	BCR Load Cur:	-0.0477	+0.00767	0.000	Amps
24	+8.5V Bus Cur:	-0.00179	+0.000894	0.000	Amps
25	+5V Bus Cur:	-0.00104	+0.00406	0.000	Amps
26	-X Array Cur:	-0.00995	+0.00243	0.000	Amps
27	+X Array Cur:	-0.02370	+0.00254	0.000	Amps
28	-Y Array Cur:	-0.02220	+0.00273	0.000	Amps
29	+Y Array Cur:	-0.01810	+0.00259	0.000	Amps
2A	-Z Array Cur:	-0.02230	+0.00221	0.000	Amps
2B	+Z Array Cur:	-0.02000	+0.00232	0.000	Amps
2C	Ext Power Cur:	-0.02000	+0.00250	0.000	Amps
2D	BCR Input Cur:	-0.02345	+0.00355	0.000	Amps
2E	BCR Output Cur:	+0.00869	+0.00303	0.000	Amps
2F	Bat 1 Temp:	+101.05	-0.6051	0.000	Deg. C
30	Bat 2 Temp:	+101.05	-0.6051	0.000	Deg. C
31	Baseplt Temp:	+101.05	-0.6051	0.000	Deg. C
32	PSK TX RF Out:	-0.0291	+0.00361	+0.0000869	Watts
33	RC PSK TX Out:	+0.0055	+0.00172	+0.0001180	Watts
34	PSK TX HPA Temp:	+101.05	-0.6051	0.000	Deg. C
35	+Y Array Temp:	+101.05	-0.6051	0.000	Deg. C
36	RC PSK HPA Temp:	+101.05	-0.6051	0.000	Deg. C
37	RC PSK BP Temp:	+101.05	-0.6051	0.000	Deg. C
38	+Z Array Temp:	+101.05	-0.6051	0.000	Deg. C
39	S band power:	-0.0088	+0.00435	0.000	Watts
40	S band HPA Temp	0.000	+1.000	0.000	Counts

Fig. 4

Keplerian Elements

Satellite	NOAA 9	NOAA 10	NOAA 11	METEOR 2/16
Int. Design	84-123A	86-073A	88-089A	87-068A
Dbject No.	15427	16969	19531	18312
Element Set	464	320	181	353
Epoch Year	1989	1989	1989	1989
Epoch Day	358.37059184	359.38159645	361.19840430	359.12010021
Inclination	99.1560	98.6177	98.9617	82.5656
RAAN	349.2440	26.0889	304.5397	68.2762
Eccentricity	0.0015852	0.0014507	0.0011883	0.0012914
Arg of Perigee	137.3129	57.8914	51.8704	29.5537
Mean Anomaly	222.9284	302.3671	308.3642	330.6382
Mean Motion	14.12358236	14.23372960	14.11365902	13.83575654
Decay Rate	0.00000716	0.00001001	0.00000989	0.00000219
Drbit Number	25920	16988	6470	11891
Nodal Period	102.013495	101.225584	102.085514	104.136883
P-drag	3.664e-06	5.004e-06	5.071e-06	1.192e-06
Increment	25.500658	25.306683	25.520328	26.162872
I-Drag	9.219e-07	1.259e-06	1.276e-06	2.979e-07
Beacon-QRG	137.620=APT 1707.0=HRPT	137.500=APT 1898.0=HRPT	137.620=APT 1707.0=HRPT	137.400=APT
Ref. EQX	01 Jan 1990	30 Dec 1989	30 Dec 1989	30 Dec 1989
Drbit	26038	16054	6510	11959
HHMM.MM	0031.05UTC	0030.35UTC	0049.11UTC	0054.23UTC
Degrees W	111.11	75.39	163.35	47.82

Satellite	METEOR 2/17	METEOR3/02	METEOR 2/18	METEOR 3/03
Int. Design	88-005A	88-064A	89-018A	89-086A
Dbject No.	18820	19336	19851	20305
Element Set	182	335	130	37
Epoch Year	1989	1989	1989	1989
Epoch Day	359.07664191	358.59495985	359.07523990	357.42223227
Inclination	82.5432	82.5275	82.5250	82.5508
RAAN	128.8639	40.9579	7.1871	341.9667
Eccentricity	0.0018038	0.0017943	0.0016303	0.0017392
Arg of Perigee	92.5272	32.8558	130.3015	48.9339
Mean Anomaly	267.7956	327.3640	229.9571	311.3270
Mean Motion	13.84259498	13.16874349	13.83906209	13.15844727
Decay Rate	0.00000231	0.00000391	0.00000117	0.00000056
Drbit Number	9609	8797	4148	783
Nodal Period	104.085445	109.407569	109.111970	109.493156
P-Drag	1.255e-06	2.468e-06	8.364e-07	3.543e-07
Increment	26.150187	27.480693	26.156957	27.501992
I-Drag	3.138e-07	8.171e-07	1.591e-07	8.859e-08
Beacon-QRG	137.300=APT	137.300=APT	137.850=APT	137.850=APT
Ref. EQX	30 Dec 1989	28 Dec 1989	30 Dec 1989	30 Dec 1989
Drbit	9678	6842	4217	870
HHMM.MM	0132.25UTC	0020.07UTC	0132.07UTC	0053.90UTC
Degrees W	356.63	62.93	118.27	134.82

Satellite	OSCAR 10	OSCAR 11	RS10/11	OSCAR 13
Int. Design	83-058B	84-021B	87-054A	88-051B
Dbject No.	14129	14781	18129	19216
Element Set	444	577	987	G4JUJ
Epoch Year	1989	1989	1989	1990
Epoch Day	344.40088763	359.61074467	359.90099707	1.293348715
Inclination	25.9017	97.9813	82.9265	57.1369
RAAN	229.8032	52.6953	96.5598	175.7081
Eccentricity	0.6018187	0.0014049	0.0010684	0.6848491
Arg of Perigee	100.2539	77.2959	236.1622	217.9609
Mean Anomaly	328.6863	282.9819	123.8531	0
Mean Motion	2.05879900	14.64633000	13.72044742	2.096993727
Decay Rate	0.00000069	0.00002210	0.00000173	0
Drbit Number	4884	31055	12568	1187
Nodal Period	899.2	98.377173	105.011916	686.6
P-Drag	-	1.014e-05	9.656e-07	-
Increment	175.3	24.595206	26.378853	172.2
I-Drag	-	2.551e-06	2.414e-07	-
Beacon-QRG	145.810/.987	145.826/435.025 2401.5	29.357/.408 145.857/.903 29.407/.453 145.907/.953	145.812 435.651 2400.660
Ref EQX	30 Dec 1989	01 Jan 1990	30 Dec 1989	
Orbit	4925	31149	12625	
HHMM.MM	0726.53UTC	0046.81UTC	0123.11UTC	
Degrees W	343.75	53.19	25.75	

