JUNE 1989 £1.30

ISSN 0141-0857

Practical Wireless

The Radio Magazine

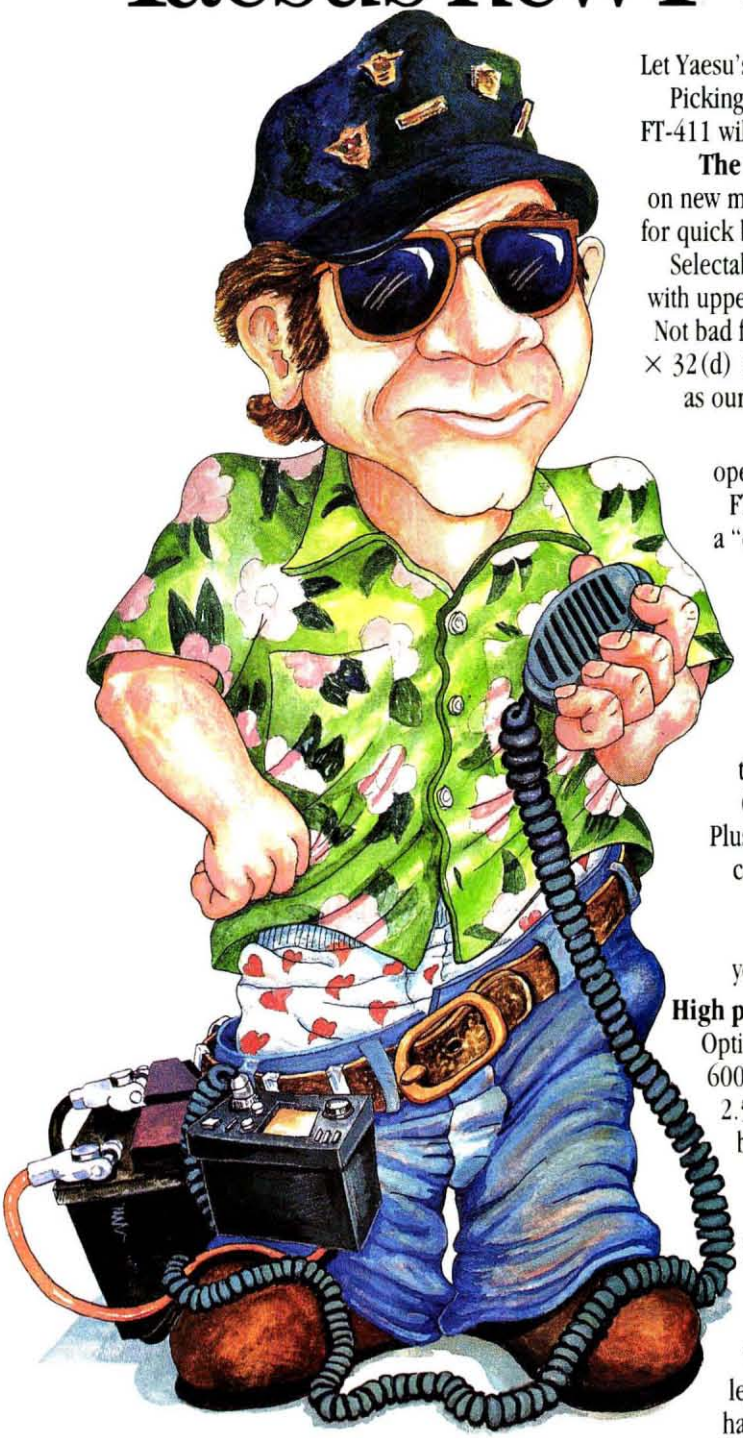
WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...

A MIZUHO QRP TRANSCEIVER - HF IN YOUR BRIEFCASE OR POCKET

RD ANTENNAS • DIRECTIONAL HF RECEIVING ANTENNAS

ANTENNA CLINIC SPECIAL: "FEEDER LOSS AND dBW"

You'll be hard-pressed to beat the performance of Yaesu's new FT-411 handheld.



Let Yaesu's "next generation" handheld lighten your load!

Picking up where our popular FT-209R Series left off, the 2-meter FT-411 will amaze with its astounding array of features!

The brains of a base station. "Sophisticated operation" takes on new meaning in the FT-411. You get 49 memories, plus dual VFOs for quick band-hopping. Keyboard frequency entry. Automatic repeater shift.

Selectable channel steps: 5/10/12.5/20/25 KHz. Programmable band scan with upper/lower limits. Selectable memory scan.

Not bad for a handheld measuring just 55(w) × 32(d) × 139(h) mm (the same size as our FT-23R Series handies).

Friendly operation. For operating convenience, the FT-411's keypad features a "do-re-mi" audible command verification. Both the display and keypad can be backlit (brightly!) for night operation at the push of a button. A rotary channel selector allows fast manual tuning. Or key in the frequency directly. Operate VOX (with YH-2 headset option).

Plus you get a battery saver to conserve power while monitoring. And a (defeatable) automatic power-off feature that shuts down your radio if you forget to turn it off!

High power capability.

Optional nicad packs available are FNB10, 2.5-watt, 600-mAh. FNB-12 5-watt, 500mAh pack or tiny FNB-9 2.5-watt, 200mAh pack. Or you can get 6 watts output by applying 13.8-volts DC from an external power supply.

Swap options with Yaesu's FT-23R Series. Our rugged best-seller's chargers, batteries, and microphones are fully compatible with the FT-411. The FT-23R is the perfect companion for the FT-411, and at a great price!

Try out an FT-411 today. At your local authorised Yaesu dealer. And experience the legendary Yaesu handie performance!

YAESU

UK Sole Distributor: South Midlands Communications Ltd, S M House, School Close, Chandlers Ford Industrial Estate, Easleigh, Hampshire, SO5 3BY. Telephone (0703) 255111, Fax (0703) 263507, Telex 477351 SMCOMM G.

Practical Wireless
The Radio Magazine

JUNE 1989 (ON SALE MAY11) VOL. 65 NO. 6 ISSUE 987

THIS MONTH

We are sorry that, due to circumstances beyond our control, the promised review of the Ten-Tec Paragon has had to be held over until our next issue

Regular Features

NEXT MONTH

Recreating the Scott-Taggart ST300 Receiver

Transmitter Control for Mobile Operation

On Line to CAIRO: A system for connecting rigs and accessories

and All the usual features

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

On sale June 8

Contents subject to last-minute revision

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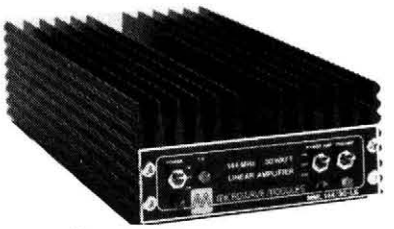
Microwave Modules

MML 144/100-S £149 (C)

★ 100 Watts output power.
★ Suitable for 10 or 25 Watt transceivers.
★ Linear all-mode operation.
★ Straight through operation when turned off.
★ Ultra-low noise receive preamplifier — front panel selectable.
★ Equipped with RF vox and manual override.
★ Led status lights for power, transmit and preamp on.

MML 144/30-LS £105 (B)

★ 30 Watts output power.
★ Suitable for 1 or 3 Watt transceivers.
★ Linear all-mode operation.
★ Straight through operation when turned off.
★ Ultra-low noise receive preamplifier — front panel selectable.
★ Equipped with RF vox and manual override.
★ Led status lights for power, transmit and preamp on.



MMT 50/28-S £295 (B)

★ 20 Watts output power.
★ Input frequency range 28-30MHz.
★ Output frequency range 50-54MHz.
★ Input level range 0.1-750 milliwatts.
★ Modes:- SSB, FM, CW, FSK or AM.
★ 18.5 DB conversion gain.
★ Exceptional large signal receiver performance.
★ RF vox operator adjustable from 20 milliseconds to 1.5 seconds.

MMT 70/144 £149 (B)

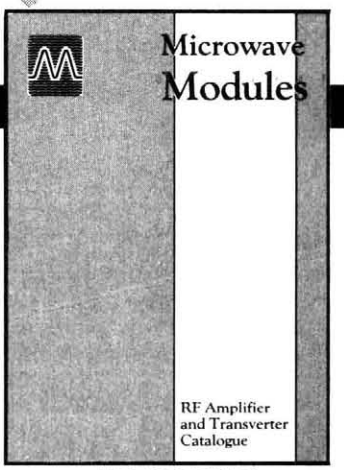
★ 10 Watts TX output.
★ Output frequency range 70-72MHz.
★ Input frequency range 144-146MHz.
★ Input power range 10-500 milliwatts.
★ Low noise receive converter.
★ RF vox provides automatic changeover.
★ Input modes:- SSB, FM, AM or CW.

MMT 50/144 £295 (B)

★ 20 Watts output power.
★ Input frequency range 144-148MHz.
★ Output frequency range 50-54MHz.
★ Input level range 150 milliwatts-15 watts.
★ Modes:- SSB, FM, CW, FSK or AM.
★ 10 dB conversion gain.
★ Exceptional large signal receiver performance.
★ RF vox operator adjustable from 20 milliseconds to 1.5 seconds.

FREE CATALOGUE

We have many other linears and transverters in our range as well as ATV and weather satellite equipment. Just write or 'phone and we will be pleased to send you a **FREE** catalogue which contains detailed descriptions and the full specifications of our products.



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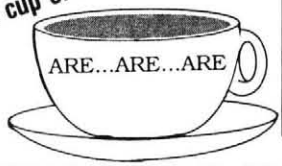
ARE COMMUNICATIONS

THE SHOP WITH THE SMILE and a cup of Brenda's coffee



Brenda G4VXL
"BERNIE — HAVE YOU HEARD OF PICKETTS LOCK?"

BERNIE G4AOG
"YES I HAVE — AND SO WILL ALL THE AMATEURS IN THE UK BY THE END OF THIS YEAR."

TS680S

The fabulous TS680S. General Coverage, Multimode, now that SIX Metres is open, there is no better time to buy. Discounted price £929.00 including FREE microphone MC43S.
Also available the TS140S without six, £799.00.

PHONE 01-997 4476

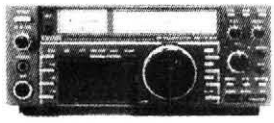
TS440S

Similar to the TS140/680S, but with additional "base station enhancements", the ever popular TS440S continues to be a best seller. At our discounted prices of only £1199 with ATU and £1039 without, can you really resist the temptation?

PHONE 01-997 4476

IC735/725

For the ICOM enthusiast, the IC735 is probably the most popular HF transceiver available under £1K. Still available at a very competitive price. Phone for details.



Icom have now introduced the new IC725 as an economy version. Available from stock at only £749.00

PHONE 01-997 4476

THE NRD-525 from JRC.
Probably one of the best receivers produced in Japan. But why pay £1095? **Our price £995.**

SO HERE SURELY MUST BE THE ULTIMATE IN HAND-HELDS.

The YAESU FT 728 DUO BANDER 2m and 70cm

FEATURES:

- Full duplex operation
- Monitor both 2/70 at the same time
- Dual display
- Full 5 watts output capability
- Programmable power save
- Auto shut-off
- FT23R/73R accessory compatible.

List price slashed!!!

£ phone!

See them all at the June Rallies HMS Mercury and Longleat.

Opening Hours Monday-Friday 9.30 to 5.30
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ICOM

THE NEW IC-2SE, SIMPLE OR MULTI-FUNCTION 144 MHz FM TRANSCEIVER

Icom's tradition of building high quality, reliable handhelds continues with the IC-2SE an incredibly compact handheld designed with features that exceed larger, bulky handhelds. The IC-2SE proves that superior quality comes in all sizes.

THE BEST OF BOTH WORLDS

Actual Size

Slim and unbelievably compact.

The IC-2SE measures only 49(W) x 103.5(H) x 33(D)* mm with the BP-82 Battery Pack. Hold the IC-2SE in your hand to truly appreciate its miniature size. Weighing just 270g† with the BP-82, the IC-2SE will easily fit anywhere – on belts in shirt pockets, handbags, etc. *1.9(W) x 4(H) x 1.3(D) in. † 9.5 oz.

Simple design for operating convenience.

Even with its tremendous versatility and a wide variety of functions, the IC-2SE is easy to use. All functions are performed by a total of just six switches and three controls. The IC2SE includes both simple and multi-function modes. The result is two transceivers in one: both an easy-operation and multi-function transceiver. Simple mode ensures totally error-free operations. Multi-function mode allows you a variety of function settings depending on your operating requirements.

Other advanced features:

Reduced size doesn't have to mean reduced quality. The IC-2SE proves this with a wide variety of advanced functions.

- Tuning control on the top panel for quick QSYing.
- Monitor function that allows checking of the input frequency of a repeater.
- Function display that clearly shows all information required for operations.
- Splash resistant design and durable aluminum die-cast rear panel for dependable outdoor operations.

Options

• **BA-11, Bottom Cap.** Protective cap for terminals on the base of the IC-2SE.

• **Battery packs and case.**

BP-81 ..... 7.2V, 110mAh
BP-82 ..... 7.2V, 300mAh
BP-83 ..... 7.2V, 600mAh
BP-84 ..... 7.2V, 1000mAh
BP-85 ..... 12V, 340mAh
BP-86 ..... Case for six R6 (AA) size batteries

• **BC-72E, AC Battery Charger.**
Desk top charger for the BP-81 - BP-85.

• **CP-12, Cigarette lighter cable with noise filter.** Allows you to use the IC-2SE through a 12V cigarette lighter socket. Also charges the BP-81 - BP-85.

• **FA-140BB, 144MHz flexible antenna.**
Flexible antenna for 144MHz band operation. Same type supplied with the IC-2SE.

•**HM-46, Speaker/Microphone.**
Combination speaker and microphone equipped with an earphone jack. Clips to your shirt or lapel.

•**HS-51, Headset.** Headset with VOX function that allows you hands-free operation.

• **Carrying Cases.**

Carrying Case	Battery Packs, Battery Case
LC-53	BP-81
LC-55	BP-81, BP-83 or BP-86
LC-56	BP-84 or BP-85

• **MB-30, Mounting Bracket.**
Mounts the IC-2SE in a vehicle or on a wall.

• **OPC-235, Mini DC Power Cable.**
For use with a 13.8 V DC power supply

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

THE COMPACT HANDHELD WITH A SPLIT PERSONALITY

5 Watt Output Power.
Utilizing a specially designed ultra-small highly efficient power module, the IC-2SE delivers a full 5 W* of output power. Bring those distant repeaters into range.
* At 13.8V DC

48 Memory Channels.
The IC-2SE has 48 fully-programmable memory channels and one call channel. Each memory and call channel stores an operating frequency and other information required for repeater operations.

Convenient Repeater Functions.
The IC-2SE is equipped with programmable offset frequencies for accessing repeaters. All memory channels and a call channel store repeater information for your convenience. The IC-2SE includes a newly designed 1750 Hz tone call transmit function. A 1750 Hz tone call transmits when the PTT switch is pushed twice quickly.

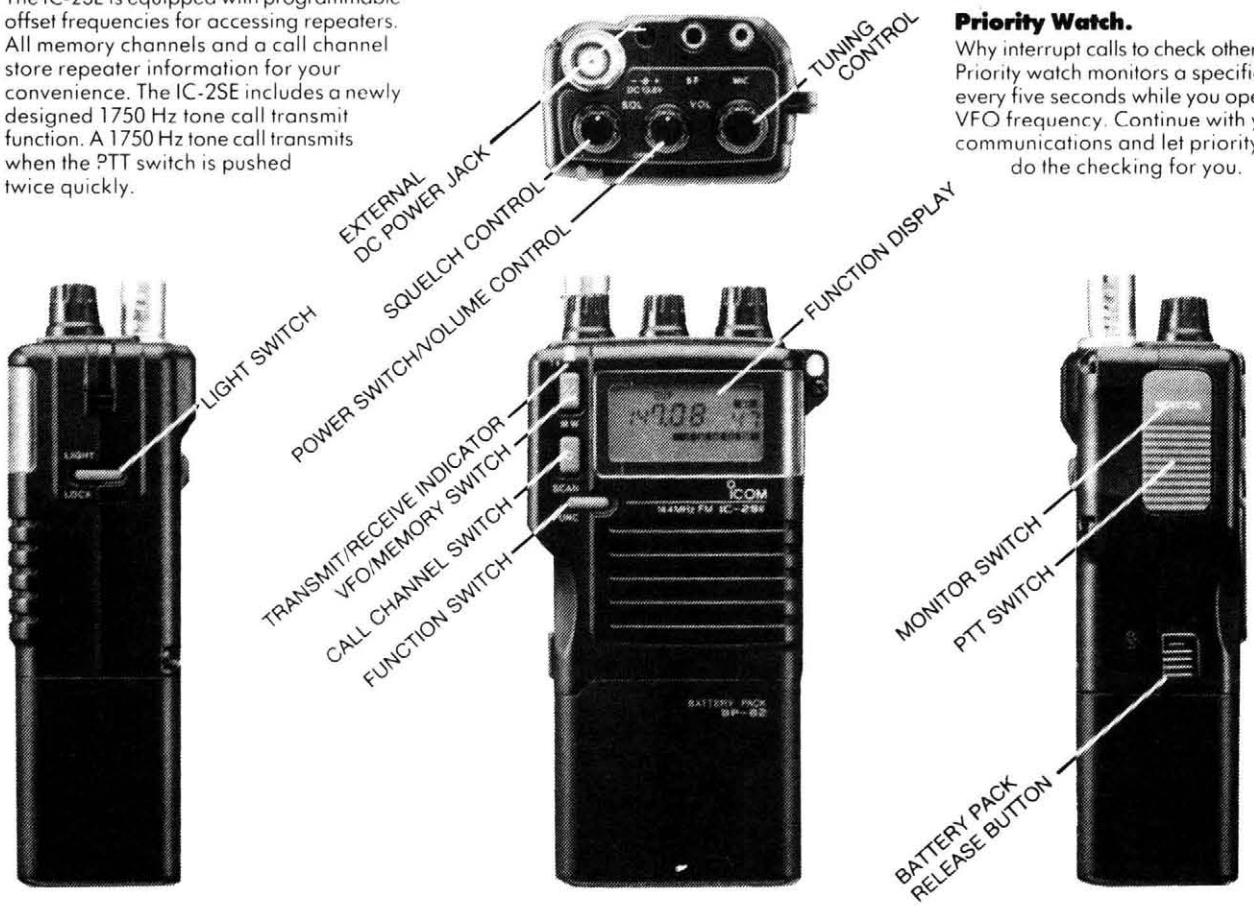
Power Saver for longer operating time.
The power saver ensures lower current flow during standby conditions. Operating times are much longer than with older, more conventional transceivers.

Built-in Clock with timer functions.
The IC-2SE is equipped with an advanced 24-hour system clock with timer function. The transceiver automatically turns on when real time matches a pre-programmed time. This is perfect for scheduling QSO's. Auto power-off timers and other settings can be made in clock mode.

Convenient Scan Functions.
The IC-2SE is equipped with VFO and memory scan.
- **VFO Scan.** VFO Scan repeatedly scans all VFO frequencies. In addition, unnecessary frequencies can be skipped.
- **Memory Scan.** Memory scan repeatedly scans memory channels.

Auto Power Off Timer Function.
If you ever forget to turn the IC-2SE off, don't worry. It will turn itself off. Power-off time can be selected or deactivated using multi-function mode. Preserve battery pack power for the times when you need it most.

Priority Watch.
Why interrupt calls to check other stations? Priority watch monitors a specified station every five seconds while you operate on a VFO frequency. Continue with your communications and let priority watch do the checking for you.

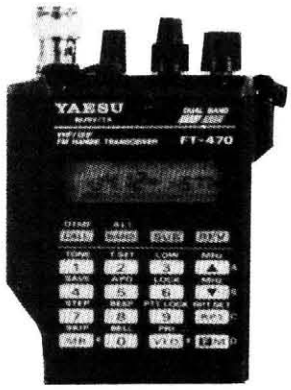


SMC South Midlands Co

SCHOOL CLOSE, CHANDLERS FORD IND. EST., EASTLEIGH, HA

*FREE FINANCE - BUY NOW SAVE M

By the time you read this, you will probably have missed your opportunity to be one of the first to own one of these new incredible little Handie transceivers. Just take a look at some of the outstanding features it offers. Since its debut at the Leicester Exhibition there has been so much interest in the FT470 that we expect the demand to be high for some time, however this was bound to be inevitable since Yaesu have created yet another winner! — A word of caution, beware of FT470 lookalikes. The FT728 is a Japanese domestic model and may not meet the requirements for the UK market. And will not have the same service and spares backup of the Yaesu appointed UK distributors.



THE NEW FT470

- Dual frequency display
- Simultaneous monitoring of both bands
- 2 VFO's and 21 memories for each band
- Automatic Repeater shift
- CTCSS encode/decode built in
- Up to 5 watts output VHF/UHF
- Multifunction scanning facilities
- 10 DTMF 15 digit autodial memories
- CTCSS paging with visual and audible alert
- Selectable power save and auto power off functions

NEW IMPROVED FT767GX

ONLY AVAILABLE FROM AUTHORISED YAESU DISTRIBUTORS

Yaesu have upgraded this popular HF and VF/UHF base station transceiver. The improved version is now available with enhanced synthesiser performance and VFO tuning rate. Read Chris Lorek's review in "Ham Radio Today".

- ★ ALL MODE LSB/USB, CW, FSK, AM & FM
- ★ ALL BAND Transmit, General Coverage Receive
- ★ Optional VHF/UHF units (6M, 2M & 70cms)*
- ★ 100% DUTY CYCLE (Key down CW for 30 mins)
- ★ Built in AUTOMATIC ATU (One memory on each band)
- ★ Computer & Pocket radio compatability

OPTIONAL ACCESSORIES

50/767 6M Unit 10W O/P	£169.00	FL7000 500W PEP HF Linear	£1600.00
144/767 2M Unit 10W O/P	£169.00	SP767 External Speaker	£69.95
430/767 70cms Unit 10W O/P	£215.00	FIF232C Computer Interface	£75.00

For existing owners of the FT767GX who purchased their sets through Yaesu's official UK distribution network, Yaesu are offering an upgraded local unit for a nominal charge. Please contact us for details.

FT4700RH DUAL BANDER

The SUPREME PERFORMER ONLY **£675** inc VAT

The FT4700RH is the second Dual Band FM Mobile to come from the Yaesu stable. Combining high performance with excellent reliability and ease of operation. The transceiver can be operated either mobile or fixed base (with the optional FP700 PSU) and the power output of 50w on 2m and 40w on 70cms is enough for all but the most difficult situations.

Full duplex crossband operation is available with a whole new look and features. A trunk mounting kit, the YSK4700, is optional, enabling dashboard mounting of the front panel controller and remote mounting of the main unit.

The FT4700RH has a dual receive facility provided with independent squelch control and mixing balance so you can listen for calls on one band while working the other.

All the latest scanning functions are included as well as 10 memories on each band.

Only buy from authorised dealers to ensure the best possible after sales service – think of the future.

OPTIONS

YSK4700 Remote Kit	£24.95
FT58 CTC55 Unit	£60.83
AD2 Duplexer	£26.45
MH-1 C8 Speaker Mic	£25.00
MH15C8 DTMF Mic	£37.50

£675 inc VAT

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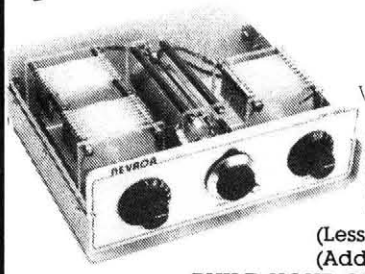
NEW TM 1000 2kw All Band ATU



Our unique wide band roller coaster enables effortless matching of G5RV, LW, Vertical and Coax fed antennas with this unit

Standard model **£168**
For balanced feed **£199**
Fitted with 2kw Balun
TM1000 Kit complete.....**£138**
(Less 2KW Balun)
(Add £5 carriage for all versions)

BUILD YOUR OWN HIGH POWER ATU WITH OUR RANGE OF ATU COMPONENETS

Roller Coaster 2kw 30µH	**£28**
Var Cap 250pF 1kw	**£19.95**
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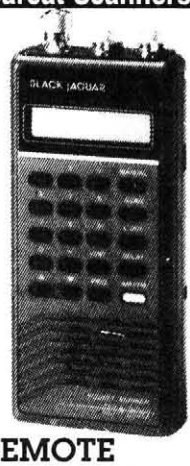
Turns Counter (For R/Coaster)	**£14.95**
Empty ATU Case	**£26**
2kw Balun Assembly	**£28**

We are the UK Distributors for Bearcat Scanners

NEW MODELS - *JUST ARRIVED!*



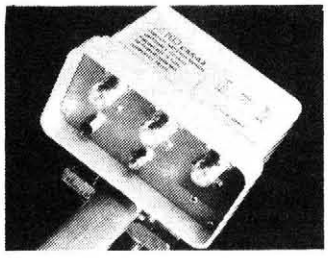
STANDARD AX700 - (50 - 904 MHz)
With Panoramic Display (inc. PSU) **£595**
AOR 3000 (100 KHz - 2 2 GHz)
New Base Receiver **£795**

HANDHELD SCANNERS

Black Jaguar MkIII	**£199**
Bearcat 200XLT (W/900 MHz)	**£229**
Bearcat 100XLT	**£199**
AOR 900 (W/900 MHz)	**£235**

BASE/MOBILE SCANNERS

Bearcat 950 XLT (W/900 MHz)	**£249**
Bearcat 800 XLT (W/900 MHz)	**£229**
Bearcat 175 XLT	**£169.99**
AOR 2002	**£487**
Cobra SR925 Base RX	**£149**



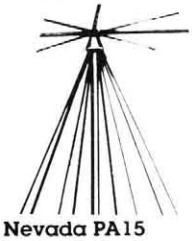
REMOTE ANTENNA SWITCH

(For masthead mounting)
Freq **DC - 1.2 GHz**
Power **300W P.E.P.**
Insertion Loss **0.19 dB at 900 MHz**
Connectors **Green Par 'N' Type**

£49.95

ALLOWS SELECTION OF 2 ANTENNAS FROM 1 COAX FEEDER

DISCONE ANTENNAS - *New British Made Antennas*



Nevada WB1300 (25-1300 MHz)
Wideband Top of the range stainless steel **£59.95**

Nevada Discone
(50-700 MHz)
HIgh Quality
8 Element
£24.00

Nevada PA15
Base Antenna 100-960 MHz
A new Colinear Ant with over 9dB gain at 900 MHz **£49.95**
(+£4 60 P&P)

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10 off 3.3uf 160v	at	40p
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10 off 10uf 50v	at	35p
10 off 22uf 10v	at	35p
10 off 22uf 35v	at	35p
10 off 47uf 35v	at	40p
5 off 47uf 250v	at	60p
10 off 47uf 25v	at	35p
10 off 100uf 60v	at	45p
10 off 100uf 10v	at	40p
10 off 220uf 25v	at	45p
10 off 220uf 16v	at	35p
10 off 220uf 10v	at	35p
10 off 220uf 40v	at	45p
10 off 220uf 50v	at	50p
5 off 470uf 50v	at	45p
10 off 1000uf 25v	at	60p
5 off 2200uf 25v	at	75p
5 off 3300uf 35v	at	80p
2 off 470uf 200v	at	£1.30
2 off 220uf 315v	at	£2.00

SEMICONDUCTORS

5 off 2SD67D NPN 120v 5a 50w TO3	at	£2.20
3 off 2N5302 NPN 60v 30a 200w TO3	at	£2.00
10 off BSX47 NPN 120v 1a 50Mhz TO5	at	80p
5 off 2SC2688 NPN 300v 200ma 10w TO22	at	70p
5 off 2SC1514 NPN 300v 1a TO22	at	£1.10
5 off 2SB857 PNP 70v 4a 40w TO22	at	£1.20
3 off 7812 12v Regulators TO22	at	£1.30
10 off 2N3904 NPN 60v 200ma	at	80p
10 off 2N3906 PNP 40v 200ma	at	80p
10 off 2SC541 NPN 40v 200ma	at	60p
10 off 2SC458 NPN 30v 100ma	at	70p
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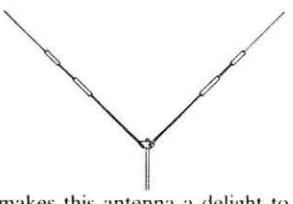

Designed for DX operation on 10, 15, 20, and 40 metres, this aerial is highly efficient and yet easy to install in most situations. Full 1kw rating on SSB and full bandwidth performance at the 2:1 VSR points. No radials and single pole support point makes it ideal for even small OTH's. The robust construction and simple assembly makes this antenna a delight to use. Dimensions: Each element = 5.8m; Total span = 8.3m; Total height = 4.1m from base point to element tip line. 2" mast mounting and full instructions. **£149. Carriage £6 via Securicor.**

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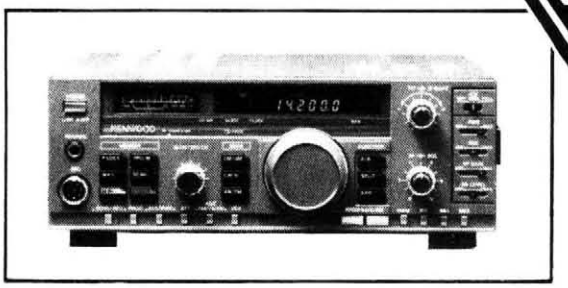
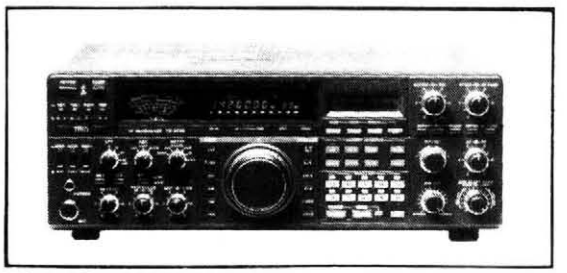


TS-140S £862.00



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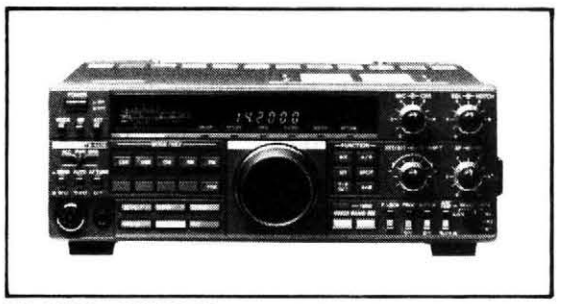

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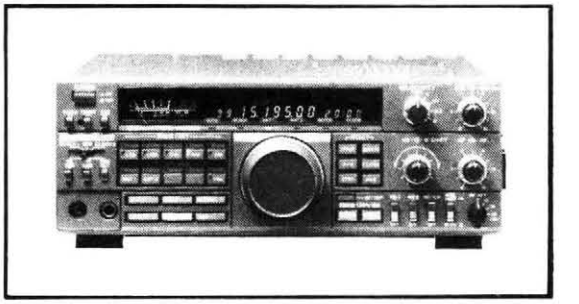

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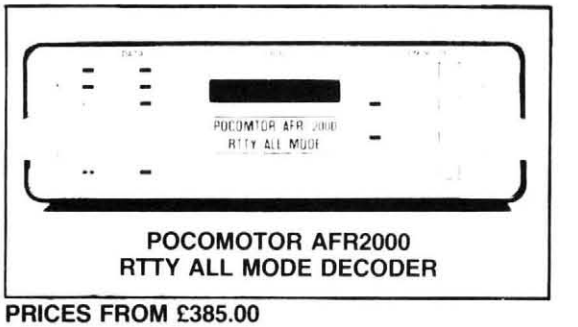

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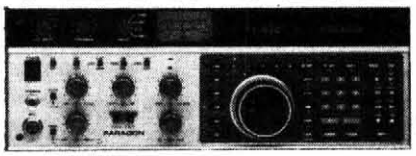

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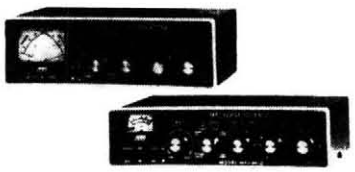

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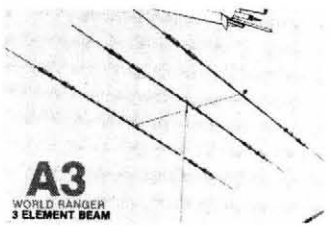
A3 10-15-20 Meter 3 Element Directional



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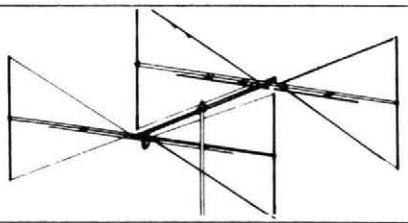
AV3	3 band 14, 21, 28 MHz	56.02
AV4	4 band 7, 14, 21, 28 MHz	104.58

BUTTERNUT ELECTRONICS



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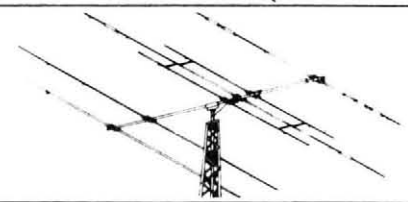
HF5B	10-12-15-20M Butterfly (wingspan 12'6" Boom 6')	235.00

TELEX hy-gain



Monoband Beams		
105BAS	5 Element 10M	187.00
155BAS	5 Element 15M	288.00
205BAS	5 Element 20M	524.17
204BAS	4 Element 20M	357.00
BN86	Balun	30.05
18AVT	5 Band Vertical	146.00
TH7DX	7 Element 20-15-10M	669.00
TH5 Mk2	5 Element 20-15-10M	575.00
EXP 14	4 Element 20-15-10M	449.00
QK710	Add on kit for EXP 14 giving 40M or 30M	115.00
TH2 Mk3	2 Element 20-15-10M	249.00
DISC 7-2	2 Element 40M	486.62
DISC 7-3	Yagi Director Element 40M	305.70

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WRITE ON...*the page where you have your say*

CW at Sea

I came across the April issue of your excellent magazine and was very interested to read the various opinions expressed regarding the use of Morse telegraphy by radio amateurs and its requirement for the Class A licence.

I am currently employed as a Marine Radio Officer and work daily with all modes of communication including c.w., s.s.b., RTTY and SATCOM on a wide variety of ships.

It is clear to me that whatever the International Maritime Organisation may like to believe, the fact is that a large amount of traffic is still exchanged using the c.w. mode, particularly so since the large number of ships registered in third world countries are only fitted with c.w., and it is cheaper to pay a salary to a, say, Philippine Radio Officer than it is to install a SATCOM station.

I can say from experience that c.w. still provides one of the best modes of communicating (and often the cheapest) for long-range services and short messages. I would also point out that I have talked to some fellow Radio Officers who have not touched a "key" for two years! Though I found it quite a chore to achieve the 20 w.p.m. necessary for the Maritime Radiocommunications General Certificate, it has turned out that c.w. will often provide a QSO when all other modes fail.

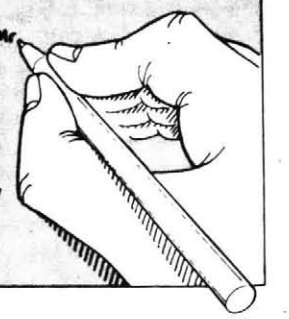
I therefore would like to encourage anyone slogging away with Morse to take heart and regard it as a vital skill, rather than just an examination skill. Morse is far from being dead in either the professional or the amateur worlds.

Mark Baker
Chippenham, Wilts

I noticed just this week that the UK Diplomatic Service is still recruiting radio operators proficient in Morse reception. I am sure that reports of its death are greatly exaggerated! - Ed.

Send your letter 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 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*.



Switch Off

I am indeed surprised by the remarks of Mr P. L. Crosland G6JNS in April *PW*. Is he like a great number of radio amateurs in attempting to be "my brother's keeper"? Surely he knew what would be broadcast on certain repeaters, so that it was his moral duty to prevent such happenings. In any case, there is always the power button that says ON/OFF.

Repeaters are useful in emergencies, provided you can access one when you need it. The abuse has been going on for years, and will continue because nobody will stop it totally. When some idiot is prosecuted another takes his place.

Again, if you can't put up with the abuse, switch off, or take your Morse test and go on h.f. Better still, give it up and start collecting stamps, as the saying goes.

J. P. Caledon-Scott G4LRS
London E4

We've tried the "Ignore them and they'll go away" approach to repeater louts, and that didn't work. What G4LRS is suggesting seems to be "They won't go away but ignore them anyway!" That's all very well, but why should the majority of responsible amateurs, who've invested time and money in their chosen hobby, suffer having a useful chunk of spectrum space hijacked by people who have no interest in amateur radio whatever. Ignoring them is no solution. - Ed. (At the request of G4LRS, we are sending his £5 voucher to RAIBC.)

PW COMMENT

New Rules

THE MONTH OF FEBRUARY 1989 saw two changes to the law affecting radio enthusiasts in the UK.

The first of these, published as a *Gazette* notice on February 17, modifies the restriction which was placed on the manufacture, sale, hire, possession or importation of radio transmitting equipment capable of operation solely in the 28MHz to 29.7MHz band, by The Wireless Telegraphy (Citizens' Band and Amateur Apparatus)(Various Provisions) Order 1988, SI No. 1215 of 1988. That was the legislation behind the now infamous Clause (aa) of the revised 1989 Amateur Radio Licence.

The *Gazette* notice (reproduced in full in our "News Desk" pages this month) authorises any UK Licensed Radio Amateur to manufacture equipment which is designed to operate only in the 28 to 29.7MHz band, or to convert or adapt certain CB equipment to operate in that band, on condition that the equipment is then intended only for that amateur's own use.

Only "legal" CB transceivers conforming to UK Performance Specifications MPT1320 and MPT1333 are covered by this authority. All a.m., s.s.b. or multi-mode rigs are excluded.

This authority may be revoked by the DTI at any time, with or without notice.

Any-one wishing to carry out manufacture or conversion to single-band 28 - 29.7MHz operation as part of their business must obtain an individual authority to do so from the DTI Radiocommunications Division.

The second change, which came into force on February 27, was published as Statutory Instrument No. 123 of 1989. This exempts from the requirement for a licence most forms of radio receiving equipment, providing it is "inherently incapable of transmission".

Reception of TV pictures from authorised ground stations (such as BBC, ITV or foreign stations) and some space stations (such as BSB) which operate in the frequency bands allocated to broadcasting, still requires a TV Licence. The special £10 television receive-only (TVRO) satellite dish licences are abolished.

Receiving TV signals from satellites which operate outside the authorised broadcast bands, such as INTELSAT, EUTELSAT and ASTRA, does not now require a licence. Because they transmit outside the authorised broadcast bands they are not classified as "authorised"; hence you don't need a licence!