Satellite	SALYUT 7	MIR	POLAR BEAR	HILAT
Int. Design	82-033A	86-017A	86-088A	88-063A
Object No.	13138	16609	17070	14154
Element Set	955	305	495	684
Epoch Year	1989	1989	1989	1989
Epoch Day	360.76042801	360.70905091	349.24495166	350.99084571
Inclination	57.6076	51.6209	89.5369	82.0344
RAAN	88.6102	117.8991	65.1425	220.9879
Eccentricity	0.0000257	0.0001785	0.0041317	0.0048026
Arg of Perigee	335.0650	191.0524	98.8957	81.4623
Mean Anomaly	24.9877	168.9634	261.6884	279.1961
Mean Motion	15.51232243	15.58356881	13.72748792	14.28075778
Decay Rate	0.00033864	0.00045990	0.00000464	0.00001680
Drbit Number	43789	22118	15461	33714
Nodal Period	92.767680	92.343255	104.962927	100.893541
P-Drag	1.305e-04	1.748e-04	2.586e-06	8.316e-06
Increment	23.575761	23.471232	26.316123	25.356540
I-Drag	3.210e-05	4.300e-05	6.482e-07	2.078e-06
Beacon-QRG	19.953/142.417 925.240	143.625=voice 166.130=data+ ranging	435.9744 149.980	435.974
Ref EQX	01 Jan 1990	29 Dec 1989	22 Dec 1989	22 Dec 1989
Drbit	43880	22154	15554	33788
HHMM.MM	0101.09UTC	0025.19UTC	0034.25UTC	0051.09UTC
Degrees W	53.34	357.43	34.30	246.95

PACSAT-1>TIME-1 <UI>:PHT: uptime is 040/21:20:00. Time is Wed Jan 24 09:49:01 1990
PACSAT-1>WASH <UI>:wash addr:3440:0000, edac=0x7d
PACSAT-1>WASH <UI>:wash addr:3680:0000, edac=0x7d
PACSAT-1>TLM <UI>:21:8D 22:6D 23:47 24:3B 25:30 26:04 27:54 28:41 29:05 2A:25 2B:09 2C:05 2D:71 2E:72 2F:72 2F:9E 30:A2 31:9F 32:00 33:5F 34:A1 35:9F 36:9F 37:A4 38:B2 39:D2 3A:01
PACSAT-1>STATUS <UI>: 80 00 00 78 B0 18 EE 01 00 80 00 00 B0 00 00 00 00 00 00 00

Fig. 5

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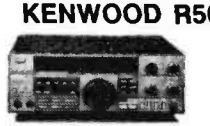

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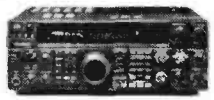

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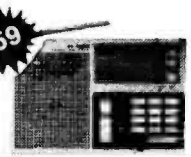

Back-Scatter

have been much improved, and far more use has been demonstrated.

Dave Rowan G4CUO, has been burning the midnight oil, and was pleased to see a re-institution of the number of transatlantic stations active. His log book shows good QSOs with KA1LMX on Rhode Island, N4IQV in Virginia, WA8EBM in Michigan, N9GHV in Illinois and W0EJ in Iowa, the latter being a very long haul. N8AM in Michigan was a 'got away' but is being pursued.

In early March, peaking toward April, auroral conditions will undoubtedly re-occur. Whilst such propagation produces excellent sub-horizon, albeit tone 'A', downlinks from many distant stations, QSOs will again be difficult and as the days lengthen, the presence of terrestrial f.m. in the satellite sub-band will also escalate.

JAS-1-b

The launch of the new JARL/JAMSAT satellite was unexpectedly postponed, and finally took place at 0135UTC on February 7. The new FUJI/OSCAR-20 is putting down good 25 w.p.m. Morse code telemetry consisting of 5 lines of 4 groups of data on 435.795MHz ±8kHz of doppler shift. All the telemetry readings look good. The analogue s.s.b. and c.w. 145.900 - 146.000MHz uplink giving a 435.900 - 435.800MHz inverting transponder was operating the following day, producing excellent signals from an uplink of only 10W to a ground placed antenna. Despite the weight for full magnetic stabilisation attainment, little roll or tumble QSB was in evidence, speaking well for the spacecraft's new antenna system.

Dave Rowan G4CUO reports early Mode JA s.s.b. QSLs with DL1CF, G8ATE, ON5UG and W8VXH, whilst G3IOR worked DL6KG. Dave reports that there are two spurious keying emissions within the transponder analogue downlink passband at 435.840 and 435.885MHz and apart from this he is really delighted with the potential of the new satellite. He has calculated an approximate set of functional Keplerian Elements for the spacecraft which give reasonably good tracking:

Epoch Year	90
Epoch Day	038.106713
Inclination	99.1161
RAAN	109.05
Eccentricity	0.05418
Arg of Perigee	344.1375
Mean Anomaly	5.3979
Mean Motion	12.842134

This puts the satellite at a slightly elliptical 1350km orbit, with a period of some 112 minutes and an increment of approximately 028.2°W per orbit. A set of calculated pass times will produce passes of about 15 minutes later each day. Far more detail and a more accurate set of elements will appear in next month's column, by when the digital transponder should be uploaded and operational.

RS-14

It is quite possible that in addition to JAS-1-B, yet another satellite will soon be with us, in the form of the earlier foretold RS-14. It may well go into space before RS-12/13, as plans are in hand to launch it on Gagarin Day, 12 April 1990. Yuri Gagarin, the first man in space, operated as UA1LO.

AP-Satellite?

Words are circulating that Pakistan is soon to launch a satellite using the 2m band, and from what has been overheard, it would appear NOT to be the 145.800 - 146.000MHz sub-band allocated for the amateur space service. Any verifiable input on this matter would be appreciated.

EME

It was interesting to note that as propagation to RS-10 improved, so did e.m.e. capabilities. **Doug Mallett G3HUL** reports that during mid-January he heard echos of his own and other modestly powered stations coming back at strengths never heard before. "I was actually getting good readings on my S-meter" said Doug. "This is a very rare occurrence". Doug made good QSOs with IN3HER, K1FO, N4GJD, OK1KIR, UA1ZCL, UA9FAD and YV5ZZ.

OSCAR-10

The first AMSAT elliptical orbiter continues to perform well, and is on for use all the time. Being no longer under command control, its attitude cannot be re-angulated, hence signal paths can at times be poor when pointing is impaired. The attitude changes are as follows:

April 1990: A.Lat 28, A.Long. -11.
July: A.Lat 17, A.Long -5.
October: A.Lat. 5, A.Long. 2.
January '91: A.Lat 353, A.Lon.9.

OSCAR-13

The current transponder schedule until at least February 21 is adjusted with a 210/0 attitude, and is:

Mode 'B' transponder on from MA 000 to MA 160.

Mode 'JL' transponder on from MA 160 to MA 190.

Mode 'S' beacon only on from MA 190 to MA 192.

Mode 'S' transponder on from MA 192 to MA 198.

Mode 'S' beacon again from MA 198 to MA 200.

Mode 'B' transponder on again MA 200 to 256.

Omni antennas on from MA 235 to MA 075.

The new schedule operative until May 9 will be :

Mode B from MA 0 to MA 165

Mode JL from MA 165 to MA 195

Mode JL & the S Mode beacon (only) from MA195 to MA 200

Mode B & S transponder mode from MA 200 to MA 205

Mode B from MA 205 to MA 256 (000)

The omni-directional antennas will be deployed between MA 240 and MA 60. Remember that the Mode J uplink receiver suffers from desensitisation when the Mode S beacon is active.

From February 21 to May 21 the transponders will be turned off from MA 20 to 90 due to solar eclipses lasting between 12 and 29 minutes, preventing the solar energy from maintaining battery charge. During this period, all Mode S MA 195 to MA 205 operations will be terminated.

Peter Guezlow DB2OS of AMSAT-DL, has had several reports of problems on mode 'J', evidenced as a sudden emergence of severe lack of sensitivity. He explains that in mid January AMSAT-DL decided to switch on the mode 5 MA units earlier, with only the beacon on during the 'JL' mode to enable 'S' mode users with small antennas to find the satellite. The transponder schedule was changed so that the mode 'S' beacon came on at MA 140. Unfortunately, whenever the 'S' mode is on, the mode 'J' 144MHz uplink receiver demonstrates dramatic desensitisation. Peter says "This effect seems to be due to some spurious signals of the mode 'S' transponder. I recall that we had the same effect last year when the Mode 'S' beacon was switched on during mode 'JL' operational transponder periods".