On the other hand, receiving signals from an unlicensed broadcasting station (in other words, a "pirate"), is not covered by the exemption, and is still very definitely "naughty". Complicated, isn't it?

What does all this mean for the radio hobbyist? Unfortunately very little. Although there are now no licences required to receive anything apart from TV pictures from authorised broadcasting stations, section 5(b) of the Wireless Telegraphy Act, 1949 still steadfastly forbids anyone to use radio apparatus "with intent to obtain information as to the contents, sender or addressee of any message" unless authorised to do so. And, of course, the Interception of Communications Act 1985 still prohibits eavesdropping on public telecommunication systems, such as cellular or cordless 'phones, point-to-point or ship-to-shore telephone links and so on (and rightly so, in my opinion).

So we are, sadly, still left with radio listening legislation which is to all intents and purposes unenforceable, and which therefore makes a mockery of the law.

Geoff Arnold

EDITOR

Practical Wireless
The Radio Magazine

The UK's leading radio hobbyist magazine, with offices overlooking the harbour in this expanding South Coast town, is looking for an enthusiast to replace the present Editor when he leaves in October to pursue other interests.

Applicants should, of course, have a sound knowledge of radio engineering and a good command of written English. They should either hold an Amateur Radio Licence, or be prepared to obtain one.

Familiarity with Apple Macintosh WP and DTP systems a distinct advantage.

Salary according to experience.

Applications in writing, marked "Private and Confidential", with details of your background and experience, to:

The Chairman, PW Publishing Limited, Enefco House, The Quay, Poole, Dorset BH15 1PP

OUR SERVICES

QUERIES

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

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP**, giving a clear description of your problem.
5. Only one project per letter, please.

BACK NUMBERS AND BINDERS

Limited stocks of many issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.40 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW* are available Price £3.50 plus £1 post and packing for one binder, £2 post and packing for two or more, UK or overseas. Prices include VAT where appropriate.

CONSTRUCTION RATING

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 experienced 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 his own.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics,** and from **FJP Kits** (see advertisements). The **printed circuit boards** are available from our **PCB SERVICE** (see page 39 of this issue).

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP**, stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP**, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit Card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 68 of this issue.

28MHz Dispensation

The following notice appeared in the Gazettes of 17 February 1989:

AUTHORITY GIVEN UNDER SECTION 7
OF THE WIRELESS TELEGRAPHY ACT 1967
WHEREAS: A. the manufacture (including construction by any method and the assembly of component parts) of certain wireless telegraphy apparatus is restricted by the Wireless Telegraphy (Citizens' Bands and Amateur Apparatus) (Various Provisions) Order 1988 (a) (the "Order"); and

B. the Secretary of State is satisfied that this Authority and the terms and conditions attached to it are compatible with the international obligations of the United Kingdom;

NOW THEREFORE
1. THE SECRETARY OF STATE, in exercise of the powers conferred on him by section 7 of the Wireless Telegraphy Act 1967 (c.72), gives his authority to any person holding a valid Amateur Radio Licence (A) or (B) issued by him (a "licensed amateur") to:

(a) manufacture wireless telegraphy apparatus designed to operate in the frequency band 28 to 29.7MHz and no other frequency band;

or,

(b) convert or adapt CB apparatus which complies with the requirements of article 3 of the Order in order to enable it to transmit messages in the frequency band 28 to 29.7MHz and in no other frequency band

subject to the terms and conditions specified in paragraphs 2, 3 and 4.

2. The apparatus shall not be manufactured, converted or adapted for any commercial purpose or in the course of any business.

3. The manufactured, converted or adapted apparatus shall be intended for use by the licensed amateur who manufactured, converted or adapted it (as the case may be) under and in accordance with his Amateur Radio Licence (A) or (B).

4. This Authority shall remain in force until it is revoked by the Secretary of State with or without notice.

5. Words and expressions used in this Authority shall have the same meaning as they have in the Order.

6. The Interpretation Act 1978 shall apply for the purposes of interpreting this Authority as if it were an Act of Parliament.

M V Coolican
on behalf of the
Secretary of State for Trade
and Industry
Dated: 9 February 1989.

(a) S.I.1988/1215

EXPLANATORY NOTE
(This Note is not part of the Authority).
The manufacture of single band amateur apparatus operating at 28 to 29.7MHz is prohibited by the Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988 (SI 1988/1215). This Authority allows the manufacture of such apparatus and conversion and adaptation of CB apparatus which falls within the purview of MPT 1320 or MPT 1333 to operate on the frequency band 28 to 29.7MHz by licensed radio amateurs on a non commercial basis. The Authority only covers manufacture, conversion and adaptation of apparatus by a licensed amateur for the purpose of use by him under and in accordance with the terms of his Amateur Radio Licence. Those persons wishing to carry out manufacture or conversions as part of their business must first apply for (and be granted) an individual authority to manufacture or convert under section 7 of the Wireless Telegraphy Act 1967 by writing to the Department of Trade and Industry, Radiocommunications Division, Room 102, Waterloo Bridge House, Waterloo Road, London SE1 8UA. Such authority may be granted by the Secretary of State at his discretion.

Bench Power Supplies

A new range of bench power supplies is now available from Tandem Technology Ltd. There are sixteen models with digital or analogue metering, constant current or voltage operation with full overload and short circuit protection. Versions with both single output and triple output with tracking are available with outputs up to 60V and 10A. Prices start from £89.

Tandem Technology Ltd.
The Old Bakery,
Petworth,
West Sussex GU28 0AH.
Tel: 0798 43642.

Veterans Associations

Fifty years ago World War II started and ex-service men are gathering together for reunions including the RNARS, RAFARS, RSARS members.

The Italy Star Association will be holding a service and march-past at Lymington, Hants on Sunday afternoon May 28, meeting at the Legion Hall.

The Monte Cassino Veterans Association will be holding a reunion on Saturday September 2 at the Floral Hall, Eastbourne, Sussex. This will be followed by a march-past through the town after a church service on Sunday September 3. All the various associations are welcomed.

The Africa Star Association will hold their reunion in the evening of Friday October 27 at the Planet Room, Winter Gardens, Blackpool.

The Eighth Army Veterans Association will hold their reunion on Saturday October 28 in the ballroom, Winter Gardens, Blackpool. This will be folowed by a march-past on Sunday October 29 on the promenade.

The EAVA Sussex Branch will hold their reunion on Saturday October 21 in the Great Hall, Town Hall, Hove, Sussex.

Yaesu FT-102 User Group

The 102 Newsletter has been taken over, for the time being, by Jim G4VBU who hopes to bring out 6 issues at a cost of £3.50 (DX members £4.50). The group continues to hold a weekly net for UK 102 owners on Sundays, 7.065MHz at 11am local time.

Anyone who wishes to be on the mailing list should send their money to:

Jim Brown G4VBU.
10 Brinmead Walk,
Withywood,
Bristol BS13 8SF.

Special Event Stations

GB2NTS, GB2NTU, GB2NTW and GB2NTE: On July 29/30 four stations will be on the air from different National Trust properties, one each in Scotland, Ulster, England and Wales. Hopefully Ireland will make up a fifth country (EI). If you live overseas and can contact two of these stations, or if you live in the UK/Ireland and contact three stations there is a Commemoration Certificate available. Overseas the cost is $1 or equivalent return postage by Air Mail, UK/Ireland it requires a 19p s.a.e. You need to send QSL cards or log extracts to: ***Scottish Tourist Board (Radio Amateur) Expedition Group, PO Box 59, Hamilton, Scotland ML3 6QB.***

GB2WW & GB4BOB: During 1989, the Bedford & District Amateur Radio Club plan to commemorate the outbreak of the Second World War by operating several Special Event Stations.

The locations will include a number of former RAF and USAAF stations in and around the Bedford areas which were in use during the hostilities. Further details can be obtained from the ***Special Events Manager: Ray G0EYM. 30 Cotswold Close, Putnoe, Bedford MK41 9LR. Tel: 0234 244506.***

GB2RB**: Celebrating Robert Burns, this station will be on the air during May 27/28 from Burns House Museum, Mauchline, Ayrshire.

GB2RBC**: Located at Royal Balmoral Castle, Crathie, Aberdeenshire on June 24/25.

There are two awards available for working those station denoted by ** (see *Practical Wireless* April 1989 "Newsdesk") and other Scottish Special Event Stations for which the dates will be announced when we know them.

GB0DOB: This is the provisional callsign for the special event station to be set up in July this year. The purpose is to link church members and school children in the Diocese of Bradford with others from the USA and elsewhere. They should be using s.s.b. on the 7, 14, 21 and 28MHz bands (WACRAL frequencies). More information from ***G4YRH. QTHR.***

GB1SI, GB4SI, GM1WAB & GM4WAB: On May 26 a group of WAB enthusiasts will be operating from Out Skerries which is situated to the east of mainland Shetland. The party intend to operate on all bands from 1.8MHz to 430MHz from a coastguard look-out post now belonging to GM0AVR on the Island of Housay HU67.

They will also be activating ZR, ZS, ZT and ZU squares from the decks of the P&O Ferry. During their stay on the Island, some members will venture out to the more remote uninhabited islands either by inflatable boat or by helicopter. Due to the risks involved, operation will be restricted to one v.h.f. band and one h.f. band. details from: ***Steve Bryan G1SGB. QTHR.***

GB4SRS: A group of amateurs mainly from the Stroud ARS along with Cheltenham ARS and the Swindon ARC will be setting up on Steepholm Island during May 27 - 29. They'll be using the 3.5, 7, 28, 50 and 144MHz bands.

GB0WAV/MM: 1989 is the Centenary year of the Caledonian Steam Packet Co. On May 13, the last sea-going paddle steamer in the world PS *Waverley* will celebrate this occasion by cruising down the river Clyde estuary calling at a number of coastal towns. A special event demonstration amateur radio station will be on air all day on h.f., 144MHz and 430MHz. The main h.f. operation will be c.w., probably on 7.02MHz, but with occasional excursions to the other bands. PS *Waverley* will sail from the Waverley terminal, Glasgow at 9.30am and call at Helensburgh, Gourock, Dunoon, Wemyss Bay, Rothesay, via the Kyles of Bute to Brodick, on the Isle of Arran, round Holy Isle and returning to Helensburgh in reverse order. A colour QSL card of PS *Waverley* will be sent to all contacts.

GB0RAF: The Scarborough Special Events Group will be on the air from the Scarborough Air Show on July 1 to celebrate the 50th Anniversary of RAF Staxton Wold Radar Base. The RAF Red Arrows display team will also be present and a special QSL card will be issued to commemorate the celebrations. Operation will be around 3.725 and 7.055MHz in the h.f. band and also on 144MHz. Further details can be obtained from: ***Roy Clayton G4SSH. QTHR.***

Can You Help?

We've heard from a reader in Trinidad asking for help tracing a book called *Christmas in the West Indies* by Charles Kingsley. If you know of a copy of this book then contact:

Rupert Barrow, 12 Clark Street, St. Madeleine, Trinidad, West Indies.

Birmingham Centenary Award

As it is the year in which Birmingham celebrates the centenary of becoming a city, the Midlands ARS would like to share the celebrations by offering a Centenary Award. This will take the form of a specially designed certificate and will be awarded to any person who works 100 stations within the city boundary **simplex** only (not to be confused with postcodes). You can use any mode, other than packet, and any band. You must also work a G1 or G3 MAR station and two special event stations from within the city walls. No RAYNET or talk-in stations may be included.

The certificate can be endorsed for any special circumstances requested by the applicant, e.g. QRP, etc., and will also be available to s.w.l.s.

The award will run for the whole of 1989 and the closing date for claims is 1 April 1990.

To claim your certificate, send an s.a.e. to ***Paul O'Connor G1ZCY at 100 Coldbath Road, Billesley, Birmingham BV13 0AH*** who will send you the necessary application and log forms. When these are completed and verified, send them back to Paul with a fee of £2 (£1.50 for MARS members) and you will receive your certificate.

Competition

Menvier Hybrids is running a circuit design competition with a first prize of £1000 and two runner-up prizes of £200 each.

The competition is to design a signalling system which uses a consumer ring-main system for the transmission of data from a sensor unit to a receiver/output unit for alarm purposes. Examples of this types of system are fire, burglar and baby alarms.

The circuit must be suitable to be manufactured using either thick-film hybrid or surface-mount techniques and conform to all the requirements of BS6839 Part 1:1987. It must use Band C frequency allocation and transmit in time-shared or burst mode.

The competition will be judged by a panel of three, one of which will be Chris Westwood, managing director of Menvier Hybrids. The closing date for entries will be 30 June 1989.***Menvier Hybrids Ltd.Southam Road,Banbury,Oxon OX16 7RX.***

Newsdesk...*Compiled by G4LFM*

Rallies

May 21: The "Hobbies Fair" is the first event in the Science Museum's Wroughton 1989 season. This event covers a wide range of interesting hobbies and also offers the rare opportunity to see some of the Science Museum's stock of aircraft and other transport items which are stored in the hangers. Wroughton Airfield is south of Swindon, Wiltshire and easily reached by road.

May 21: The Parkanaur Rally, organised by the Mid-Ulster Amateur Radio Club will be held at the same venue as last year, the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. The usual trade stands, bring & buy, bookstall and QSL Bureau will be there and talk-in will be on S22. Proceeds from this rally go to the Stanley Eakins Memorial Fund, Parkanaur, near Dungannon, so the club hope for a really good turnout of everyone interested in all aspects of radio and electronics.

May 21: The British Telecom South Wales District ARS are holding their first rally at the BT HQ, Coryton, North Cardiff. The site is within 100 yards of the M4 junction 32. There will be a licensed bar and catering facilities available.

May 28: The 13th Annual East Suffolk Wireless Revival will take place at the usual venue of the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. That's between Bucklesham Road and Felixstowe Road (now the A1156) and adjacent to the Suffolk Showground. There will be the usual traders, an RSGB book stand, an antenna testing range, Bring & Buy, car boot sale, transceiver clinic, etc., plus non-radio stands, a children's play area and a model flying display. Doors open at 10am. Further information from: ***Colin Ranson G8LBS, 100 Stone Lodge Lane West, Ipswich IP2 9HR. Tel: 0473 464047.***

May 28: Plymouth Radio Club are holding their mobile rally at Plymstock School, Church Road, Plymstock. Doors open at 10am and there is a large, free car park, refreshments, raffle, trade stands, demonstrations and talk-in on S22. Full details from: ***Joe G1RXR on 0752 509855.***

May 28: The rally will be at the Maidstone (YMCA) Sportscentre on the A229 at Loose Village. Admission is £1 at 10.30am, but disabled visitors can get in free at 10am. There is also free overnight parking with a snack bar, showers, etc., available. There are children's videos and a playroom, GB2YSC active on all bands, ATV demo, a beer tent and all the usual trade stands. For more details, contact: ***G6FZD. Tel: 0622 50709.***

May 29: The Doncaster Radio Rally will be held at the Bircotes Sports Centre, near Bawtry, Doncaster. This rally is organised by the Doncaster RAYNET Group and they rely on this rally for their source of income to keep the group running.

***June 11**: The Royal Naval Amateur Radio Society's Annual rally is being held at HMS Mercury again this year. The event opens at 10am.

June 11: The Mid Lanark Amateur Radio Society are having their open day at the Community Education Centre, Newarthill, by Motherwell. This is on the A723, 2.4km south of the Newhouse interchange on the M8. There will be trade stands, bring & buy, demonstrations of packet, RTTY and QRP together with lectures and the award of the Society's annual EHI Trophy. Talk-in is on S22 and refreshments will be available.

June 11: The Elvaston Castle Radio Rally will be held in the showground of the Elvaston Castle Country Park. This is 5 miles southeast of Derby.

June 18: The Newbury & District ARS will be holding a radio Boot Sale and Rally at Acland Hall and Recreation Fields, Cold Ash, Newbury. The sale is on between 10am and 3pm and admission if free. There are both indoor and outdoor stands and talk-in will be given by GB4NBS. Details and bookings from: ***Mike G3VOW. Tel: 0635 43048.***

June 25**: The 32nd Longleat Amateur Radio Rally will be held as usual in the grounds of Longleat House, Warminster, Wiltshire. This rally is always popular as it offers something for the whole family. More details from: ***Shaun O'Sullivan G8VPG, 15 Witney Close, Saltford Bristol BS18 3DX.

June 30 - July 2: The Popular Flying Association Rally is again being held at Cranfield Aerodrome, Bedfordshire. The rally covers the whole spectrum of sporting aviation from light aircraft through powered gliders and microlights to airband radio. For more details, contact: ***Popular Flying Association. Tel: 0273 461616.***

July 2: The Newport Amateur Radio Society will be holding their 2nd Grand Surplus Equipment and Junk Sale at Brynglas House, Newport. The event opens at 11am (10.30am for disabled visitors) and it finishes at 4pm. There will be surplus/second-hand equipment and junk stands. From 12 noon to 3pm there will be an auction held in the main hall of the building. Light snacks and refreshments will be available. Talk-in will be provided by GW1NRS on S22. The money raised will go towards training young people in line with Project YEAR.

July 9: The 1989 Droitwich Strawberry Rally will take place at the High School, Droitwich. There will be trade stands, a Bring & Buy, family entertainment and strawberry fields (weather permitting). There is both free entrance and car parking. Details from: ***Derek Batchelor G4RBD. Tel: Worcester 641733.***

July 15**: The Cornish Radio Amateur Club rally will be held at Richard Lander School, Truro. There will be the usual trade stands, a Bring & Buy, computer displays/demos and refreshments. There is plenty of free parking as well as attractions for all the family. More details from: ***Rolf Little. Tel: 0872 72554.

***July 16**: The Sussex Amateur Radio & Compute Fair will be held at Brighton Racecourse from 10.30am to 4.30pm.

* *Practical Wireless* & *Short Wave Magazine* in attendance.

If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line, preferably as soon as you have fixed the date but no later than 6 weeks in advance (marking your envelope Rally Calendar) and we'll do the rest. Please make sure that you include all the details including such essential information as the venue, starting time, special features and a contact for further information.

The K1BV Directory

The *K1BV Directory of DX Awards* is issued annually and contains the rules for about 1064 different awards from 103 DXCC countries. The book has some 231 pages, so to give many details would be impossible, but there are even things like sample applications forms to help the applicant.

The kind of details included about the awards are the cost, the QSL and contact requirements and the address to sent your application.

The costs for the book are: USA & Canada first class $15.50; DX surface mail $15.00; DX airmail (W. Europe, South and Central America) $17.00; DX airmail (rest of world) $19.00. Cheques from outside the US should be from a bank which has a USA correspondent bank. International Money Orders in US dollars are also alright. Any queries or correspondence must be accompanied by an s.a.e and IRCs.

Ted Melinosky K1BV.
525 Foster Street,
South Windsor,
CT 06074-2936. USA.

100MHz Pulse Generator

Global Specialties have introduced the Model 8600 100MHz programmable pulse generator to their Sovereign range. The microprocessor-based 8600 can be used manually or via a GPIB interface to provide two 5ns pulses through two independently programmed channels. The pulse period may be set between 10ns and 2s, with an amplitude of between 0.5V and 10Vp-p, within a ±10V window.

The unit features a non-volatile memory, can store up to 30 pre-programmed set-ups and retains the current setting after being switched off. The 8600 has a built-in counter loop which constantly monitors output frequency and, if it senses a deviation, sends correcting data to the microprocessor to give a basic frequency accuracy of 0.1%.

The counter is also utilised by the internal self-calibration routine which corrects the basic accuracy of the v.c.o. to better than 1%. This routine can be selected from the front panel at any time. The 8600 can also be used as an independent 7-digit universal reciprocal counter/timer, measuring three external repetitive parameters: frequency from 10Hz to 150MHz; period from 7ns to 50ms and pulse width from 50ns to 1s.

Global Specialties.
2nd Floor,
2-10 St Johns Street,
Bedford MK42 0DH.

Revived Callsign

At Brunel Technical College in Bristol, the Aerospace and Communications Engineering ARC have recently revived the old club callsign G5FS. At present they are operating on 3.5, 7 and 14MHz Wednesday mornings 1000-1200 and Thursday lunchtimes 1200-1300 c.w. only. They hope to eventually add voice and telex capabilities. These operating times can change according to the demands of the college and the time available for operating by the staff and students.

They would be pleased to hear from all and sundry, particularly the older radio amateurs who remember G5FS and Billy Andrews. It has been over 20 years since G5FS was active on the bands.

P.J. Brouder G3ZJH.
Brunel Technical College,
Aerospace & Communications Engineering Dept.,
Ashley Down Road,
Bristol BS7 9BU.

Glasgow 1990

Glasgow City has been designated Cultural Capital of Europe 1990. Members of the West of Scotland ARS will be operating a number of special callsigns, from selected events, out of Glasgow during 1990.

You could win a prize just be looking out for these stations. There is a free trip, from any DXCC country, during July 1990 to visit Glasgow courtesy of the Scottish Tourist Board. The prize winner will stay in a luxury hotel and will be treated as a VIP. This will include some sightseeing of the countryside within easy reach of Glasgow, visiting cultural events in and around Glasgow and, conditions permitting, talking to radio amateurs back in your home country.

If you want details of what's happening with the special event stations, send three s.a.e.s to:

Allan GM0EFH/1990.
Special Events Co-ordinator,
West of Scotland ARS,
PO Box 599,
Glasgow G1 1EW.

No Swindon Rally in '89

There will be no Swindon Rally this year. This is due to the Wroughton Science Museum not being available this year and a failure to find a large enough alternative site. The group do hope to hold the rally in 1990 though.

Morse Seminar

The Arnold & Carlton College of Further Education Amateur Radio Society are holding a Morse seminar on May 27 from 10am to 4pm. There will be a range of events of interest to the Morse learner, the newly licensed as well as the more experienced operator.

At 2.30pm there will be a talk by Tony Smith G4FAI on "The origins of Morse". At various times of the day there will be short talks on "Operating a key" and "Learners Forum". The activities will include:

Try A Key - a range of keys will be attached to oscillators so that people can have a real try.

Test Your Morse - For 10p you can test your hand sent Morse against a computer. If you're perfect then you can have another try, if not your money goes to RAIBC.

Mock Tests - For the learner, the "test" has got a reputation of being a nerve racking experience! Have a MOCK test to see just what it can be like.

Higher Speed Tests - Try your speed on your hand key for a nice certificate endorsed for your choice at 15, 20, 25 or 30 w.p.m.

Morse Clinic - If your Morse is rough, have a session with the "experts" who may be able to help you to produce that glorious sound!"

The fee for the day will be £1, any profits going to the RAIBC. Tea, coffee, orange juice and biscuits will be available from 1100 to 1500. Arnold & Carlton College, locally referred to as Digby College, is in Digby Avenue, Mapperley, Nottingham. There's plenty of free car parking space too.

Some Directional Antennas for the HF Bands

Late at night, Malcolm Kirk listens to the top end of the 3.5MHz band. He was quite impressed one day when a DJ4 station, with his "little loopstick", pronounced the source of some QRM to be located in SE England. He then decided that he too needed a directional antenna, both to find bearings and maybe null some QRM. Whilst building the loop, from a multitude of designs, he refreshed his understanding of loop principles and origins.

Loop Fundamentals

The loop (Fig. 1a) is the earliest, and still best known, direction finding antenna. The frame antenna (Fig. 1b) and ferrite rod are all close relatives and much of the following text applies equally to all three, though the text refers only to the single turn loop.

The familiar horizontal polar diagram in Fig. 2 applies to loops which are smaller than say one fifth of a wavelength and is the response of a vertical loop to a plane, vertically-polarised field. The particular shape of the loop is not critical, however it must be symmetrical about the electrical centre-line. When the loop is orientated at right-angles to to the field, equal voltages are induced in each vertical segment. Since these are in opposition around the structure, the net voltage is zero. The horizontal component of the structure will not respond to the vertical field. When the loop is turned so as to be in the plane of the field, the transit time across the loop results in a phase shift of the two voltages such that there is a net voltage in spite of the opposition around the loop.

The resultant voltage for loops smaller than $\lambda/5$ is:

$$2\pi \times N \times \eta \times A \times (\cos\theta) / \lambda$$

where A = loop area in metres
η = field strength V/m
N = the number of turns
λ = wavelength
θ = directional of travel of field relative to plane of loop.

It should be evident that the directional response is literally $\cos\theta$. The deep nulls are broadside off the loop and it is usual to use the null for taking bearings. Due to the symmetry of the ideal loop, bearing ambiguity results. This can be resolved by triangulation or by a judicious summing of an omnidirectional whip to create a cardioid pattern.

Origins

It is somewhat surprising to learn that the d.f. loop, in its early l.f. form of "frame antenna", was demonstrated to the US Navy as early as 1906. By 1915, Dr. Kolster of the US NBS could demonstrate a practical antenna and receiver to the US Navy with the declared purpose of deducing bearing information. The name of this device was "radio compass". At this time, before the superhet patents and firmly in the spark era, such a device was the leading edge of technology.

Nonetheless, the utility was recognised and real devices were commissioned and installed on major fighting ships. Some of these ships were deployed against the German U-boats in 1917 who, unsuspectingly, betrayed their presence and location to the allies with this herald of electronic intelligence. The use of this technique against the U-boat had a decisive effect in ending the First World War.

Some Loop Deficiencies

Antenna Effect: In all practical cases, loops exist not in free space but close to large structures or merely close to the ground. In spite of otherwise excellent electrical symmetry, this proximity will unbalance the loop by a differential capacitance to ground. This results in an asymmetry of the response and consequently a bearing discrepancy. The universal solution is to screen the loop as shown in Fig. 1b.

Polarisation Effect: There is a charming simplicity to the loop analysis given earlier and which is seen a thousand times elsewhere in radio literature. If you were to construct such a loop for 3.5MHz, or indeed any frequency, then the performance will depart from that suggested by the previous analysis. In early implementations, back in 1916, some deficiencies manifested after dark and the collection of symptoms were dubbed night effect. Night effect includes inconstant and indistinct minima, and worse, wandering bearings for identified fixed services! In other areas, "aeroplane effect" was described when similar behaviour was experienced when taking bearings on high flying aircraft.

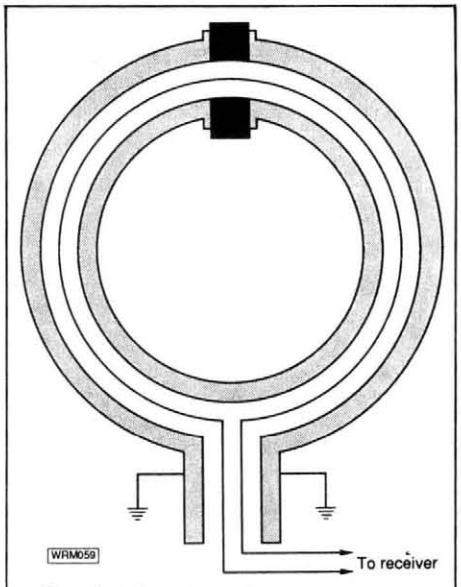


Fig. 1a: A screened loop antenna

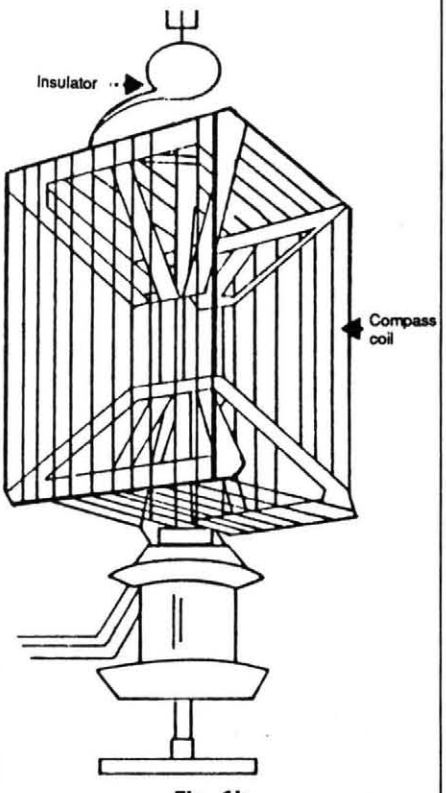


Fig. 1b

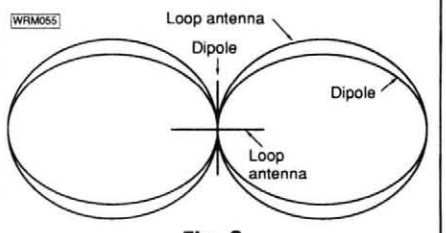


Fig. 2

These and other deficiencies are collectively known as polarisation effect. The problem lies not with the analysis given, but that it deals with only a vertically polarised field. In amateur practice, pure vertically polarised fields are rare. All waves incident on an amateur antenna can be regarded as mixed polarisation and sky waves. That is, the waves are descending waves, possibly at fairly large angles.

Consider now the earlier analysis with regard to the loop response to a descending horizontally polarised field broadside to the loop. Equal voltages are induced in the top and bottom of the loop, but phase shifted by the transit time across the loop—there is a net voltage. Unfortunately, the maximum of this voltage is coincident with the minima discussed earlier regarding the vertical component. The real culprit is the ionosphere which applies random and inconsistent rotation to the field during the reflection such that the original antenna orientation is no longer significant. In these circumstances, orienting a simple loop for a minimum to get bearing information is fruitless.

To summarise, simple vertical loops only give the classic "figure-of-eight" response to pure vertical polarisation. The problem is not new and was well understood over 70 years ago. A Lieutenant Adcock solved this bearing problem during the First World War, but before going into details it is first useful to introduce the radiogoniometer.

Radiogoniometers

In spite of the deficiencies outlined previously, wireless direction-finding using fixed services and simple loops was seen to have possibilities, especially for coastal navigation. Leaving the shack in a gale to attend to the d.f. loop was never popular. Similarly, steering the ship to and fro to find a null was never a long term proposition.

The solution was a device known as a Bellini-Tosi Goniometer, the general arrangement is shown in Fig. 3. Two static, crossed, loops (Fig. 4) are mounted high on the superstructure with each loop connected to a corresponding field coil, each being one half of the stator. Within the two stator coils, a rotor search coil is positioned by the operator. This rotation then behaves as a virtual rotating loop on the superstructure.

Real working and calibrated goniometers require care and mechanical precision, but there are few problems in simple implementation. The *Admiralty Handbook of Wireless Telegraphy 1938* Vol II is a good source of reference and perhaps there is some scope for using active antennas in such a configuration.

Adcock Antennas

The easiest solution to the polarisation problem is to use an antenna which is sensitive to one component and not the other. A vertical antenna should not respond to a horizontally polarised field and *vice versa*. A common arrangement of the Adcock antenna in its rotating v.h.f. form is shown in Fig. 5a, it's a pair of spaced, opposed, vertical dipoles. The drawing, Fig. 5c, shows a pair of reflectors with which the problem of directional ambiguity can readily be solved, yielding the directivity pattern of Fig. 5b. With careful construction, the structure should have no response to horizontally polarised fields and the opposition of the two dipoles yields the familiar figure-of-eight directional response. The antenna has a deficiency in that sensitivity is affected by the angle of incidence, but in other respects the directive pattern is maintained for sky waves of mixed polarisation.

At h.f., full-sized rotating structures would be monsters and unworkable. The common solution for land services was two (or more) pairs of opposed fixed verticals attached to a goniometer, Fig. 6. Perhaps a novel amateur receiving antenna could be built using just such a general arrangement, but substituting electrically short active antennas for the towers of commercial installations.

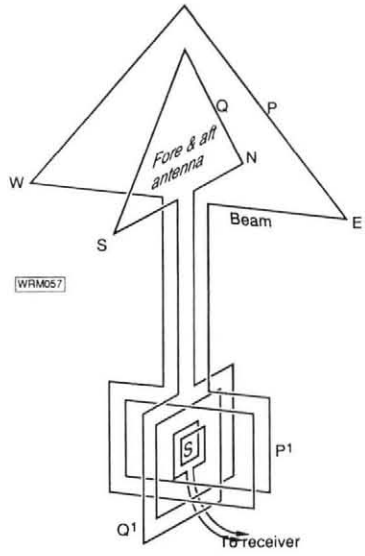


Fig. 3

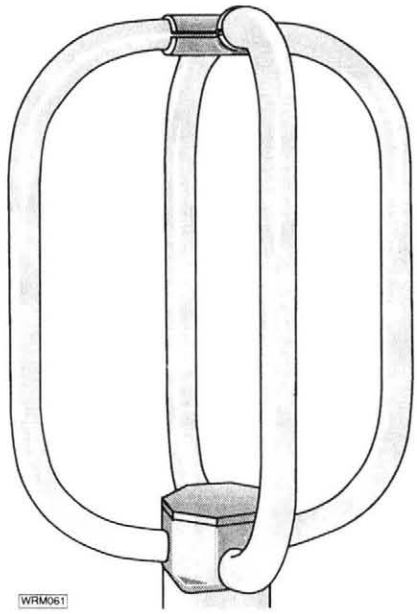


Fig. 4

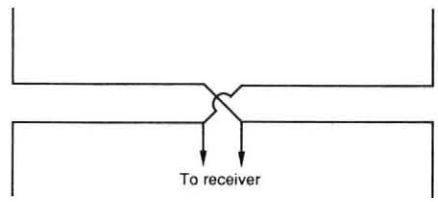


Fig. 5a: Rotating Adcock antenna system. Sometimes called an H-Adcock antenna

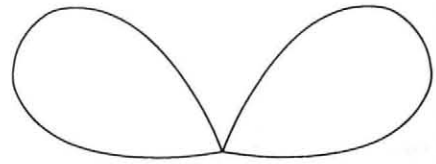


Fig. 5b

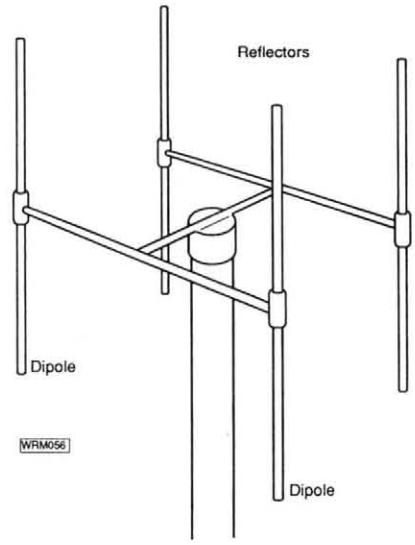


Fig. 5c

Spaced Loops

Spaced loops are a further class of mechanically simple antennas which can overcome the polarisation problem. Three elementary configurations are shown in Fig. 7. The first two are actually the same device, but orientated to have a sensitivity to either the vertically polarised energy or the horizontal component. In the simple case of one vertical loop, the problem was caused by an unwanted sensitivity to descending horizontally polarised energy. Cross-connecting the two loops as in Fig. 7 cancels this e.m.f. and restores the null developed on the appropriate component.

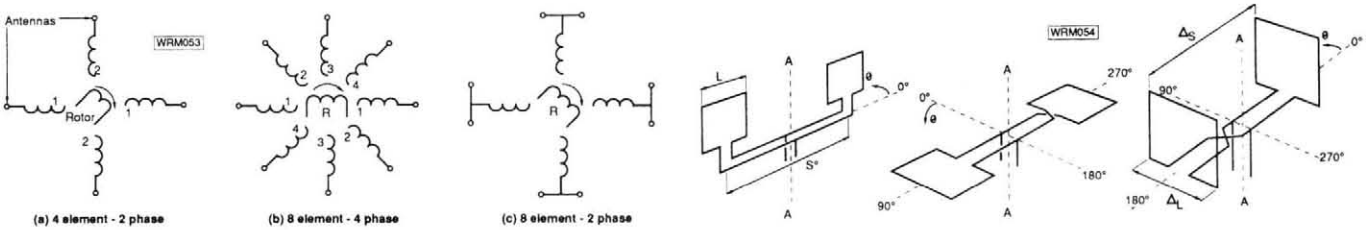


Fig. 6: Plan view of Adcock arrays with goniometer. Stator coils are connected diametrically across centre, as 1 to 1, 2 to 2

Fig. 7a: Co-planar loops

Fig. 7b: Coaxial loop

Fig. 7c: Coaxial loop

The coaxial form of Fig. 7c has proved to generate a better null, however there is a penalty in that the figure-of-eight pattern has divided and a four-lobed response results, Fig. 8.

Fig. 8 ▸

Conclusions

This text has been concerned with some aspects of electrically small loops used as directional receiving antennas at h.f. For the most part, the techniques and theory were uncovered in the first decades of this century and deserve to be more widely appreciated. More recent practice uses electronically commutated synthesised arrays where the one antenna array can be simultaneously used by many receivers, each with separately synthesised directivity.

For amateur purposes, simple and inexpensive systems are required and hopefully this article has covered some of the problems and also some inexpensive solutions. ***PW***

Practically Yours

By Glen Ross G8MWR

In the last Practically Yours we looked at transistor codings which covered all types except those using the Pro-Electron nomenclature. This is the system now used by most of the large European manufacturers and the code usually consists of two letters followed by a serial number of up to three figures. There are some exceptions to this rule but these are not commonly encountered in the amateur radio world. The normally used code letters are shown in the Table.

The Figures

The group of coding that follows the first two letters depends on several things. If the device is intended mainly for use in consumer applications such as radio and TV the serial number will consist of three figures, an example of this is our old friend the BC108. The B indicates that it is made of silicon, the C shows that it is intended for low power audio applications (although it is frequently put to other uses) and the 108 part is simply the manufacturers series number, this is to differentiate it from the other low power audio devices. If the device is intended mainly for industrial applications the "in house" serial will consist of a letter and two figures, as in the BCY70, for example.

The first letter indicates the material the device is made from:

A Germanium
B Silicon
C Gallium arsenide
D Indium antimonide
R Cadmium sulphide

The second letter indicates the use:

A { Detector diode / Mixer diode / Switching diode
B Variable capacitance diode
C Low level audio type
D High power audio type
E Tunnel diode
F Low level r.f. type
G Anything not on list!
L High power r.f. type
N Photo coupler device
P { Photo diode / Photo transistor / Radiation detector / Photo cell
Q Light emitting diode
R Low power thyristor
S Low power switching transistor
T High power thyristor
U High power switching transistor
X { Varactor diode / Step recovery diode
Y { Rectifier diode / Booster diode / Step recovery diode
Z { Reference diode / Zener diode / Transient suppressor diode

Range Codings

Where there are a range of devices as in rectifiers and Zener diodes additional coding is used to indicate various parameters of interest. For instance, a Zener diode may also carry a code of 6V3, this is to indicate a reference of 6.3 volts. Some diode codings may be found to end with the letter R. This is most commonly found in rectifiers which are mounted using a threaded stud which is integral to the device. In such cases the R indicates that the polarity of the device is the opposite of that normally expected. This is particularly useful in making up heavy current bridge rectifier blocks from discrete components.

One More

Zener diodes are not extremely accurate reference devices, the rated voltage is subject to a percentage tolerance rating which can go as high as plus or minus 15 percent of the actual indicated voltage. the first letter of the coding indicates the tolerance rating using the following code;

A = ±1%
B = ±2%
C = ±5%
D = ±10%
E = ±15%

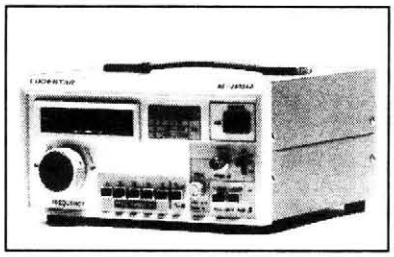
An example of a Zener code could be BZY88-C4V7. This indicates a silicon voltage regulator diode for industrial applications, with a stabilising voltage of 4.7 volts with a tolerance of plus or minus 5 percent. ***PW***

Piezo Buzzer now only 56p 43-27203

Cirkit NEWS

MAY 1989

YOUR CHANCE TO WIN...



Once again, you'll need all your wits about you to identify the six items we've picked from the catalogue, and a Lodestar audio signal generator worth more than £180.00 is waiting for the sender of the first all-correct entry drawn in this season's competition.

Second and third prizes are top-of-the range multimeters from Cirkit's outstanding new range, offering frequency and capacitance measurement and transistor test, and valued at £55.00 each.

Fourth and fifth prize-winners will receive recently published books to the value of £30.00.

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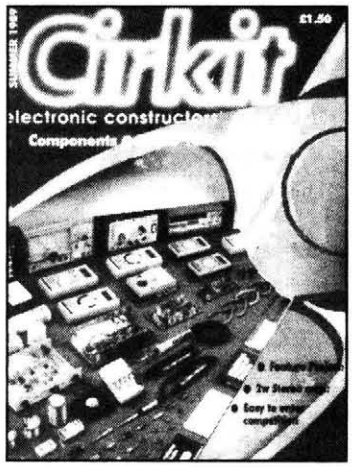
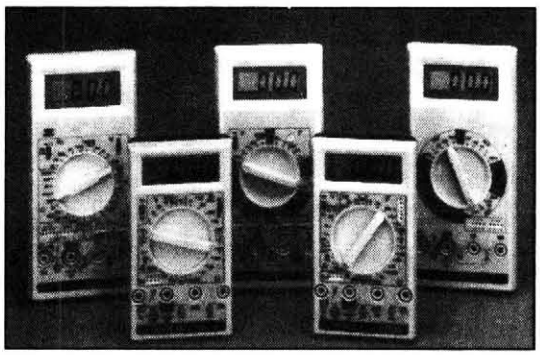
NEW CATALOGUE OUT 25th MAY



Over 3,000 product lines feature in the Summer 1989 edition of the Cirkit Constructors' Catalogue, available from most larger newsagents or direct from the company priced at £1.50. The latest books, an RF frequency meter, two new PSU designs and a 3.5MHz converter are among the innovative new kits this issue, while our construction project - a 2 Watt stereo amplifier - is bound to prove an absorbing activity for dedicated constructors. In the test equipment section there's a whole new range of multimeters, a bench DVM and a triple output PSU.

For eagle-eyed readers who enjoy a challenge of a different sort, there is the opportunity of winning an audio signal generator worth more than £180.00 In the latest fiendish competition. All prices now include VAT for quicker, easier ordering; and Cirkit's same-day despatch of all orders, combined with value-for-money discount vouchers, makes the line-up even more attractive.

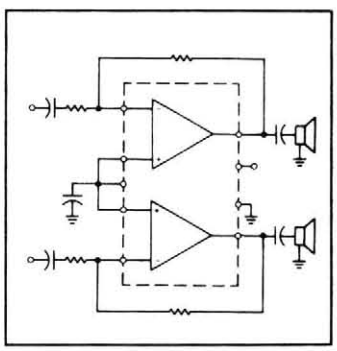
D-MM GOOD VALUE!



Cirkit's six new digital multimeters are packed with sophisticated extra facilities: capacitance measurement, frequency measurement up to 20MHz, temperature reading, transistor test and logic test in addition to the usual volts, current (DC and AC) and resistance measurement - and all unbeatable value with prices ranging from **£20.00** to **£55.00!**

FEATURE PROJECT: 2W STEREO AMP

Our construction project this issue is for a straightforward but very effective 2 Watt stereo amplifier. Based on the LM1877, it is the perfect amplifier for a 'Walkman' cassette deck and equally suitable for AM/FM radios or mixer desks. Featuring 2W per channel and 75dB channel separation, it operates from a 10-26 volt supply, making it ideal for in-car applications. The catalogue includes full details of this economical kit.



Ever Thought of Trying a VHF Contest?

Neill Taylor G4HLX

Every year, on a Sunday in the middle of Summer, scores of radio amateurs take to the hills with their v.h.f. radio equipment and antennas, and spend eight hours enjoying contest operation in the Practical Wireless 144MHz QRP Contest. If you're not one of them, you may be wondering what they get out of it. And if your station is a simple one, you may be thinking that you couldn't take part anyway, without complex and expensive equipment and antennas. Think again. A lot of fun is to be had in a QRP contest with the simplest s.s.b. transceiver, and the contest has been won in the past by a station using an FT-290R.

There are many v.h.f. and u.h.f. contests each year, but if you're tempted to try one for the first time, the PW QRP event is a good choice, because the 3 watt limit on output power means you can compete effectively with simple gear. Also the level of activity is high, so unless you live in a particularly un-populated area, you should find plenty of stations to work.

Why a Contest?

The appeal of contest activity, if you're still unconvinced, lies partly in the competitive element, and partly in the DX working which results. The first part is due to that desire which we all have to prove our station, or our operating skill, to be superior in some way. There's no better test of the capabilities of your equipment than by putting it through the rigours of a contest, and a few hours behind the microphone will sharpen anyone's operating technique.

The chance to work some DX comes simply from the large number of well-sited stations who will be active. Every year, entrants continue to be amazed at how far they can make contacts with their 3 watts. Even if something prevents you from getting to a hill-top yourself, operating from home will bring some pleasant surprises. You may, for example, be able to work some of the rarer locator squares, as stations frequently come on the air to activate these. And if we're lucky enough to get a lift (June is a good time of year for Sporadic-E), anything might happen!

So, whether motivated by the competitive spirit or by the fun of a QRP activity day, you're thinking of having a try. Let's see what you'll need.

Your Equipment

Almost all contest operation on 144MHz takes place on s.s.b., with a little on c.w. In the past the level of c.w. activity has been low in the QRP contest, which is a shame because the mode is so well suited to low power. There is virtually no activity on f.m. So you'll need a transceiver which is either s.s.b. or multi-mode,

Practical Wireless 144MHz QRP Contest 1989 0900-1700UTC (GMT), 11 June 1989

Rules for the seventh annual PW QRP contest are given here; would all entrants please read these carefully.

Rules

1. General

The contest is open to all licensed radio amateurs, fixed stations or portable, using s.s.b., c.w. or f.m. in the 144MHz (2m) band. Entries may be from individuals or from groups, clubs, etc. The duration will be from 0900 to 1700UTC on 11 June 1989.

All stations must operate within the terms of the licence. Entrants should observe the band plan and keep clear of normal calling frequencies (144.300MHz and 145.500MHz) and those used by GB2RS during the morning (144.250MHz and 145.525MHz). Keep clear of any other frequency that is obviously in use for non-contest purposes.

The station must use the same callsign throughout the contest and may not change its location. Special event callsigns may not be used.

2. Contacts

Contacts will consist of the exchange of the following minimum information: (i) callsigns of both stations (ii) signal report, standard RS(T) system (iii) serial number: a 3-digit number incremented by one for each contact, starting at 001 for the first (iv) locator (i.e. full 6-character IARU Universal Locator for the location of the station). Information must be sent to, and received from, each station individually, and contact may not be established with more than one station at a time. Simultaneous operation on more than one frequency is not permitted.

If a non-competing station is worked and is unable to send his full universal locator, his old-style QTH locator ("QRA") or his location may be logged instead. However, for a square to count as a multiplier (see rule 4), either a full 6-character IARU universal locator, or full 5-character European QTH locator must have been received in at least one contact with a station in the square. Contacts via repeaters or satellites are not permitted.

3. Power

The output power of the transmitter final stage shall not exceed 3 watts p.e.p. If the equipment in use is usually capable of a higher power, the power shall be reduced and measured by satisfactory means. The simplest way is often to apply a (variable) negative voltage to the transmitter a.l.c. line, reached via the accessory socket. The output power can be accurately measured using the simple circuit of Fig. 1. Connect this to the 50 ohm output of the transmitter and adjust the power so that the voltmeter does not exceed 16.7V on a good whistle into the microphone.

4. Scoring

Each contact will score one point. The total number of points gained in the eight-hour period will then be multiplied by the number of different locator squares

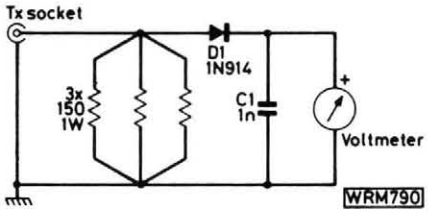


Fig.1 Suitable circuit for low power measurement in a 50Ω system. The resistors should not be wirewound. All leads (exept those to voltmeter) should be as short as possible (10mm maximum). The meter will read (√100P) - 0.6V for a power of P watts (16.7V at 3W).

in which contacts were made (a "square" here is the area defined by the first four characters of a universal locator). Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 5 x 52 = 260. Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log, and clearly marked as a duplicate.

5. Log

The log submitted as an entry must be clearly written on one side only of A4 sized (210 x 297mm) paper (the normal way up, not sideways), ruled into columns showing: (i) time UTC (ii) callsign of station worked (iii) report and serial number sent (iv) report and serial number received (v) locator received (or location). Underline or highlight the first contact

capable of up to 3 watts p.e.p. output. Something like a FT-290R or an IC-202 is certainly suitable.

If you happen to have a TX which runs more than 3 watts output, you'll have to find some way of reducing the power (see remarks in the contest rules). This is usually quite simple, so please don't just resort to turning down the mic gain, since this may reduce the average power but leave the peaks quite high, and also leads to rather strange and "thin" audio quality on some rigs.

Your normal microphone will do, though some operators prefer a boom mic, with a foot-switch for transmit switching, leaving both hands free for logging, etc. Headphones are a useful addition, too, even if you're not working in a noisy environment - they help you concentrate, somehow.

Other accessories you might have are a speech processor and a receive pre-amplifier. Some audio processing, providing a degree of compression, certainly can improve the mean signal level and is perhaps of particular value for QRP work. However the temptation to turn up the processing level too far must be avoided at all costs - all it does is render the audio less intelligible, and may lead to an anti-social "broad" signal. If you have a processor, make sure it is adjusted properly.

A high gain RX pre-amp, on the other hand, can almost be a menace in a contest. If you are sited in an active area, your receiver will probably have never encountered so many strong signals at one before. Even the best designed front-end can only take so much of this before it overloads. Adding a pre-amp means that the overload point is reached much sooner! The effects can appear to you to be "splattering" and general distortion of the signals you hear; it's easy to be ignorant of the part your receiver performance is playing in this. A pre-amp can certainly help pull in the weaker signals, especially if it is located at the mast-head to overcome feeder losses, but it is virtually essential in a contest that you are able to switch it out of circuit if you start getting strong signal handling problems.

As for antennas, you'll need a beam, and the more gain it has, of course, the better. One way of getting high gain is to have an array of two or more Yagis, properly phased, but if you can't manage this, don't worry. You'll want to get the antenna(s) at a good height above ground, but if you are portable at a good site with a clear take-off, all that is really necessary is to get the antenna above any surrounding objects, trees, shrubs, etc.

Choosing a Site

That brings us on to the matter of deciding where to set up your station. Unless you are fortunate enough to live at an excellent v.h.f. site, the benefits of going portable to a local high spot are well worth the effort. The band may sound quite dead from home but spring into life with DX signals when you get to the top of a hill. To choose the spot from which you operate, a certain amount of research pays off.

There's more to a good site than just height above sea level. A good "take-off" is important, preferably in all directions, which means the land slopes away from you, ideally with a steep gradient. Try visiting the

PRACTICAL WIRELESS 144MHz QRP CONTEST

Date	Callsign	Locator	Sheet N° of

Time GMT	Callsign	Report & serial N°		Locator
		Sent	Received	

in each of the locator squares worked. At the top of each sheet, write: (a) callsign of your station (b) your locator as sent (c) sheet number and total number of sheets (e.g. "sheet No. 3 of 5"). The sample shown here illustrates how each sheet should be headed.

6. Entries

Accompanying each entry must be a separate sheet of A4 sized paper bearing the following information: (a) name of entrant (or of club, etc., in a group entry) as it is to appear in the results table (b) callsign used during contest (including any suffix) (c) name and address for correspondence (d) details of location of station during contest; for portable stations, a national grid reference is preferred (e) locator as sent (f) whether single- or multi-operator (a single operator is an individual who received no assistance from any person in operating the station, which is either his permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns (g) total number of contacts and locator squares worked (h) list of the locator squares worked (i) a full description of the equipment used including TX p.e.p. output power (j) if the transmitting equipment is capable of more than 3W p.e.p. output, a description of the methods used (i) to reduce and (ii) to measure the output power (k) antenna used and approximate station height a.s.l. Failure to supply the previous information may lead to loss of points or disqualification.

The following declaration must then be written and signed by the entrant (by one responsible person in the case of a group entry): "I confirm that the station was operated within the rules and spirit of the event, and that the above information is correct".

This declaration concludes the entry, which should be sent, with the log sheets, to: Practical Wireless Contest, c/o Dr. N.P. Taylor G4HLX, 46 Hunters Field, Stanford in the Vale, Faringdon, Oxon. SN7 8LX. Entries sent to the old address used until 1987 will not be accepted. A large s.a.e. should be enclosed if a full set of contest results is required. Entries must be postmarked no later than 26 June 1989. Late entries will incur a heavy points penalty. Any other general comments about the station, the contest and conditions during it are welcome, but should be written on a separate sheet of paper. Photographs of the station are also invited (but please note that these cannot be returned); if these are not available by the time the entry is submitted they may be forwarded later, to arrive by 7 August 1989.

7. Miscellaneous

When operating portable, obtain permission from the owner of the land before using a site. Always leave the site clean and tidy, removing all litter. Observe the Country Code. Take reasonable precautions to avoid choosing a site which another group is also planning to use. It is wise to have an alternative site available in case this problem does arise.

8. Adjudication

Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts will carry a heavy points penalty. Failure to supply the complete information required by Rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicators will be final. The leading station will receive the winner's cup, and the leading Scottish station will be awarded the PW Tennamast trophy. Certificates will be awarded to runners-up and in many other categories, including the leading station in each locator square.

locations which you are interested in, taking along a portable receiver to check the strength of the various beacons.

Remember, when you've chosen a site, that you will probably have to obtain permission to use it from the landowner. This should be straightforward enough if you explain clearly what you are doing (take along a copy of this magazine), and that you will observe the Country Code and leave the site clean and litter-free.

One practical point about picking your portable location: it is possible that someone else has also chosen it! It's worth checking if anyone else has used it in previous years, and enquiring amongst the local amateurs to see if you can discover anything about other groups' plans. There's a lot to be said for having an alternative site in mind in case a clash does occur at the last minute - even using QRP, operating in close proximity to another station can give rise to real difficulties.

Operating

So, having assembled the station at the site (in good time for the 10 o'clock start), the most important ingredient is added: your operating skill. Whatever the technical capabilities of the station, it is the operator's ability to maintain a steady (preferably fast!) flow of contacts, accurately passing and logging the information, which makes or breaks the station's performance. Also important is the tactical side of the operation, for example when to change the beam direction, or move frequency.

The contact format is simple - an exchange of signal report, serial number (001 for your first QSO, 002 for the second and so on), and IARU "Universal" locator. In each contact, it is best to send this information once, clearly and precisely, using standard phonetics, only repeating details if asked to by the other station. Avoid rushing so fast that it all comes out in a gabble, and remember that someone at the other end is having to write it all down. Go at whatever pace you feel comfortable, and don't be put off if you hear others sending serial numbers well in advance of yours, just go for steady progress.

Send the required information in the standard order: report - serial number - locator, as this is what the receiving operator will be expecting. If you miss some of the information sent to you, simply ask for a repeat (e.g. "please repeat your locator"). Be brief and concise, but polite and courteous. Be particularly careful to write everything accurately in the log, and be sure to get callsigns correct; by far the most common error in previous events has been to miss the "/P" suffix from a callsign (or to add one which shouldn't be there!).

You'll have to decide when to call CQ and when to tune around answering other stations' calls. Most people spend some time doing each of these - if you are well sited and putting out a good signal, you might expect to spend rather more time sitting on one frequency and calling CQ. As a newcomer to contest operating, though, it's probably easier to start by answering other stations' CQs (a quick call, announcing your own callsign particularly clearly, is all that is required).

When you do decide to call "CQ contest" yourself, find a clear frequency to use, on s.s.b. this will be somewhere between 144.150 and 144.400MHz, but avoid the normal calling frequency of 144.300MHz, which might be needed by non-contest stations. Always check that the frequency is clear before starting to call CQ, by asking "is this frequency in use?". This is not foolproof, however, and be prepared that in a crowded band, clashes do occur, and you may have to vacate "your" frequency if it turns out to be in use by someone else. It's not uncommon for two stations to share a frequency without realising it, neither being able to hear the other until one of them rotates the antenna!

Your final score will be your number of contacts multiplied by the number of different locator squares you have worked, so always be on a look-out for new squares. Some operators like to keep a checklist of squares, or a map with those worked shaded in, so that areas which have not been obtained can be sought by appropriate setting of the beam direction.

Another list that you'll need to keep is of the callsigns of all the stations you have worked, arranged on a single sheet of paper in such a way that you can quickly look up a callsign to see if you've worked it or not. This "checklog" is best arranged by dividing a large sheet into 26 blocks marked A - Z, into which you write the callsigns of stations, as you work them, according to the first letter after the prefix (so G4HLX/P would go under "H"). You must refer to this checklog to avoid working the same station a second time, which would loose you many points if spotted in your log by the adjudicator.

Getting Together

If all this is beginning to sound like rather a lot to do, there's a very effective way of making light work; it is, of course, to have many hands! Sharing the operating with one or two friends not only prevents the consequences of fatigue, but you can organise things so that one person is actually operating, another is logging, a third keeping the check-log, etc. It also makes the erection of the antenna mast a simpler job.

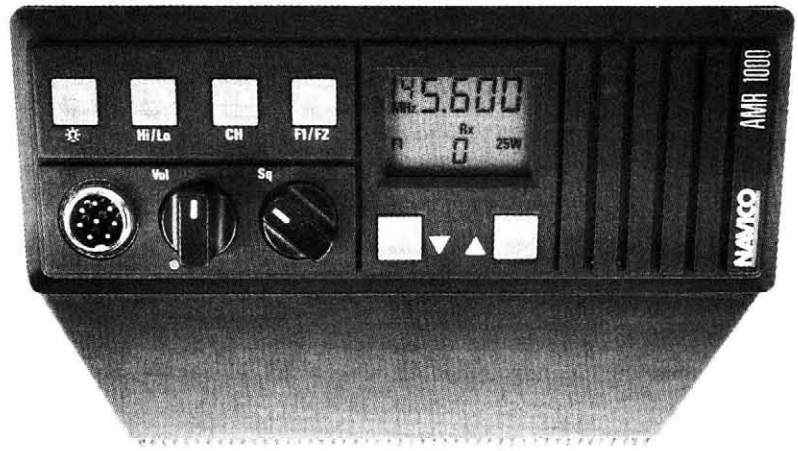
If you form a small group in this way, you may also benefit from pooling your resources in terms of equipment. But if you end up with different parts of the station being supplied by separate individuals, do try out the combination in advance of the contest. There's nothing worse than a long hard climb to the top of a mountain, only to discover that the antenna feeder has an N-type plug whereas the transceiver has an SO239 socket. And this has happened, to a quite experienced group, too!

After the Contest

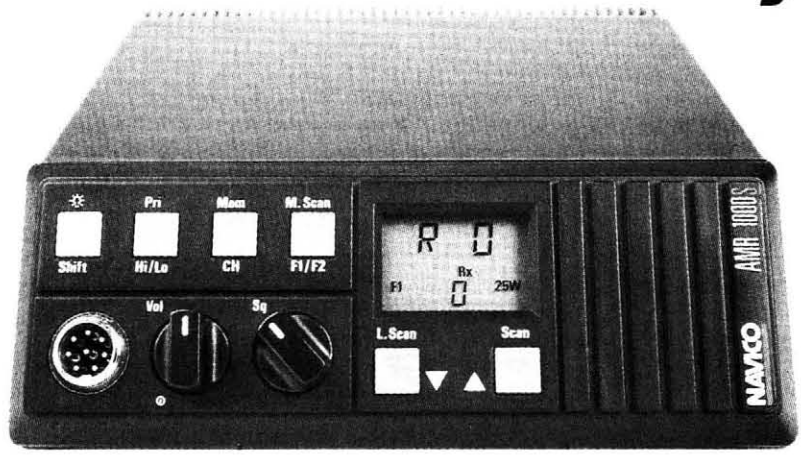
When the day is over, you have at most two weeks to put your entry together and send it off. Copy out your log, as clearly as possible, onto A4 sheets as described in the rules. Please don't just send in your rough copy written during the event. Make sure you provide all the additional information required by the rules, on a separate sheet of paper. We like to have your remarks about your experiences and any interesting anecdotes you might have about the contest, but please do put these on a separate sheet of paper to make the administration easier for the adjudicator.

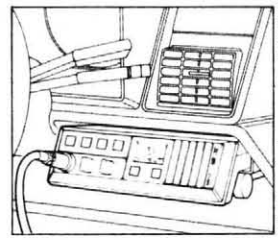
Then it's time to sit back and await the results, a summary of which will be published in *Practical Wireless* later in the year. For a full detailed results list, send a large stamped addressed envelope with your entry. Last year this full results list was also distributed via the packet bulletin board network; did anyone receive it this way? If there's a demand, this can be done again this year.

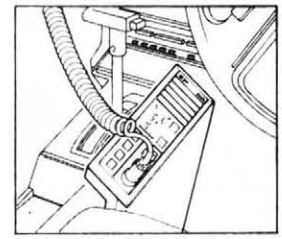
Whether you are a newcomer to v.h.f., to contests, QRP, or an old hand at all three, I hope that the 1989 Practical Wireless QRP Contest provides you with some interesting contacts, some fun, and plenty of DX.

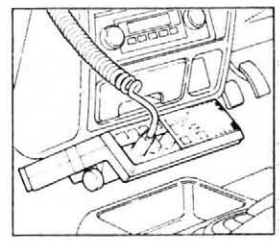


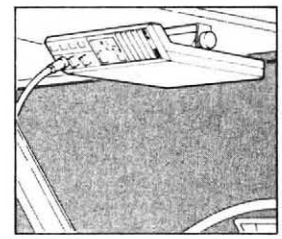
The new AMR1000/S
It checks out from every angle




Under dash mounted (side)


Central console mounted


Under dash (central)


Roof mounted

Whichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

There is also a choice of models to suit your exact needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal demonstration clip the coupon today.

PRIORITY INFORMATION REQUEST
For full details send to:
Navico, Star Lane, Margate, Kent CT9 4NP,
United Kingdom. Telephone: 0843 290007.

Name _____

Address _____

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PW **The professionals in amateur radio**

NAVICO®

Front Panel Memory Bank Switching for the TS-940S

Transceivers have become very complex in recent years without a corresponding increase in physical size. This means that front panel space is at premium and many of less used controls are either moved to the back panel or hidden away on a sub-panel. This design by Stuart A. Fox G3VVS, KM7V hopes to promote one of these relegated controls back on to the front panel.

This modification will give an improvement in operating convenience by making it possible to switch between the four memory banks of the TS-940S from the front panel. Presently this is achieved using a slide switch accessed through the sliding panel on top of the transceiver.

Today's transceivers have become very complex without a corresponding increase in size. This has resulted in a very dense internal layout so that modifications, which would normally require adding hardware such as switches, are best accomplished by utilising existing components.

Fortunately, for obvious reasons, Kenwood placed the "Voice" switch on the front panel. This switch is the ideal choice for activating an alternate function for most people. Where the "Voice" function is required, an alternate choice of switch might be the "M.CE" function. Any redundant front panel switch that operates by making a ground closure is suitable for use with this modification.

Original Switch Operation

Referring to Fig. 1, the four-position memory bank slide switch, in combination with diodes D22, D23, D24 and D25, is used to create four possible states that can exist on the two output lines, MB0 and MB1. These states are shown in Table 1. The output

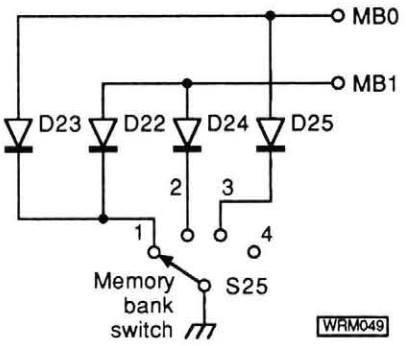


Fig. 1: TS-940S Switch unit circuit diagram

lines are connected to IC111, the "Input Select" integrated circuit which is located in the TS-940S "Digital-B" unit.

The four possible states can also be generated using a digital counter. The "Voice" push button is used to generate clock pulses to increment the counter. The counter sequentially switches between the four possible memory bank options, M0, M1, M2, M3, M0, M1 and so on. The counter system is unidirectional, but this is a minor inconvenience.

New Circuit

Two integrated circuits are used to generate the switching signals, see Fig. 2. Device IC1 is a dual non-retriggerable monostable multivibrator with reset. One half of this integrated circuit is used to eliminate the effects of "contact bounce" which are inevitable when pushing the "Voice" switch on the front panel. Contact bounce would result in switching through more than one memory bank at a time when the switch was pushed, producing erratic and unpredictable operation. Resistor R1 and capacitor C1 are chosen to generate an output pulse that exceeds the anticipated duration of any contact bounce. With the values shown, the pulse width is equal to 150 milliseconds. Different pulse widths can be obtained by using a different *CR* combination.

Device IC2 is a synchronous decade counter. The "QA" and "QB" outputs generate the four possible states shown in Fig. 3 for each low to high transition (positive edge) of the clock input waveform.

The clock signal is taken from the active low output of IC1. The clock is a single pulse for each depression of the "Voice" switch. The typical waveforms of the switch signal, monostable output and counter outputs are shown in Fig. 3.

To duplicate the capability of the slide switch to select the same desired memory bank, (0-3) at rig power-up, the new circuit has to be made "non-volatile". This means the circuit needs a constant source of power even when the equipment is off and in this case it is provided by a small "on-board" lithium battery. Both i.c.s are 74 c.m.o.s. series and draw very little current so the battery should last for several years.

Construction Details

The author's prototype was constructed on an Archer Multipurpose p.c.b. obtained from Tandy. However, to make the project a little more compact a dedicated p.c.b. has been designed, the track pattern and component placement diagram of which can be seen in Fig. 4. It is critical that the non-used inputs of both integrated circuits are connected as shown, in efforts to keep the quiescent current to an absolute minimum and ensure long battery life. Do not mount the lithium battery until the remainder of the parts have been assembled and the circuit board has been checked to en-

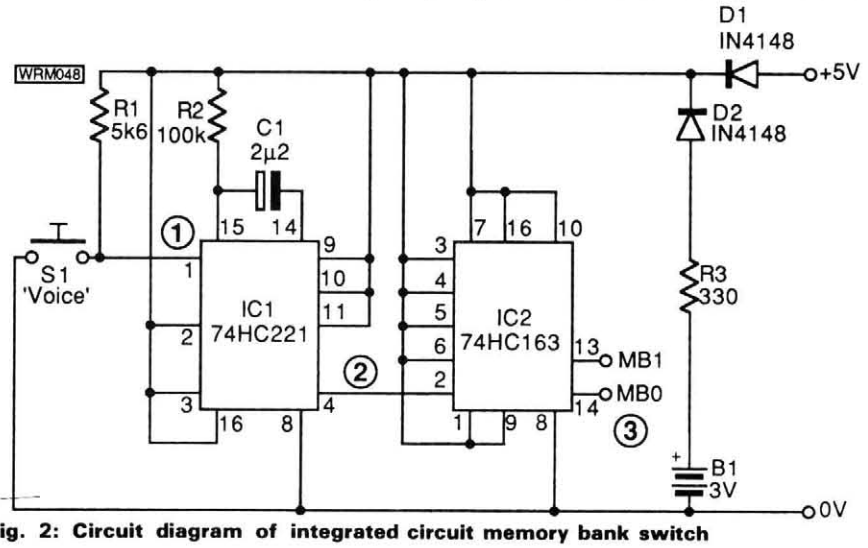
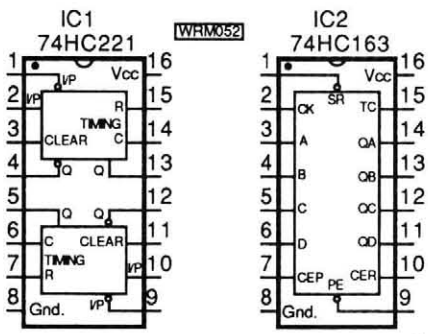


Fig. 2: Circuit diagram of integrated circuit memory bank switch



sure it is functioning correctly. It is recommended that satisfactory operation is verified prior to installing the modification in the transceiver.

Operation of the board should be checked using a digital multimeter prior to installation. First, measure the quiescent current drain, it should be less than 20μA. Next, connect the meter between pin 4 of IC1 and ground and check that it momentarily goes low when pin 1 of IC1 is grounded. This will check the operation of IC1. Then connect the meter to "QA" of IC2 and check that it goes from high to low to high and so on, each time pin 1 of IC1 is grounded. Now connect the meter to "QB" of IC2 and check that it goes high for two groundings of pin 1 of IC1 then low for two groundings, then high and so on. This checks for the correct operation of IC2. Now mount and connect the lithium battery. Finally check the polarity of D2 once more and then the board is ready for installation.

Installation

The following procedure describes how to install the circuit board with the minimum amount of modification to the existing TS-940S hardware. Start by disconnecting plug 29 on Switch Unit (F). This is the board with the slide switch for memory bank selection. Carefully slide out pin 1, (MB1), and pin 2, (MB0), while gently pushing on the locking tab with a small screwdriver, see Fig. 5. The other ends of the white/green wire from pin 1 and white/orange wire from pin 2 are connected to the Input Select IC on "Digital-B" unit.

Reconnect plug 29 to retain operation of the TS-940S internal frequency calibration. Connect two pieces of wire, about 75mm long, to the pins removed from plug 29. Cover the pins/bare wires with insulating tape. Connect the white/orange wire from the "Digital-B" unit to pin 14 of IC2 on the new circuit board and the white/green wire to pin 13 of the same integrated circuit.

Connection to the "Voice" switch is made by carefully sliding out pin 1 (VCR), from plug 8 on the "Digital-B" unit and connecting a 150mm length of wire to the exposed pin. Insulate as before. To reach plug 8, it will be necessary to hinge down the front panel of the TS-940S by removing the two flat-head screws on each side of the chassis assembly and loosening the pan-head screw on each side. The other end of the 150mm length of wire is connected to the S1 pad on the new p.c.b.

The 5V positive and common rails are picked up from pin 8 of plug 3 and pin 2 of plug 1 respectively. Plugs 1 and 3 are secured to the top of the shielded case covering the "Digital-B" unit. The new circuit board may be mounted in the transceiver, using sticky fixers, in the space originally intended for the voice synthesiser option.

Operation

Sequential switching from Memory Bank 1 through Memory Bank 4 will be selected with each depression of the front panel mounted "Voice" switch.

Now, for example, one bank can be assigned to store DX stations while tuning around the bands; another to frequently used broadcast station and standard time and frequency beacons; the third to repeater frequencies for use with a 144MHz transverter and the fourth might be for FAX frequencies in use at various times of the day. ***PW***

Acknowledgments to Rolf Petterson for his help with this project.

Table 1

Switch Position	Memory Bank	MB0	MB1
1	0-9	Low	Low
2	10-19	High	Low
3	20-29	Low	High
4	30-39	High	High

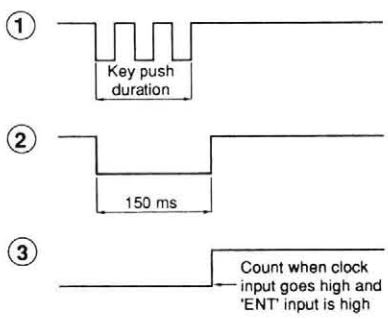


Fig. 3: Logic waveform for integrated circuit memory bank switch

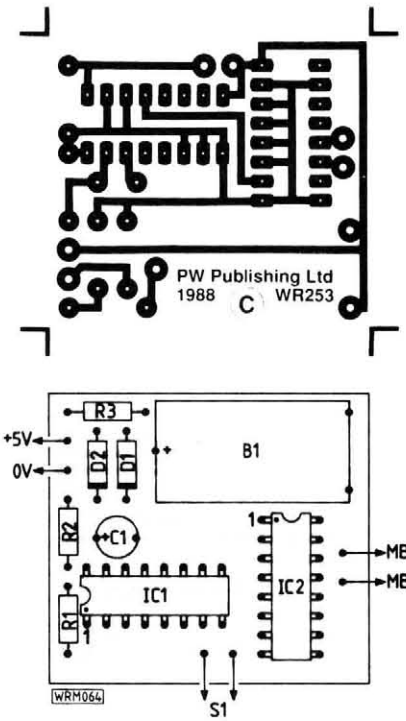
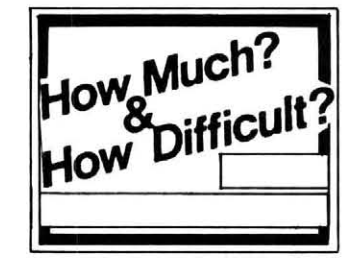


Fig. 4: Full size single-sided p.c.b. track pattern and component placement diagram of integrated circuit memory bank switch



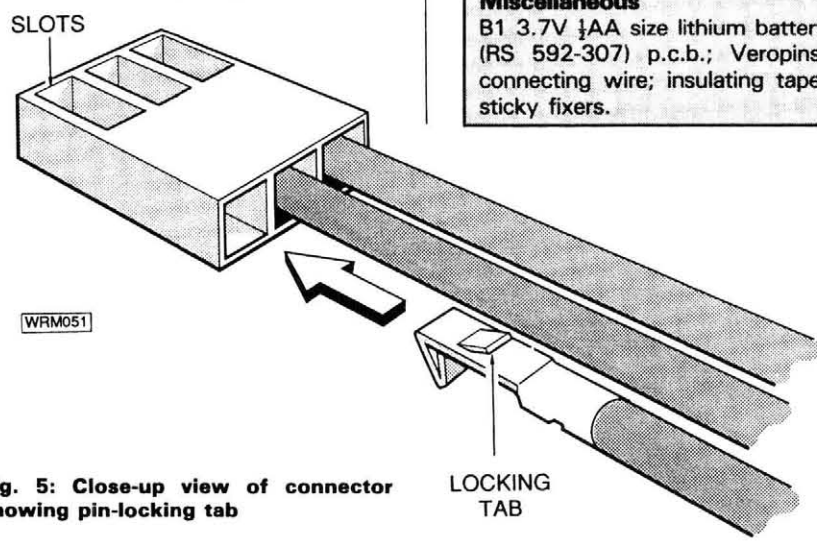


Fig. 5: Close-up view of connector showing pin-locking tab

Shopping List

Resistors

0.125W 2% Carbon film

330Ω	1	R3
5.6kΩ	1	R1
100kΩ	1	R2

Capacitor

Tantalum bead 35V

2.2μF	1	C1

Semiconductors

Diodes

1N4148	2	D1,2

Integrated circuits

74HC163	1	IC2
74HC221	1	IC1

Miscellaneous

B1 3.7V ½AA size lithium battery (RS 592-307) p.c.b.; Veropins; connecting wire; insulating tape; sticky fixers.

Feature

Packet Radio Update

This month in Part 4, Roger J. Cooke G3LDI takes a look at two recent programs and some suggestions from Greece.

To start this month, a description of two new BBS programs, both compatible with existing systems. They have both been around for a few months now, but some of you may not have the details of the systems, or know where to obtain a copy. The first is from Nord-Link, the same group that produced the much-used TheNet. Not too surprisingly, it is called TheBox.

Release 1.5 is available with an English sysops manual (thanks to Don DJ0HC). Just send a formatted 360K IBM disk to Reinhard Ruediger DF3AV, Breite Strasse 20, D-3150 Peine, West Germany. If you send two disks you will get the source code as well, three disks will get you the Nord-Link program Turbo-Packet, written by DL1BHO. This features four split screens on four different channels and a separate monitor screen on a PC-AT, file send and receive routines and everything else a good terminal program should have. Turbo-Packet is written in Turbo-Pascal and comes with the source code.

Here are some of the features of TheBox:

(i) 9-channel multiconnect
(ii) Speaks up to six different user-selectable languages
(iii) Up to four TNCs with up to eight channels on each TNC
(iv) Store and forward compatibility with WA7MBL and W0RLI BBS
(v) Lifetime management for every message
(vi) Channel monitoring on all mailbox channels
(vii) Monitoring on all TNCs
(viii) AMTOR usage (with modified hardware)
(ix) Will run on any XT/AT/386
(x) Multi-tasking operating system not needed
(xi) Takes about 350Kbytes of memory
(xii) Source code available
(xiii) Runs with TNC1 or TNC2 or mixed
(xiv) Password for remote users (new password after every logging)
(xv) Selectable exclusive channels for store and forward and remote sysops
(xvi) Completely configurable from remote
(xvii) Comes with log analysis on the distribution disk.

TheBox gives best performance with TheFirmware on TNC2, a WA8DED host-mode compatible software written by DC4OX of Nord-Link. The distribution disk contains one 4-channel and one 8-channel version of TheFirmware for the TNC-2. Both the TNC1 and 2 may be used with the original WA8DED host-mode. Nearly 90 per cent of the Mailboxes in West Germany are using TheBox with great success. If you do send for a copy, PLEASE don't forget return mailers and postage.

The other BBS is the one known as "BB", for Bulletin Board, written by H. Roy Engehausen AA4RE. It will run on any IBM PC/XT/AT or clone. To obtain a copy of this program, please send to Gary Mitchell WB9TPG, 220 East Eagle, Versailles, Kentucky 40383, USA. Gary is acting as distributor for Roy so that Roy can concentrate on writing enhancements to the program.