James Miller G3RUH informs us that a lunar eclipse is forecast for OSCAR-13 for 30 minutes from 2215UTC on March 26, and stations are not to use the satellite transponder at this time of depleted battery charging.

LUSAT-OSCAR-19: Equations are in the form Y = A x N² + B x N + C where:-
N = Telemetry Count (00-FF). A, B, C = Equation coefficients.
Y = Result (in specified Units).
ADC Equations: V = 0.00953 N. N = 104.94 V.
* Note 1: The thermistor is located near the box centre adjacent to the LUSAT thermistor channel No. 5.
** Note 2: The thermistor is located near the -X face of the box on the experiment baseplate.

HEX	Description:	C: cccccccccc	B: bbbbbbbbbb	A: aaaaaaaaaa	Units: uuuuuu
0	Rx D DISC:	+9.802	-0.08779	0.000	kHz
1	Rx D S meter:	+0.000	+1.000	0.000	Counts
2	Rx C DISC:	+8.429	-0.09102	0.000	kHz
3	Rx C S meter:	+0.000	+1.000	0.000	Counts
4	Rx B DISC:	+9.291	-0.08317	0.000	kHz
5	Rx B S meter:	+0.000	+1.000	0.000	Counts
6	Rx A DISC:	+9.752	-0.08310	0.000	kHz
7	Rx A S meter:	+0.000	+1.000	0.000	Counts
8	Rx E/F DISC:	+10.110	-0.08610	0.000	kHz
9	Rx E/F S meter:	+0.000	+1.000	0.000	Counts
A	+5 Volt Bus:	+0.000	+0.0385	0.000	Volts
B	+5V Rx Current:	+0.000	+0.000250	0.000	Amps
C	+2.5V VREF:	+0.000	+0.0108	0.000	Volts
D	8.5V BUS:	+0.000	+0.0391	0.000	Volts
E	IR Detector:	+0.000	+1.000	0.000	Counts
F	LO Monitor I:	+0.000	+0.000037	0.000	Amps
10	+10V Bus:	+0.000	+0.0508	0.000	Volts
11	GASFET Bias I:	+0.000	+0.000026	0.000	Amps
12	Ground REF:	+0.000	+0.0100	0.000	Volts
13	+Z Array V:	+0.000	+0.1023	0.000	Volts
14	Rx Temp:	+93.24	-0.5609	0.000	Deg. C
15	+X (RX) Temp:	+93.24	-0.5609	0.000	Deg. C
16	Bat 1 V:	+1.7343	-0.0029740	0.000	Volts
17	Bat 2 V:	+1.7512	-0.0032113	0.000	Volts
18	Bat 3 V:	+1.7790	-0.0034038	0.000	Volts
19	Bat 4 V:	+1.7286	-0.0030036	0.000	Volts
1A	Bat 5 V:	+1.8114	-0.0036960	0.000	Volts
1B	Bat 6 V:	+1.7547	-0.0032712	0.000	Volts
1C	Bat 7 V:	+1.7151	-0.0030739	0.000	Volts
1D	Bat 8 V:	+1.6846	-0.0028534	0.000	Volts
1E	Array V:	+8.612	+0.06433	0.000	Volts
1F	+5V Bus:	+2.035	+0.0312	0.000	Volts
20	+8.5V Bus:	+5.614	+0.0184	0.000	Volts
21	+10V Bus:	+7.650	+0.0258	0.000	Volts
22	BCR Set Point:	+2.191	+1.0616	0.000	Counts
23	BCR Load Curr:	-0.0244	+0.000628	0.000	Amps
24	+8.5V Bus Curr:	+0.00412	+0.000773	0.000	Amps
25	+5V Bus Curr:	+0.02461	+0.00438	0.000	Amps
26	+X Array Curr:	-0.01614	+0.00232	0.000	Amps
27	-X Array Curr:	-0.01158	+0.00238	0.000	Amps
28	-Y Array Curr:	+0.00278	+0.00206	0.000	Amps
29	+Y Array Curr:	+0.00136	+0.00218	0.000	Amps
2A	-Z Array Curr:	+0.00370	+0.00209	0.000	Amps
2B	+Z Array Curr:	-0.00793	+0.00216	0.000	Amps
2C	Ext Power Curr:	-0.02000	+0.00250	0.000	Amps
2D	BCR Input Curr:	-0.00901	+0.00283	0.000	Amps
2E	BCR Output Curr:	+0.00663	+0.00344	0.000	Amps
2F	Bat 1 Temp:	+93.24	-0.5609	0.000	Deg. C
30	Bat 2 Temp:	+93.24	-0.5609	0.000	Deg. C
31	Baseplt Temp:	+93.24	-0.5609	0.000	Deg. C
32	PSK TX RF Out:	+0.1059	+0.00095	+0.0000834	Watts
33	RC PSK TX Out:	+0.0178	+0.00135	+0.0000833	Watts
34	PSK TX HPA Temp:	+93.24	-0.5609	0.000	Deg. C
35	+Y Array Temp:	+93.24	-0.5609	0.000	Deg. C
36	RC PSK HPA Temp:	+93.24	-0.5609	0.000	Deg. C
37	RC PSK BP Temp:	+93.24	-0.5609	0.000	Deg. C
38	+Z Array Temp:	+93.24	-0.5609	0.000	Deg. C
39	LU Bcn Temp A:	+93.24	-0.5609	0.000 *	Deg. C
40	LU Bcn Temp D:	+93.24	-0.5609	0.000 **	Deg. C

Fig. 6

Keplerian Elements

The sets from **Birger Lindholm** includes the first ones for 1990. Do not forget to check your sidereal times given earlier. The latest microsat set follows as a single set for the undefined 'Microsat-4' that may be temporarily used for all the cascade, as it is believed to be central to the stream.

Satellites	Mean Microsats
International Designation	Yet to be confirmed.
Object Number	9-05-'N'
Epoch Year	90
Epoch Day	024.38180079
Inclination	98.7167
Right Ascension of Ascending Node	100.8503
Eccentricity	0.0012258
Argument of Perigee	210.658
Mean Anomaly	149.3875
Mean Motion	14.28756933
Acc., Decay rate or Drag Factor	0.00017243
Epoch Orbit Number	Rev 33
Beacon Frequencies	As given in text

They seem to give a reasonably good fit, but next month we shall need to give them separately, as they will have taken up discernible different pass times by then.

Back-Scatter

Propagation

Reports to
Ron Ham
Faraday
Greyfriars, Storrington, West Sussex RH20 4HE

Solar

Please remember readers, **NEVER LOOK DIRECTLY AT THE SUN, WITH OR WITHOUT AN OPTICAL INSTRUMENT, BECAUSE IT CAN SERIOUSLY DAMAGE YOUR EYESIGHT.** Experienced astronomers project the sun's image on to a screen and then pencil in the shape and positions of any sunspots that are present at the time. Before even doing this I suggest that you get some advice from your local astronomical society about the proper way to use a projection system. Their address should be available from your public library or by writing to the British Astronomical Association, Burlington House, Piccadilly, London W1V 9AG.