The following packages are available:

Number of disks	Description
2	BB programs, BB documentation and MBBIOS 3.2
3	Source code for BB (Turbo-Pascal) and MBBIOS 3.2
1	WA8DED TNC-1 and WA8DED TNC-2 host-mode code
1	Nord-Link TNC-2 and PK87DED host-mode code

(You will be responsible for burning the e.p.r.o.m.s)

One of the features of the BB program is that it is a true multi-user BBS program.

```
Following a considerable period of discussion and negotiation, both at
national and international level, the following HF mailbox
applications are with the DTI for approval -

====== PACKET ======

3.5MHz FSK
Requested frequencies 3.593MHz, 3.597MHz, 3.605MHz
GB7BNI     GI4XFN     Belfast
GB7ERA     G0DXX      Evesham
GB7GUR     GU4YMV     Guernsey
GB7LDI     G3LDI      Norwich
GB7MAC     GM4AUP     Airdrie
GB7PLY     G0BSX      Plymouth
GB7SEK     G4IDX      Ashford, Kent

14MHz FSK
Requested frequencies 14.093MHz, 14.097MHz, 14.103MHz, 14.107MHz
GB7BNI     GI4XFN     Belfast
GB7GUR     GU4YMV     Guernsey
GB7LDI     G3LDI      Norwich

21MHz FSK
Requested frequencies 21.103MHz, 21.107MHz
GB7LDI     G3LDI      Norwich

28MHz FSK
Requested frequencies 28.123MHz, 28.127MHz
GB7SEK     G4IDX      Ashford, Kent

29MHz AFSK
Requested frequency 29.250MHz
GB7MAC     GM4AUP     Airdrie

===== AMTOR =====

Requested frequencies 7.035MHz, 7.036MHz, 10.140MHz, 10.146MHz,
                      14.075MHz, 14.076MHz, 14.077MHz, 14.078MHz,
                      28.075MHz.
GB7PLX     G3PLX      Gosport, Hants.


Owing to the long term nature of the necessary negotiations, the
rapidly changing nature of packet radio, and the current international
bandplanning agreements, some of the above does not exactly match the
frequencies being used by the most active packet stations.
Nevertheless, the success (or otherwise) of these applications will
give us a very good indication of what the next step should be. It is
to be hoped that bandplanning agreements made at the next IARU Region
1 Conference in 1990 will pave the way for a more stable HF mail
forwarding environment.
```

Fig. 4.1

On existing MBL and RLI systems, you must run Desqview or Double-DOS and have multiple copies running to allow multiple users to connect. Even then you are limited to only one user per TNC. BB removes these restrictions:

(1) You do not need Desqview or Double-DOS. BB contains its own internal multi-tasking executive. Each additional user only requires 12Kbytes of memory.

(2) BB does not limit you to one user per TNC. BB allows multiple users on each TNC at the same time. You could have several users connected to each TNC and still forward all at the same time.

BB includes a built-in text editor so you can edit messages and forward files without interrupting any users or taking the BBS down.

BB uses windowing on your terminal: you have a monitor window, a connect window and an operator window.

The only limiting factor is that BB must use a TNC that supports Host Mode. So, unless your TNC already has Host Mode built-in, you must replace the e.p.r.o.m.

Host Mode allows the computer to maintain strict control of the link between it and the TNC. The TNC never sends anything to the computer without the computer asking (or polling) for it first.

The following TNCs are supported:

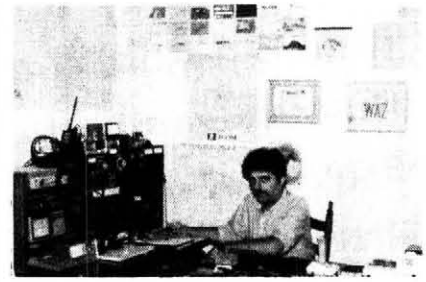
TNC-1 —requires WA8DED e.p.r.o.m.
TNC-2 —requires WA8DED TNC-2 or Nord-Link e.p.r.o.m.
PK-232—Host Mode built in
PK-87 —requires PK87DED e.p.r.o.m. or its built in Host Mode

Again, please remember to include the appropriate number of formatted 360K disks to support your request and also a return mailer and postage. Without these enclosures, your disks will not return!

HF Operating

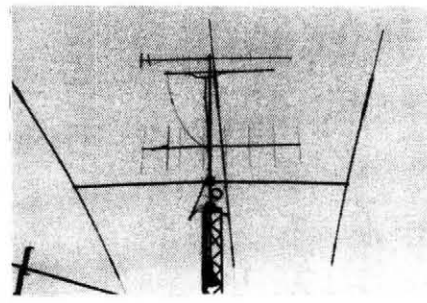
The IARU Region 1 HF Committee is actively engaged in revising the bandplans for h.f. packet and if you have any suggestions or ideas that might be of assistance, please send them to Ron Roden G4GKO (4X8RR) @ GB7ZZZ, who is the IARC Liaison Officer to IARU Region 1. Hopefully, there will be more details to print next time. The applications of h.f. BBS operation in the UK, as seen in Fig. 4.1 are now with the DTI for approval, so it is hoped that GB7 will soon be used on the h.f. bands. This will ease the situation with the USA, as at present all mail for the USA has to be routed via 4X1RU.

I have had several discussions with Manos SV1IW on the telephone and on air regarding the poor planning we have at present and he sent me his views, which I have edited and included here, together with photographs of himself and his station. Now you know where some of the h.f. mail goes!



Manos SV1IW at the operating position

Station of SV1IW



Antennas of SV1IW

"Packet radio in Greece is still something of a new mode. Activity started during the summer of 1986 with two stations becoming active at about the same time, SV1IW and SV1MO. We have made some progress since then, but not enough in my opinion. Although there are more than 50 amateurs capable of using packet in Greece, only a handful are active daily with just 2 or 3 staying on 24 hours per day.

"I am an avid DX-chaser so I have quite a comprehensive station, which I have now devoted to the packet mailing network worldwide. The station consists of an FT-747GX transceiver dedicated to packet plus an Icom IC-751 when conditions are not favourable. I have an FT-480R on v.h.f. and an FT-780R on u.h.f. Antennas are all beams, as can be seen in the photograph, and I have linears for all transceivers. The computer is an IBM XT clone with one floppy and a 20MB hard disk. TNCs are a Kantronics KAM and Pac-Comm TNC220.

"When I joined the AMEA net on 21.107MHz about 18 months ago, there were just three BBS, G3LDI, 5H3ZO and ZS6KE. Traffic flow was good, but now there are more than 15 BBS all trying to force-forward mail on the same frequency. This only creates havoc and chaos. These are my suggestions for a solution to the problem.

(1) Spread out. Use 21.105, .109 and .110 as well as 21.107MHz. Try the 28MHz band under these good conditions too.

(2) Talk to the sysops in your country and do not occupy the same channel as each other. If two BBs are forwarding along similar paths to stations abroad, then this will be impossible as the TNCs cannot hear each other.

(3) Do not force forward every ten minutes. This makes it impossible for anyone to forward anything!

(4) If you know your forwarding partner gets certain mail from a more reliable source, then omit these from your forward list.

(5) If your forwarding partner hops around in frequency, make a REVERSE FWD file so you will not call him when he is not there.

(6) Use the v.h.f./u.h.f. network whenever possible to route traffic.

(7) Choose the right time to forward, check propagation.

(8) Keep the TNC buffer tight so if a disconnection takes place in the middle of a session, the TNC will not block the channel unloading several K of information.

"I put this out as a bulletin to sysops and invited suggestions and comments. I received three replies, a written one from Brian AX4BBS and two verbal ones from Roger G3LDI and Nic PA0SCH. There seem to be three categories, those that wish to ignore the problem and maintain the status quo; those that make an offer to the gods in the hope the problem goes away and finally those who pass their thoughts to others in the hope that they would find a solution!

"In Greece, we have so far installed two digipeaters, one in the Athens area with the call SV1DGA which is equipped with the Rose switch software and can serve as a node and one in the SV7 area with the call SV7SV, which is just a level 2 digipeater. We plan to install at least three more nodes in 1989 with dual-band capability (v.h.f./u.h.f.) and equipped with TheNet software. The objective is to establish a link with Yugoslavia and/or Cyprus and Israel on v.h.f. and further interlinks in Greece."

As you can see, Manos has some constructive suggestions. It really is a pity we cannot have a sysops meeting in the same way as we do in the UK. However, perhaps an international sysops net might be a good idea.

If you have any suggestions, (constructive please!), let me have them. More next time.

Antenna Clinic Special

This month, F. C. Judd G2BCX deals with a bumper bundle of questions on antennas and transmission lines, and on the new and widely misunderstood practice of stating transmitter output power in dBW.

Q "How much r.f. power is lost because of a mismatch between a transmission line (or antenna tuner) and an antenna?"

A It is common practice to connect a v.s.w.r. (voltage standing wave ratio) meter between the transmitter output and the transmission line to the antenna or a.t.u. (antenna tuning unit). A mismatch between the transmission line and antenna (or transmitter and tuner plus antenna) is indicated if the v.s.w.r. is greater than unity, in other words greater than 1 to 1. Most v.s.w.r. meters are also calibrated to show actual forward power, and any power reflected due to a mismatch.

When the transmitter is connected to the antenna via a v.s.w.r. meter and coaxial cable transmission line, and there is a mismatch between antenna and cable, neither the meter nor its calibration takes into account the reduction of both forward and reflected power due to attenuation by the transmission line—usually some finite length of 50Ω coaxial cable. Because of this, with the v.s.w.r. meter in its usual position at the transmitter end of the line, the INDICATED v.s.w.r. may not be the TRUE v.s.w.r., particularly at v.h.f. and u.h.f.

True indication of the power arriving at the antenna, and of any reflected power due to a mismatch between the transmission line and the antenna, can only be obtained by making the measurement with the v.s.w.r. meter connected at the antenna end of the transmission line. However, Table 1 provides a reasonably close approximation of r.f. power loss *vs* v.s.w.r. at h.f., and also at v.h.f. and u.h.f. providing the transmission line loss is low, as with open-wire lines or very low loss coaxial cable.

Table 1: Reflected Power for a Given VSWR (cable loss not taken into account)

VSWR to 1	TX Power from Transmitter to Antenna							
	10W	25W	50W	100W	150W	200W	250W	300W
1	0	0	0	0	0	0	0	0
1.1	0.02	0.06	0.11	0.23	0.34	0.45	0.57	0.68
1.2	0.08	0.21	0.41	0.83	1.24	1.65	2.07	2.48
1.3	0.17	0.43	0.85	1.7	2.55	3.4	4.25	5.1
1.4	0.28	0.69	1.39	2.78	4.17	5.56	6.94	8.33
1.5	0.4	1	2	4	6	8	10	12
1.6	0.53	1.33	2.66	5.33	7.99	10.65	13.31	15.98
1.7	0.67	1.68	3.36	6.72	10.08	13.44	16.8	20.16
1.8	0.82	2.04	4.08	8.16	12.24	16.33	20.41	24.49
1.9	0.96	2.41	4.82	9.63	14.45	19.26	24.08	28.89
2	1.11	2.78	5.56	11.11	16.67	22.22	27.78	33.33
2.1	1.26	3.15	6.3	12.59	18.89	25.18	31.48	37.77
2.2	1.41	3.52	7.03	14.06	21.09	28.13	35.16	42.19
2.3	1.55	3.88	7.76	15.52	23.28	31.04	38.8	46.56
2.4	1.7	4.24	8.48	16.96	25.43	33.91	42.39	50.87
2.5	1.84	4.59	9.18	18.37	27.55	36.73	45.92	55.1

Q "How does attenuation due to a coaxial cable transmission line affect a v.s.w.r. reading taken at the transmitter end of the line when there is a mismatch between the antenna and the line?"

A This applies particularly at v.h.f. and u.h.f. with coaxial cables such as UR43 (Uniradio 43) or its modern metric equivalent URM43 or M43. The attenuation factor of this cable at 145MHz, as stated by manufacturers BICC, is 0.1592dB per metre. As shown in Table 2, the total attenuation for a 10 metre length of this cable will be approximately 1.59dB. This is not really acceptable, as the power loss at the antenna will be 3.07 watts with a transmitter output of 10W. Even with a TRUE indication of unity v.s.w.r. (1 to 1), the power into the antenna at 145MHz will be 10−3.07 = 6.93W. At u.h.f., the loss will be much higher still.

However, in the event of an antenna/cable mismatch and with cable attenuation as above, the v.s.w.r. measured at the transmitter end will be FALSE. Reflected power due to the mismatch will be attenuated by the cable and then measured relative to the forward power from the transmitter (for this example 10W). A true indication of v.s.w.r. could only be obtained by measurement AT THE ANTENNA, where the reflected power will be relative to the "attenuated" power of 6.93W.

Let's assume that the indicated v.s.w.r. with the meter at the antenna end is 1.5 to 1, which means that the reflected power is about 4 per cent of the power going into the antenna, or approximately 0.28W. By the time this reflected power reaches a v.s.w.r. meter at the transmitter end, it will have been attenuated by its journey down the cable to nearly 0.2W. Relative to the original 10W forward power, the indicated v.s.w.r. will be 1.34 to 1, but the TRUE power to the antenna will be 10−(3.07 + 0.28) = 6.65W.

Q "Should the full performance specifications of r.f. coaxial cables be available from retail suppliers as well as from manufacturers?"

A They should indeed, and my advice is not to purchase cable unless such specifications can be supplied at the same time. Apart from nominal impedance, one of the most important is the attenuation in dB per X metres or feet, at various frequencies such as 100, 200, 300 up to 1000MHz, depending on application. Tables 3 and 4 (computer calculated) apply to two popular BICC low-loss cables operating at 145MHz. There are other makes and equivalents suitable for v.h.f. and u.h.f.

Table 2: Power at Antenna and Power Lost
(URM43 operating at 145MHz, TX output 10W, v.s.w.r. 1:1)

Cable Length (metres/feet)		Power at Antenna (watts)	Power Lost (watts)	Cable Total Attenuation (dB)
6	20	8.03	1.97	0.96
8	26	7.46	2.54	1.27
10	33	6.93	3.07	1.59
12	39	6.44	3.56	1.91
14	46	5.99	4.01	2.23
16	52	5.56	4.44	2.55
18	59	5.17	4.83	2.87
20	66	4.8	5.2	3.18
22	72	4.46	5.54	3.5
24	79	4.15	5.85	3.82
26	85	3.86	6.14	4.14
28	92	3.58	6.42	4.46
30	98	3.33	6.67	4.78
32	105	3.09	6.91	5.09

URM43: Zo = 50 ; o/d = 5mm; Specification BS2316
Attenuation at 145MHz = 15.92dB per 100m

Table 3: Power at Antenna and Power Lost
(URM67 operating at 145MHz, TX output 10W, v.s.w.r. 1:1)

Cable Length (metres/feet)		Power at Antenna (watts)	Power Lost (watts)	Cable Total Attenuation (dB)
6	19.7	8.9	1.1	0.51
8	26.2	8.56	1.44	0.67
10	32.8	8.24	1.76	0.84
12	39.4	7.92	2.08	1.01
14	45.9	7.62	2.38	1.18
16	52.5	7.33	2.67	1.35
18	59.1	7.05	2.95	1.52
20	65.6	6.79	3.21	1.68
22	72.2	6.53	3.47	1.85
24	78.7	6.28	3.72	2.02
26	85.3	6.04	3.96	2.19
28	91.9	5.81	4.19	2.36
30	98.4	5.59	4.41	2.53
32	105	5.38	4.62	2.69

URM67: Zo = 50 ; o/d = 10.3mm; Specification BS2316
Attenuation at 145MHz = 8.42dB per 100m

Table 4: Power at Antenna and Power Lost
(URM74 operating at 145MHz, TX output 10W, v.s.w.r. 1:1)

Cable Length (metres /feet)		Power at Antenna (watts)	Power Lost (watts)	Cable Total Attenuation (dB)
6	19.7	9.36	0.64	0.29
8	26.2	9.15	0.85	0.38
10	32.8	8.95	1.05	0.48
12	39.4	8.76	1.24	0.58
14	45.9	8.57	1.43	0.67
16	52.5	8.38	1.62	0.77
18	59.1	8.2	1.8	0.86
20	65.6	8.02	1.98	0.96
22	72.2	7.84	2.16	1.06
24	78.7	7.67	2.33	1.15
26	85.3	7.5	2.5	1.25
28	91.9	7.34	2.66	1.34
30	98.4	7.18	2.82	1.44
32	105	7.02	2.98	1.54

URM74: Zo = 50 ; o/d = 22mm; Specification BS2316
Attenuation at 145MHz = 4.08dB per 100m

Q "How can the otherwise unknown attenuation factor of coaxial cable at a given frequency be established, even though the cable has the correct impedance?"

A The attenuation factor of any length of coaxial cable can be measured fairly accurately at any given frequency, with the aid of a high-grade v.s.w.r. meter such as a Daiwa or a Bird Thruline, and an accurate dummy load (resistance the same as the cable impedance). Power from the transmitter is first verified by direct connection to a dummy load via the meter as in Fig. 1(a). Next, check with the transmitter connected to the cable via the meter but with the dummy load at the far end of the cable, to ensure that the transmitter power into the cable is the same (Fig. 1(b)). Finally, connect the transmitter directly to the cable, and the meter between the far end of the cable and the dummy load, to measure the power at the end of the cable (Fig. 1(c)). The total cable loss in dB will be 10 × Log_{10} (power in watts from transmitter ÷ power in watts at end of cable).

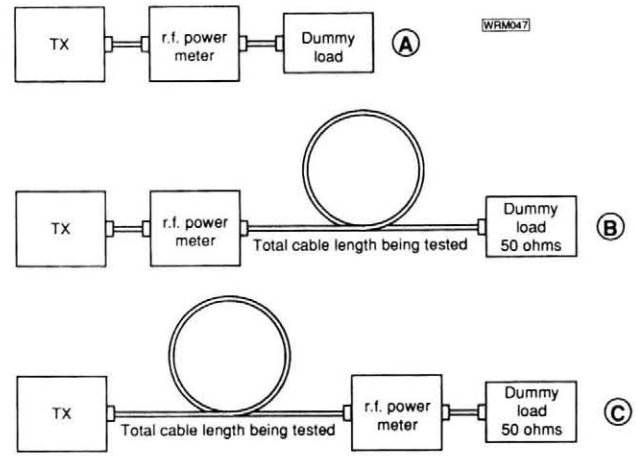


Fig. 1: Checking a length of coaxial cable for power loss

For example:
Transmitter power 10W
Power at end of 12m length of cable 6.5W
(power lost 3.5W)

Loss = 10Log_{10} 10/6.5 = 1.87dB

approximately 0.156dB per metre, or 15.6dB per 100 metres.

Q "Is it possible to get a favourable impression of antenna performance because of an acceptably low v.s.w.r. reading at the transmitter, when in fact there is a relatively large mismatch between the antenna and a coaxial cable that, unknown to the user, has a very high attenuation factor?"

A Even though the impedance may be correct, some low-cost coaxial cables may well have an unknown, but nevertheless very high attenuation factor at v.h.f., higher still at u.h.f. Sometimes it may be too high even for h.f. applications. This can also apply to otherwise low-loss cable that has been stored for a long time in damp conditions (buyer beware!). Good quality cable that has been in use for a number of years, exposed as it usually is to all kinds of weather, and cable into which water has seeped, can also become extremely lossy.

The data in Fig. 2, derived from a special computer program, with appropriate data inputs, illustrates quite well the result of using, unknowingly, a length of coaxial cable with a high attenuation factor. The low reading (1.23 to 1) from a v.s.w.r. meter connected at the transmitter end of the cable, gave a totally false indication of an "all is well" performance. Again, let the buyer beware!

Some years ago, the writer purchased a 100 metre drum of ostensibly low-loss, 50Ω, 10mm diameter coaxial cable at an attractively low price. An initial test with about 14m of this cable revealed no power at the far end when checked with a dummy load and Bird Thruline meter. Faulty piece of cable? A second and slightly shorter length was tested with identical results. A third test with about 2m of this cable revealed that with 10W in at one end, less than 1W was available at the other. This cable must have had a hard fall off the back of the proverbial lorry!

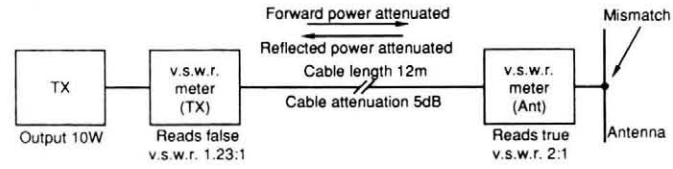


Fig. 2: True and false v.s.w.r. indications.

Q "What is meant by effective radiated power (usually abbreviated to e.r.p.) and how is it calculated?"

A The term e.r.p. refers to the r.f power actually radiated by an antenna. First, however, any power lost because of transmission line attenuation, including reflected power resulting from a mismatch between the antenna and the transmission line or antenna tuner, must be deducted from the r.f. output from the transmitter (or from an r.f. linear amplifier, if used).

Effective radiated power is applicable to omni-directional, uni-directional and bi-directional antennas. It is directly related to "power gain", which is derived from the "directivity gain" of a main lobe or lobes, and is usually given in dBd (decibels with reference to the radiation from a dipole), this being taken as 0dBd. Power gain and directivity gain is sometimes related to the otherwise hypothetical isotropic point-source radiator; reference 0dBi, directivity gain in dBi. See *PW*, February 1988, "Directivity Gain in Transmitting Antennas".

The term e.r.p. can apply to antennas having a directivity gain less than that from a dipole, as well as to any of the four major lobes of long linear antennas operated at some fundamental frequency. It now applies to two of the allocated frequency bands for which the maximum amount of r.f. power allowed by the new UK amateur radio licence is the "effective power" radiated by the antenna and NOT the output power of the transmitter. See the *Licence Terms and Limitations Booklet BR68*, reproduced in *PW*, September 1988.

The calculation of e.r.p. can be a little difficult, since the directivity gain of the antenna must be known in either dBd or dBi. If not known, then this must first be calculated, or measured and referenced to a dipole, or calculated with reference to an isotropic radiator. Not exactly a simple task, which makes one wonder about the DTI Amateur Licence requirement of determining e.r.p. in dBW (decibels referenced to 1 watt) for operation in the 50MHz and 430–432MHz bands. But wait; p.e.p. (peak envelope power) is mentioned somewhere. For these two bands, and when using s.s.b., this too must be taken into account—e.r.p. as p.e.p. in dBW, or should this be "e.r.p.e.p. dBW"?

Table 5: Antenna Gain in dBd to Antenna Power Gain Conversion

Antenna Gain (dBd)	Power Gain	Antenna Gain (dBd)	Power Gain
3	2	12	15.8
4	2.5	13	20
5	3.2	14	25.1
6	4	15	31.6
7	5	16	39.8
8	6.3	17	50.1
9	7.9	18	63.1
10	10	19	79.4
11	12.6	20	100

Effective radiated power (e.r.p.) = r.f. power at antenna x power gain

Having determined the requisite directivity gain, preferably in dBd, the power gain relative to this must be calculated. Also, if one is to be reasonably accurate about e.r.p., any power lost to the antenna due to transmission line attenuation, as well as reflected power (resulting from a mismatch between the transmission line or antenna tuner, and the antenna) must be verified and deducted from the r.f. power supplied by the transmitter.

Assuming the "directivity gain" of the antenna relative to a dipole is known, or can be calculated (as per "Directivity Gain in Transmitting Antennas", *PW*, February 1988), the power gain may be found from Table 5. Remember that this can apply to the main lobe of uni-directional antennas, to either lobe of bi-directional antennas such as horizontal collinears, broadside or end-fire arrays, or to one of the four main lobes of linear antennas one or more wavelengths long, commonly referred to as "long-wire" antennas.

Apologies to readers if all this appears to be as confusing as the terms of the new UK Amateur Radio Licence!

Q "At one time, radio amateurs were only concerned with the measured 'd.c. input power' (watts) to the final or output amplifier stage of the transmitter. The new UK Amateur Licence gives the maximum r.f. power which may be used in the various allocated bands in 'dBW'. It is now a requirement to note in the station log the power used for all transmissions, though Clause 6.(1)(e) of Booklet BR68 does NOT require that this shall be in dBW. The question remains, though, how does one relate the more familiar 'V squared over R watts' to dBW?"

A Decibel watts or dBW are not an actual measurement because they are the logarithmic ratio of a number of ordinary watts to 1 ordinary watt, or *vice versa*, the "reference" being 1 watt = 0dB. However, the number of ordinary watts may be less than, or greater than 1, and since 1 = 0dB, a number of watts less than 1 becomes "negative dBW" whilst more than 1 becomes "positive dBW". They may be written, respectively, as either −NdBW or +NdBW, though in general the "+" prefix is omitted from positive values.

Power Ratio: The numeric ratio of a number of ordinary watts to 1, or *vice versa*, is known as the "power ratio". For example, a ratio of 25W to 1W is a power ratio of 25. If the ratio was 1W to 25W then the power ratio would be 1/25 = 0.04.

What may also seem confusing to the uninitiated is that as the "dB" figure increases (either + or −) the "power ratio" increases at a much greater rate. Taking 1W = 0dBW, then +60dBW, which seems relatively small, represents a power ratio of 1 000 000 to 1. So, if the licence allowed a maximum of 60dBW for some particular band, the true maximum power would be a megawatt (1MW)!

▶ 38

S.E.M.

UNIT P, UNION MILLS, ISLE OF MAN
Telephone: (0624) 851277

S.E.M. QRM ELIMINATOR

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Development of Radar in the Netherlands before World War II

The "father" of Dutch radar, Professor von Weiler, escaped to England on 14 May 1940, when Germany invaded The Netherlands. Together with an assistant he worked at the Admiralty Signal Establishment at Portsmouth for the duration of the War. Who knows, there may be some readers who remember him. D.W. Rollema PA0SE tells his story.

The discovery that radio waves could be used to detect the presence of aircraft came about more or less by accident in the Netherlands. It all centred around jhr. ir. J.L.W.C. von Weiler (Fig. 1), who joined the "Meetlaboratorium" (Measurements laboratory) in 1934. This rather meaningless name was given to a small research group that was set up in 1927 to investigate the so-called "deathly ray" about which disturbing rumours made their way from Germany.

It was quickly realised that radio waves of sufficient power to be "deathly" had to be of very short wavelength. To produce such power was impossible with the technology of the twenties. The situation changed when, in the beginning of the thirties, special valves for v.h.f. and u.h.f. use appeared on the market, both for reception (acorn valves) and for transmission, e.g. the apple-shaped 316-A triode, made by Western Electric.

Test-bed

To gain some experience with these new valves, von Weiler developed a portable v.h.f. radiotelephone, operating on a wavelength of 1.2 metres. This set was later produced in some numbers by Nederlandse Seintoestellen Fabriek (NSF) of Hilversum, now Philips Telecommunication Industries. During propagation tests over a long path, the weak signal received did not quite suppress the hiss of the super-regenerative receiver. When an aircraft crossed the path severe fluctuations in the received signal were observed—the aircraft flutter now so familiar to us.

Von Weiler concluded that the reflections of the 1.2m waves by the aircraft were strong enough to compete with the direct ray. This thought led him to the construction of what we now call a radar set. Von Weiler called the apparatus "Electric listening set", because it was to replace the acoustic listening sets that were used up to that time to locate the position of aircraft and which were found to be less and less accurate because of the increasing speed of military aircraft.

A model of the radar set is shown in Fig. 2. The frequency used was about 425MHz. The transmitter employed four Telefunken RS297 triodes in parallel in a self-excited "ultra-audion" circuit. The frequency was determined by a coaxial tuned circuit. Peak power was about 1kW. The transmitter was pulsed in the grid circuit by a separate, rather simple, pulse generator. The pulse repetition frequency was 10 000Hz and was kept stable by a magnetostriction oscillator made of "Monel" metal. The pulses could be modulated in width by a 1000Hz note. This permitted the received signal to be heard in headphones after detection. The final model of the pulse modulator comprised only two valves in a push-pull circuit.

Fig. 1: Prof. jhr. ir. J.L.W.C. von Weiler, photographed after the war as Director of the Netherlands Laboratory for Electronic Development of the Armed Services

Antenna

The antenna was of the billboard type; 64 half-wave dipoles before a screen of copper mesh. The size was about 3 x 3m and the gain about 25dB with respect to an isotropic radiator. The antenna was rotated in azimuth by bicycle pedals worked by the radar operator. Elevation was adjusted by a lever, not shown in Fig. 2. The operator slowly increased elevation whilst pedalling the antenna around in azimuth (spiral scan).

First detection of a target was noted with the 1000Hz note in the headphones; this was found to be less tiring that constant watching of the cathode ray tube. To prevent ground clutter from the immediate surroundings causing a continuous signal, a blocking impulse of adjustable duration could be applied to the receiver.

The receiver was a superheterodyne with a self-oscillating mixer (acorn pentode) at the input, followed by an amplifier using high-slope AF100 pentodes by Telefunken. The intermediate frequency was 6MHz. Many precautions had to be taken to prevent the strong transmitted impulse overloading the receiver, such as screening and r.f. decoupling. Remember, these techniques were unknown at that time and had all to be developed.

Diplexing

The antenna was common to transmitter and receiver, but no transmit-receive switching was employed. During transmission, the receiver was kept connected to the antenna cable. The mixer valve had a limiting resistor in the grid circuit and the transmitter pulse automatically developed a high negative bias. This changed the space charge in the valve and in turn the input capacitance of the valve. This caused detuning of the receiver input circuit, thus providing extra protection.

During reception, the transmitter valves were also blocked by a high negative bias. The same detuning effect occurred here which prevented received energy disappearing into the transmitter tuned circuit. The minimum radar range was about 400-500 metres.

For presentation of the received radar echoes, von Weiler used a cathode ray tube with circular deflection for the time base (J-scope). It is interesting to note that this trick to increase the length of the time (range) scale on the tube face was independently found in

Britain, Germany and the Netherlands and maybe other countries as well. At first a special c.r.t. for circular deflection was not available—it was developed later by Philips at the request of von Weiler. The range scale was obtained by feeding voltages with 90° of phase difference to the deflection electrodes. This made it difficult to apply the video signal to the c.r.t. as well. It was solved by feeding the 6MHz i.f. signal to the deflection electrodes, also via a 90° phase shifting network.

So, the radar returns presented themselves as small circles, superimposed on the circular range scale. To improve range measurement, the timebase signal could be shifted in time by a manually operated phase-shifter. This was used to bring the echo to be measured onto the zero mark of the range scale. A calibrated dial of the phase-shifter permitted accurate reading of the distance to the aircraft.

The set proved to be quite successful. Single aircraft, like the Fokker C5 fighter, could be detected up to about 15km, groups of aircraft up to 30km. It was quickly learned to distinguish a single aircraft from more than one. Also, the effect of aircraft flying a curve and the influence of the propellers were readily observed.

Military Interest

As was to be expected, the military showed interest in the device, especially those involved in finding a solution to the problem of early warning of enemy aircraft. But, most of the generals failed to recognise the military potential of the "electric listening set".

A demonstration was also staged, in 1939, for young Prince Bernhard, who showed a lively interest. Unfortunately, fog prevented the aircraft ordered for the demo appearing. Von Weiler therefore showed the Prince the echoes of the church spires in and around the Hague, where "Meetlaboratorium" was established. He pointed out that Roman Catholic churches produced much stronger returns that Protestant ones; the iron cross on top of the former acting as a radar reflector!

Plans were made for series production of the set by the NSF factory, but the invasion of the Netherlands by the Hitler forces on 10 May 1940 prevented this. On that same day a prototype of IFF (identification friend or foe) was to be demonstrated for some military commanders, the responder being placed on a church tower to save the expense. The invasion caused the demo to be called off. Most of the equipment of the "Meetlaboratorium", including some of the radar sets, were destroyed. One of the remaining sets was put into action in co-operation with an anti-aircraft gun in the centre of the Hague to provide early warning of enemy aircraft.

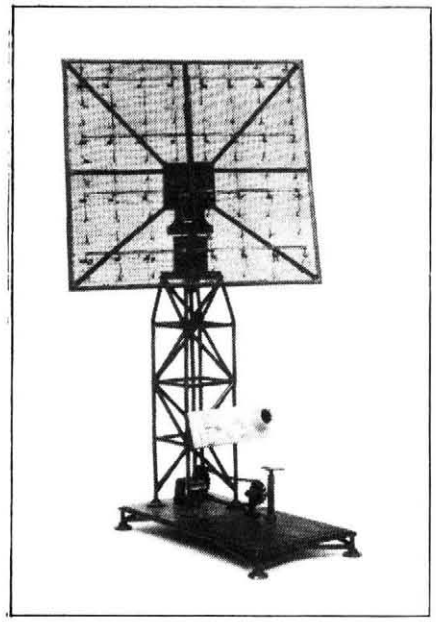

Fig. 2: A model of the radar set developed around 1939

Escape!

Early in the morning of 14 May 1940, the day the Dutch forces surrendered after the bombing of Rotterdam, von Weiler together with Mr M. Staal (an observer added to von Weiler's team by the military forces) escaped to England on a British destroyer, taking with them the plans for the radar. An uncomfortable moment occurred when German aircraft attacked the ship. Von Weiler and Staal were engaged in a human chain to pass the shells up from the store under the floor of the longroom to the anti-aircraft guns.

Obviously they did not look too happy during the action. A British Naval officer reassured them, "Don't worry old boy, our ammo is nearly finished".

Without further mishaps, London was reached and von Weiler and Staal went to Portsmouth where they became members of the team at the Admiralty Signal Establishment. During the rest of the war they contributed among others to research on antennas for artillery radar.

To their great surprise, after some weeks, two "electric listening sets" arrived at Southampton. Obviously the group at the Hague had managed to ship these to England after von Weiler and Staal had departed. The sets were suitably modified and added to the Dutch destroyer HMS *Isaac Zweers* for fire control of the 40mm Bofors anti-aircraft guns. The billboard antenna was replaced by Yagi beam antennas that were mounted on the guns; an early example of systems integration. The radar proved to be useful as an addition to the visual gun-laying equipment which provided azimuth and elevation with great accuracy but could not determine distance to the target very well. That information could be gathered by radar with good precision. The fire control equipment was used during one of the Malta convoys which included the Dutch HMS *Isaac Zweers* among the escort.

When the war ended, von Weiler and Staal returned to the Netherlands. Von Weiler became a professor in the Delft Technological University. He also became the first director of the "Laboratorium Elektronische Ontwikkeling voor de Krijgsmacht" (Laboratory for Electronic Development of the Armed Forces) at Oegstgeest near Leyden. Ir. M. Staal became director of Hollandse Signaal Apparaten of Hengelo, now part of the Philips concern.

Professor von Weiler died on 16 September 1988 at the age of 86. ***PW***

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32 ▶ Table 6: RF Power in dBW to Power Watts Conversion (-8dBW to +9dBW)

Power (dBW)	Power (watts)	Power (dBW)	Power (watts)
-8	0.16	1	1.3
-7	0.2	2	1.6
-6	0.25	3	2
-5	0.32	4	2.5
-4	0.4	5	3.2
-3	0.5	6	4
-2	0.63	7	5
-1	0.79	8	6.3
0	1	9	7.9

Power in dBW is expressed in dB referenced to 0dB =1 watt

Table 7: RF Power in dBW to Power Watts Conversion (+10dBW to +27dBW)

Power (dBW)	Power (watts)	Power (dBW)	Power (watts)
10	10	19	79.4
11	12.6	20	100
12	15.8	21	125.9
13	20	22	158.5
14	25.1	23	199.5
15	31.6	24	251.2
16	39.8	25	316.2
17	50.1	26	398.1
18	63.1	27	501.2

Power in dBW is expressed in dB referenced to 0dB =1 watt

N watts and NdBW: When the ordinary (N) watts are "less" than 1 then watts expressed in dB may be derived from:

log to the base 10 of (1 ÷ N watts) multiplied by 10 in which case NdBW, although having a number N greater than zero, must be indicated as "negative", in other words −NdBW as in Table 6.

For example, to convert an r.f. power of 0.4W to dBW:
$10 \times \log_{10} (1 \div 0.4) = -3.97$ or −4dBW approx.

When the ordinary watts are "greater" than 1 then watts expressed in dBW may be derived from:

log to the base 10 of (N watts ÷ 1) multiplied by 10 in which case NdBW still have a number greater than zero but are in effect +NdBW. Normally the positive sign is not used, as in Table 7.

For example, to convert an r.f. power of 25W to dBW:
$10 \times \log_{10} (25 \div 1) = +13.9$ or +14dBW approx.

Tables 6 and 7 cover the range −8dBW to +27dBW and the equivalents in ordinary watts (or *vice versa*).

Conversion: The conversion of NdBW to N (ordinary) watts can be achieved from:

N watts = 10^X, where X = (dBW ÷ 10)

For example, 20dBW = 10^2 = 100 watts.

The DTI should perhaps have added another clause to the terms of the new Amateur Licence: "Pocket calculators must be worn during all periods of transmitting"!

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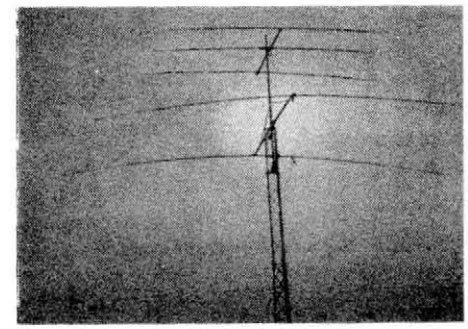
PW REVIEW

Cushcraft 40-2CD 2-element Yagi for 7MHz



The Cushcraft 40-2CD has recently become available from a UK importer, HRS Electronics. In this article, Ron Stone GW3YDX reports on his experiences with one he imported directly from the USA about two years ago.*

The reaction of most people when hearing that a 40m Yagi is in use is that an enormous monster has been hoisted into the air. Indeed that would be so if a full-size Yagi were in use with, typically, a 21.3m (70ft) reflector length. The 40-2CD uses a combination of inductive and capacity hat loading to give a quart of 40m performance in a pint pot. This antenna is kinder to both the eye and the rotator than a full-size version, with a maximum element length of 13.1m (43ft), which is only 1.8m (6ft) or so more than the reflector length of a full-size 14MHz (20m) beam. The other dimensions, as set out in the table, are equally modest. The whole thing is not much bigger than a 3-element Yagi for 20m. All however is comparative, and the antenna admittedly looks big compared with the usual 3-element, short-boom, trapped tribander. The photograph shown is of the GW3YDX tower with such a tribander (a Jaybeam TB3) stacked 3m (10ft) above the 40-2CD. Yes, it does look big!

Delivery

The 40-2CD arrived from the USA in two long boxes, imaginatively called Box A and Box B. Installation and assembly instructions are easy and straightforward to follow. The specifications state that the antenna will cover 200kHz within the 2:1 v.s.w.r. points, and the suggested lengths for 7.025MHz were followed in assembly. The antenna went together in about four hours without any problems at all. Having first connected the feedline, it was mounted to the stub mast with the mounting blocks and plate supplied.

During the next year, two mechanical problems arose with the antenna. The tubing brace assembly, designed to stop the boom from sagging under the weight of the elements, did not hold fast. The brace assembly is made adjustable by sections of tubing telescoping into each other and held in place by hose clips. The hose clips on their own were evidently not sufficient because the tubing slipped, and the entire arrangement was beefed up by using stainless steel self-tapping screws through all the thicknesses of the tubing to hold it all together. There have been no slippage problems there since.

The other mechanical problem was caused by the saddles and "U" bolts holding the boom to the stub mast. Several trips up the tower were necessary when high winds blew the antenna off course, to re-align it and to tighten the "U" bolt nuts yet again. This still seems to happen whenever there is a big blow, even though the nuts are done up as tight as possible and "Loctited". It would have been much better had some rough serrations been provided on the surface of the saddles to give them a bit more grip. The rest of the antenna, including the suspiciously thin 12.7mm (½in) diameter tubing beyond the capacity hats, has flapped around alarmingly but nothing has broken off, and all the connections were free of corrosion at the last routine inspection. This indicates careful choice of materials for the elements and fittings.

For readers interested in the rotator requirements, my 40-2CD and stacked tribander have been turned and held in place by a Daiwa Multitorque rotator (3 motors) for over a year.

Directivity and Gain

Electrically, the performance of the antenna was beyond criticism. As a 2-element Yagi, the front-to-back ratio is not going to be wonderful, but the theoretical gain of 5.5dBd (decibels with reference to a dipole), if realised, is well worth having. Gain figures, of course, are very difficult to prove without antenna test ranges and the like. The only meaningful way to estimate "gain" for most amateurs is by comparison with other antennas. During the year, various sorts of alternative antennas were available for the band. By comparison with a dipole, the 40-2CD was always at least 20dB better on DX signals. It is the sort of difference one can expect from a beam that is working well. A front-to-back ratio of 20dB, as claimed in the specifications, was evident but only on low-angle DX signals. There seemed to be some high-angle response lobes from the rear of the antenna and there was not much F/B ratio on European signals, perhaps 10 or 15dB.

To test the radiation pattern in the horizontal plane, a crystal oscillator signal source was mounted 10 wavelengths away. The a.g.c. on the receiver was switched off and an a.f. wattmeter connected to the audio output. With a calibrated r.f. attenuator placed in the antenna lead of the transceiver, adjusted so that an equal a.f. output was present at all beam headings, a plot was made on azimuthal graph paper. The excellent radiation pattern obtained is reproduced at Fig. 1. The high angle lobes found on European signals were not apparent in those tests.

The v.s.w.r. response is excellent, being perfectly adequate to work over all ▶44

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Longest element:	13.1m (43ft)	**Wind survival:**	125kph (80mph)
Turning radius:	7.3m (23.93ft)	**Maximum mast o.d.:**	53.4mm (2.125in)
3dB beamwidth:	75°	**Material:**	6063-T832 seamless tubing
Assembled weight:	20kg (44lb)	**Termination:**	Stainless steel terminals

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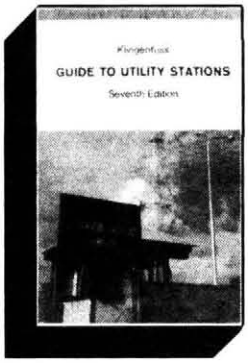

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Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 14, R.F. Fautley G3ASG deals with single sideband and what's needed to generate it.

There are several methods of generating an s.s.b. signal:
(i) the filter method (most popular)
(ii) the phasing method
(iii) the "third" method

Only the filter method will be described here as the others are more complicated and not often encountered in amateur radio equipment. For those interested, their operation is described in many radio publications.

Single sideband transmitters using the filter method of generation comprise some eight main sections:
(i) microphone amplifier
(ii) i.f. oscillator,
(iii) balanced oscillator
(iv) sideband filter
(v) h.f. converter
(vi) h.f. oscillator
(vii) h.f. driver amplifier
(viii) linear r.f. power amplifier

A variable frequency oscillator (v.f.o.) or a frequency synthesiser may also be used to control the output frequency, but in this series we are looking only at the simpler circuits that would add up to a usable system. In most modern equipment, a frequency synthesiser would be the standard method of controlling both the receiver tune frequency and the transmitter output frequency.

Microphone Amplifier

If you look at Fig. 14.1, it shows a simple amplifier for a dynamic (moving coil) microphone. Capacitor C1 passes speech signals whilst isolating the microphone from d.c. bias at the base of the transistor Tr1. Components R1, 2 and 4 and C2 set the d.c. conditions for the transistor and R3 is the load resistor. Capacitor C3 couples the amplified output to the following stage (giving d.c. isolation) and C4 provides a low impedance path for a.f. signals. If you need a description of the amplifier's operation see Fig. 7.1 and the associated text.

IF Oscillator

This oscillator is used as one input to the balanced modulator (which is shown later) and is usually crystal controlled. The circuit shown in Fig. 4.9 could be used for this purpose, with the output taken from the transistor emitter via a small capacitor. A frequency around the i.f. range of 400 to 500kHz would be appropriate.

Balanced Modulator

The purpose of a balanced modulator is very similar to that of a mixer. Two signals are applied to it and one of the resultant beats, after a bit of filtering, provides the required s.s.b. signal.

Why a "balanced" modulator? It means that one of the two input signals can be "balanced" out, i.e., it appears at a very much attenuated level at the modulator's output. Ideally, it would not be present at the output at all.

A balanced modulator circuit called a "ring modulator" is shown in Fig. 14.2. It is so-called because the four diodes form a ring with the cathode of D1 connected to the anode of D2 which has its cathode connected to the anode of D3, etc. Reference should be made to standard text books on s.s.b. for an explanation of its operation, for we are really only concerned with being able to recognise the circuit as a balanced modulator when we see it.

The i.f. oscillator could operate at about 465kHz and be about 1.5V r.m.s. in amplitude. The a.f. signal from the microphone amplifier should never exceed about a tenth of the i.f. oscillator voltage, so for a 1.5V r.m.s. i.f. oscillator voltage, the a.f. signals should not exceed 150mV. The reason is that excessive a.f. signals would cause distortion and intermodulation products within the wanted sideband.

Output from the modulator consists of an upper sideband signal combined with a lower sideband signal. These are beats resulting from the i.f. and a.f. signals mixing in the modulator. As it is a balanced modulator, the i.f. oscillator, or carrier, signal is very nearly zero in the output. It is "balanced" out, thus the "suppressed carrier".

Beats were discussed in Part 7 of the series. In the balanced modulator case, the beats we're interested in are the sum and difference beats.

For $f_{carrier}$ = 465kHz and f_{audio} = 1000Hz, the "sum" beat will be:

$f_{carrier} + f_{audio} = 465 + 1 = 466$kHz

and the "difference" beat will be:

$f_{carrier} - f_{audio} = 465 - 1 = 464$kHz

Similarly, for an audio (microphone) signal of 300Hz the sum and difference frequencies will be:

465 + 0.3 = 465.3kHz and 465 − 0.3 = 464.7kHz

Again, for an audio signal of 3000Hz the sum and difference frequencies will be 468 and 462kHz.

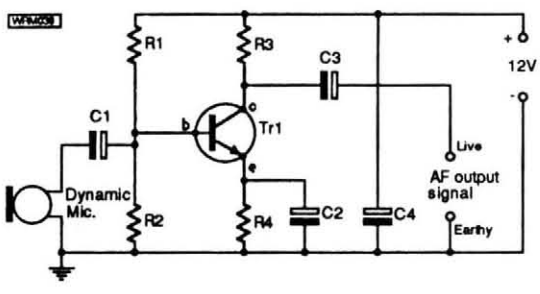

Fig. 14.1: A microphone amplifier

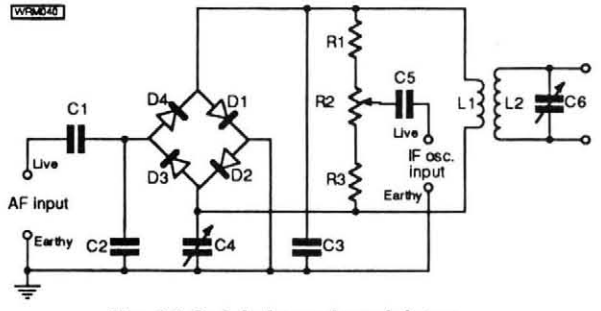

Fig. 14.2: A balanced modulator

So, for speech signals in the band 300 to 3000Hz, two bands of signals will be produced by the modulator:

(i) 465.3 to 468kHz—which is the upper sideband

(ii) 464.7 to 462kHz—which is the lower sideband

Note that for the lower sideband (l.s.b.), the **higher** the speech frequency the **lower** is the corresponding sideband output frequency.

Referring to Fig. 14.2 again, a few components need explanation. Capacitor C2 is chosen to have a very low reactance at the carrier frequency but high reactance at the highest audio frequency to be transmitted. Components C4 and R2 are adjusted for minimum (ideally zero) carrier at the modulator output. These balance controls are necessary because of small diode differences and differences of stray capacitance in the circuit.

If a single sinewave a.f. tone is applied to the modulator, the shape of the output appearing across the tuned circuit L2, C6 (as displayed on an oscilloscope) is shown in Fig. 14.3. It consists of two signals added together, one u.s.b. and one l.s.b.

(i) u.s.b. signal frequency equal to $f_{carrier} + f_{a.f.}$

(ii) l.s.b. signal frequency equal to $f_{carrier} - f_{a.f.}$

The output from the modulator is via a low impedance coupling winding L1 to the tuned circuit L2, C6 which is tuned to the i.f. oscillator frequency.

As both upper and lower sidebands are present in the modulator's output, we have the choice of selecting which one we want to transmit. This leads us to the next stage, the sideband filter.

Sideband Filter

As the modulator output provides both upper and lower sidebands, one of them has to be removed completely (ideally) or at least to be very highly attenuated, so as to leave us with the required s.s.b. signal. A device that will pass some frequencies and reject others is called a filter so that's what we want.

Apart from balanced modulators operating at low frequencies, where mechanical or inductance-capacitance (*LC*) filters may be used, the most common sideband filters in use are undoubtedly crystal filters. In Part 4 (about oscillators) we had a look at some of the characteristics of piezo-electric, or quartz, crystals and discovered that they behave as very high *Q* tuned circuits. Now one of the features of a high *Q* tuned circuit is that its frequency response has very steep sides. This means that it has the ability to discriminate in favour of a very narrow band whilst rejecting almost all other frequencies.

A little bit about the peculiar characteristics of crystals. They haven't just one resonance as most tuned circuits, but **many** resonances. Only two are really important as far as filters are concerned, the lowest frequency pair. If we were to measure the reactance of a crystal as the frequency applied to it was increased from zero, it would at first be a very high negative (capacitive) value decreasing with increasing frequency until at a certain frequency the reactance would fall to zero. This is point F1 on Fig. 14.4 and, because the reactance is zero, is called the "series resonance". Look at Part 1 of the series for information on series tuned circuits.

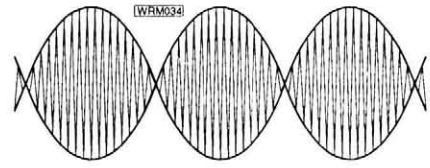

Fig. 14.3: Balanced modulator output waveform for single tone a.f. input

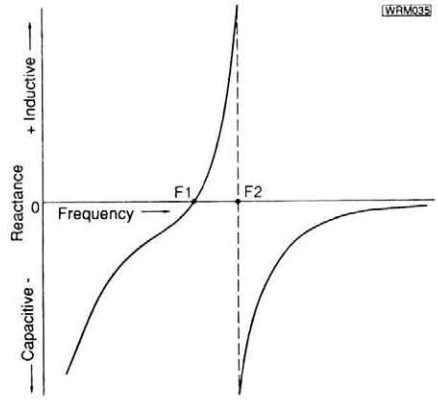

Fig. 14.4: Reactance vs. frequency for a typical crystal

Increasing the frequency still higher the reactance becomes positive (inductive) and continues to increase until at a very high value (infinity for a perfect component with no losses) it suddenly changes sign to become a very high **negative** reactance. This transition, at point F2, is coincident with a very high value of resistance and is the parallel resonance of the crystal. Refer to Parts 2 and 3 of the series for an explanation of parallel tuned circuits. Further increases in frequency reduce the value of the negative reactance until it tends to approach zero. This never quite happens as the capacitive reactance can only actually reach zero when the frequency is infinite. (Mathematically speaking, it is asymptotic).

The very high *Q* value of crystals makes them very suitable for use as filter components, and if several such crystals are used in one package the resulting filter can be made to have a nearly flat response across the wanted band together with high rejection of unwanted signals at adjacent frequencies.

Most amateurs who make their own equipment tend to purchase a crystal filter as a single component, which comes complete in a metal box with only the input and output terminals showing. What's inside the box? Well, Fig. 14.5 shows one possible, very simple, filter using only three crystals called a "single section half lattice". The crystals are mounted within a metal box (shown dotted) and the external connections have been shown to help in understanding how the filter fits into the system. Most commercially available filters are very much more complicated than this containing up to about eight crystals, Fig. 14.5 has been included just to demonstrate the principle of operation.

Inductor L1 is a low impedance coupling winding from the balanced modulator, L2 with C1 and C2 comprises a circuit tuned to the carrier frequency which provides a balanced output to the filter. "Balanced" in this case means balanced with respect to earth; i.e. neither of the input terminals is earthed. However, the centre tap between C1 and C2 (where C1 is equal in value to C2) provides a signal to each crystal which has the same voltage but which is opposite in phase.

For a u.s.b. filter; crystal XL1 should resonate near to $f_{carrier}$ + 0.85kHz, XL2 at about $f_{carrier}$ + 2.7kHz and XL3 at the carrier frequency.

In an l.s.b. filter; crystal XL1 should resonate near to $f_{carrier}$ – 0.85kHz, XL2 about $f_{carrier}$ – 2.7kHz and XL3 again at the carrier frequency.

All crystals utilise their series resonance frequencies, XL1 and XL2 passing the band about 0.3 to 3kHz above or below the carrier frequency depending on which sideband is used, and for both filters XL3 provides a near short circuit at the carrier frequency itself. This increases the carrier rejection and also steepens the slope of the response curve near the carrier and unwanted sideband.

To obtain a suitable shape for a u.s.b. filter, the response needs to fall very rapidly on the low frequency side to prevent transmission of unwanted signals in the lower sideband. Similarly, a steep slope on the high frequency side of the l.s.b. filter is required to prevent unwanted upper sideband signals being passed. The desirable responses for both filters to obtain the sharper cut-off necessary

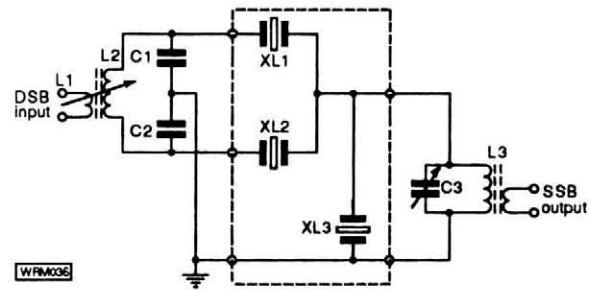

Fig. 14.5: A simple crystal filter

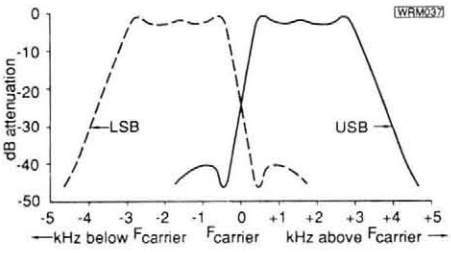

Fig. 14.6: Crystal filter response for u.s.b. and l.s.b.

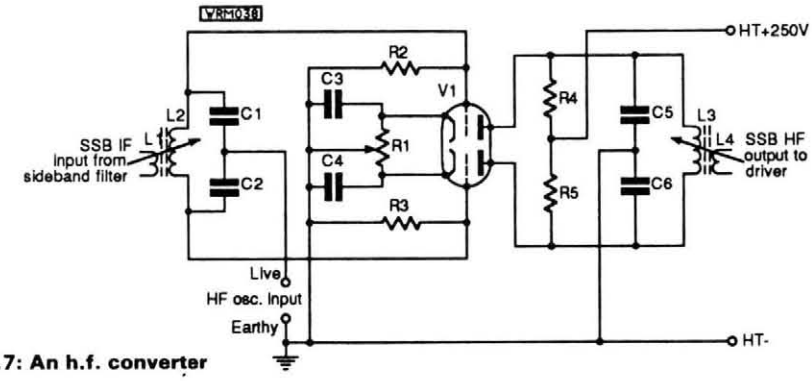

Fig. 14.7: An h.f. converter

on the carrier side of each filter is shown in Fig. 14.6. Any attenuation by the filters at carrier frequency helps to reduce still further any small carrier signal present in the output of the balanced modulator.

HF Converter

Having produced a single sideband signal at i.f., the next step is to convert it to the required higher output frequency. To do this another mixer is necessary with its two inputs:

(i) the s.s.b. (u.s.b. or l.s.b.)

(ii) an h.f. oscillator signal

If the s.s.b signal is about 0.5V r.m.s. the oscillator will need to be at least 5V and preferably about 10V r.m.s. to minimise distortion of the signal at its converted frequency. A possible mixer using a double triode valve, V1, is shown in Fig. 14.7.

Inductor L1 has already been identified as a low impedance coupling coil from the sideband filter with L2, C1 and C2 as a tuned circuit resonating at i.f. and providing a push-pull input to the grids of the valve. The high level h.f. oscillator signal is applied to both grids in phase and the balance control R1 is adjusted for minimum output at L4 when no s.s.b. signal is present at L1.

A low level s.s.b. signal at i.f. will be heterodyned by the oscillator resulting in many beats appearing at the anode circuit. Usually, either the sum or the difference frequency is selected and tuned by L3, C5 and C6. The sum frequency will be:

$f_{sum} = f_{osc} + f_{s.s.b.}$

and for an h.f. oscillator frequency of 13.735MHz and a u.s.b. signal at 0.465MHz:

$f_{sum} = 13.735 + 0.465 = 14.2MHz$

Conventionally, upper sideband is used above 10MHz and lower sideband below 10MHz. "Sum" frequencies produce the same sideband signal at the converter output as that at the input, **but** "difference" frequencies invert the output frequency spectrum thus giving l.s.b. output signals for u.s.b. input signals. A bit confusing?

Let's look a little closer.

If the a.f. band is: 300 to 3000Hz

and the i.f. oscillator is: 465kHz (0.465MHz)

the u.s.b. input band is: 465.3 to 468kHz

and the h.f. oscillator frequency is: 13.735MHz

Then:

$f_{sum} = 13.735 + 0.4653 =$ 14.2003MHz

to $13.735 + 0.468 = 14.203MHz$

So, the a.f. band of 300 to 3000Hz has been converted to an h.f. band of 14.2003 to 14.203MHz. Still **upper** sideband.

For the difference frequency output: the u.s.b. input band is: 0.4653 to 0.468MHz

and the h.f. oscillator frequency is: 13.735MHz

The:

$f_{difference} = 13.735 - 0.4653$

$= 13.2697MHz$

to $13.735 - 0.468$

$= 13.267MHz$

The a.f. band of 300 to 3000Hz has been converted to an h.f band of 13.2697 to 13.267MHz which is a **lower** sideband signal. (Yes, it is outside the 14MHz band, but it demonstrates the principle).

By using **only one sideband filter** (either u.s.b. or l.s.b.) it is **possible,** by careful choice of h.f. oscillator signal frequency and tuning of the converter output circuit, to obtain either upper or lower sideband.

Continued next month

40▶

the European band of 7—7.1MHz without it rising above 1.4:1.

Comparisons

Other beams for 40m have not been tried, and there are not many people in the UK with similar antennas to run tests with. However, the 40-2CD seems to hold its own with the KLM 3-element Yagi gain-wise, but it is not as good on front-to-back ratio due, no doubt, to the extra element of the KLM. The Hy-Gain 2-element Yagi

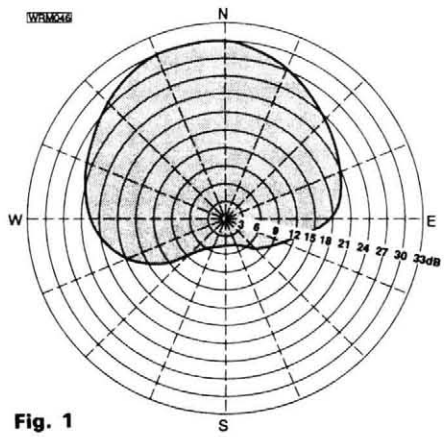

Fig. 1

does not seem to be anywhere near as good as the Cushcraft.

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Constructional

Backyard Antennas

If like Peter Labron G0DWO you're faced with only a small garden and a desire to work DX on the 14MHz, 21MHz and 28MHz bands, then the results of his experiments using sloping antennas will no doubt be of interest to you.

I have thought for a long time, if it can't go out, it must go up! After many years of short wave listening and using an end fed long wire antenna and a.t.u., I decided to try something different for my first transmitting antenna. One day, when looking through the *ARRL Antenna Book,* I came across the section on sloping dipoles for the 7MHz band and immediately thought it to be an ideal antenna for limited space h.f. operation.

One advantage of a "sloper" is that if it has a metal support, it can exhibit a gain in the direction away from the support, approximately 3.5dB. This order of gain is equivalent to a small beam antenna which would cost a lot more than a strong piece of wire. Another advantage is that if a dipole is vertical, or near vertical, the amount of skyward radiation is quite small, as most of the radiated power is at right angles to the wire. (Remember the doughnut analogy.)

Construction

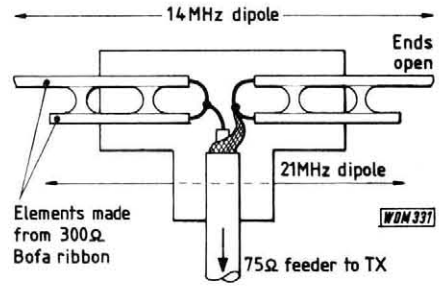
The support/reflector, measuring just over 9m high, could be a suitably sized TV pole mounted at the apex of the roof, or if you live in a terraced property, on the chimney plus a length of wire run from the bottom of the pole to an earth stake. If you're fortunate enough to live in a three storey building around 9 metres high with a cast-iron down-pipe on the guttering, then most of the installation work is already done. The antenna suspension point could then be a screw eye in the barge-board just under the guttering. Alternatively if you're lucky enough to own a tower then this could be used to support the "sloper".

The dimension of "a" in Fig. 2. can be varied according to the amount of space available, but the larger the angle "b" up to 45 degrees, the better the directivity. Dual band working can be achieved by the use of 300Ω Bofa ribbon as shown in

Fig. 1: Dual-band dipole using 300Ω Bofa ribbon ▸

Fig. 2: Single band dipole using 75Ω twin for both feeder and radiating elements. Use standard dipole formula and trim to resonance:

$$\text{Length (Metres)} = \frac{143}{f(\text{MHz})}$$ ▼



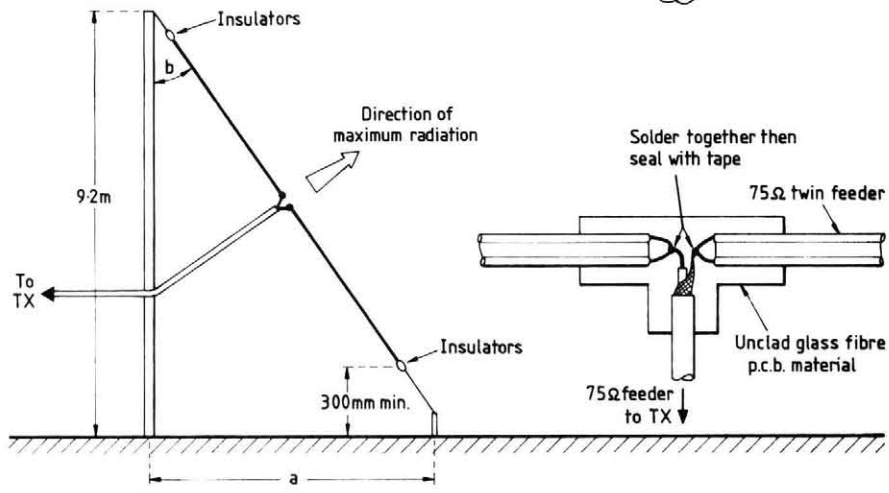


Fig. 1, for single band operation doubled-up 75Ω balanced twin can be used, Fig. 2.

The elements are shorted together at the feed point, (see Fig. 2), then fed with any length of 75Ω balanced twin or 75Ω coaxial cable. It should be noted that the inner conductor of the coaxial cable should be connected to the upper half of the antenna. Although a dipole is a balanced antenna, an unbalanced feed doesn't seem to upset the antenna's operation. With the antenna installed at the prescribed height in an enclosed yard approximately 43m² in area, the v.s.w.r. was certainly no worse than 1.5:1.

This particular antenna configuration has been found to work very well on the 21MHz band when compared against a G5RV antenna at my QTH. If it came to a choice, I would rather have my "sloper" every time. The difference is S5 on the G5RV antenna compared with S7-S8 on the "sloper". Of course, it all depends on the direction in which you are working and what the propagation is like at the time of operation.

A great deal of pleasure has been derived from experimenting with these designs and stations have been heard on "slopers" that were just not audible on other antennas. Please try this antenna, you'll enjoy the results. ***PW***

(Acknowledgements, *ARRL Antenna Book,* 13th Edition.)

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Got a camera want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise?

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A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only-no items for sale-and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

The appropriate licence must be held by anyone installing or operating a radio transmitter.

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Competition

WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN...WIN

The Mizuho MX-series is a range of single-band, VXO controlled, QRP h.f. s.s.b./c.w. transceivers designed for portable use. Weighing in at just 590g (1.3lb) and measuring only 66W X 39H X 142D mm (2.6 X 1.5 X 5.9in) they are ideal to slip in a coat-pocket, bag or brief-case along with a simple wire antenna, or the optional pocketable rod antenna for short-distance communication.

The MX-series is available in 3.5, 7 and 14MHz versions, each with an r.f. power output of 2W. The antenna used must present a matched 50Ω load to the rig's BNC socket. Powered by an internal 9V NiCad pack, or an external 9.5V d.c. supply, the consumption is 70mA on receive (no signal) and 620mA maximum on transmit. An optional adaptor is available for operation from a 12 - 14V d.c. supply.

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We regret that this competition is open only to residents of England, Scotland, Wales, Northern Ireland, the Channel Islands and the Isle of Man.

Complete the form with your name and address, ensuring that all the details are clearly printed. Send the completed form, together with the Competition Corner Flash which will appear in the July 1989 issue of Practical Wireless, in an envelope addressed to PW Publishing Ltd., FREEPOST, Mizuho Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. No postage stamp is required.

If you do not wish to cut the form from your copy of *Practical Wireless*, a photocopy of the completed entry form is acceptable, but it MUST be accompanied by the competition corner flashes cut from the June and July issues. Photocopies of the corner flashes will not be accepted, and entries without these corner flashes will NOT be valid.

The closing date for receipt of Competition Entries is Friday, 14 July 1989. Each entry form having all 12 answers correct will be judged for the aptness of the reason given for wanting to win a Mizuho QRP transceiver. The judging panel will comprise Geoff Arnold G3GSR, Editor of *Practical Wireless*, and Peter Waters of Waters & Stanton Electronics. The winner will be notified by post, and the winner's name will be published in the November 1989 issue of *Practical Wireless*.

Complete the following form, ensuring that your answers and name and address are clearly printed, and send it in an envelope, addressed to **PW Publishing Ltd., FREEPOST, Mizuho Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP**, to arrive no later than **Friday, 14 July 1989** Photocopies of the form will only be accepted if accompanied by the Competition corner flashes from the June and July 1989 issues of Practical Wireless.

This competition is open to all readers of *Practical Wireless*, except for employees of Waters & Stanton Electronics or PW Publishing Ltd., and their families.

YOUR NAME AND ADDRESS

.....

.....

.....

..... Post Code

YOUR ANSWERS (please tick selected appropriate box)

1. (a) ❑ (b) ❑ (c) ❑	5. (a) ❑ (b) ❑ (c) ❑	9. (a) ❑ (b) ❑ (c) ❑
2. (a) ❑ (b) ❑ (c) ❑	6. (a) ❑ (b) ❑ (c) ❑	10.(a) ❑ (b) ❑ (c) ❑
3. (a) ❑ (b) ❑ (c) ❑	7. (a) ❑ (b) ❑ (c) ❑	11.(a) ❑ (b) ❑ (c) ❑
4. (a) ❑ (b) ❑ (c) ❑	8. (a) ❑ (b) ❑ (c) ❑	12.(a) ❑ (b) ❑ (c) ❑

WHY I WOULD LIKE TO WIN A MIZUHO QRP HF TRANSCEIVER .....

.....

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.....

(Not more than 50 words)

If I am judged to be the competition winner, I wish my prize to be the model for operation on the following band:
3.5MHz (80m)❑ 7MHz (40m)❑ 14MHz (20m)❑

PW Publishing Ltd, Poole, Dorset (Reg No 1980539, England)

MIZUHO No. 1

THE QUESTIONS

1. **The G-QRP Club was founded in:**
   (a) 1973
   (b) 1981
   (c) 1979
2. **The monthly magazine of the G-QRP Club is called:**
   (a) Milliwatt
   (b) Sprat
   (c) QRP
3. **The book "Introducing QRP" is published by:**
   (a) Practical Wireless
   (b) RSGB
   (c) ARRL
4. **The output of the Mizuho h.f. QRP transceivers is:**
   (a) 2 watts
   (b) 2.75 watts
   (c) 5 watts
5. **The difference between 3 watts and 60 watts is:**
   (a) 10dB
   (b) 13dB
   (c) 20dB
6. **An S-meter calibrated in 6dB units indicates S9 when receiving an 80W signal. If the transmitter power is reduced to 5W it will read:**
   (a) S5
   (b) S8
   (c) S7
7. **The QRP frequency for 40m c.w. is:**
   (a) 7.025MHz
   (b) 7.030MHz
   (c) 7.035MHz
8. **Low power operation on h.f. c.w. is permitted under the terms of the UK licence for Class B licensees:**
   (a) True
   (b) False
   (c) On 28MHz (10m) only
9. **Practical Wireless reported that G4BUE had a transatlantic QSO in May 1981 running only:**
   (a) 1 watt
   (b) 250 milliwatts
   (c) 200 microwatts
10. **The QRP frequency for s.s.b. on 20m is:**
    (a) 14.225MHz
    (b) 14.285MHz
    (c) There isn't one
11. **In May 1983 Practical Wireless ran a series on the construction of a 40m QRP transceiver called:**
    (a) PW "Severn"
    (b) PW "Forty"
    (c) PW "QRP"
12. **The Mizuho range of h.f. QRP transceivers use:**
    (a) Single channel crystal control
    (b) VXO control over narrow bands
    (c) Free-running v.f.o. over full band

On The Air
On The HF Bands

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QSL Managers

The argument about F6FNU and his attitude to his QSL Manager chores continues. The *DX Magazine* has done us all a service by publishing a serious analysis of the whole question. As far as I can see, what F6FNU is saying seems to be that he is not a QSL Manager, but a design consultant.

If he doesn't like the look of your QSL card design or if there are minor errors he just doesn't bother to answer. However, that in his view still gives him the right to keep the money enclosed with the QSL cards to which he objects. If the card is perfect by his judgement and contains an s.a.s.e, he expects one IRC or the equivalent in addition! Again, while he states that $1 is unacceptable as he "doesn't want to explain to his bank why he has so much currency" - the same station offering $2 for his QSL could be shown to have received his QSL! The position then is that REF have now advised that as from 1 March 1989 they will not accept any F6FNU QSL cards for any of their awards. F6FNU used to say that he preferred to handle QSLs through the Bureau, but since he is no longer an REF member he cannot send cards through the Bureau anyway.

Undoubtedly, some QSL Managers are in the business purely for profit; those who are a bit less blatant that F6FNU stay within the bounds of possibility to a large extent. Yet, over the years I have thrown away more than one DX QSL card which came back in answer to one of mine which was very grievously in error - like it got the year wrong for example! That shows that some managers, in the interests of productivity and/or profit, omit the little matter of checking the log. As far as I am concerned nowadays, I don't regard any card as valid unless it was via the Bureau in both directions!

Thirty years or so ago, when the QSL manager system started, there was some justification. Hal Perkins G3NMH before he started Western Electronics used to handle QSL cards for the VP8 chaps, and they were very grateful for all his help simply because the postal facilities were so slow. There are very few places in the world which can justify QSL managers on that ground in 1989. Anyway, the QSL Bureau system is just as quick as direct QSLing - it must be quick, or it would choke on its incoming mail; what is slow is the chap who doesn't put envelopes into the receiving end or the guy who "sits on" the outgoing cards to be shipped to the Bureau for several months. Unless, and until, this abuse of radio amateurs by QSL Managers can be stopped, ARRL should refuse all cards originated by QSL Managers. If nothing else, it would give some Honour Roll types an excuse to get on the band and work their scores back up!

Callsigns

An interesting, and potentially aggro-creating, situation seems to have arisen as regards the allocation of calls by the DTI. It seems that they have been allocating calls prefixed GW to stations who are physically located in England (doubtless a similar situation will have arisen on the G/GM border) by virtue of their computer program having assumed that post-codes necessarily conform to national boundaries. Wrong! In, for example, the Oswestry area, where some club members are Gs and others GW (the area has been fought over for hundreds of years anyway!) it has caused much pain and annoyance. An enquiry to RALU, I understand elicited the reply, "Use the callsign quoted in the Validation Document" which really is not much help; and the revised wording of the new licence makes the situation quite impossible anyway: a station located in England but allocated a GW callsign is told by the licence at para 7. 1. to use the callsign printed on the validation document, while Note W which refers to the use of the regional secondary locator states clearly that to sign GW from the G side of the border is quite incorrect. Ho-ho!! Chuckle or not, it's a bit of thoughtlessness on the part of people who have never lived on the border and have no conception of the meaning of it to locals.

Events

XU1SS was heard a few days ago, on 28MHz, calling for QSLs to JA4KFA; if this was the Real McCoy it indicates improvement in the political situation there.

Albania: my note last time about a possible operation from that country should be taken for what it is; many people have negotiated over the years, some with help and backing from their governments, but none save ZA2RPS ever actually showed. What is wanted is an "Albania-substitute" award, say, "Worked all ZA Slims in 1989" or something of that ilk!

The Laccadive operation wended its slow way towards the finish date, but VU7JX opened up on time with a good and efficiently-operated signal; a week after their advertised finishing date I heard them - or a fine imitation - still operational.

The 5R8AL Madagascar operation is at the time of writing stalled, with Alain still in France. However, I hear he hopes to arrive in May.

The promised 4W0PA operation actually got started, but then Hans was forcibly taken off the air, his equipment confiscated and he returned home. To the best of his knowledge, he was operating his within the terms of his licence and the people who shut him down, I hear, admitted that the licence was quite legal. On the other hand, I understand that the prime reason he was forced to QRT was that a certain European station had pressed the Yemeni authorities to do so. Not very nice at all. I await the promised word from PA3CXC.

If you were thinking that Rockall might have possibilities for a "new one", then one needs to know that it doesn't currently qualify, as the distance from Scotland is only 181 miles!

Top Band

I have been attempting to organise myself on to Top Band again, with somewhat dubious results so far. Fundamentally the problems are the old ones; the antenna configuration in a tiny garden and personal inertia! Be that as it may, it hardly accounts for the lack of reports on the band in this column; despite the fact that I know people on the band are knocking off the DX; sometimes I hear them but rarely, if ever, can I hear the distant signal.

G2HKU (Sheppey) mentions s.s.b. contacts with ON7BW, c.w. with EI2FN and UQ2GQU; but Ted adds that sometimes his Sunday skeds with ON7BW and ON4CC have been completely hopeless due to lack of signals at 1300Z. What one needs to recall when reading this is that from the G2HKU mansion, most of this area is straight east across a short sea hop and normally a simple ground-wave job. On a different tack, Ted says a W4 told him the Aurora mentioned earlier had in fact been seen as far south as Florida for the first time ever.

Michael Crimes (Northampton) wrote to note that he has a Lowe HF-125 with which he is quite pleased; an a.t.u. is now under construction and an outdoor wire should be up by the time you get to read this; Michael listened to Top Band and noted s.s.b. signals from DJ0EC and OY9JD.

During the G-QRP Club Winter Sports, G3PDL managed to get his three watts of c.w. over to W, although the W was running normal power level.

The 3.5MHz Band

Again, a band on which not much DX can be worked from here, thanks to the antenna problem. However, I do listen round.

Michael Crimes mentions hearing CU2BR, KB1KE and OZ1IZB on the indoor antenna.

Turning to the report from **Angela G0HGA** in Stevenage, her c.w. went to HB9DLF, LA9HFA, YU3EO, PA3CCF, PA0SOL, ON5UK, F6DUQ, DL2FAK, DL6ZBA, DJ8SW, DK5GD, DF4PA, DK5QR, DL1ZN, G0CMM, G0FNW, G3EMH, GW4GJT, G4KGK, G4RMV, G3ZWH, G5GH, G8PQ, G3PDH, G3DOJ and G4BJM.

The 7MHz Band

This month I have a good crop of reports to consider. First off, I have been fooling around with thoughts on how to radiate at least some sort of a signal on this band, where the existing wire is not, to be honest, a notable success. In the past I have had a vertical and found it very successful when mounted well up in the air as a ground-plane, but the present QTH doesn't permit such solutions for purely mechanical reasons. The answer is beginning to look like a bent wire dipole, fed round the end wall of the house as a rectangle and carefully trimmed on to the frequency, always provided I can physically get it there - old age is gradually taking toll of my mobility! I'll let you know more, IF it works.

G2HKU stuck to c.w. and this mode yielded him UL7JZ, UF6FAL, 4X4DX and K9QVB.