While using the projection method, from locations in Edinburgh or Glasgow, **Ron Livesey** found 4 active areas on December 7, 11, 21 and 22; 6 on days 2, 25 and 28; 7 on the 4th and 26th and 8 on the 3rd. **Cmdr Henry Hatfield** (Sevenoaks), using his spectrohelioscope [a very specialised instrument], located 2 sunspot groups, 16 filaments and 11 quiescent prominences at 1233 on January 7, 1 group, 24 fils. and 11qps at 1126 on the 13th and 2 groups, 26 fils., 10qps and a medium sized semi-eruptive prominence on the sun's east limb at 1232 on the 24th. **Ted Waring** (Bristol) counted 18 sunspots on January 4 and 8.

"The h.f. bands seemed upset around the 28th/29th of December, solar flares no doubt!" wrote **John Woodcock** (Basingstoke) and **Ern Warwick** (Plymouth) heard the background noise surging on 28MHz around midday on January 2, 6, 7 and 14. **Steve Reader** (Nuneaton) heard sudden large increases of noise at 50MHz around 1215 on January 19 and Henry Hatfield recorded bursts of solar noise at 136 and 1297MHz on the 20th. Unfortunately, overcast skies prevented him using his spectrohelioscope to identify the source of the noise on the sun's disc. He also recorded large bursts of noise on 136MHz at 1146 and 1350 to 1455 on the 9th.

"The mean sunspot number for December 1989 was 165.1," wrote **Neil Clarke GOCAS** (Ferrybridge) who also supplied a graph, Fig. 1a, showing how the daily number of solar flux units ranged from around 225 at the beginning down to 165 in the middle and peaking at 285 toward the end of the month. No doubt that large rise on Neil's chart is due to the increasing number of sunspots shown in Figs. 5,6 and 7 drawn by **Patrick Moore** at his observatory in Selsey at 1115 on December 19, 0940 on the 24th and 1105 on the 26th respectively. Although his observations were hampered by cloud on January 2, 14, 17 and 21, he was able to see that large double, Fig. 8, at 1310 on the 22nd.

Auroral

Ron Livesey, the auroral coordinator for the British Astronomical Association, received reports of aurora described as "ray bundles" from observers in Cornwall overnight on December 1st, Denmark and West Ireland on the 4th, Mersey on the 17th, North Dakota on the 22nd and South Scotland on the 26th; "active, flaming and flickering" from North Dakota, Mersey and North Scotland on the 1st, North Dakota on days 5, 24, 26, 30 and 31; "coronal structures, half sky" from Forres on the 17th and North Scotland on the 29th and "all-sky" from Inverness on the 29th.

The auroral effect on terrestrial radio signals was reported by **Tony Hopwood** (Worcester) on days 12, 16, 24, 29 and 30 and by **Doug Smillie** (Wishaw) on the 1st and 30th. Ern Warwick reports "weak aurora" on the signals from the German beacon DK0WCY at 1800 on January 5, and echos on 28MHz transmissions from the North American beacon WA4DJS on

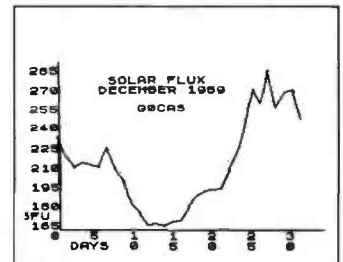

Fig. 1a

Fig. 1b

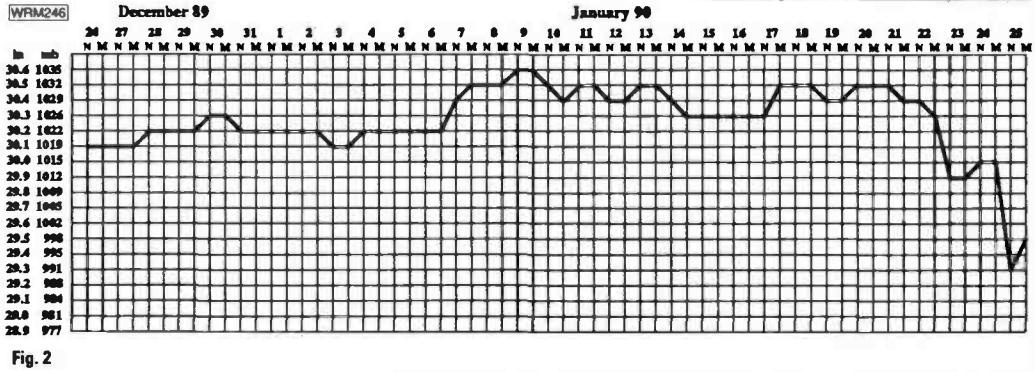

Fig. 2

Beacon	Dec 26	27	28	29	30	31	Jan 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
AL7GQ																X		X												
DF0AAB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EA2HB									X		X																			
EA3JA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EA6RCM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X
EA7PS						X	X	X																						
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KA3OEM						X	X	X		X	X		X	X	X	X	X													
KA9UBX													X																	
KB4UPI	X	X		X		X	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X
KB6SVK																			X											
KC4DPC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
KD4EC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		
KE2DI/B	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KE5GY/B	X	X					X	X	X	X	X	X	X						X	X						X	X			
KF4MS	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X
KJ4X/B	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KM4MY												X																		
KW7Y/B	X	X	X					X				X									X									
LA5TEN	X	X	X	X		X	X		X	X		X	X	X	X	X	X	X		X		X	X					X		
LU1UG	X				X			X		X	X	X	X		X			X	X	X	X	X	X							
LU4XI	X																													
NX20/B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N8KHE	X																													
OA4CK												X																		
OK0EG	X	X			X			X	X		X	X			X		X	X					X							
OH2TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PY2AMI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X	X				X
PY2GOB				X	X	X				X	X	X																		
SK5TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X		X		
VE1MUF																			X											
VE2HOT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
VE3TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X														
VE6YF	X		X	X		X		X		X		X	X							X		X		X	X					
VK2RSY	X			X	X				X	X	X		X	X		X	X	X	X	X	X	X	X		X	X				
VK5WI													X			X	X			X	X					X				
VK6RWA														X		X	X	X		X		X	X		X	X				
VS6TEN																										X				
WA4DJS	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
WB4JHS																										X				
WC8E	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
W3VD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W7JPI/B	X	X						X		X		X							X	X	X				X	X				
W8FKL/4						X	X																							
W8UR/B	X	X	X					X	X	X	X	X	X	X			X	X			X	X	X		X	X				
W8UT/B													X																	
W9UXO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
YO2KHP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
ZD8HF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
ZL2MHF																								X						
ZS1LA	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
ZS5VHF	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X								X				
ZS6PW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4N3ZHK	X	X			X		X	X	X	X		X	X	X		X	X	X						X		X	X			
5B4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Fig. 3

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For more information on the IC-725 budget H.F, and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

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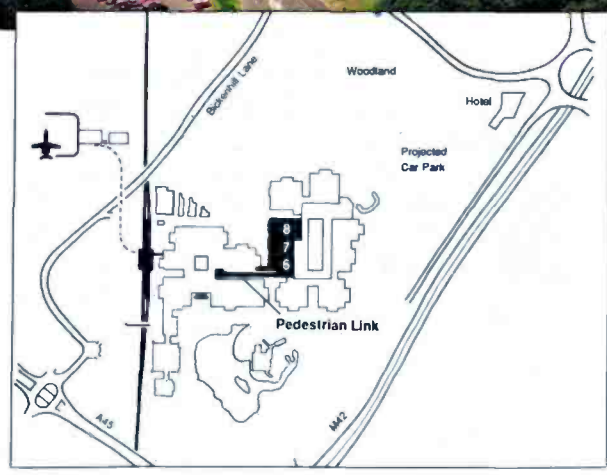
AND

AMATEUR RADIO EXHIBITION

Saturday 21 April — Sunday 22 April

HALL 7, NATIONAL EXHIBITION CENTRE, BIRMINGHAM



With over 100 stands, free parking and easy access, this is the **premier** amateur radio event of the year. Full facilities are available for disabled visitors and an extensive lecture programme is offered.