Quite a dab on this band is **GM3JDR** (Aukengill); Don again sticks to c.w., and his bag included KK7K, WA6EUE, K9JF/7, V31BB, 3B8CF, KP2A/KP5, VU2DX, PT7VB, KE9A/DU3, HK1IU, HJ1PDH, ZD8BOB, ZD8IAN, CM8HH, YB0BAQ, CO2HT,

8P6AU, JA5MHD, HK2IWI, XE3LPV, 6W6JX, YB0DPO, J79ROJ, 7X3DA, YW5LR, 3W0A, KH6/JA5DQH, 9X1AF, LU4EQD, VU7NRO/JOS, C56/G3TXF, UM8NC, RH3F/RW9WA, UZ9MWJ/UJ0, UA0ZAS, PT7SY, UM8MBA, ZL2IN, UW0CN, UV3CC/UA1P, JA3NQG, JR6CSY, JA3DM, JA4DND, RH8BA, RW9HYY, VE6UX, UA0ABB, PA0GAM/ST2, S79M and UP0BB.

Next, we have G3NOF (Yeovil) who raised CT3DL and KP2A/KP5 for a couple of new ones on this band.

G0HGA stayed at the 10-15 watt level on 7MHz, and managed to make it over to OH1MDR, OH6MBQ, SM3CER, EA6ZY, RB5MA, UA9FGJ, UA9FAL, RL7ABN, N4AR, UW9CK, UB5CQ UA9XHT, W3BQF, AJ1Q and others in the RSGB contest. IK6BAK, I1UST, EA2NF, OZ7JR, SP3LPR, I4GGL, I2CZQ and I3LUC were raised at other times, plus lots of small fry.

WARC Bands

G0APV (Potter Heigham) writes to offer a nice one on 10MHz: One evening, just before turning in, the FT-707 rig was turned on, a quick check said the tower was still up in the air, so a couple of CQ calls were put out on c.w. J37XC was raised at RST549 both ways. This was on February 28 at 2150-2204Z.

During the G-QRP Club Winter Sports, several interesting events happened; perhaps the most interesting was the G4BUE/AA2U cross-band contact on 18MHz which wasn't open to the Ws at that time.

G2HKU tried 18MHz, and found his c.w. connecting with K4II, YU4AU and WA1UPB; while on 24MHz there were W1UCD and EA7GS.

GM3JDR used 10MHz to raise A35YO, while his 24MHz signal got over to PT7AA and IS0BMX.

The 14MHz Band

Michael Crimes first; Michael heard A41JR, EA3OT, JA9AA, SM4SET, TA1U, VS6WV, YV2AHR, Y33KN, 3A/PA3CPG, 4X4FR and 6W7OG.

The QRP from G0HGA included DL6ZBA, SP6HSK, Y24ZM, Y43RW, DK4LX, ON4LY, ON4CW, F6IIE and I2CUP.

Turning to G2HKU, Ted tried his hand at a spot of s.s.b. with G4UPG/EA6 and ZL3FV, while a reversion to the key handed him contacts with UZ9KWA, C53GS, VP5V, YV5KHX, HK3RQ, UF6FAL, PJ4/AD8J and C56/G3SXW.

Over now to Don G3NOF; he found the long path to VK, ZL and the Pacific opening around 0630Z and the short path openings to VU, VK, JA, YB plus a few ZS occurring around 2300Z - the VU7s were hooked at this time. Contacts on s.s.b. were completed with AH9AC, FG5/KA3DSW, FR4FD, JY4YJ, HL1LW, KH6FKG, KH6JEB/KH7, KP2A/KP5, OY9A, RA3YF/RJ0K, SU1ACC/ER, UZ0KWC in Zone 19, VKs, VQ9GM, VU7APR/URX, VU7JX, ZP5ZR, ZS6BRZ, 3A/F9UW/M, 5W1YL and 9M2HB.

The 21MHz Band

For many folk, the favourite band, but for some odd reason few contributors mention it this time.

Here again, G2HKU stuck to his key; N4RNR, PP1CZ, W9VNE and J80A were raised this way.

G3NOF found the band conditions rather like 28MHz, opening at around 0800Z; however the Americans were in until past midnight on occasion. Contacts using s.s.b. were made with A35DX, CE2LZR, CE3BFZ, CM5VF, EL2DK, FG/KA3KSW, FM4EB, FM5DN, FO0EXV/M (Marquesas Is), FV9NDX, H44/DL2GAC, HC2DZ, HC2DWD, HC2G, HD1OT, HH2JR, HK3DFQ, HK6ISX, HL5FEE, HP1XJL, JAs, JT1KAA, KC6IN, KP2A/KP5, P29VOX, RA3SS/R0B (N. Pole Expedition), RL8PYL, TA4A, TI2YO, TU2QQ, TY9CR, UA0FZ (Zone 19), VKs, VP9HK, VU2WAP, 3DA0DX, 8Q7MT, 9Q5DX and 9Y5VU.

Angie G0HGA had a little play in the HSC 'test, but worked only DL0ER/DL1EFD, Y24MI, Y22JF, YU4IF and SM5UW.

The 28MHz Band

G4ITL (Harlow) mentions that he raised VU2ALG for a new one. G2HKU tried c.w. and raised WV5M/VP5, PP1CZ (again at QRP), CT3CU who is also W2ZZ and DJ0FXT/CT3, all at the 100 watt level.

It makes no difference to GM3JDR whether it's c.w. or s.s.b.; on 'phone it was VU2DST, CQ8LN, LU1GGP, LU4DUZ, LU1FLY, CE2BEL, P40V, PY5CA, VK5NFA, UA0ABK, YJ8JS, KP2A/KP5, TU4CO, SV5TS, VU2QQ, YS1OD, VK6BA, OX3DZ, VP9IB, VU7APR/URX, ZP5CC, 9K2DR, HK0HEU, KC4GLT/HH5, HL3IID, JA5AVC, AP2MB, HL5BRU, VU2GUY, BY5RT, HL2IEF, UA0WW, UA0WEQ, ZS6AUH, HZ1AB, VK6II, RA0AF, KP4AZG, BY4SZ, YW5LR, HI3TEJ, TI5RLI, VK4GP, VE2BYR/VS6, YC0JIV, YC3HUO, YB2CTW, KC4EVE/HP1X, 3W0A, RM8TAL, R8BUO, PZ5ES, YC0OMO, YC0MCA, ZP5CF, UA0SNT, VP2LM/AA4GA, A92C, UW3CC/UA1P, VK6AI, VK3PGE, ZL4LZ, YC0JVT, VK2FPV, PJ7BR, PY6WT, FG5/KA3DSW, YC7NI, PY6WT, VU2GSW, LU1HOO, VU2GRS, FG/DK8FZ; while on c.w. 3W0A, CQ8LN, VK6HG, HL5BRU, R8BUO, PY7DX, JAs, Ws, VU7NRO/SU and YB0DPO.

Now we turn to the listing from **GM4ELV** (Glasgow), all QRP using an Argonaut 509, plus a half-size G5RV at 17m a.g.l., the ground itself being some 160m a.s.l., with a good take-off. The list seems to be all-s.s.b. and includes JY9SR, Ws, IB8A, AA22RA, VS6CT, 7X2SX, KO7CD, VE1EMP, ZS6TLV, FH4EE, LU7JP, HC5CL, PJ2WG, ZS6ATX, RH8AD, EA9RM, 8P9AF, VU2RX, VS6HF, UM8MEW, DK8OT/C6A, UI8GF, SV5TS, VU2GUY, HK0HEU, EL2LMP, XX9CT, PJ2WG, 6W7AG, PY8AOL, ZL1LE, J50NU, FM5CL, FP4HL, OH0NJ, PT2ZDR, VP2MBA, VP2MBC, YV3VU, TG9GI, HC2G, KP4AAQ, 8P6BX, YC0AWA and TL8HW.

G3NOF found the band opened for him around 0800Z to USSR, JA, VK and Asia, with JAs staying around until 1200. Africans were heard in the mornings and afternoons, North Americans were noted 1130-2300Z and openings to the Pacific around 1900. Don completed s.s.b. contacts with BY5RT, C53FV, C45A, CE3NR, CE6EDZ/3, CT3FT, CU2BR/CU8 (Flores Is), DF2UU/KH8, EP2DL, FG5CL, FR0VD, FY4FC, HC2G, HK1LDG, HK4DUM, HK4HHG, HK5JPS, HL2IDJ, HL9OB, HS0A, many JAs, JT1BG, JT1T, JY9LC, K3OMI/J8, K5MM/7, KB7GAP (Nevada), KB7W, KE7EQ, KH6DLW, KH6IJ, KL7Y, KP2A, KP2A/KP5, N6AHU, NH6HF, NN7L, OY9JD, P33ES, P40V, RM8TAL, TA1AZ, TE5JS, TE0UP, TI1L, TU2TW, TY9CR, UZ0AWH, VE8PW, VO2GD, VP2ESM, VP2MBA, VP2MU, VP5/W4NPX, VP8BWL, VS6BL, VU2GI, VU7APR/URY, WP4GQB, YI0ACC, YK1AA, ZD8JP, ZD9BV, ZP0Y, 4G1A/3 (a DU), 3B8DB, 4M1G, 5H1HK, 5H3RB, 5H3TW, 6O1GG, 8P6SH and 9Y4LX/LU.

G0HGA and her QRP signal raised, on c.w., YU1FD, LZ2CL and KA1MKJ/YL.

Vale

One of the greats of amateur radio has passed on; Jim Kirk G6ZO died in the middle of March. After WWII broke out and licences were "determined", G6ZO and VE5ZM organised a first social gathering of Service amateurs at the YMCA, North Camp, Farnborough on 25 February 1940. In the post-War years, when the Empire DX Certificate was first offered, Jim was one of the first six to achieve the requirements for this most prestigious of all awards and the badge which went with it. He will be much missed.

THE NEXT THREE DEADLINES ARE MAY 31, JUNE 28 & JULY 26

Compiled by N.A.S. Fitch G3FPK

VHF Up

The headlines this month concern the intense Aurora which occurred on March 13/14, the first QSO on 50MHz between the UK and Australia which took place on March 20, of more "new" countries being worked on 50MHz and of its release to some Swedish amateurs.

Beacon Notes

Readers with receivers covering the 10MHz h.f. band may have heard the German beacon DK0WCY on 10.144MHz. This is a useful one for v.h.f. operators as it gives propagation details. For example, it alerted us to the March 13/14 Aurora. Worth listening for.

PLEASE NOTE

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

The next three deadlines are May 31, June 28 & July 26

Ted Collins G4UPS (DVN) has compiled a very comprehensive worldwide list of well over one hundred 50MHz beacons. He mentions a new one in Hawaii, KH6HI, on 50.063MHz which runs 15W to two turnstile antennas. The Australian beacons in the 52MHz part of the band have been reorganised and the frequencies give a clue to the call area, e.g. VK4ABP is on 52.345 and VK2RSY is on 52.420MHz. ZS6PW (KG44) is now on 50.0265MHz. A new UK beacon started transmission on March 21 from IO93BF. GB3BUX is phased locked to MSF at Rugby and operates on exactly 50.000MHz. It sends dashes for 50 seconds between callsigns. Anyone wanting a copy of Ted's beacon list should send a 9 x 4in s.a.e. to his Call Book address.

Contest Notes

The first of three sessions of the 24GHz

SPECIAL NOTICE TO READERS

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Cumulatives is scheduled for May 13, 1500-2100 and there is only one section. Scoring is one point per kilometre and half-points may be claimed by both stations making a cross-band contact. The other legs are on July 8 and Sept 9.

The second leg of the 10GHz Cumulative contest is on May 14, 0900-2100UTC. The next session starts at 2000 on June 24 running for 24 hours but with a mandatory minimum continuous break of eight hours. There are two sections, wideband and narrowband, scored separately at one point per kilometre. The remaining three sessions are normal twelve hour stints on July 16, Aug 13 and Sept 10.

The 144MHz and s.w.l. event is on May 27/28, 1400-1400 with Single-op, Multi-op and Listener sections. County and country multipliers apply and entries should go to G4WAD, Tanglewood, Bridge Street, Lower Moor, Pershore, Worcs. WR10 2PL. There are several more events in June.

Scandinavian VHF Meeting

In the April column I included preliminary details of the Danish v.h.f. meeting and have now received more information from **Søren Pedersen OZ1FTU**, on behalf of the DAVUS Committee which is now the sole organiser. The venue is an education centre 10km southeast of Silkeborg which is in the middle of Denmark, the nearest well known town being Aarhus about 35km to the east.

The dates are June 9-11 and a comprehensive programme of lectures has been arranged on e.m.c., microwave equipment, computer simulation of Yagi antenna gain, low noise pre-amps and so on. They plan measuring facilities for antenna gain and radiation pattern, gain and noise figure of pre-amps and general RX and TX parameters.

There is a selection of social events such as a barbeque and Ham Dinner. Indoor accommodation is possible plus camping facilities - bring your sleeping bag. Prices seem reasonable. Søren's address is: Krumstien 10 A, DK-2730 Herlev, Denmark. He can be reached on the telephone and the dialling code from UK is 01045; his home number, after 1600UTC, is 42844615 or in business hours 42651122, extension 3290.

Worked All Britain

The April press release from the WAB group includes information about recent awards. G0JHC has contacted 200 Districts on 50MHz s.s.b. to earn the first Class III Districts award. G0BQP has won the first Large Squares Award Class III for contacting stations in 30 of the 100km squares on 144MHz c.w. G1EUU is the first to 1100, 1200 and 1300 Third Series Book Numbers on 144MHz s.s.b.

For rare areas seekers May 20/21 is when G0HWL and G1PXM plan to activate SX94 and SY38 (DVN) in the afternoons; listen on 144.43MHz s.s.b. The WAB Newsletter is published quarterly and contains lots of useful articles and general information. For details of this and all group activities send an s.a.e. to Brian Morris, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED.

The 50MHz Band

Welcome to **Robert Ibbotson G0DVY** (LCN) who is QRV on the band though he did not mention any station details. He had QSOs via Ar on March 9, 14, and 17. **Mike Gotch G0IMG** (ESX) worked lots of new counties on the band in the intense Aurora on March 13/14, along with SM6PU. **Gerry Schoof G1SWH** (MCH) operated in this event, his best DX being EI5FK (IO51) and SM6PU (JO67), both new 1989 countries and the SM was all-time new. On Feb 26 he worked J52US, also new.

The remarks about some 50MHz operators allegedly running more than their licensed power has brought several replies from those who are working the DX with the legal limit or less. **Ted Holmes G4TLY** (WLT) uses home-made equipment and a *PW* 'Meon transverter, with p.a. running 10-15W to a 5-ele Yagi. He has worked over 30 countries, including TI, P4 and ZS, and suggests one needs patience.

By contrast, **John Jennings G4VOZ** (LEC) writes, "As the average length of QSO is now under ten seconds and the band is full of over-processed, mindless signals, I have suspended operations." **John Palfrey G4XEN** (NHM) is also fed up with the band and is selling his gear. With the proceeds he intends to set up a 1.3GHz station.

Ela Martyr G6HKM (ESX) has now worked 72 squares on the band. New on Feb 26 were ZS6XJ (KG33), ZS4AAB (KG11) and K3MLD (FN10); on March 7 ZS3AT (JG87) and on the 11th ZS3E (JG89). The Ar on the 13th brought G4IFX (IO94), G7CMK (IO81), FC1CDS (IN77), G4IZQ (IO95), GI0GDP (IO74), PE1ADE (JO22) and OH7AXB (KP32). Further additions were ZS6WB (KG44) on the 26th and ZS6XL (KG43) the next day. Best "gota-way" was LU8MBL (FF57) on March 20.

More lucky with the LU was **Bill Biltcliffe G6NB** (OFE) who found the band quite good in March with ZSs workable most days. In the March 13 Ar he contacted EI, F, G, GM, GW, LA, PA and SM stations.

P.W. Feldhahn G7CFK is another new contributor from Altrincham (CHS), licensed last August. Using a Yaesu FT-690R Mk 2 bought cheap secondhand, a 10W Nevada p.a. and HB9CV antenna, he also worked LU8BML on March 20 getting an RS33 report. He lists EI5FK and three PAs worked in the March 13 Ar and during February J52US, also contacted on Feb 26 by **Ian Harwood G8LHT** (YSS). That same day, Ian heard TR8, VE1, W and ZS6 stations. The big Ar brought QSOs with G, GI and SM stations.

John Fitzgerald G8XTJ (BKS) praises J52US who often listens for stations he has not previously worked. He worked him on Feb 16 and got an S9 report from his 10W and a dipole. In the March 13/14 Ar John heard most all the possible countries and worked G4WQL (CNL), GM4IGS (SCD), GJ6TMM, G1AHA (MSY) and G1JDP (DHM).

To illustrate how intense the March 13/14 Ar was **Dave Brown GD4XTT**, running a full 0.4W from his transverter, had QSOs with GM4IGS, GM0GEI (HLD), GI4WVN and GI4XFS - a husband and wife team from Belfast - G4AHN, G3WOS (LDN), G1HLX (SXE) and G1GUA (BRK). He contacted OH9NLO and exchanged reports and locators but the Finn copied his call as GD4XXT so he is not counting it.

From Jersey, **Geoff Brown GJ4ICD** had QSOs with ZS3E and ZS6XJ on March 5 and with ZS3E again on the 8th. In the big Ar, all signals were S9-plus and he worked OH1YP and the more usual EI, G, GI, GM and PA stations. There was a South African contest on the 18th and Geoff worked over 30 ZS6s plus ZS1IS (JG77), ZS4B (KG42), ZS3AT and ZS3E.

Alan Harper GM1SZF (HLD) had to repair his antenna system which collapsed

Station	Band (MHz)			
	1296	430	144	Total
G3IMV	48	124	412	584
G4KUX	-	120	372	492
G4RGK	50	124	284	458
G3UVR	79	129	239	447
G3XDY	89	147	196	432
GJ4ICD	59	119	254	432
G0DAZ	27	128	277	432
G3JXN	87	134	179	400
G1EZF	-	93	263	388
G4XEN	-	111	274	385
G6DER	78	110	183	371
G6HKM	45	107	196	348
G4RRA	-	80	255	335
G3COJ	44	103	186	333
G4DEZ	48	37	248	333
G4SSO	-	93	229	322
G4FRE	72	146	102	320
G4TIF	-	110	200	310
G1KDF	37	98	174	309
G4DHF	-	-	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G8PNN	63	98	128	289
G6MGL	59	89	141	289
G4NBS	63	105	119	287
G1LSB	-	133	150	283
DL8FBD	-	-	280	280
G8ATK	45	91	143	279
G4MUT	28	90	149	267
G4PCS	-	3	258	261
G1GEY	11	77	168	256
G3NAQ	-	80	175	255
G8LHT	6	83	156	245
G6DZH	-	87	154	241
G0EVT	-	56	184	240
G4IGO	-	-	238	238
ON1CAK	-	33	204	237
G3FPK	-	-	236	236
G0EHV	-	75	154	229
EI5FK	-	56	172	228
G6STI	24	69	130	223
ON1CDQ	-	32	182	214
G4MEJ	-	-	213	213
G8LFB	-	-	209	209
GW4FRX	-	-	204	204
G8MKD	-	49	150	199
GJ6TMM	-	48	151	199
G4YCD	-	-	197	197
G4DOL	-	-	186	186
GI1JUS	-	-	181	181
G6MXL	16	45	91	152
G4AGQ	1	41	104	146
GW6VZW	-	6	125	131
G4ZTR	30	45	53	128
G1WPF	-	29	97	126
G0FEH	-	24	101	125
G1IMM	-	17	98	115
G8XTJ	-	-	110	110
G0FYD	-	-	108	108
GM0HBK	-	-	107	107
GI4OWA	-	-	103	103
GM0GDL	-	20	73	93
G1SMD	-	-	93	93
GW1MVL	-	20	72	92
G8PYP	-	15	77	92
G1TCH	-	6	84	90
G4WHZ	7	-	76	83
GU4HUY	-	-	73	73
G0HEE	-	-	73	73
G1DOX	2	10	58	70
G1CEI	-	-	68	68
G0HDZ	-	-	64	64
G1NVB	-	-	58	58
G2DHV	2	7	33	42
GM0JOL	-	-	37	37
G7AHQ	-	-	34	34
G7CLY	-	-	31	31
GM1ZVJ	-	-	24	24

in the hurricane force winds of Feb 13. On March 10 around 0845 he had E-layer QSOs with FC1GTW (AF), whose address he would like, F6CCH (ZG) and FC1LNU (AE). In the March 13 Ar he heard GJ4ICD for over an hour at S9A but he was calling only for Scandinavians. On the 17th, 1556-1715 he worked G, GI and GM stations in another Ar, while on the 19th he made a couple of Auroral-E QSOs with OH7ABX (KP32) at 2146 and OH2BYW (KP20) at 2228.

Now to G4UPS who, as well as offering his comprehensive beacon list, also publishes notes about band plans, useful TV frequencies, a list of all the active OH stations with locators, a list of the US states with their two-letter abbreviations, QSL addresses of DX stations and notes on cross-band working. His running records of news and activity are a real mine of information for which this v.h.f. columnist is very grateful.

First the general news for March and on the 6th SM6PU and SM7BAE got their permits which allow operation after TV closedown at approximately 2235. I understand that these permits are a bit vague when referring to power, e.g. it is not clear if it is input power, output power or e.r.p.

In Gabon, TR8BL and TR8RLA are now licensed. Ted has a QSL from JH4IUO confirming that their c.w. QSO on Feb 25 at 0909 was a first G/JA contact. Also the G4UPS/VS6UP QSO at 0858 on Feb 25 was another first ever two-way on 50MHz. ZS8MI on Marion Island was due to be shipped an Icom IC-551D and two 4-ele Yagis on March 29. 9J2KF has been worked by 9H1 stations.

At 0833 on March 20 **Tim Hugill G4FJK** (AVN) and VK6KXW made the first G/VK two-way on 50MHz. Tim was using 10W from an Icom IC-551D and a 5-ele Yagi and got a report of RS45. In the March 20 opening, LU8MBL worked 19 Gs, two GIs, five GWs, two PAs and 9H1CG.

Next some activity news for March and Ted's six page printout reveals openings to ZS from the UK on at least 22 days. At 0800 on March 13, G4UPS was alerted to the Ar by GM4DGT. At 1415 Ted heard strong Ar signals and made 31 QSOs with EI, F, G, GD, GI, GJ, GM, GW, PA and SM stations until he switched off at 2359. At 2203 VE1YX was heard at RST339, also by GM4DGT. In the evening of the 14th, he worked more G, GM, GW and PA stations in another Ar event.

On the 23rd at 0855, Ted heard ZL3JUW at RST449 although the "Z" was being badly sent. The operator was just sending "de ZL3JUW" as if working a DX station. G4UPS called to no avail. Any further information on this? At 1658 he had a contact with GM3POI/P (IO88OW) in Orkney. On the 24th, ZS3CE/P (KG34) worked 109 Gs in an hour.

The 70MHz Band

Eddie Ashburner G0EHV (TWR) has taken part in the Cumulative contests and in the first four legs made 11, 11, 14 and 8 QSOs respectively; he mentions G4RFR, EI9FK/P, G3NAQ, G4BVY and G4YNL/P as strong regulars. He operated in the March 13 Ar and worked EI9FK, GI4SZU (who was only using 1.5W) and a few others. G0IMG also used the band for a while in the Ar and is now up to 22 counties this year.

Pat Billingham G4AGQ (SRY) comments on the new operators he has not heard before on 70MHz, otherwise he has little to report. **Tony Collett G4NBS** (CBE) operated for a time in the March 13 Ar and lists QSOs with EI9FK, GI4ONL (IO64), GW4HBK (IO81) and GM3TAL (IO86) between 1545 and 2132. Others were G6DER, G4IJM and G1YEM. G4OUT has an entry in the c.w. ladder with QSOs up to March 12. Ian succumbed to the lure of 144MHz in the Ar, though.

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G6HKM	27	16	-	-	61	22	34	12	5	5	182
G4XEN	21	9	13	2	63	21	33	9	-	-	171
G1SWH	19	11	12	3	55	15	31	6	-	-	152
G1DOX	26	3	30	5	50	12	16	2	-	-	144
G8LHT	10	8	19	4	33	18	29	7	2	1	131
G0IMG	35	13	22	4	33	7	13	3	-	-	130
G6NB	35	20	-	-	38	7	16	2	-	-	118
GM1SZF	16	9	-	-	49	14	-	-	-	-	88
G4ZTR	8	6	31	6	20	11	-	-	-	-	82
GD4XTT	32	5	-	-	30	7	5	2	-	-	81
G8PYP	7	6	-	-	30	13	18	6	-	-	80
G0EHV	-	-	20	4	39	11	-	-	-	-	74
G0FYD	-	-	-	-	52	19	-	-	-	-	71
G3FPK	-	-	-	-	51	19	-	-	-	-	70
G4LDR	13	2	-	-	21	4	22	7	-	-	69
G4VOZ	-	-	41	6	-	-	17	4	-	-	68
G7CLY	-	-	-	-	48	12	4	1	-	-	65
GW6VZW	21	3	-	-	33	8	-	-	-	-	65
G8XTJ	21	5	-	-	34	5	-	-	-	-	65
GW4HBK	-	-	44	6	-	-	6	2	-	-	58
G1TCH	7	7	-	-	29	10	-	-	-	-	53
G1GEY	4	2	-	-	-	-	34	8	2	2	52
G0EVT	-	-	-	-	13	17	1	4	-	-	35
G6MXL	2	1	4	1	7	4	8	5	-	1	33
G0HDZ	-	-	-	-	25	4	-	-	-	-	29
G3EKP	4	3	11	2	3	1	1	1	-	-	26
G1CEI	-	-	-	-	14	4	-	-	-	-	18

Annual v.h.f./u.h.f. table

G4VOZ happily remarks that, "February and March proved to be excellent in terms of both the number of operators and locations turning up. Seven of the nine possible countries have already been on - only GU and ZB2 not heard." John has enjoyed the Cumulatives which have been well supported even though the portable stations had to endure appalling weather at times. He worked GW4YNL/P (GNM), one of the rarest Welsh counties, on Feb 26, GJ6CSY/P on March 3 but the main excitement was the Ar on March 13.

At first he operated /M in the car park at Rugby station using a three-eighths wavelength vertical antenna. He made c.w. QSOs with G0DQA, others in the south of England and EI9FK. From home, starting at 1935, John contacted GI4ONL (LDR), GM3WYL (SCD), GW4HBK (GWT), GM0FET (WIL), GM3TAL (FFE), G4ZTR (ESX) and GM0EWX (HLD) on the key and GI4SZU (ATM) on s.s.b., the last QSO at 2343. He made a few more Ar QSOs on the night of the 14th.

John Lemay G4ZTR (ESX) mentions recent QSOs with GW4YNL/P, GM3MHW (PWS) and GJ6CSY/P. In the Ar he lists EI9FK, GI4ONL, GM3TAL and GM3WYL. G8LHT refers to miscellaneous contacts in the Cumulatives. For **Dave Lewis GW4HBK** (GWT) the Cumulative session on March 12 was disrupted by high solar noise. In the Ar next day he started at 1652 and was on till 0220. He reports a gap between 2000 and 2140. He worked 42 stations in 32 counties including 3 GMs, 2 GIs and an EI. Doppler shift was up to 1.5kHz. Between 1919 and 1933 on the 14th he worked G3NAQ and GM3WYL via Ar.

The 144MHz Band

Tropo conditions on 144MHz have been rather uninspiring of late but the huge Aurora of March 13/14 made up for this. I was alerted to it by a telephone call from **Eddi Ramm DK3UZ** (EN20c) at 1345 who reported it had been going on since mid-morning in Germany. Obviously it was destined to develop into a major event as there had been a colossal amount of solar activity and ionospheric disturbance over the previous week.

Eddi sent a list of his contacts. In summary he made 91 QSOs with 17 countries and 57 squares, QTEs being 020-080°. Furthest north was with FT square, northeast with QQ, southeast with SJ, south with GD and southwest with ZK. From his "quality" list I choose UA3IDG (QQ64d) at 1420, I4XCC (GD03d) at 1443, YT4AM (IE17f) at 2319, RB5LSR (SJ45a) at 0146 and UB5QDM (RH34f) at 0224. DK3UZ operated from 1130-1712 and 2212-0249.

The evening of the 14th brought more Ar contacts with D, G, OK1, SP4 and UV1AS (PT03a) at 1931. Eddi copied a beacon SK0VHF at S2A at 0051 on the 15th, then worked UR2RJ (MT35g) at 0102. SK4MPI (HU) was S6A at 0259. A few SM, LA and GM QSOs were made just after midnight on the 17th.

G0DVY had QSOs with D, F, GD, GI, GM and SM staions in the March 13/14 Ar; on the 15th with GM1SZF (YS); the 16th with SM5DCX (IT); the 19th with GM4IPK (ZU) and on the 23rd with GM4UPL, LA8AV (ET) and UR2RJ (MT) at 1724.

On March 13 G0EHV had QSOs with stations in D, F, PA and Y but missed out on HB9 and OE. He worked 25 squares, five being all-time new ones. **John Hoban G0EVT** (YSW) describes the March 13/14 event as a "Mega Aurora" with which few would disagree. His best DX were IK4ISR (JN54), IK4HAI (JN64) and SP9EWO (JO90) on s.s.b. while c.w. brought SP8AOV - not SP7, John - (KO11) and RQ2GAG (KO26).

Until March 13, **Ian McCabe G0FYD** (LNH) found conditions very disappointing. He started operating in the Ar at 1742 using 30W and a 15-ele Cushcraft Yagi. QTEs varied between 040° and 090° and brought c.w. QSOs with five new 1989 countries, EI, I, OK, SP and YU and ten all-time new squares. SP3BLR (JO72), OK1OA

(JO70), YU3ES (JN65), I1DMP (JN35) and OK3CUZ (JN97) were the pick of the bunch. On the 19th Ian worked GM4IPK/P (IP90) in another Ar.

Steve Nicholls G0JFM (DVN) is tucked away under the cliffs in Brixham so does not have much success in Auroras as a rule. However the March 13 one was different and he worked ten countries in eight hours from 1545. His station "prime mover" is a Yaesu FT-767, the output 150W to a QDX quad-Yagi 18m a.g.l. Yes, Steve, all the G prefixes are separate countries.

Clyde Hinton's G1TCH (SXE) equipment was "up the creek" for six weeks, including the whole of February, but the Ar enabled him to catch up bringing two new countries and another five squares. G1SWH got five new 1989 countries from the event on s.s.b. which were OE5OLL, HB9DFG, SP9LCV, OK2PZW and IV3GBO. Gerry also mentions several other Polish and Italian QSOs.

John Quarmby G3XDY (SFK) did not start on 144MHz in the Ar till 0212 on March 14. He contacted OK2PZW (JN89), YU1WP (JN94), YU1NU, YU1EV and YU7NU (KN04), IK2HDF (JN45) and HG0HO (KN07) and went to bed at 0245 as conditions seemed to be fading. In the following evening John worked LA8SJ (JO59) and GM0EWX (IO67) via Ar.

G4NBS spent much of his time on c.w. in the big Ar but found the going rather tough before midnight due to the sheer number of stations. It was not till 0030 on the 14th that he put out his first CQ call which was answered by I4XCC. In the next two hours, beaming at 070-080°, Tony worked three Is, four YUs, two each HGs and SPs and eight OKs. Best DX was YU1EV at 1714km.

G4OUT wrote that he had never before experienced anything like the conditions of March 13 and particularly in the early hours of the 14th. On c.w. he worked into EI, F, G, GM, HG, I, OE, OK, ON, PA, SP and Y, collecting four new countries and a dozen new squares on the way.

For G4XEN too it was the biggest event of its kind John had ever heard, and seen; at 2200 the display took the form of an arc with rays which turned blood red and converged to a point just south of the zenith. He made 78 QSOs, all but five on c.w., in 18 countries. OK3AU (KN08) and SP8AOV were new squares and HB9, HG, I and YU were first time Ar QSOs.

Best DX in the Ar for G4ZTR were HG0HO, SP4MPB (KN03), OK1KT (JO70) and OZ4D (JO55).

G6HKM took part in the Derby Club's contest on March 12 and worked more stations than last year, but Ela found high band noise made it difficult. She operated in the Ar next day and was well rewarded on s.s.b., best DX being worked after midnight on the 14th. Her CQ call was answered by I1DMP, F6EPE (CD), IK4ISR, OK1FDJ (GK), IW4BFF (FE), IK2FIV (EF), IW1AZJ (DF), IV3BBR (GF), YU3JY (HF), OE6DGG (IH), SP9MQU (IK), SP7OGR (KL), HG8CE (KG) and SP9EWO.

The Ar was the highlight of the month for G6NB. In his long v.h.f. experience Bill reckons it to have been the greatest such event. He contented himself listening and heard what everyone else did but also IT and SV. Now no other reader has mentioned any Sicilian or Greek stations and when I queried callsigns with him he could not recall them since, as he was only listening, he did not write them in his log. Can anyone else shed any light on this intriguing matter?

Station	Band (MHz)				Points
	50	70	144	430	
G4XEN	7	-	144	9	160
G4OUT	-	10	85	-	95
G3FPK	-	-	32	-	32
G4VOZ	-	27	-	4	31
G0FYD	-	-	31	-	31
GD4XTT	1	-	14	-	15
GW4HBK	-	15	-	-	15
G4AGQ	-	6	4	-	10
GW4VVX	-	-	9	-	9

Number of different stations worked since January 1.

G8LHT had 57 s.s.b. QSOs in the Ar, all resulting from Ian's own CQ calls. 35 squares were worked, new ones being SP3MFI (JO91), F6IPR (JN27) and F6EPE. Best DX was YU1WP (JN94OM) and other notable QSOs were with SP6GWB (JO80), FC1JRX (JN25) and IW4BFF, all at QTE around 080°. The evening of the 14th brought Ar contacts with GM1SZF and GW6IWY (IO73) and in the afternoon of the 19th more Ar QSOs with ON1BLY (JO10), G and four GMs, including GM6RGN (SLD) between 1546 and 1608.

Julie Yates G8MKD (WMD) sent a graph showing the solar and geomagnetic data for the period March 12-15 based on the information from Boulder, USA. At 1345 on the 13th she detected GB3VHF at tone A, called CQ towards the north and worked EI3GE (IO63). Between 1512 and 1925 she worked D, F, G, GW, ON and PA stations, QTE 010-060° then switched off to go to a local high spot to watch the visual display. From 2220 to 0230 more D, F and Gs were worked, best DX being OK3KMY (JN88). Other countries heard were HB9, HG, I, OE, OZ, SM and SP.

Steve Damon G8PYP (DOR) was pleased with his results in the Ar which brought s.s.b. QSOs with SP9EWO, EI9GO, OK3KMY, HB9SJV and assorted Germans, etc. GJ4ICD was only using 10W in the Ar but managed QSOs with SP4MBP and GW4FRX through the wall-to-wall QRM.

Most of GM1SZF's contacts have been via Ar in March. On the 3rd from 1500-1545, D, EI, OZ and SM; on the 8th, G, GI and GM from 1945-2052. Alan started at 1600 on the 13th and worked SP3MFI, Y23KO, Ds, Gs, ONs and PAs but conditions were nowhere near as good as in the south. There were more events on the 14/15th to D, G, GI, GW, ON, OZ and PA. On the 18th, 1503-1541 when SM4CSA (HU) was a new square, LA8OW (FU) and OZ1JVX (EQ). On the 19th, 1300-1645, he contacted many Gs, LA, OZ, SM and the usual near continentals.

Ian Wright GW1MVL (CWD) worked FC1LHL/P (JN19) and ON4ASL/A (JO10) on March 4 in the contest. In the March 13 Ar, QSOs were with GM0KNT (IO87) and GI4WRJ in Belfast but he found copy difficult.

John Nelson GW4FRX (PWS) worked most everything that was on and his 72-ele Cushcraft array was sharp enough to detect three distinct reflecting directions; 010° for the locals, 060-070° for the HGs and SPs and 080° for the Is and YUs. He wrote, "I never thought the day would come when I would be on the wrong end of a 45 minute auroral pile-up from SP, HG, YU and OK."

John found the Ar on the 19th which produced many loud GMs at 10C with Scandinavians at 020-030°, best DX being SM5CBN (JO78). He mentioned that **Andy Steven GM4IPK/P** was operating from the Lerwick beacon site (IP90JD) using an Icom IC-251E, 100W amplifier and the beacon's 3-ele Yagi; he made 122 QSOs.

The 430MHz Band

G1SWH operated in the March 4/5 contest to boost his table score by ten more counties. Further additions were GI8AYZ (ATM) on the 11th and EI2GK (WKW) on the 13th for country number six this year.

G3XDY operated from 0012 on March 14 in the Ar and his list of QSOs is reminiscent of a 144MHz Es opening. It reads: DF5LQ (JO44), DL7APV (JO62), HB9BZA (JN36), OK1GW (JO70), I4LCK (JN54), YO2IS (KN05) and John's best DX at 1619km, DL7QY (JN59), HG8ET (KN06), HG2RD (JN87), DJ5BV (JO30), OK3YCM (JN98), SP9HWY (JO90), YU3ZO, (JN86), OK3PV (JN88), YT4AM (JN84), OK3LO (JN88), DL6WU (JN49) and DL5MCO (JN58) the last QSO at 0206 before QSYing to 144MHz. Several stations were well over S9.

Dave Robinson G4FRE (SFK) has completed his 4 x 21-ele Tonna array for e.m.e. work, complete with mast-head pre-amp. In the March contest he operated from New Radnor as GW4FRE/P and made 237 QSOs, five with stations in the 900-1000km range, best DX being HB9ASB. He was amazed at the number of Fs on the band. The gear used was a Yaesu FT-726, single 4CX250B amplifier and 4 x 19-ele Yagis at 8m a.g.l.

Dave Dibley G4RGK (BKS) came on the band for half an hour at 0130 on March 14 to sample the Ar and worked DK5AI (FL), HG2RD, DL6WU, OK3DV (II), HB9BZA and YO2IS, the best DX at 1735km. G6HKM got a few more table points in the March 5 contest from HB9, PWS, YSN and DVN QSOs. On the 13th Ela made her first Ar contact with G8KBQ (SOM) followed by PE1GHG (JO21). However, she found copy very difficult.

The Microwave Bands

G0DVY has a nightly sked at 2130 local time on 1296.200MHz with G1ULS in North Norfolk. They are carrying out long term research into propagation over the path, noting signal strengths at the prevailing temperature, pressure and humidity. Robert says they would welcome calls from others.

During the Ar on March 14, G3XDY and DJ5BV tried a test on 1.3GHz at 0132 but heard nothing. Radar signals were not heard so John concludes that there was no auroral propagation at 23cm. G6HKM wonders where everyone has got to as Ela reports no contacts at all.

Paul Thompson G6MEN (SPE) publishes a brief Newsletter for the Backpackers Microwave Group. This can be distributed by normal post or via packet radio. At present the notes are on GB7AKE-2. For more details contact Paul via packet or by writing to PO Box 32, Shrewsbury SY1 1ZZ enclosing an s.a.e. The group does a lot of portable work around the SPE/PWS area which has been reported in this feature from time to time.

Final Final

As this is my last VHF UP, I would like to take the opportunity to thank all of you for your support without which there would be no feature. You will be in very capable hands with Dave Butler G4ASR and I hope you will give him as much support as you have given to me. 73 and Good Luck on v.h.f. and up.

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

BARTG Spring HF RTTY Contest

This year I managed to find time to operate in this popular international contest. My activities started at about 1215UTC on the Saturday and being an optimist, I started with 28MHz. I was soon rewarded with a very interesting range of stations and 28MHz seemed to be wide open. My first contact was with ZW2A (Brazil) who came straight back on my first call which was a pretty good start. Having logged a selection of stations on 28MHz I moved down to 21MHz to find that this band was also very lively and I soon worked LZ1KAA (Bulgaria) and UZ9CWA (USSR) though the best catch was HK1LDG (Colombia). I then took a break for a few hours and returned again at about 1600UTC. As with my first session I started on 28MHz and the band seemed to be even better with the following stations heard: KB2VO/4 (USA), WB2CHO/6 (USA), YU7KMN (Yugoslavia), LX1TO (Luxembourg), LZ2KCA (Bulgaria), ZP5JYC (Paraguay), 4U1UN (United Nations) and last but not least, S79HF (Seychelles). As you can imagine I was quite pleased with that little lot! That just about finished my monitoring for Saturday as we had visitors for the evening.

On Sunday I managed to crawl out of bed by 0900UTC only to find the band conditions totally changed! 28MHz was almost silent and any activity I did find was suffering very deep QSB. I then started searching the other bands and soon established that everything was pretty flat, even on 14MHz I could only hear a few Europeans, so much for my "early" start.

My next visit to the shack was at 2000UTC on Sunday and I was pleased to see that the bands had perked-up a bit with 21MHz being the best. Some of the more interesting stations heard on this band were: PU7RGW (Brazil), HK1LDG (Colombia), CP6KM (Bolivia) and VU7JX (India). This latter station proved to be very much in demand and when I found him he was working an enormous pile-up.

My next stop was to check on the lower bands and 3.5MHz seemed to be in best condition with plenty of European RTTY stations.

In addition to my own activities, **John Barber G4SKA** sent in a very good contest report. John operated from home on the Saturday morning and joined his colleagues in the afternoon at the Tiverton ARC rally, using the club call G4TSW. Apparently their contest activities attracted quite a bit of interest from other amateurs at the rally.

Contest operation continued on Sunday from the clubhouse, which actually comprises the top bar of the Half Moon pub! Sounds ideal to me. John reports band conditions during the contest to be only fair, with one or two unusual calls, i.e. I0AOF operating with a HV call and UZ9FWA using EY9FWA, though no one was sure whether he was operating from Asiatic Russia or the Ukraine.

Overall then an enjoyable contest with the best DX available on the Saturday. Did you enter?. If so why not drop me a line with your comments.

Alessandro Volta Contest

Still on the subject of contests, if you're quick you should still have time to enter the 23rd Alessandro Volta RTTY DX contest which runs from 1200UTC on Saturday May 13 to 1200UTC on Sunday May 14. The contest is usually very well supported and comprises the usual three sections - single operator, multi-operator and short wave listener. The bands to use are 3.5, 7, 14, 21 and 28MHz. If you do have a go, if only to give a few points away please drop me a line with your impressions.

Looking at a copy of the results for last year's contest, sent in by John Barber, there was a very good UK showing. John Barber won the single operator, single band section while G3UUP won the multi-operator section. In the single operator, all band section G0ARF came a very creditable third and in the short wave listener section Martin G1DPL also came third. According to John, Martin should have won the contest, but he lost three hours listening time as he had to go back to work!

New Equipment

FAX enthusiasts will be delighted to hear that J & P Electronics (1) are about to announce a brand new FAX transceive package for the Spectrum computer. The program and hardware have been designed to run on all issues of the 48K and 128K Spectrum and should make a very economic entry to amateur FAX.

In order to achieve accurate timing and tones, a separate hardware interface is required which combines the drum speed generator, tone generator and p.t.t. switching into one neat unit.

The FAX mode supported by this new program is the normal amateur standard of 120 r.p.m. with a frequency shift of 800Hz which is achieved using audio frequency shift keying. In simple terms this means that you apply the audio output from the FAX interface to the mic socket on the radio. The audio frequencies used are 1500Hz for black and 2300Hz for white which again complies with amateur standards.

With regard to the types of images that can be transmitted the program seems to be very versatile as it will send any standard 256 x 176 pixel display. If you only want to send simple text messages there is a text entry mode included which will allow the creation of simple images. An alternative is to use commercial graphics packages like ART STUDIO to generate the images which can then be saved to disk or tape for later transmission by the J & P program. The ultimate of course is to be able to send photographs and other documents but in order to achieve this with a computer FAX system you need to be able to connect a video camera. Fortunately J & P have not ignored this problem and I understand that they are currently evaluating a digitiser (a device to turn a video signal into a digital equivalent for computer processing) that will work with this program it will apparently even handle the output from a video recorder!

Now to the crunch the price - the hardware interface is expected to sell for £48.00 whilst the program will cost £15.00 for the tape version and £18.00 for the disk version. That makes a total of either £63 or £66 depending on the version you require which I think is a very reasonable price. I know from past experience that J & P like to look after their existing customers and if you have a copy of the J & P FAX receive only program you will receive an allowance of £18 if you trade-in the program and interface for this latest program.

As this is all hot news please check the prices with J & P before you send off your cash!

Where Do I Begin?

I have had a number of letters from readers asking where to start in radio data comms. With all the contrasting comments and packet, RTTY, ASCII, AMTOR and FAX to choose from, I can understand their confusion. I thought it would be a good idea to use some space to explain my own feelings on the various modes and where to start.

The easiest starting point is with class B licensees or indeed anyone with an interest in only the v.h.f. bands and above. There is only one route to follow at present and that is packet. Although there are some pockets of v.h.f. FAX activity, packet is by far the dominant mode. RTTY, AMTOR and ASCII seem to be all but extinct on these bands. As there are many publications dealing with how to get started on packet I won't dwell on the subject here.

If, however, your interest lies in h.f. operation then all the modes are available so the decision may be a little more difficult. Despite this wide choice some modes are definitely more practical and effective than others. The first surprising fact for the newcomer is that h.f. packet is probably the least effective communications mode! Having said that I'm sure someone will take me to task, but in my experience h.f. packet as it is being operated today is a very poor communications system. The problem is very simple and is caused by too many stations trying to use too few frequencies. This results in a high proportion of transmissions "doubling" or colliding which causes lost data. As the packet system is error correcting, every time a data loss occurs the whole packet of data has to be re-transmitted. When the bands are busy it can be almost impossible to successfully send data.

That's enough bad news so let's look on the positive side at the remaining data modes of which the most popular is probably RTTY. Although activity is dwindling in the UK there is still plenty of international activity and stations can always be heard on 14MHz. I suspect that the reason for the continued popularity of RTTY is its simplicity and the modest outlay required to get started. The easiest and cheapest way to get started on RTTY is with a computer and a RTTY program which uses a software interface. Good examples of these programs are available from Technical Software, J & P Electronics and Pearsons Computing. Once the necessary equipment has been acquired RTTY operating is really very simple, the golden rule being to listen first to familiarise yourself with the types of messages being sent. If you have operated on c.w. you will have little problem with the abbreviations, as most of them have been taken from c.w. operating practice. RTTY stations can be found at the h.f. end of the c.w. section of each band with the most popular band being 14MHz.

ASCII transmission needs to be men-

tioned alongside RTTY as the modes are very similar except for the code used to represent the characters. Another difference is that ASCII is normally sent at higher speeds than RTTY. Although ASCII is an effective communications code it is very seldom used by amateurs so you will have difficulty finding any activity and as such it is not worth considering as a mode for the newcomer.

The next mode to look at is AMTOR which in my opinion is by far the most effective h.f. text communications system. The reason it is so good is that like packet it is fully error correcting, but unlike packet the blocks of information sent are very short (3 characters at a time). In addition to these short blocks of information, each QSO uses its own frequency as opposed to the sharing system employed on packet. The end result is that collisions rarely occur and any information that is lost due to interference, etc., can be very quickly and easily re-transmitted.

There is always a snag which in this case is slightly more expensive equipment. As far as I am aware there are no AMTOR programs on the market that use a software interface. This means that in addition to a suitable program for your computer you will need to buy or build a terminal unit which can cost between about £30 and £100.

AMTOR activity can be found at the l.f. end of the RTTY section of each band and there are usually stations to be found on 14MHz and 3.5MHz. One other advantage of the AMTOR system is that there is a network of AMTOR mailboxes around the world that can be a very useful source of all manner of information from rig mods to the latest DX and propagation news.

The final mode I would like to cover is FAX which although not strictly a data mode is part of my brief for this column and is often decoded using computers. This mode seems to be very popular in some countries and yet virtually non-existent in others. Although there is a lot of activity in Europe the UK seems to be an exception with very little going on. This is particularly surprising as a few years ago BARTG secured a large number of Telecopier 400 FAX machines which were distributed to members. It would seem that most of these are sitting around unused which is rather a shame.

There are two basic ways of getting involved with FAX - either by using a suitable FAX machine or by using a computer FAX system. If you are interested in electro-mechanical systems then the first option can be very rewarding and also quite cheap. Before you rush out and buy a FAX machine you ought to be aware that there are many different commercial standards and it is important to buy either the correct type or one that can be converted. You should find the odd Telecopier 400 at rallies and BARTG have published full details of the conversion of this machine.

If you want to use computer FAX then there are a couple of options currently available namely the AMIGA FAX from ICS Electronics and the new Spectrum program from J & P Electronics. Computer FAX has its problems in that to transmit printed images or pictures you will need a video camera and a digitiser and even with all this the image quality is not as good as a conventional FAX machine.

Finally if your pocket is deep enough you could consider one of the multi-mode terminal units like the PK-232 or the Kantronics KAM. These devices which cost around £250 - £300 are capable of operating RTTY, ASCII, c.w., packet, AMTOR and sometimes FAX. If you are interested in all these modes then these units are very good value for money. I would add though that the FAX transmit option is usually a bit cumbersome.

To conclude then the simplest way to start is with RTTY, but if you are keen to try all the modes and can afford it the multi-mode terminal units are a very good bet.

THE NEXT THREE DEADLINES ARE MAY 31, JUNE 28 & JULY 26

Amateur Satellites

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

UoSAT

Whilst OSCAR-9 continues to spiral in toward earth and is now noticeably frictionally heating as it meets denser atmosphere, it nevertheless continues to give excellent service.

All four h.f. beacons are now switched on and, although audibility of the 7.002MHz telemetry seems by the lack of reports so far absent, the 14.002, 21.002 and 29.512MHz transmissions are all producing excellent signals, noticeably affected in quality and time of hearing by high m.u.f. and Auroral conditions.

The massive and sustained solar flare of 1640UTC of March 11 and the ensuing major radio and visible aurora of March 13 was captured by the UoSAT magnetometers and radiation detectors. The WOD telemetry is now being analysed at the University of Surrey.

John Newman G6ZQE of Wymondham, Norfolk, has been experiencing problems in retrieving the Keplerian elements transmitted by UoSAT. At first, he tended to put the trouble down to QRM and blocking by the local GB3NB repeater. He uses one of the Spectrum computer programs for this purpose and for some long time had been battling with the imposed difficulty. As it is highly likely that other UoSAT followers are meeting the same problem, John provides the "cure" - merely switch off the parity and all of the scramble is revealed to form good values!

OSCAR-10 is, as expected, without its indicating beacon carrier at the time of writing this column in mid-March. Those attempting to use the satellite are finding severe frequency pulling on even modestly powered signals, due, as predicted, to poor power regulation. Although users are welcome to experiment in order to attempt to use the transponder if the f.m.

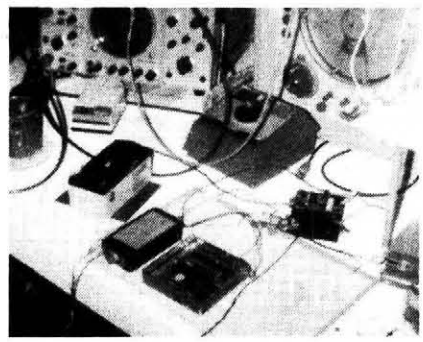


Fig.1

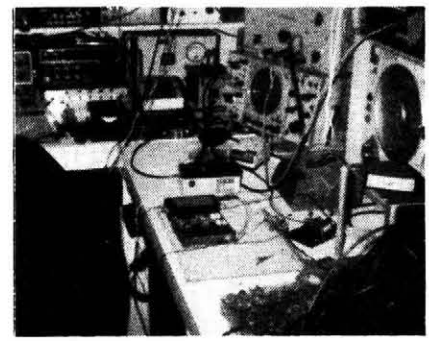


Fig.2

is absent and if communications are possible during the current period of poor sun angle, it is best to wait until at least the last week of April, by which time the beacon should have returned to the transmitting state again. Good transponder communication prospects should be back with us by May 1, when the solar illumination reaches better than 60 per cent, and even better indications exist when the solar cells get back to 64 per cent illumination power production efficiency by May 8.

OSCAR-13 is steadily improving as the apogee slowly moves north and is currently far more used for contacts than OSCAR-10.

Graham Radcliffe VK5AGR reports that the first commanded magnotorquing took place on the perigee passes of March 13/14, resulting in a change of Bahn coordinates to ALONG 198 and ALAT +6. The second manipulating session is set for the perigee passes of orbits 582 and 583, and will result in an attitude of ALONG 210 and an ALONG of +0.5, thus further improving the earth pointing of the satellite's antennas.

John G6ZQE has noted that OSCAR-13 on Mode B appears to possess a far narrower beamwidth on the 435MHz uplink than that shown by the 145MHz antenna array on the downlink. "I can often hear the beacon as a splendid signal, but find it impossible to be able to hear my uplink signal in the downlink passband. This is not the case with OSCAR-10". Undoubtedly the reverse will be true on Mode J, which employs common antennas, but here the 144MHz uplink will be received at angles when the 435MHz downlink is impaired by beamwidth limitation. The information of the changes of squint and the new schedule resulting will be placed upon the AO-13 c.w., RTTY and p.s.k. bulletins.

Work continues on the RUDAK of OSCAR-13, in the hopes that an uplinked software solution may be found to jolt the chip that will not respond into activity.

FO-12

The Fuji satellite continues to attempt its periodic times of transponder activity interspaced with quiet recharge periods. Whilst the long term planned schedule is not available, the last plan of operations provided by JARL was Mode JA from

1815UTC March 18 to 0227UTC March 19, then a battery recharge quiet period until Mode JA resumes from 1412 to 2224UTC April 5. Recharging mode resumes until it comes back on in Mode JA from 2145UTC April 8 until 1238UTC April 9, a further charge, resuming activity on JA mode from 1251UTC April 11. All but one of these times gave activity periods of access in the Far East only, with no European users possibility. Even when it is found on over Europe, activity is at a very low ebb.

Whilst the next topical period of attempted transponder activity cannot be supplied, it is hoped that a re-application of the above schedule will give valuable clues when JO-12 may be used. The AMSAT nets will provide updates as they arrive and the current attempted schedule should be found on the JD mode FUJI-OSCAR-13 bulletin board .

RS-10/11

RS-10 continues to be the activated transponder, with its activity fully sustained for 24 hours per day. The use of f.m. in the satellite downlink passband continues to be a severe problem, with few users in the UK or USA seeming to even realise that they are using a listed satellite band. The ROBOT is often rendered unworkable due to a combination of f.m. on its 29.400MHz downlink plus f.m. repeaters, simplex users, OSCAR-9 and 11 and now even packet radio users on its 145.825MHz uplink frequency. Add to this the high level of en route F2 and E layer attenuation to the 29.360 - 29.400MHz downlink during daylight passes, and it can be very difficult to make solid QSOs at times. Even so, the DX is there, and many stations are regularly using RS for reliable contacts.

Microsats

AMSAT are looking for operational persons with the interest to run nets or Bulletin Board Systems to provide updated information as the launch day for the new satellites nears. Already the new high efficiency solar cells are in position. The battery charge regulators and p.c.b.s have been completed by the ARRL. YT3MV, now at the Boulder Colorado University, is working on the BPSK p.c.b. layouts. W3IWI is working on the receiver layouts and the batteries have been sent from Ottawa to Boulder. Progress is on time and all looks good for the launch, which was last given as taking place at 0142:13 on 15 June 1989 from an Ariane with the SPOT-2 imaging satellite from the ESA launch site in French Guiana.

MIR

The resident crew of MIR including Valery Polyakov are now known to be returning to terra firma on April 29. The new crew will certainly have Alex Viktorenko as an operator, but Alex Serebrov will have his mission delayed to the end of the year to coincide with the docking of the new large modules, upon which he is the specialist. Thus, we have one known pre-trained amateur radio operator who will use the call U5MIR, but unless time is available for the other (as yet unknown) cosmonaut, U6MIR will not evolve in the next mission.

U4MIR has been active sporadically and U3MIR from time to time, but with no pre-indicated schedule of operations. It is best to listen on 145.550MHz during pass times in the afternoons and early evenings of week-days and over the whole

Fig.3

day of week-ends in the hope of catching them. **Leonid Labutin UA3CR** reports that the 10 watt transceiver has yet to be delivered to MIR and that the 2.5 watt remains the rig in use. He confirms that the serialisation of callsign allocation up to and including U0MIR will be used by successive crews, so we have plenty of opportunities to QSO with the Soviet manned space station for years to come yet, with everyone getting a chance.

The MIR cosmonauts have been overheard to complain on their 143.625MHz downlink of QRM from "..police, fire brigade, aircraft, ships, radio station and radio amateur(!) interference..." whilst over western Europe on their VHF-1 uplink, undoubtedly brought about by second channel breakthrough. It is recommended that when they are using the near to 145.550MHz essential communications channel, that radio amateurs do not beam high power at the spacecraft in the hopes of a chance QSO.

DX News

Compared to the early days of satellite communications, there now seems to be a distinct lack of some of the rarer DXCC countries. I worked over 140 separate DXCC countries on the lower orbiting OSCAR-6, 7 and 8 plus the RS-1 to 8 satellites, which were in mutual range of few countries compared with OSCAR-10 and 13.

Whether this is an indication of expense, of better h.f. conditions, of alligator extinction or lack of novelty is not known, but most certainly the high elliptical orbiters have not turned out to be the world-wide amateur communications facility earlier thought. A Luxembourg LX

Fig.4

station was heard to say on OSCAR-13 "...I came up here because the h.f. bands have been taken out by the aurora..". The indication would appear to be that when this current solar maximum declines in three years time, satellite activity will blossom again.

Meanwhile, **Dave Rowan G4CUO** reports that QSLs for his week's Easter activity as GD4CUO and those of G4ZHG as GD4ZHG can go to the QTHR address or via the bureau. DD5DI reports that he will be active on all satellites as EB6/DD5DI from Mallorca for a week commencing August 22, QSL to home QTH. **G6SVJ** reports working S83H in Transkei on OSCAR-10.

WA3NAN re-broadcast the successful March Discovery shuttle mission on OSCAR-13 using 145.945 and 145.955MHz downlink. (This is the first of 7 planned missions this year, but sadly no amateur radio activity just yet!). Other Sat-DXpeditions from Andorra, Monaco and a few more rarer spots are likely to evolve over the summer period.

HAART-VLEO-satellite

Earlier information published in this column related the technical details and mission objectives of the AMSAT-UK High Altitude Amateur Radio Transponder, which was due to fly last summer or in the spring of this year with balloonist Danielle Bridge whilst endeavouring to achieve the ladies' hot air balloon ascent record. The long term intention of the planners, Dave Rowan G4CUO and Richard Limebear G3RWL, was to use these early flights as an evaluator and as a precursor for a later orbiting satellite project.

The transponder, seen undergoing bench tests in Fig. 1, was built by G4CUO whose entire building and test bed facility can be seen in Fig. 2. The transponder, with its 60mW 145.852MHz beacon was found to perform well when at the G4CUO QTH (by the Trent Valley in Newark, Nottingham) even though the unit was pulley hoist elevated to only a few feet above ground. Good reports on its reception came in from a wide area and from as far as the south coast of the UK.

Alas, although technically sound and good functional progress was being made, the best laid plans of all of us often fail when faced with the limitations applied by bureaucracy.

A licence to fly the transponder was applied for through the liaison offices of the RSGB, but a long wait resulted before the eventual answer came back, far too late to be able to make use of Danielle's test flights made during the summer of 1988. When the reply did finally come, to everyone's surprise, it was negative! Mike Dennison G3XDV, Assistant to the Secretary and Chief Executive of the RSGB wrote confirming the refusal on 23 November 1988. He stated: "I regret to say that, following an initially favourable response from the licensing authority - the Department of Trade and Industry, they reported that the Civil Aviation Authority were not prepared to allow any airborne amateur radio operation. This attitude was confirmed when the Society applied for all amateurs to be permitted to operate Aeronautical Mobile as part of the revised Amateur Licence. We will continue pressing the DTI for this facility, but we expect this to take some time".

Many similar balloon launches, with and without accompanying balloonists, have been made over all of Europe, espe-

cially Italy and Germany, plus many from the United States, South Africa, etc., all without problems and to good effect. As far as is known, the UK is unique and alone in its refusal to permit let alone encourage such valuable work by the amateur radio community. Whilst other countries' aeronautical mobile amateurs and balloon borne transponders can be worked above our horizons, it would appear that for some strange reason known only to the CAA and their advisers, those radio amateurs of British origin cannot.

The net result is that we shall be unlikely to see this "low orbiter" opportunity taken up from the UK in the foreseeable future, but other viable alternatives exist where the authorities are not so restrictive. **Nico Janssen PA0DLO**, reports that he has been in contact with the Dutch authorities, who are only too anxious to encourage this valuable project. He has also talked with **Henry Vermeulan PE0THZ,** who works with SIMAC and flies their balloon, which is shown taking off from Breda (in the south west Netherlands) in our Fig. 3. Henry, with the full backing of the Dutch controllers, would be very pleased to carry the project in his flights which normally get up to above 3500 feet a.s.l. Although this is not the 10000 feet required to ensure a direct path even to East Anglia and Kent, thus to enable UK participation, it could be that a non-prevailing wind, a little extra height and a degree of temperature inversion could bring balloon transponding possibilities to Britain yet! I wonder if the CAA know about the amateur radio satellites passing over the United Kingdom yet, some built in the UK? Perhaps it would be as well not to draw this to their attention at this time!

OSCAR operators

The international meetings that take place via contacts on the satellites often mean that one will get to know a fellow enthusiast well, often without the opportunity of ever having met in person. The latter is not true of **Ross Forbes WB6GFJ,** who in addition to his many satellite QSOs with fellow operators, attended the colloquium at the University of Surrey last year and will probably come again to this years event scheduled for July 28-31.

Ross, pictured in his extensive and well equipped shack in Fig. 4, has been involved in satellites since the very beginning, having started out by visiting the Project Oscar headquarters when they were setting up the command station for OSCAR-3. Now, in 1989, he is president of Project Oscar!

Ross has been active since 1976 and started operating using OSCAR-6 when he used a TS-430S. Later he drove a Microwave Modules 435MHz transverter for OSCAR-7. He used this for all the satellites up to and including FO-12, but within two hours of the successful launch of OSCAR-13, he treated himself to the IC-475A seen in the photograph.

Ross says his OSCAR activities are "..fairly general..". He states: "I chase DX when I run across it, but I don't enjoy the contest style contacts - they are best left to the h.f. bands - I would rather talk to the DX stations".

He continues: "In the US my OSCAR activities have been from California. I have operated under my 'second' call as FO0FB from the island of Tahiti on Mode B on OSCAR-10." (Ross also speaks excellent French). "During my regular travels

K E P L E R I A N E L E M E N T S.

Source: NASA 2-line elements, edited by B. Lindholm.
(Should NOT be used for precise scientific analysis.)

Satellite ...	OSCAR 9	* OSCAR 10	* OSCAR 11	* OSCAR 12
Int. Design .	81-100B	* 83-058B	* 84-021B	* 86-061B
Object Nr. ..	12888	* 14129	* 14781	* 16909
Element Nr. .	465	* 380	* 411	* 129
Epoch Year ..	1989	* 1989	* 1989	* 1989
Epoch Day ...	56.90981140	* 44.26633241	* 51.11886565	* 38.07742442
Inclination .	97.5763	* 26.6809	* 98.0217	* 50.0179
R.A.A.N.	104.5142	* 280.2786	* 113.2791	* 338.2722
Eccentricity	0.0002091	* 0.6055766	* 0.0012975	* 0.0011061
Arg of Per ..	30.0894	* 17.2066	* 334.6593	* 13.5524
Mean Anomaly	330.0247	* 356.6793	* 25.4035	* 346.5603
Mean Motion .	15.45636833	* 2.05878097	* 14.63015973	* 12.44397497
Decay Rate ..	.00057728	* -.00000008	* .00003072	* -.00000025
Epoch Orbit .	41172	* 4266	* 26542	* 11320
Nodal Period	93.226086	* 699.1901	* 98.485637	* 115.65293
Increment ...	23.302702	* 175.3539	* 24.622295	* 29.239254
Beacon-QRG's	14.002/ 21.002/ 29.510/ 145.825 MHz	* 145.810/ * 145.987 MHz	* 145.826/ * 435.025/ * 2401.5 MHz	* 435.797/ * 435.913 MHz
Ref. EQX :	03 Mar 1989	* 04 Mar 1989	* 03 Mar 1989	* 03 Mar 1989
Orbit Nr. :	41251	* 4305	* 26702	* 11618
HHMM.MM :	0033.59 Utc	* 0459.87 Utc	* 0128.49 Utc	* 0016.11 Utc
Longitude W :	59.31 Deg	* 319.72 Deg	* 59.01 Deg	* 260.09 Deg

Satellite ...	OSCAR 13	* RS 10/11	* SALYUT 7	* MIR
Int Design ..	88-051B	* 87-054A	* 82-033A	* 86-017A
Object Nr. ..	19216	* 18129	* 13138	* 16609
Element Nr. .	30	* 683	* 459	* 713
Epoch Year ..	1989	* 1989	* 1989	* 1989
Epoch Day ...	40.26552022	* 59.14771684	* 60.73085382	* 60.78868491
Inclination .	57.3661	* 82.9305	* 51.6102	* 51.6195
R.A.A.N.	220.4414	* 318.7092	* 122.2735	* 183.9310
Eccentricity	0.6656511	* 0.0012256	* 0.0001886	* 0.0009286
Arg of Per ..	198.6348	* 1.6595	* 32.7081	* 69.8713
Mean Anomaly	115.5647	* 358.4546	* 327.4042	* 290.3357
Mean Motion .	2.09697875	* 13.71947670	* 15.37958038	* 15.69013035
Decay Rate ..	.00000016	* .00000206	* .00014830	* .00049051
Epoch Orbit .	504	* 8444	* 39163	* 17440
Nodal Period	686.6523	* 105.01923	* 93.569133	* 91.715572
Increment ...	172.1953	* 26.380544	* 23.772767	* 23.316590
Beacon QRG's	145.812/ 435.651 MHz	* 29.357/.403, * 145.857/.903. * 29.407/.453, * 145.907/.953 MHz	* 19.953 MHz	* 143.625=Voice * 166.125=Data/ Ranging (AM?)
Ref. EQX :	01 Mar 1989	* 03 Mar 1989	* 07 Mar 1989	* 04 Mar 1989
Orbit Nr. :	546	* 8484	* 39245	* 17475
HHMM.MM :	0656.54 Utc	* 0133.48 Utc	* 0124.70 Utc	* 0025.53 Utc
Longitude W :	45.40 Deg	* 227.62 Deg	* 89.60 Deg	* 355.57 Deg

Satellite ...	NOAA 9	* NOAA 10	* NOAA 11	* METEOR 2/15
Int. Design .	84-123A	* 86-073A	* 88-089A	* 87-001A
Object Nr. ..	15427	* 16969	* 19531	* 17290
Element Nr. .	335	* 195	* 48	* 227
Epoch Year ..	1989	* 1989	* 1989	* 1989
Epoch Day ...	54.89618662	* 56.56136282	* 56.93903815	* 57.01462540
Inclination .	99.1382	* 98.6495	* 98.9286	* 82.4664
R.A.A.N.	39.6904	* 89.1279	* 1.5588	* 242.9385
Eccentricity	0.0013944	* 0.0013145	* 0.0011984	* 0.0012373
Arg of Per ..	271.7457	* 210.8253	* 181.5048	* 211.0700
Mean Anomaly	88.2141	* 149.2153	* 178.6086	* 148.9716
Mean Motion .	14.11854017	* 14.22837126	* 14.10838628	* 13.83669198
Decay Rate ..	0.00001908	* 0.00000884	* 0.00000735	* 0.00000177
Epoch Orbit .	21646	* 12806	* 2178	* 10824
Nodal Period	102.04983	* 101.26351	* 102.12358	* 104.12959
Increment ...	25.510106	* 25.316109	* 25.530306	* 26.161695
Beacon-QRG's	137.620=APT	* 137.500=APT	* 137.620=APT	* 137.850=APT
Ref. EQX :	01 Mar 1989	* 01 Mar 1989	* 01 Mar 1989	* 03 Mar 1989
Orbit Nr. :	21719	* 12855	* 2222	* 10893
HHMM.MM :	0140.10 Utc	* 0010.27 Utc	* 0125.65 Utc	* 0006.01 Utc
Longitude W :	138.91 Deg	* 68.84 DEg	* 175.59 Deg	* 283.32 Deg

Satellite ...	METEOR 2-16	* METEOR 2-17	* METEOR 3-02	* OKEAN 1
Int Design ..	87-068A	* 88-005A	* 88-064A	* 88-056A
Object Nr. ..	18312	* 18820	* 19336	* 19274
Element Nr. .	245	* 88	* 140	* 295
Epoch Year ..	1989	* 1989	* 1989	* 1989
Epoch Day ...	56.02152460	* 56.99603652	* 56.61020462	* 60.69277476
Inclination .	82.5596	* 82.5420	* 82.5415	* 82.5151
R.A.A.N.	308.4176	* 8.9071	* 254.6109	* 235.9228
Eccentricity	0.0012403	* 0.0015677	* 0.0016841	* 0.0022528
Arg of Per ..	144.7916	* 218.7896	* 98.4446	* 219.3474
Mean Anomaly	215.4060	* 141.2143	* 261.8541	* 140.6119
Mean Motion .	13.83433497	* 13.84100723	* 13.16854525	* 14.74095523
Decay Rate ..	.00000444	* .00000328	* .00000391	* .00001885
Epoch Orbit .	7700	* 5430	* 2822	* 3524
Nodal Period	104.14745	* 104.09726	* 109.40911	* 97.746812
Increment ...	26.165446	* 26.153035	* 27.480945	* 24.566337
Beacon QRG's	137.400=APT	* 137.300=APT	* 137.300=APT	* 137.400=APT
Ref. EQX :	03 Mar 1989	* 03 Mar 1989	* 01 Mar 1989	* 04 Mar 1989
Orbit Nr. :	7783	* 5500	* 2867	* 3558
HHMM.MM :	0035.23 Utc	* 0121.11 Utc	* 0042.10 Utc	* 0000.99 Utc
Longitude W :	225.91 Deg	* 176.19 Deg	* 277.14 Deg	* 288.19 Deg

Fig.5

through the South Pacific I try to explain OSCAR and how to use the satellite to as many island countries as possible. Back home in California, I spend much of my 'off air' time answering questions about OSCAR on the 'phone and at club meetings. Along with KH6JRB I have organised many all day meetings to describe OSCAR operations to newcomers, and I also work very closely with our local amateur radio stores to be sure that these newcomers to the satellite side of our hobby understand what equipment is needed."

In addition to this, Ross speaks on the topic of satellites before ARRL conventions and contributes articles about OSCAR to World Radio newspaper. He is a strong advocate of running low power on any satellite and evidences this fact by having copied the AO-10 AMSAT ZRO tests down to level 7. His best contacts from the 50 DXCC countries worked include 4S7 and FO0 (Clipperton Island).

To accomplish his contacts, the gear seen in the photograph is connected to a pair of KLM-14C crossed Yagis on 145MHz and a pair of KLM-18C crossed 435MHz Yagis. At 145MHz the feeder consists of 20m of 9913 coaxial cable, whilst on 435MHz a further 20m of LDF-4 hardline is used. In addition to satellite contacts, Ross has built the G3RUH UoSAT and AO-10/13 modems to copy the telemetry and is currently working with a team at the N6IIU-1 BBS to set up a UoSAT DCE station on the West Coast.

Ross concludes, "Having attended the 1988 AMSAT-UK Colloquium at the University of Surrey, I am always on the look out for stations on AO-13 that I met over there. It was really great to be able to meet G3CDK, IOR, G4CUO, DL1CF, DK2ZF and others that I had spoken to on AO-10."

Keplerian Elements

Birger Lindholm has again provided us within the bi-monthly sets of Keplerian elements shown in Fig. 5. They emanate from NORAD, NASA, AMSAT and are then extracted, checked, collated and typed up by our correspondent in Dalsbruck, Finland. He asks us to note that they should not be used for precise scientific analysis and that the nodal period and increment supplied for each orbiter is that for the epoch day.

In addition to those supplied by Birger, we add a "stop press" to enable users to update the since boosted MIR and the now rapidly decaying OSCAR-9 tracking to the very latest figures, and also to provide the first data for the new Soviet METEOR-2/18 weather satellite which was launched on 28 February 1989.

Satellite:	MET 2/18
MIROSCAR-9	
Int. Des:	89 018A
86 017A	81 100B
Object.No.	19851
16609	12888
Epoch Year:	1989
1989	1989
Epoch Day:	61.11001708
63.2728228	76.061435
Inclination:	82.5176
51.6261	97.568
R.A.A.N:	244.4995
171.2639	124.542
Eccentricity:	0.0013414
0.0011743	0.000298
Arg.of Perigee:	247.0277
80.2078	136.842
Mean Anomaly:	113.0261
280.003	223.104
Mean Motion:	13.83746684
15.68917403	15.4789280
Decay Rate:	1.17E-6
4.9425E-4	9.2546E-4
Epoch Orbit:	27
17479	41468

It proves interesting to apply the decay day formula given in last month's column to the lower altitude satellites. The latest date for the plunge to earth by OSCAR-9 calculates to September 11/12 this year. Salyut-7 would soon form a massive meteor, but for the fact that the Russian Space Agency intend to recover the no longer used space station by means of the large Buran shuttle type craft in the near future. It will be seen that MIR, were it not for the frequent boosts by the Progress engines, would be down to earth within a few weeks.

Dataspace '89

As aforesaid, this annual event will take place at the University of Surrey from July 28-31 inclusive. Talks and lectures will range from simple "getting-started" sessions up to and including specialist topics on specific subjects. An international day will be held on the Thursday, with Dataspace '89 from 10am on that day, and with Monday July 31 being kept for an educational day for those involved in research and tuition. Whilst members naturally will have priority, some tickets are expected to remain, and are best sought by sending an s.a.s.e. and a request for details and the programme to Ron Broadbent G3AAJ, QTHR.

Correction

Last month, the piece about the demise of OSCAR-9 got a bit muddled! The G3IOR prize is as was written last month, but the AMSAT-UK and Uiniversity of Surrey details need some correcting.

The University of Surrey have said they will give one of their special UoSAT Team Sweat Shirts to the nearest predicted date/time of re-entry received at least ONE month prior to the event. BUT, ALL PREDICTIONS MUST BE SENT TO AMSAT-UK.

AMSAT-UK are also adding their own prizes to the competition. They are offering any piece of software that they sell for the BBC, IBM or C64 or two T-shirts as seen at the AMSAT-UK Colloquium plus other prizes. The winner takes their pick and runners-up get sent the various items in rotation. Don't forget the judges desicion is final and no mail will be entered into. Send your prediction with your name and address (no quoting QTHR please), the receiver you use and the prize you would like to: **Re-entry Comp, AMSAT-UK, London E12 5EQ.** You can have as many as five entries up to and including the one month rule and all entries should be on a postcard or QSL card.

THE NEXT THREE DEADLINES ARE MAY 31, JUNE 28 & JULY 26

Propagation

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

The Radio Sun

My archives show that in 1982, I recorded solar noise storms, at 143MHz, on January 17, 19 and 29 to February 3; February 7-10, 14, 18-21 and 25; March 1, 15-20, 23, 24, 26 and 27; April 22; June 12, 17, 18, 22 and 23; July 12; August 20 and 26-28; September 12, 27 and 28; October 28; November 13-15, 22 and 30 to December 2; December 5-16 and 26-28.

While the severe storms in January and February were in progress, **Cmdr Henry Hatfield** (Sevenoaks) logged solar noise at 198MHz. This noise was also heard at 28MHz on February 25, June 17 and July 9. When the sun is active in this way aurora is likely to occur and, apart from visual observations, its presence can be detected by the strange effect it has on radio signals.

In 1982 aurora manifested at 1915 on February 1, 1530 and 0300 on March 1 and 2 respectively, 1800 on July 13 until early on the 14th, midday and most of the afternoon on September 6 and at 1800 on the 26th, 1445 on November 24 and 1750 on the 29th and at 1740 on December 10. All good stuff, but, how will February and March 1989 look in the record books?

New Ideas and Equipment

Many new discoveries in the radio and astronomical worlds have been made through consistent observations and to find out if there is any correlation between solar noise at widely differing frequencies, Henry Hatfield is currently running a second radio telescope on 1298MHz. The antenna, a 14-element loop Yagi, for the new instrument follows the sun in parallel with its larger 136MHz companion, Fig. 1. The r.f. converter, concealed under the hood just below the antenna, was supplied by Piper Communications. Henry says, "I have acquired their UEK3 local oscillator and receive mixer (a beautiful kit that was easy to assemble and quite beautiful to adjust and tune) and their DX 1296S GaAs-f.e.t. preamp, which came ready built with a noise figure of 0.5dB. Both are now attached to my mast on an equatorial mounting and are working well."

Henry recorded a violent burst on 1298MHz at 1357 on March 6 which just preceded a similar event at 1401 on 136MHz. "I think that this bursting is probably the strongest that I have observed in twelve years work," said Henry. He also recorded varying degrees of radio noise at 1298MHz on March 1, 5, 6, 7, 11, 12, 13, 14, 15, 16 and 26.