Opening times:
Saturday 21st April, 10 till 6
Sunday 22nd April, 10 till 5

Talk-in on 2 metres, S22

Entry fee — £2

TRADE ENQUIRIES WELCOME

TEL 0277 225563
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Back-Scatter

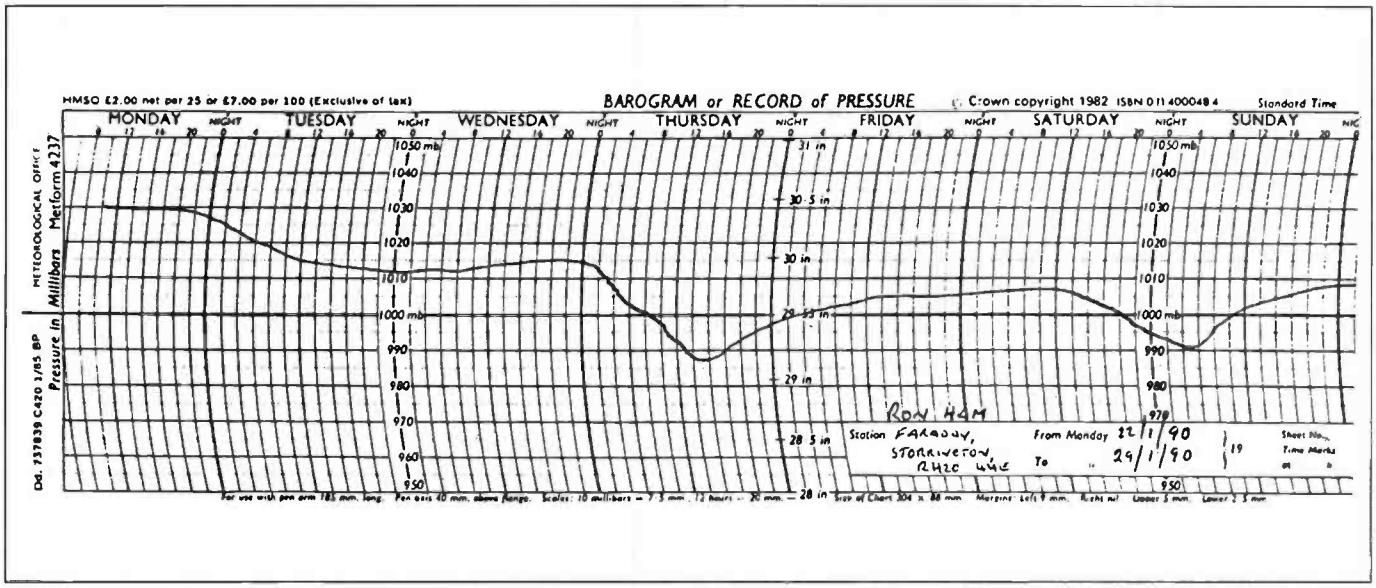

Fig. 4

the 18th and 19th and from a 'G' and two stations in the USSR on the 20th.

Magnetic

The various magnetometers used by Tony Hopwood, **Karl Lewis** (Saltash), Ron Livesey, **David Pettitt** (Carlisle) and Doug Smillie between them recorded storm conditions at some time on December 1, 2, 3, 4, 5, 10, 12, 22, 24, 26, 27, 29, 30 and 31 and the computer print out, Fig.1b, showing the Ap index for the month was kindly supplied by Neil Clarke.

Sporadic-E and F2

Simon Hamer (New Radnor) received television signals from Australia (46.25MHz) and China (49.75MHz) during an 'F2' opening at 0900 on December 12 and, later in the day at 1700, logged pictures, via Sporadic-E, from Albania, Austria, Czechoslovakia, Hungary, Italy, Poland, Portugal, Scandinavia, Spain, the USSR and Yugoslavia in Band I and several East European f.m. broadcast stations between 66 and 73MHz.

Meteor Scatter

Simon Hamer identified "pings" of pictures in Band I, via meteor trail reflection, from Czechoslovakia on December 15, Denmark on the 17th, Finland on the 27th and then added Germany, Ireland, Italy, Norway, Poland and Sweden on January 3 at the peak of the Quadrantids meteor shower. In addition he logged "pings" from the Danish f.m. broadcast transmitters at Rangstrup on the 3rd and Naestved on the 5th, and Steve Reader heard several 'pings' of signal from an unidentifiable station on 50MHz at 1225 on the 19th.

28MHz

The Editor, **Rob Mannion G3XFD** found both long and short skip on 28MHz during the early evening of January 15 when, at 1730, he worked the Editor of the American radio magazine QST, heard both sides of a QSO between stations in Scotland and the USA, worked into Italy and listened for a while to an amateur in Sweden. Although the background noise was very quiet, Rob noted rapid fading on some signals.

Propagation Beacons

First of all my thanks to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Henry Hatfield, **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Ted Waring and Ern Warwick for their detailed 28MHz beacon logs from which I compiled the chart in Fig. 3.

Mark Appleby heard the 15W beacon DA4CK on 28.240MHz at 1530 on January 6, Greg Lovelock copied "CQ DE EA7PS BCN 1W GP QTH LAT 3638N LONG 15W PSE QSL" (28.202MHz) on January 2, "KA3OEM/BCON MEADVILLE Pa." (28.205MHz) on January 7, "KA6SVK BCN 15W" (28.280MHz) on January 13, "KE5GY/BCN FIVE WATTS VERTICAL ARLINGTON TEXAS PSE QSL 73" (28.201MHz) on December 22 and Ern Warwick reports that PY2GOB and ZS1LA have been transmitting on 28.221MHz and 28.275MHz since October 10 and January 4 respectively and copied "VVV DE KA9UBX/BCN WEST BEND, WI. 2WATTS VERT" on 28.224MHz at 1510 on the 7th. Ern also logged signals, almost daily from the beacons in Brazil (PY2AMI) and Italy (IK6BAK) on 24.931 and 24.915MHz respectively, OH2B, ZS6DN/B and 4X6TU/B on 14.100MHz and DK0WCY on 10.144MHz. Among those he heard less frequently between December 31 and January 20 were JA2IGY, KH6O/B and 4U1UN/B on 14.100MHz.

Tropospheric

The slightly rounded atmospheric pressure readings for this period, Fig. 2, were taken at noon and midnight from the Short and Mason barograph installed at my home in Sussex. Apart from January 23, the pressure remained above 30.0in (1015mb), often higher between 30.4in (1029mb) and 30.6in (1036mb), from December 26 to January 24 when it suddenly fell from 30.0in at midnight on the 24th to 29.2in (988mb) around 1500 on the 25th, Fig. 4, as the ferocious storm with hurricane force winds crossed the British Isles causing so much damage and loss of life. It began rising again at 1600 reaching 29.5in (998mb) by midnight. The pressure change for the second, thankfully less severe, storm is traced between 1600 on the 27th and 0800 on the 28th.

Simon Hamer found conditions good for DX on January 4 when he logged f.m broadcast signals from the Benelux countries and Eire and pictures from Belgium, France and Holland in the u.h.f. band and I logged several co-channel "warbles" and at least 7 foreign voices in Band II at 1025 on the 19th, and BBC Radios Bristol and WM and a Belgian station all around 95.5MHz at 0845 on the 21st.

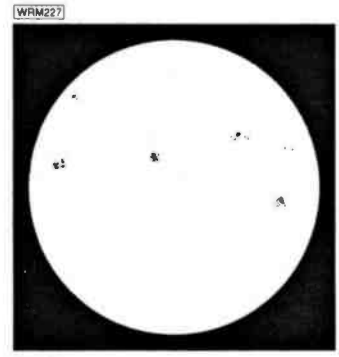

Fig. 5

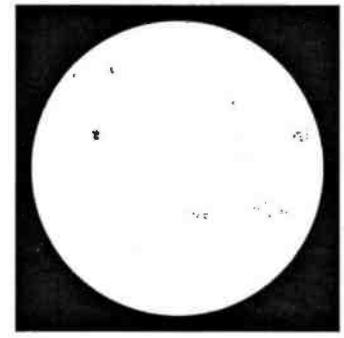

Fig. 6

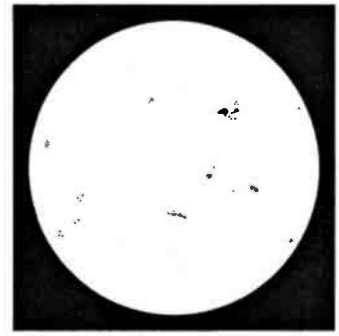

Fig.7

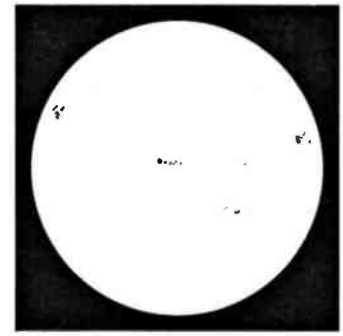

Fig. 8

934MHz

"The usual Christmas morning greetings net was enjoyed by a considerable number of stations over flat conditions," wrote **Terry Wyatt UK-845** from Walton on Thames. The high atmospheric pressure in early January, which peaked at 1032mb (30.5in) on the 8th, meant contacts for Terry between his home in Surrey and stations in Wokingham (Berks), Watford (Herts) and a mobile at Brighton in Sussex.

Back-Scatter

Broadcast Round-up

Reports to
Peter Shaw

With dramatic events continuing in the East, short wave radio once again proves how useful it is as a primary source of information. A clandestine station called 'Azadlyk' or Freedom sprang up in mid-January in Azerbaijan, and was even reported by the Soviet news agency Tass. It seems that the station operated on frequencies used by the Mayak second programme from Moscow, assuring it of large audiences.

Meanwhile, an independent radio station has started in Lithuania. Called M1 (standing for music, and the first independent station in the Soviet Union), it is run by just four people, and can be heard within a 150km radius of Vilnius. Equipment for the station was provided by the West German station SDR, the Ritter Sport confectionery firm and the German social democrats.

Few people doubt that Germany will be reunified in the very near future and it is very interesting to speculate what will happen to international broadcasting then. Currently, there are three international broadcasters in East and West Germany - Radio Berlin International, Deutsche Welle and Deutschlandfunk. The latter two emanate from smart, modern facilities in the city of Cologne, with high power transmitters in Germany and at overseas relay bases, whilst RBI has the benefit of being located in what will undoubtedly be the new capital of Germany, but with outdated studios and transmitters. As with the rest of East German industry and commerce, much capital will need to be injected into RBI in order to bring it up to the standards currently enjoyed by its Western counterparts. And what will the new station be called. DW Berlin perhaps?

We have reported on closer ties between Poland and broadcasters overseas, and now concrete evidence of this is provided by an agreement between Polish radio's first programme and the voice of America, whereby several VoA programmes are to be re-broadcast on Polish Radio, including VoA News In English and Polish at 2348 for ten minutes every day, a press review programme on Mondays at 1125, a Top Ten pop music programme at 1410 on Saturdays and *American Polonia Speaking* at 0945 on the fourth Tuesday of the month. Polish Radio's first programme is carried on 225kHz, long wave.

The Voice of Nigeria is reported to be about to reactivate its 500kW transmitters in order to bring the station to international standard. Priority for the rejuvenated station will be an African audience, with languages spoken on the continent the prime focus, including English and French. The station has been operating with reduced facilities for some years, with just one of its five 500kW senders operating at half power. The Voice of Nigeria also has one 300kW and two 100kW senders.

The Swedish Riksdag or Parliament has authorised the installation of three new h.f. transmitters for Radio Sweden to replace the ageing equipment at Hoerby and Karlsborg. The new transmitters may be ready by 1994, which reprieves the station from premature closure at the end of 1994 since the current transmitters contain pcbs in oil and it will be forbidden to use such equipment in Sweden from the beginning of 1995.

In Switzerland, the long running saga of new transmitting sites for Swiss Radio International seems to have hit another snag. the Swiss authorities intend to build four transmitters north of Lausanne near Mount Jorat, but local residents in the western Swiss Canton of Vaud are to submit a petition to the Swiss Communications Minister.

European Stations

All times UTC (=GMT)

The current schedule for Radio Sofia, in Bulgaria, includes English transmissions :

0400-0500 on 9.70 & 7.115MHz
0730-0800 on 17.825, 15.160 & 11.720MHz
1530-1630 on 15.37, 11.84 & 11.735MHz
1830-1930 on 15.37, 11.84 & 11.735MHz
1930-2000 on 9.70, 7.155 & 6.07MHz
2130-2200 on 9.70, 7.155 & 6.07MHz
2230-2330 on 11.68 & 9.70MHz

In the Soviet Union, Radio Moscow has introduced two new 30 minute broadcasts in Romanian at 1230 and 1400 on 9.795, 7.38 and 4.895MHz increasing the total output from 35 to 42 hours each week in Romanian.

Estonian Radio has started a new service for seamen and has asked for reception reports from around the world using the frequency of 5.925MHz on Sundays alternately in Estonian and Russian from 0700. Listeners are invited to telephone the studio whilst the programme is on the air on 43-44-91. An address, together with telex, FAX, and telephone numbers were given:

Estonian Radio , Lomonosova 21, Tallinn 200001, USSR, Telex 173-271, FAX 43-41-72 and telephones 43-44-24 and 43-43-39.

Radio Station Peace and Progress seems to have stopped Indonesian language transmissions which until January were heard on Tuesdays and Wednesdays. Instead, Radio Moscow's Indonesian language programmes have been extended to 60 minutes in line with transmissions during the rest of the week.

Middle Eastern and African Stations

Iran is currently transmitting English :

1130-1225 on 11.79, 9.685, 9.61 & 9.52MHz
1930-2030 on 11.865, 9.022 & 6.03MHz

Israel has English broadcasts:

0000-0030, 0100-0125, 0200-0225 on 11.605, 9.93 & 9.435MHz
0500-0515 on 17.63, 15.485, 11.655, 11.588 & 9.435 MHz
1100-1130 on 21.78, 17.59, 17.578, 17.575, 15.65, 15.485 & 11.585MHz.
1800-1815 on 11.655 & 11.585MHz
2000-2030 on 17.63, 15.64, 15.485, 13.75, 11.605 & 9.435MHz
2230-2300 on 15.615, 13.75, 11.605, 9.93 & 9.435MHz.

The Voice of Israel has easy Hebrew lessons daily at 1830 for 20 minutes on 11.655 and 11.585MHz.

If you are looking for some obscure languages, Israel might be the station to tune into; on Tuesday and Thursday at 1330, 21.79 and 17.575MHz beamed to the Middle East carry Temanite, whilst on Sunday and Wednesday at 1445 for ten minutes, Tat may be heard on 21.79, 17.685, 17.575, 17.64 and 15.485MHz beamed to Europe and the Americas.