At the other end of the radio-frequency spectrum, **Anthony Hopwood** (Upton-on-Severn) is studying electrostatics with a

wire antenna, about 20m long and 5m high, connected to a home-brew v.l.f. receiver, d.c. to 10Hz, coupled to a pen recorder. Tony is looking for an association between the disturbances that he has recorded and sudden outbursts from the sun. In addition he has observed a random quantity of strong "blips" above the receiver noise level which increase in number as the earth passes through a meteor shower. Do let us know how both of these experiments develop Tony.

Roger Barker G4IDE has been interested in propagation for many years and is currently building up solar records based on the transmissions from Radio Australia. I feel sure that Roger (QTHR) would like to hear from any readers with solar or magnetic records prior to 1987.

Solar

"The monthly mean sunspot number for February 1989 was 164.4," wrote **Neil Clarke G0CAS** (Ferrybridge). The graph in Fig. 2a is Neil's computer print-out of the daily variations in solar flux for the month. In February, **Ron Livesey** (Edinburgh) observed between 6 and 12 active areas on the sun on days 5, 12, 16, 18 and 26.

Ted Waring (Bristol) counted 10 sunspots on February 28 and 18, 32 and 34 respectively on March 7, 13 and 17. "On 13 March there was an elongated spot group containing 15 spots, running north-south, its length about 1/7 of solar diameter," said Ted.

Henry Hatfield, using his spectroheliioscope, observed the data show in the table in Fig. 3. In addition, Henry recorded strong individual bursts of radio noise, at 136MHz, on February 28 and March 1, 5, 6, 7, 8, 11, 12, 15, 17, 18, 21 and 26 and noise storms on February 27 and 28 and March 14, 16, 17, 22 and 24.

"Huge group coming round!" wrote **Patrick Moore** (Selsey), on March 8, after projecting and drawing its shape earlier in the day, Fig. 4.

While listening to the BBC World Service programme *Waveguide* I learnt that 4 sudden ionospheric disturbances (s.i.d.) had taken place during the week prior to their broadcast on March 12. "Those solar flares upset some of the USA beacons for a few days," wrote **John Coulter** (Winchester) on March 24.

Dave Coggins (Knutsford) heard bursts of solar noise on 28, 50 and 144MHz early on March 12, around 144MHz at midday on days 13, 14 and 15 and noise from the setting sun on 54MHz at 1750 on the 17th. **Fred Pallant G3RNM** (Storrington) reports solar noise on 28MHz throughout the morning of the 14th. **Ern Warwick** (Plymouth) heard "Rushing (fried eggs sound)" on 28MHz between 1455 and 1528 on March 12 and around 0945 on days 13 and 14. Ern also heard this sound on 14MHz for much of the 13th and noted echoes on the 14MHz beacons CT3B on the 13th, OH2B on the 16th and ZS6DN on the 18th and 19th.

From New Zealand on March 20, **Harold Bourne ZL1OI** wrote, "The solar activity has been quite exciting lately with the very large solar flare in mid-March followed by the disruption of the high frequencies and a spectacular display of the aurora here in Auckland," and continued, "A photograph of the large sunspot group, said to be 15 times the size of the earth, also appeared in the *New Zealand Herald*." Since March 14, Harry has learnt about several solar flares and loud bursts of solar noise on the 28, 21 and 14MHz bands.

Date	Groups	Filaments	Quiescent Prominences	Notes
26.2.89	4	13		Seen through cloud
27.2.89	2	19	8	
28.2.89	2	20	8	1 medium subsiding flare
06.3.89	3	18	9	3 ribbon flares
08.3.89	3	20	9	
13.3.89	1	19	10	
15.3.89	3	20	10	2 very small flares
20.3.89	5	17	6	loop prominence on SW limb
22.3.89	4			hampered by cloud
23.3.89	4			hampered by cloud
26.3.89	2	22	13	spray above NW limb, 2 small declining flares on W limb
27.3.89	2	19	12	

Fig.3

Magnetic

"The month was generally unsettled, with the most disturbed on the 3rd," reports Neil Clarke who printed the Ap index for February in Fig.2b. The magnetometer used by **Karl Lewis** (Saltash) recorded storm periods on days 1, 2, 3 and at 0700 on the 28th and very unsettled during the evenings of 4, 12 and 15 and unsettled after 0800 on 25, 26 and 27. Ron Livesey's "jam jar" magnetometer was disturbed on days 1, 2, 3, 5, 9, 11 and 24.

Aurora

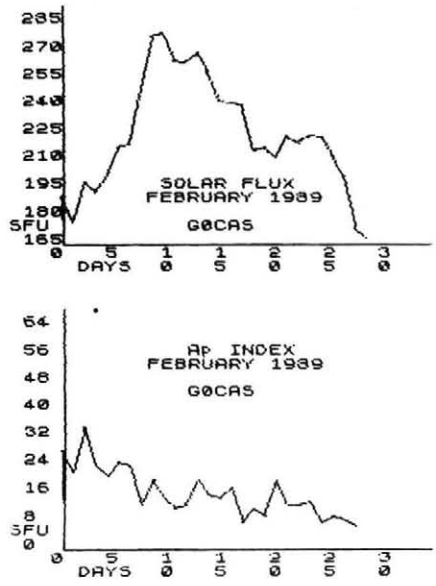
Ron Livesey, the auroral co-ordinator for the British Astronomical Association, received reports of aurora, described as "active forms", "glows", "glows and arcs" and "quiet arc" on each night from February 1 to 12 from observers in central and northern Scotland and north Dakota, RAF Kinloss and Weather Station Lima. Doug Smillie and Roger Stapleton told Ron about the radio aurora they logged on the 3rd. **Simon Hamer** (New Radnor) reports that around 1200 on the 12th, he heard "very echoey" signals from the BBC World Service on 25.750MHz, Radio Denmark - 25.850MHz, Radio France International - 25.820MHz and Radio Norway International on 25.730MHz.

We never know what the sun has in store and last November, I told you about the activity from a giant sunspot group which caused the big aurora on August 4/5 1972. This event was visible from southern England and it happened again, almost 17 years later, on March 13 when another massive sunspot group was present. Patrick made a further drawing of this at 1000 on the 13th, Fig. 5. Fortunately, the night was reasonably clear and although the moon was bright, Joan and I saw the aurora manifesting in patches of white, pink, light blue and green, periodically a few beams appeared high in the northern sky. A quick tune around at 2300 revealed tone-A c.w. on the 28, 50 and 144MHz bands and "burbling" television signals in Band I and from some East European broadcast stations between 66 and 73MHz. I am told that the aurora was so large and intense that, in some places, it was disturbing signals way up in the u.h.f. bands.

"The sight of a large sunspot suggested that auroral activity might develop in March, although this was by no means certain. Big sunspots and large auroral storms do not necessarily go together," wrote Ron Livesey. However, during the evening of March 12, Ron's magnetometer showed signs of activity and between 1900 and 2000 on the 13th it registered a large deviation. Michael Murphy (Co. Clare) phoned Ron and confirmed the sighting of auroral light in the early hours of the 13th. "At Edinburgh at 2000 there was a green corona overhead to the south of the zenith, at the magnetic zenith, a homogeneous arc 25° above the southern horizon, while to the north, Arthur's Seat was backlit by glows and rays," said Ron, who had many reports from all over the UK about this spectacular event. The 28MHz beacons, heard with tone-A signals by several contributors between 2000 and 2359 on the 13th are indicated with the letter "A" in Fig. 7.

Dave Coggins logged tone-A signals from some European beacons on March 13, 16 and 17 and on a variety of other stations on days 13, 14, 19 and 20. **Don**

Fig.1



▲ **Fig.2**

Hodgkinson G0EZL (Hanworth) found the signals from the beacons DF0AAB, DL0IGI, LA5TEN and SK5TEN "very harsh at times" and by beaming 030° he could get auroral tones on the beacon GB3RAL which is only 16km NW from his location.

From the southern hemisphere (aurora-australis), Harry Bourne says, "it appeared as a pulsating red display in the southwest with a few white streamers...it is so rare for an aurora to be seen so far north. At Invercargill in the far south, the aurora was exceptionally colourful and bright and covered about 80 per cent of the sky. It was also reported from Australia that aurora was seen in Sydney and as far north as Brisbane." Harry also told me that there was a blackout on all h.f. bands the next day and even Radio Australia could not be heard on any frequency. When propagation began to return the modulation from short wave broadcast stations was very "burbly".

"It looked like a hill fire with patches of turquoise and blue and green beams," said Simon Hamer. Dave Coggins wrote, "I could not believe my eyes when I looked at the sky during the evening. There it was in its full glory - a visual aurora, the best one I have ever seen". During the event, Dave received amateur stations from Finland, France, Holland, Norway and the UK on 50MHz. Roger Stapleton noted auroral signals on 50 and 144MHz, "with mounting chaos on both frequencies as more and more stations made use of auroral propagation".

The 50MHz Band

I thank **John Allaway G3FKM** for my regular copy of the *IARU Region 1 News*. In the March issue I see that the Greek authorities have granted a licence for a 25W beacon, SV1SIX, with a horizontal omnidirectional antenna, to operate on 50.040MHz from a site 1100m high, near Athens. This should be operational within the first half of 1989.

John Woodcock (Basingstoke) heard RT traffic, some with American and East European voices, around 1500 on February 15, 1000 on the 17th and 18th and again on the 24th.

Propagation Beacons

My thanks to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Dave Coggins, John Coulter (Winchester), **Vaclav Dosoudil OK2PXJ** (Kvasice), Henry Hatfield, **Don Hodgkinson G0EZL** (Hanworth), **Ken Lander** (Harlow), **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), Fred Pallant, Ted Waring and Ern Warwick for their 28MHz beacon logs from which I compiled Fig. 7.

Greg Lovelock heard an echo on SK5TEN during at 2300 on the 13th and during the current period he, Mark Appleby and Fred Pallant experienced difficulty in reading the keying of ZS1LA.

Ern Warwick heard SK5TEN and YO2KHP give their respective locations as 10 miles ENE of Eskilstuna, Sweden and 4 miles NW of Timisoara, Romania. John Coulter logged WB9FVR on 28.255MHz using 1W and heard PY2AMI on 18.102MHz only on most days between February 26 and March 24.

Vaclav Dosoudil is the QSL manager for the Czechoslovakian beacon OK0EG and would be pleased to receive your signal reports at Horni 9, CS-76821, Kvasice, and will acknowledge with their QSL card.

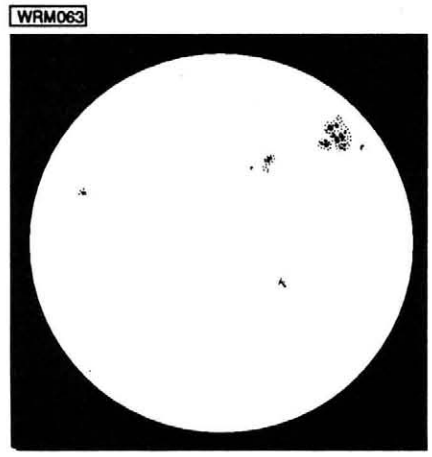


Fig.4

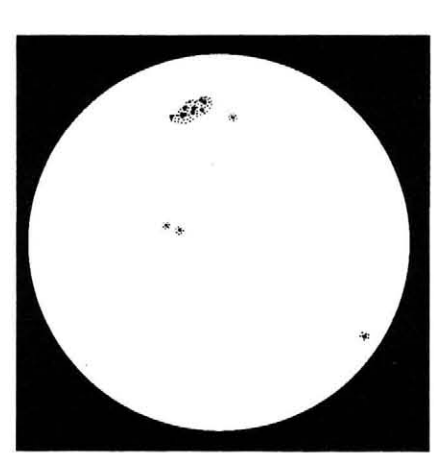


Fig.5

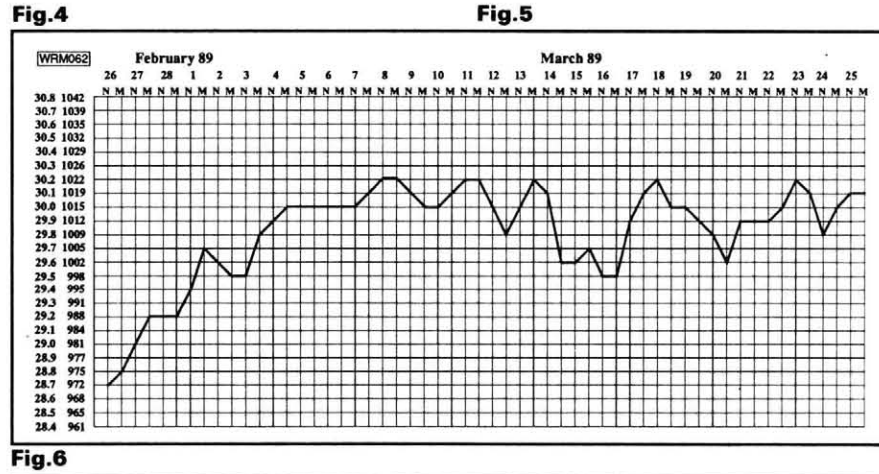


Fig.6

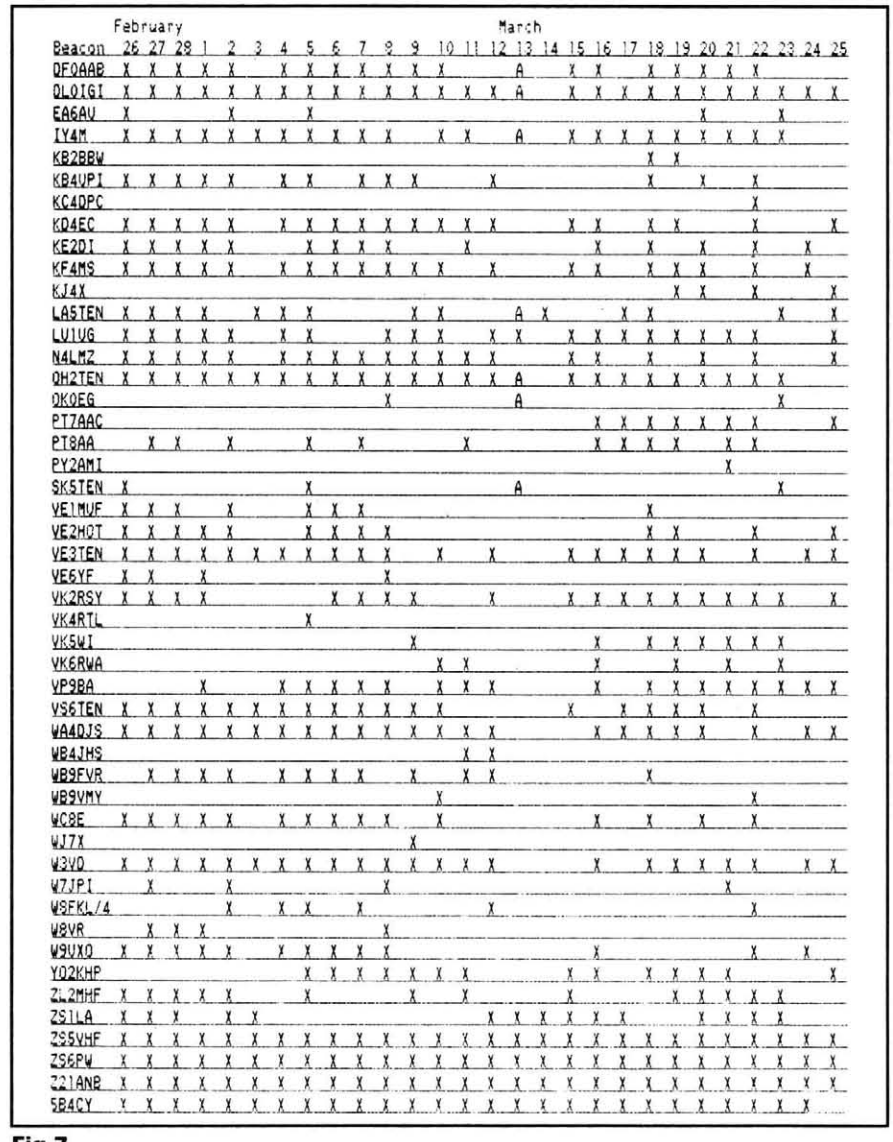


Fig.7

During this period Ern Warwick frequently logged the beacons IK6BAK on 24.915MHz, CT3B, JA2IGY, OH2B, ZS6DN/B, 4U1UN/B, 4X6TU/B on 14.100MHz, DK0WCY on 10.144MHz and occasionally KH6O/B and LU4AA on 14.100MHz.

Tropospheric

The atmospheric pressure for the period February 26 to March 25 was taken at 12 hour intervals from my barograph charts, Fig. 6. In Maldon, Ted Owen's barometer peaked at 1025 (30.25in)and 1026mb (30.3in) on March 11 and 18 and was low at 984mb (29.05in) at the end of February.

THE NEXT THREE DEADLINES ARE MAY 31, JUNE 28 & JULY 26

934MHz

John Levesley UK-627 tells me that the next 934MHz National Field Day is on May 14 and their national contest is on October 15. John worked GY-186 in Guernsey at 160km on March 11 and heard him, but with a scratchy signal, during the evening of the 18th.

Broadcast Round-up

Peter Shore

The change from winter to summer time here in the northern hemisphere caused its usual confusion - for this writer at least, having to cope with the calculation of what's on the air when, and trying not to miss important programmes! Frequencies have changes, too, and we include a selection in this month.

The cyclone which devastated part of Australia in April also affected the new Radio Australia transmitter site at Brandon. Three 10kW transmitters have been moved there, and tests were underway when the winds arrived, damaging the top of the log periodic antenna. It will be at least a month before tests resume following repairs.

If you have ever wondered whether the claims made by broadcasters for the number of listeners are accurate, or simply dreamt up by the publicity people one quiet Friday afternoon, how about this: the Central People's Broadcasting Station in China purports to have 630 million listeners, or more than half the country's population of one billion. Some of the most popular programmes are *News and Newspaper Excerpts* and the *Local News Network* programmes. Almost 500 million tune in to *Half an Hour at Noon*. These astonishing figures for radio listening may perhaps be explained by the shortage of television sets in the country - estimated to number around 10 million.

The Voice of America, which recently disbanded its Thai language service, has started a new project in the Pacific and East Asia region. Radio Thailand has started broadcasting a new one-hour show entitled *VOA Pacific*. The show started in January and is sent to stations either by post or by satellite to US Embassies for distributing locally. The programme content is much like that of *VOA Europe*, with popular music, interspersed with four or so features an hour, in this case looking at topics such as US-Japanese relations, US export policies and so forth. Topical material is not generally included, because of the delay between recording and broadcasting. Recently the output has been increased to two hours a week and the aim is to have the programme fed directly to stations by satellite.

Radio Finland is planning to establish a new long wave transmitter to broadcast Finnish-language programmes to the Baltic countries. Currently, YLE in Helsinki uses a medium wave station at Tapoila which is to be dismantled in the autumn, so a temporary m.f. transmitter will be required to plug the gap between the closure of the existing station, and the construction of the new l.f. transmitter.

Correspondent **Des Walsh** in Carrigaline, Co. Cork in the Republic of Ireland has written to ask why stations such as Radio Moscow use "blanket multi-frequency transmitters in many of the bands, with up to twenty frequencies being used over just two of the bands at times". Des cites, in particular, the R. Moscow World Service in English at 1100UTC which uses eleven audible channels in the 19m band and nine in the 16m band. "Are they all sanctioned by the International Frequency Registration Board for the ITU?" asks Des. The simple answer is "yes", for under the current system for frequency allocation, a station is able to use however many frequencies it likes for transmitting purposes. It must be noted that not all the frequencies are directed to Europe. The particular point about Radio Moscow is that it has many transmitters throughout the Soviet Union and many are used for domestic broadcasting as well as external services, and frequencies often switch from the Moscow 2nd "Mayak" programme to external services (the switching occurs at around nn59.19 when the Mayak interval signal starts). Under the terms of WARC-HFBC, stations will be limited to a specific (much lower) number of frequencies for any one target area, in order to ensure equitable use of the bands. In the meantime, stations such as Radio Moscow are likely to continue to use many frequencies day and night for their short wave broadcasts.

Europe

All times UTC (=GMT)

Radio Austria International's European Service schedule for the summer is:

0400-2300 on 6.155MHz
1700-2200 on 5.945MHz
2000-2300 on 9.87MHz
0400-1700 on 13.73MHz
1300-1700 on 21.49MHz

English programmes are heard daily at 0730, 1130*, 1430*, 1630 and 1930. Broadcasts marked with an asterisk carry the Austrian *Shortwave Panorama* on Sundays only.

Radio Sofia in Bulgaria has English to Europe:

0630-0700 on 11.72 & 9.7MHz
1830-1900 on 11.72, 9.7 & 6.07MHz
2030-2100 on 11.735, 11.72 & 9.7MHz
2130-2230 on 11.72 & 9.7MHz

In Cyprus, it is reported that the Nicosia town authorities are unhappy with broadcasting and, if a licence to operate a local station is not forthcoming, will take to the air with a pirate station. Watch for more news.

The Voice of Greece has changed frequency at 1900-1950 - it now uses 7.43 and 9.905, replacing 6.21MHz.

RTE and Radio Luxembourg's joint long wave project from Ireland will start testing in July, and plans to be fully operational from the autumn on 254kHz long wave. The station, to be known as Atlantic 252 (in anticipation of the move to 252kHz next February) will be aimed at the 16-34 age group, playing contemporary music and will be, according to a station spokesman, "an international station".

Radio Netherlands' *Media Network* programme is now able to be reached by telefax: from the UK dial 010 31 35 218112.

Radio Norway International's new schedule, using 30 minute transmission slots instead of 45 minutes, starts on May 7 - English remains on Sundays.

0600 on 21.725 & 15.165MHz
0800 on 21.73 & 15.165MHz
0900 on 17.84MHz
1200 on 15.325MHz
1300 on 9.59MHz
1400 on 21.705MHz
1600 on 17.78MHz
1700 on 25.73 & 17.78MHz
1800 on 21.73MHz
1900 on 15.22MHz
2200 on 25.73MHz
2300 on 15.19MHz
2400 on 11.845MHz

It is interesting to note that usage of 25MHz has been reduced for the new schedule, despite increasing sunspot activity.

Radio Sweden's English language programmes are now structured for Europe:

1700 on 9.615, 6.065 & 1.179MHz
2100 on 9.655, 11.705 & 1.179MHz

for Asia/Australia

1230 on 21.61 & 17.705MHz
1400 on 21.61 & 17.705MHz
1530 on 17.705MHz
0100 on 17.79 & 15.39MHz

for North America

1530 on 21.61 & 17.88MHz
0300 on 11.705 & 9.695MHz

Broadcasts in Estonian are heard at 1645 on 6.065 and 1.179MHz.

Africa & The Middle East

Radio Nationale Tchadienne in French on 4.904 and 7.12 now has news bulletins at 1330 and 1900, with summaries at 1300 and 1900.

Radio Cairo English broadcasts are as follows:

0200-0330 on 9.675 & 9.475MHz
1215-1330 on 17.595MHz
1630-1830 on 15.255MHz
2030-2200 on 15.375MHz
2115-2245 on 9.90MHz

Radio Kuwait in English broadcasts at 0500-0800 on 15.345MHz and at 1800-2100 on 11.665MHz.
Radio RSA started a new English transmission directed to Africa in March at 1200-1230 on 21.59, 11.90 and 9.585MHz.

Asia & The Pacific

Radio Ulan Bator broadcasts in English on Fridays at 2015 on 11.82 and 9.985MHz.
Voice of Vietnam, Hanoi, is heard in English:

1000-1030 on 15.01 & 9.84MHz
1100-1130 on 9.732 & 7.432MHz
1330-1400 on 15.01 & 9.84MHz
1545-1600 on 12.035 & 10.01MHz
1600-1630 on 15.01 & 9.84MHz
1615-1630 on 12.035 & 10.01MHz
1900-1930, 2030-2100, 2230-2300 & 2330-2400 on 15.01 & 9.84MHz

KSDA is on the air at 0000 on 15.125MHz, 0200 on 11.70MHz, 1000 on 13.72MHz, 1600 on 11.98MHz, 2300 on 15.125MHz. All broadcasts in English last for 60 minutes.
Try Tonga at around 0700 on 5.03MHz, they have a 1kW transmitter which will prove an excellent catch, conditions permitting.

The Americas

The current complete schedule for HCJB in Quito, Ecuador is:

0030-0130 on 15.25, 15.155, 11.775 & 9.72MHz
0130-0430 on 15.155, 11.775 & 9.72MHz
0500-0700 on 11.775, 9.72 & 6.23MHz
0700-0830 on 11.835 & 9.61MHz
(to Europe)
0700-1030 on 11.925, 9.745 & 6.13MHz
(to Australasia)
1030-1130 on 11.925MHz
1130-1200 on 11.74MHz
(to N. America)
1200-1630 on 17.89, 15.115 & 11.74MHz
1900-2000 on 21.47, 17.79 & 15.27MHz
2130-2200 on 17.79 & 15.27MHz

WSHB in Cyprus Creek is now testing, using 9.495MHz at 1100 and is heard, in Spanish, on 17.555 at 2300.
The RCI/R Austria transmitter exchange agreement means that RCI is relayed on 15.275 to the Middle East at 0400 in English from the Moosbrunn site in Austria.

THE NEXT THREE DEADLINES ARE MAY 31, JUNE 28 & JULY 26

ATV

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

Welcome to PW's new ATV column! If this is the first time you have encountered amateur television (scarcely likely) you should enjoy reading about the most highly developed mode in the amateur radio spectrum!, and if you have followed me up the band from the previous frequency, welcome back. Tell everyone else too that ATV is now in PW every month.

And now down to business with the three-monthly activity report. The mildness of the weather did not favour many dramatic tropo openings (at least only one was reported to me), so operating success was down to people's skill (and not the weather).

Stellar Images

Ted Gilbert G8TMM (Harpole, near Northampton) is having an interesting time combining his two hobbies of television and astronomy. He has coupled up a TV camera to a remote-controlled telescope and is now experimenting with overlaying a sky map onto "live" pictures from the telescope. He also wants to try digitising these pictures and processing them with his Atari ST computer, and would be pleased to hear from anyone who has a design for a video digitiser for the ST (and from anyone who has a monochrome video mixer for disposal). Ted is in the callbook or I can pass on letters.

NBTV and 405 Rule OK

It is time I gave another plug for the Narrow Band Television Association. It was founded in 1975 and exists to promote the development, study and use of low definition and mechanical television techniques. Membership is open worldwide to anyone interested and the current subscription is £3 (reductions for the unwaged). There is an annual exhibition and conference held in April or May, and members receive a quarterly newsletter containing 12 pages of technical articles, constructional projects and news. The association also offers a number of special services to members. Activities include the building of experimental cameras, monitors and so on, closed circuit demonstrations, tape correspondence on cassette as well as transmission on the amateur radio bands (mainly 28MHz and 144MHz). Membership enquiries should be addressed to N. Reynolds G8YXL, 6A Collingbourne Road, London W12 0JQ. For information on amateur band NBTV write to D.J. Sumner G3PVH, 20 Woodlands Way, Southwater, Horsham, Sussex RH13 7HZ.
For those whose interests are a little higher in definition, there is the newly reformed 405 Line Group. Members include people interested in collecting and restoring receivers, monitors and cameras, also students of broadcasting history and one member even designs and builds standards converters. A quarterly newsletter keeps members in touch for £5 plus four A4-size s.a.e.s, sent to Andrew Emmerson, 71 Falcutt Way, Northampton NN2 8PH.

News from New Zealand

Our main man in NZ, **Michael Sheffield ZL1ABS**, says that he and Wayne ZL1TVW have been hard at it, promoting ATV. As interest in kits for exciters (*CQ-TV* 122 design) is low, Michael has been building them up and selling them tested and ready to run. As a result sales have shot up. He says he knows the circuit by heart now! Wayne constructs 5.5MHz subcarrier sound generators to go with them and also supplies a p.c.b. for the M57716 linear amplifier module. For those not inclined to construct, he supplies all three units in an aluminium case ready to run. Wayne produces a list of these and other ATV projects and anyone interested should get in touch with him QTHR. The Wellington repeater is back on the air after a year's absence, so we can expect a revival of ATV activity in that neck of the woods.
Things are looking up in Auckland too. While it is still two years for the long-awaited QSY of 602MHz radar to 1300MHz, a good temporary site should be available soon. Plans were in hand to operate the repeater with 443.25MHz in and 615.25MHz out from the AK Group's beacon site. But just as antennas and equipment were being prepared the club was informed that the site owner was going to lay new cable ducts and do general renovations. The 50MHz beacon has been off the air because of waterlogged coaxial cable, and there was no point in replacing it if the new ducts weren't ready. Happily the club has now heard that the works have been completed and the way is clear for the amateur gear to be overhauled. New antennas are to be built for all the beacons and new coaxial cable has been purchased and donated. The ATV repeater is to be installed in conjunction with these improvements. Previous tests from the site have shown no QRM to the radar (unlike the club's Klondyke Tower site, which is unfortunately line of sight to the airport). Klondyke is still the eventual goal, however, as it has superior coverage and good potential for ATV linking between Auckland city, Hamilton city and other locations in the Waikato region.

UK Activity

Dave G8JET in Misterton near Gainsborough, is looking for new stations to work now that he has got back on the air again. G3OSF in Lincoln is a regular contact. Earlier Dave had a rather disastrous encounter with a collapsing wind-up tower - the wire cable snapped and quite a bit of damage was done (though no personal injury fortunately). Dave warns that appearances can be deceptive and just because something used to be safe, that doesn't mean that it always will be. If there's the slightest trace of rust visible on the cable GET IT CHANGED NOW! Unlike cats, ATVers have only one life. Still on the eastern side of the country, **Clive G8EQZ** has been trying out his 1.25GHz (24cm) station. First tests have been in conjunction with Richard G4YTV in Skirlaugh, 13km north-east of Clive's QTH in Hull. So far they have achieved a one-way with P4 results, which is not bad considering no pre-amp is used. They are now looking forward to making it a two-way contact.
Moving south to Kent, **Roy G6OKB** sends us a report from the Isle of Thanet. He says that the Maidstone rally will have a demonstration ATV station operating

under the callsign G8TRF. The event is on May 28, so mark that in your diary. Another ATV special event station will be GB2WVW at Waldershare Park (near Dover) at the vintage vehicle rally on June 24/25. As well as ATV, there will be h.f. and v.h.f. voice stations.

New Video Net

Roy tells us a video net is now well established on 434MHz (70cm) and takes place Monday evenings at 1930. Regular participants are Roy G6OKB, Brian G8ZYZ (St. Margaret's Bay), Les G3LCW (Mongeham) and David G0DQI (Kingsdown). Calling in from time to time are John G8UWS (Hougham), Norman G8GCL (Broadstairs) and Ron G6GHP (Margate). David seems to have a vast store of tapes and entertains the net with these; he is also into DX-TV and satellite reception. The net is more entertaining than technical, concentrating on general interest matters, holiday movies and demonstrations of other radio modes. It sounds like a good deal of fun - it must be, since it even attracts some unlicensed viewers and listeners! Tuesday January 26 saw more ATV activity than normal: there was a good lift on. Roy saw the 430MHz output of the German DB0CD repeater at P2 strength and also managed to work a German station on ATV.

More on 434MHz

From Oxford **Jeff G8PX** says that he is looking forward to the BATC's convention in Coventry. He hopes to develop a little more activity in his area and keeps up a regular 434MHz TV sked on Tuesdays, Thursdays and Sundays. These days G3CU and G6YTW call in, plus G6ZHC when he cannot get contacts on 1.3GHz (hills tend to get in the way). Jeff's latest project is packet radio: he is working on 144.650MHz and learning the AX.25 protocol. It's fun, he says, but a bit on the slow side. You should get ATV news on the BBS". It may get more people interested in ATV. We get the Six Metre, RSGB and DX news on it".

SSTV Programs

"You didn't get the news item on my programs quite right - but never mind", writes Grant G8CGK. "I have two programs for the Sinclair Spectrum which use the same input/output p.c.b.

"WXPR uses an input port to load digital video from the YU3UMV framestore board and store it in memory. It can then print out a picture using an Epson compatible printer. It does not put a picture on the Spectrum computer screen.

"SCRLTV uses both input and output ports and also requires a small interface board to link up the SSTV scan converter to the computer. This also stores a picture in memory and prints it as above. It can also send the picture back to the scan converter where it replaces the usual camera picture - hence disk-based pictures can be called up and transmitted as required. It also has the facility to display the picture on the Spectrum screen with scrolling as described.

"Note that the weather pictures can be called up from disk (or tape) and displayed like an SSTV picture as they both use 128 x 128 pixels and they both occupy the same area of memory." You can get more details by writing to Grant Dixon, Kyrle's Cross, Peterstow, Ross-on-Wye, Herefordshire HR9 6LD. Don't forget to enclose an s.a.e.

More Foreign News

The editor of America's newest amateur radio magazine, ATV Quarterly, is visiting the BATC's convention and will be bringing samples of his new magazine. The April issue looks like surpassing all previous efforts, with 92 pages including some in colour. Technical articles deal with understanding f.m. sidebands, a proc amp, using the Amiga for ATV and much more. The top constructional project is a 13cm p.a. using a microwave oven magnetron and no, it's not an April Fool special! Annual subscription by air mail is $25: write to ATVQ, 1545 Lee Street, Suite 73, Des Plaines, Illinois 60018, USA.

The latest edition of *On-Screen*, the Belgian ATV magazine, has just arrived. Helpfully written in Flemish and French, the articles cover a mini ATV upconverter, a data table of Schottky diodes and a callsign generator (originally published in *CQ-TV*). If anyone one desires a photocopy of this I can oblige for an s.a.e.

Sign-off

That's all for this time. Please let me have all your reports in good time for the next article and send them to 71 Falcutt Way, Northampton NN2 8PH. Thanks.

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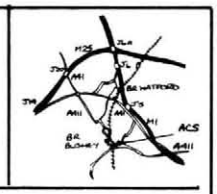
Packet Radio – Now in Watford!



Andrews Computer Services are pleased to announce the opening of their Retail Shop in Watford. We have a live demonstration Packet Station available to you, so that you can compare our range of products or discover what Packet Radio is all about. The shop is open Monday to Saturday 9:00am to 5:30pm and is within easy reach of M1 and M25 motorways (see map) and BR rail links.

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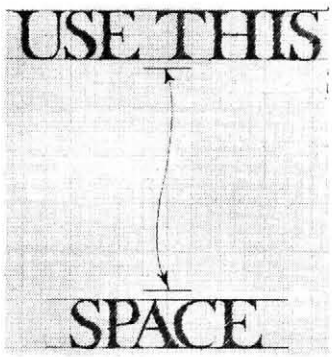
73 from Dave G4KQH, Technical Manager



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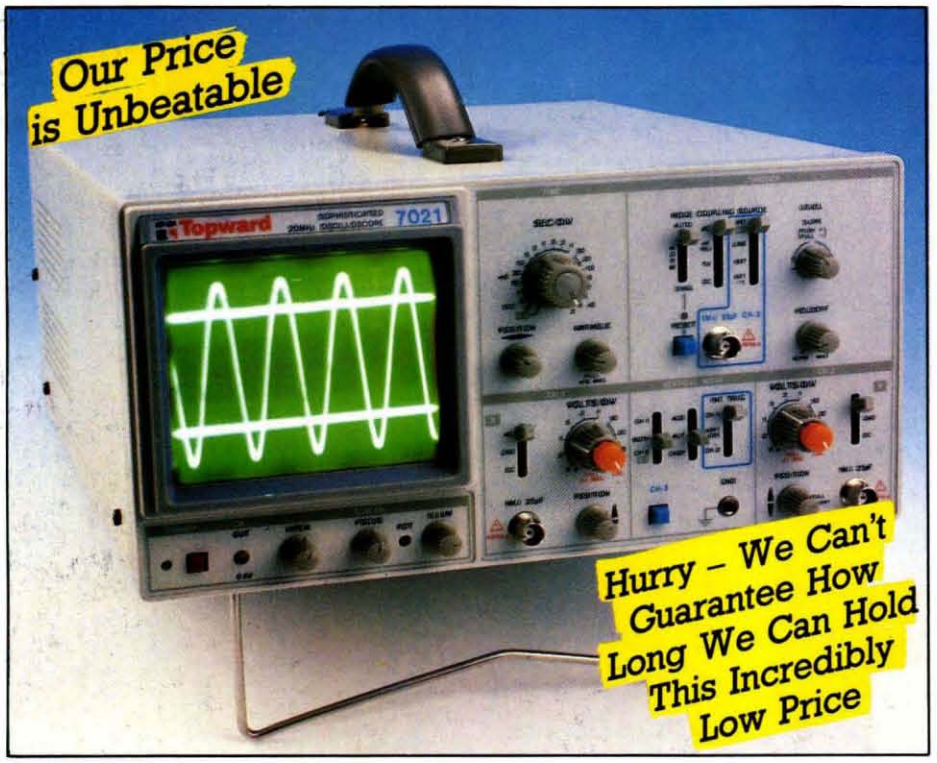

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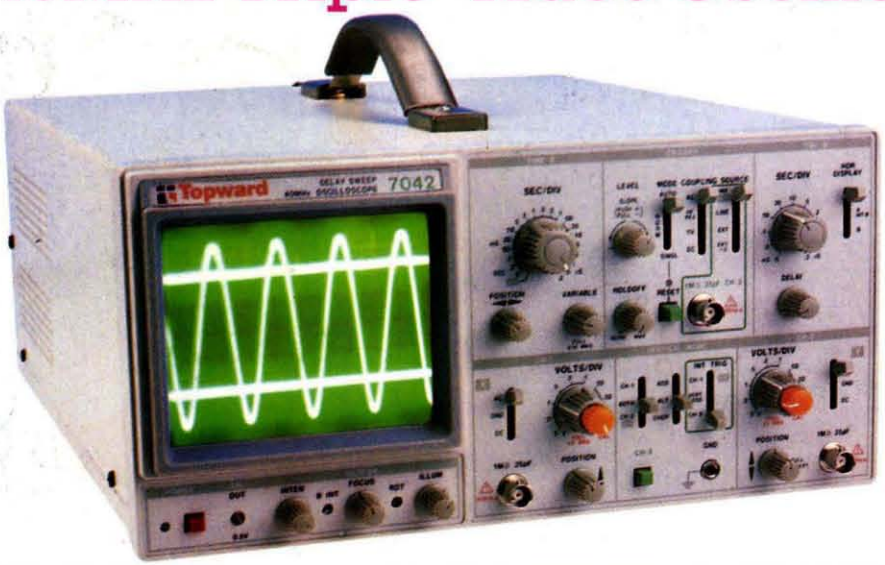

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