Radio RSA has moved its early evening English broadcast from 1800 to 1900 and changed frequency to 17.765 and 15.23MHz.

Radio Omdurman has moved just 10kHz up to 11.635MHz, in parallel with 9.54MHz between 0330 and 2100.

Asian and Pacific Stations.

Radio Afghanistan has started to use the channel of 4.975MHz for its first programme, in parallel with the long established frequency of 4.74MHz. The new frequency may have replaced 3.965MHz which has carried the first programme for some time.

Meanwhile, English services from Radio Afghanistan to Europe seem to have been increased from 30 to 60 minutes daily. Transmissions are now at 1830 until 1930 on 6.02, 7.215 and 9.635MHz.

Radio Bangladesh has English transmissions to Europe:

0800-0830 & 1230-1300 on 11.705 & 15.195MHz.
1815-1900 on 15.255 & 11.705MHz.

Bengali to Europe follows the evening English broadcast at 1915 until 2000 on the same channels.

English news broadcast by the Bhutan Broadcasting Service has been heard on nominal 5.025MHz (actually noted on 5.023MHz) at 1415, with sign-off at 1500.

Taiwan's Voice of Free China which has transmitters in the Republic and uses facilities of WYFR in Florida, broadcasts in English at 2200 for 60 minutes daily on 15.37, 11.805 and 9.8525MHz.

Standard Chinese from VoFC to Europe may be heard at 1900 on 17.845, 15.44 and 15.37, and at 2200 on 11.86, 9.765 and 9.51MHz with both transmissions lasting for 60 minutes.

The Voice of Vietnam has returned to its 12MHz channel for most of its broadcasts, including English at 1600 (to Africa), 1800, 1900, 2030 and 2330 when 12.02 and 9.84MHz are used for the 30 minute transmissions.

Back-Scatter

ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN2|8PH|

News this month of progress on the amateur television repeater scene.

First of all, the Emley Moor repeater, south of Leeds in Yorkshire. On the problem front GB3ET has suffered a loss of signal to the south-east. Ken G8VDP first reported the problem and then set off up the tower to investigate the problem. Everything in the turret room was found to be functioning well, but a look at the antenna itself soon revealed the problem. The antenna is mounted on a YTV mast on the north east of the tower and points east into what was the clear, but the tower has now grown a new dish on the east of our TX antenna and this dish completely obscures any r.f. to the south-east. At present they are not sure how they are going to fix this problem but you can rest assured that they will find a fix - "We have come too far to lose all our south-east viewers", says Trevor G8CJS.

The transmitter has been changed for a free running Solent unit on loan from G6LIC, which is proving to be more stable than the Wood & Douglas TVT 1240 used before, so they have invested in a crystal-locked version. This is now being completed by Clive G8EQZ and will shortly go into service. Ant Products (Derek Simpson) has now almost finished the new receive antena which is the same design as the transmit antenna and this will go into service in due course.

The loaned satellite receiver is still in service but again Clive G8EQZ is looking into a better one, so until then users will have to put up with the low deviation in repeat mode.

Flushed with success at now being able to radiate colour signals from the new transmitter, Trevor has rebuilt the logic so that eight different test patterns are now being radiated. The pages rotate in sequence and include News, Coming Events and a very large ET caption for the hard of viewing. Page 8 has a very large K and is only displayed when someone has accessed the repeater and dropped out. The K is maintained for about 10 seconds, so it is possible to get back from TX to RX in the most antiquated of stations and see proof of having got in. The 10 seconds is interruptible by any other incoming signal, and so does not hold up QSOs. On the finance front they have had one or two further donations, one from G6RIL who will shortly be seen on the repeater with a Wood & Douglas RX and Solent TX and SC1040 p.a. Producing software and e.p.r.o.m.s takes up a lot of time but generates some income for the repeater, so it must be worthwhile! One of the prominent features of the BATCs convention at Harlaxton in May is the Bring and Buy stall, which this year will be managed and run by GB3ET. This will mean a lot of work for the group but they get to keep the commission charges so it will swell funds.

On the organisation front a committee has been formed, and the meetings are held monthly at Wooly Edge Services on the M1 (northbound). If you are interested please get in touch with either Barry or Trevor. Barry G6LIC can be reached on (0924) 822605 and Trevor G8CJS can be reached on (0532) 670115.

Back-Scatter

New Proposals

Several schemes for new television repeaters are in the offing. These include GB3TN at Fakenham, GB3TT at Bolsover, GB3DV 'somewhere in Dorset' (all these are 24cm) and GB3XT (10GHz) near Burton-on-Trent. I have contacts for the last two, in case you'd like to offer assistance or support. For the Dorset repeater you should get in touch with Les G0FAJ, 29 Overlands Road, Wyke Regis, Weymouth, Dorset. Bob Platts G8OZP is your man for GB3XT, and he is at 8 Station Road, Rolleston on Dove, Burton-on-Trent, Staffs DE13 9AA.

In addition, the Rugby TV repeater is set to move from Barby to a higher spot near Coventry. There was a scheme for a TV repeater covering Oxford and the Vale of Aylesbury but that seems to have gone quiet lately. But if you know different ...

Repeater Roster

Just to keep you up-to-date, here is a list of TV repeaters already on the air, compiled from the RSGB's Repeater Report. The format is repeater callsign, channel, location, the callsign of the person to contact for further information (see callbook) and status in January 1990.

GB3AF	RT2	Durham	G1FBY	temp off air.
GB3CT	RT2	Crawley	G4ZPP	operational.
GB3GT	RT2	Bellahouston	GM0GIB	operational.
GB3GV	RT2	near Leicester	G0CND	low power.
GB3HV	RT3	High Wycombe	G4CRJ	operational.
GB3NV	RT2	Nottingham	G6YKC	operational.
GB3PV	RT2	Cambridge	G4MDC	temp off air.
GB3RT	RT2	near Rugby	G6IQM	operational.
GB3TG	10G	Milton Keynes	G4NJU	licenced.
GB3TV	RT2	Dunstable Downs	G4ENB	operational.
GB3UD	RT2	Stoke-on-Trent	G8KUZ	operational.
GB3UT	RT1	Bath	G8CPF	AM TV beacon only.
GB3VI	RT1	Hastings	G4BCD	AM, operational.
GB3ZZ	RT2	Bristol	G8VPG	operational.

All these use f.m., except GB3UT and GB3VI. I'd welcome news from any of these groups, also any updates and additions.

Andy's Soapbox

The more I look at the way amateur television is going, the more I see repeaters as the future. I am not convinced they are entirely for the best, but they certainly promote activity and encourage newcomers to the hobby, people who may be unable or unwilling to set up a more elaborate station for Simplex contacts. Pressure on the lower u.h.f. bands is bound to increase, almost inevitably from the packet radio people, who have given amateur radio a 'high-tech' image and a degree of street credibility that it was lacking for a while.

I won't bore you with my views on packet except to say that I think it is killing off 'real radio' and causing very real QRM to our video mode. We should seek to reach an accommodation with the PR brigade and learn to live together, and not ignore the situation.

But changing technology will inevitably determine the way our hobby moves, regardless of what other modes do, and I am convinced we shall all be moving to 10GHz soon. Even five years ago that sounded like arrant rubbish: you needed a degree in microwave technology and a G3 callsign to work X-band, and even then you could only make it work with a monster dish on a war-surplus tripod from some mountain-top in north Yorkshire or Wales. Now it's all different: there are small dishes, surplus satellite TV receivers at silly low prices and Solfan heads for £5. You'll be able to put together a complete station for well under £100 and some kind soul will put up a TV repeater on a tower block in nearly every major town. These repeaters will be linked on 2.3GHz and by tapping out a few touch-tone digits on a keypad mike, you'll be able to hook yourself through to another TV repeater 120km away or more. Too bad that your QSO partner is not monitoring currently, but some things never change in amateur radio. Am I right or am I right? Drop me a line and express your own point of view!

Good (quality) News

Are you an ATV junkie? Do you flick through the ATV literature voraciously and still want more after that? Well, how about an off-beat idea? Join another repeater group! (Severnside Group members stop reading now ...)

I say this because I am continually impressed by the quality and quantity in *P5*, the newsletter of the Severnside ATV Group, and it seems a crime that most ATVers don't get to see it! Recent issues have included an excellent series on video editing, books reviews, how to get the best out of a Solent transmitter and a low-cost DTMF (touch-tone) encoder. You get an extremely worthy 10-page effort every quarter and by subscribing you are also supporting the work of the repeater group. For details send an s.a.e. to Shaun O'Sullivan G8VPG, 15 Witney Close, Saltford, Bristol BS18 3DX. Don't forget the group sells admirable antennas, pre-amps and f.m. TV transmitters for 24cm: again, an s.a.e. to G8VPG will bring you details.

Sign-off

Once more that's another session over. Please continue to send in your comments, reports and letters ready for the next article. Thanks.

Wanna Swap!

Have many valves. Would exchange for complete copy of *Wireless World Radio Valve Data* seventh edition by Illife Books of 1961-4. Also wanted a comprehensive CV to civilian valve conversion book. R Southall. Tel: (0526) 20520.

Have Yaesu FRG-7000, 0.25-30MHz receiver in very good condition. Would exchange for a v.h.f. receiver or scanner. Paul Forrester. Tel: (0946) 823797.

Have Eddystone 840 receiver, as new, no screwdrivers or soldering iron near it , plus Telequipment Lab scope with workshop manual, also JVC stereo keyboard KB300B. Would exchange for Airmec C864 or old gramophone. L Conway. Tel: 01-594 7840.

Have Icom and Pye v.h.f. and u.h.f. equipment, looking for T1154 and WWII indicator units No 6, 62, 162, 184, etc., w.h.y? E. Green G4EZM. Tel: Blackpool 47176.

Have AVO Model 8 Mk 3 multimeter. Would exchange for Datong D70 Morse tutor. Dave MacLiver. Tel: Ayr 520925.

Have an American model handie 144MHz portable and 7.2V 600mAH battery pack complete with speaker mic. Would exchange for a video camera. Paul Daly. Tel: 01-961 6627.

Have Trio TS-510. Would exchange for a 144MHz multi-mode or dual band mobile rig. Would also consider other options. Dave McLachlan, 71 Ellfield Court, Northampton NN3 4LS or leave a message on @GB7AAA for G1BGF.

Have Collins R351 (430MHz) receiver, BC1000 (WS31), Commodore Pet computer; components from post WWII era including tens of valves, coils on ceramic formers, h.d. transformers. Would exchange for any of: TX12, a.t.u. matching unit TX12 , B47, R216 or Pye Westminster. P Webra G7FXO. Tel: Swanage 425805 evenings.

Have R206. Would exchange for FRT-7700 a.t.u., FRV-7700 v.h.f. convertor and matching speaker. Cash adjusyment available. Keith Heselton, 3 Upavon Court, Penhill, Swindon, Wilts SN2 5HD.

Have Philips 4307 7in reel-to-reel recorder, or Eddystone 740 RX. Would exchange for Eddystone EA12 or 888A amateur only receiver. R. Kay G3NSW. Tel: Manchester 759 7084.

Have 26in Telefusion (similar to Telfunken FE709) in good condition and working order. It has v.h.f. and u.h.f. tuning with scales and full circuit diagram. I could deliver in the Warrington area. Would exchange for computer equipment, w.h.y? D. Bisset. Tel: Warrington 62410.

Have PRO 2009 v.h.f./u.h.f. base scanner and manual. Would exchange for an Era Microreader or Sony ICF or similar receiver, or w.h.y? D. Simpson, 42 Wareham way, Crook, Co. Durham DI15 ONG.

Have DX40U and VF1U. Would exchange for anything v.h.f./u.h.f. or ATV. Tony Williams , 26 Aston Avenue, Winsford, Cheshire CW7 2HX.

Have Racal RA218 s.s.b. adapter. Would exchange for accessories, w.h.y?, for the RA17. M. Swan. Tel: Norwich 622290.

Have sailing dingy, an easy to handle catamaran , with 7m glass fibre hulls and marine ply decking. Complete with aluminium mast, stainless steel rigging, red sails and a towing trailer to a value of £550. Would exchange for a 430MHz multi-mode tranceiver and accessories to similar value, or h.f. transceiver with full receive coverage of 1-30MHz. Would also consider 50MHz or 70MHz transceiver of similar value. M. Overton. Tel: 091-388 5936 evenings or weekends.

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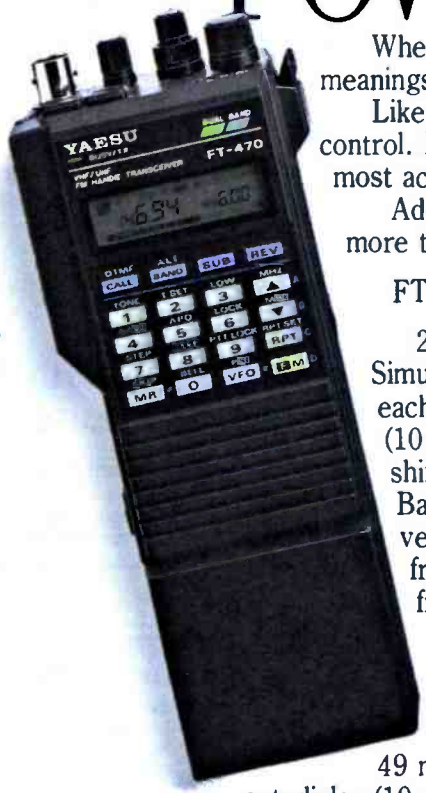

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This unit is very compact and is one of the smallest dual band transceivers currently available. With the battery pack supplied output power is 2.5W for VHF and 2W for UHF. Frequency selection is either by direct keypad entry of the required frequency or by using step up/step down buttons in increments/decrements of 5kHz, 100kHz and 1MHz. An automatic battery save (ABS) function will extend battery life considerably. There are 20 memories (10 VHF and 10 UHF) for storing operating, offset and tone frequencies. The scanning facility has a priority function which has the ability to scan between chosen VHF and UHF frequencies. A 10dB RF attenuator is switch selectable and can be used in areas of high RF saturation.

Quote Reference DHT50 **£369.95**

PLUS **TOP VALUE AMATEUR RADIO VHF FM Handheld 2m Transceiver**

- *Ultra compact, lightweight design*
- *6.5W Output Power (with optional 12V battery pack)*
- *Simple Operation*
- *Easy to See LCD Display*
- *10 Channel Memories*
- *Battery Save*
- *Function Lock*
- *Tone Burst*
- *Amazing Compact Size Only 3×6×17 cm approx.*

A very high quality, lightweight, 2m handheld transceiver, incorporating many useful features. This transceiver is extremely simple to operate, most functions can be performed with one hand!

Quote Reference AHT50 **£219.95**

12V Ni-Cad Battery Pack

For use with either above hand-held transceivers.

A 12V 700mAh battery pack with integral DC-DC converter which allows the transceiver to be powered from a car cigarette lighter socket.

A charger is also available for use with this pack.

Battery Pack **NBP13 £59.95** Charger **NBC13 £14.95**

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