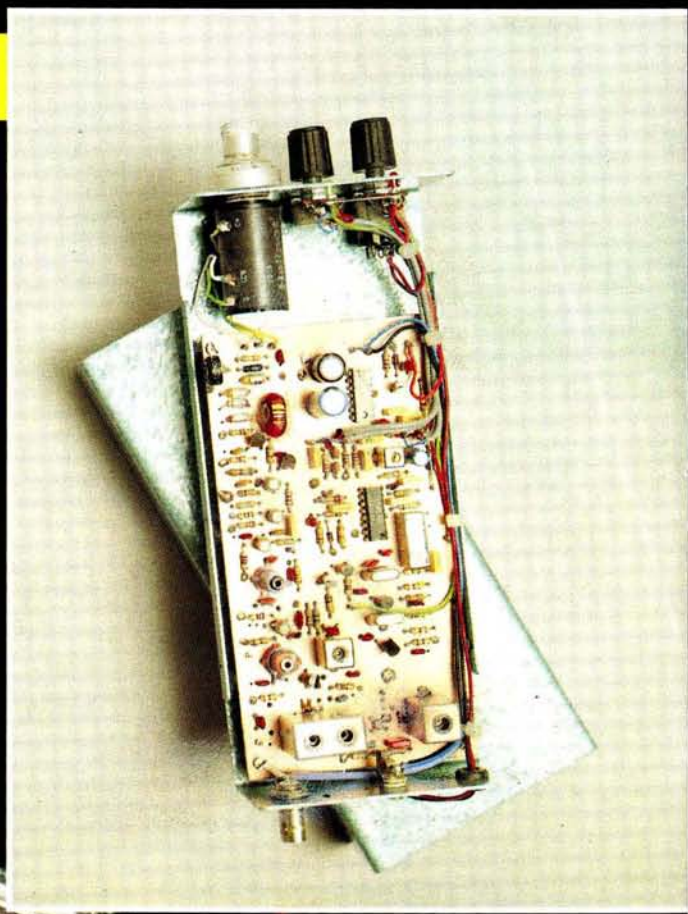
OCTOBER 1988 £1·30

ISSN 0141-0857

Practical Wireless

The Radio Magazine

THE PW "BADGER" Build this 144MHz Receiver



PW READER QUESTIONNAIRE

Your chance to tell us what you think of Practical Wireless

REVIEWED

The Kenwood TM-721E Dual-bander

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

Why just dream of talking beyond earth?

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

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

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

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

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

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

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

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

YAESU

*CW narrow optional

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

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

Practical Wireless
The Radio Magazine

OCTOBER 1988 (ON SALE 8 SEPTEMBER 1988) VOL. 64 NO. 10 ISSUE 979

THIS MONTH

We are sorry that, due to pressure on editorial space, this month's session of Computing Corner has had to be held over

Regular Features

NEXT MONTH

Yesterday's World of Technology (new series)

A Practical Antenna Electrometer

"Valved Comms Receivers" The DST100

The Yaesu FT-747GX HF Transceiver Reviewed and All the usual features

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

On sale October 13

Contents subject to last-minute revision

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ARE COMMUNICATIONS

Kenwood TS440S HF Transceiver

Now available once again from **ARE Communications** the excellent Kenwood TS440S. General Coverage Receiver 100W output between Top band and 10m. FM fitted as standard. Auto Tuning Unit optional extra. Offered at a discounted price of **£1,039.00** or, with ATU **£1,199.00.**

Kenwood TS680S HF and SIX metre Transceiver

Since our introduction of this remarkable transceiver last year, October 1987 to be precise (Dales of Derby please note), many of these are now in use throughout the U.K. From 160m to 10m, including the ever-popular 6m band and a General-Coverage Receiver. Price: **£929.00** including MC43S microphone.

Yaesu FT23R 2M HANDIE

Due to A.R.E.'s continued policy of direct importing from Japan, we continue to offer Yaesu's best seller at a discounted price to full U.K. spec with FBA9 empty battery case, helical antenna and strap. Price: **£195.00** or complete with FNB10 and NC28C charger **£249.00.**

Standard C500 Dual Band Handie

You must have read our adverts by now, we've sold hundreds! 2m & 70cm full duplex 138-170 MHz + 420-469 MHz. Many additional features. Price: **£369.00**

Icom IC32E Full Duplex dual-band handy

Available Ex-stock, the new Icom IC32E full Duplex dual-band handy. Similar in specification to the Standard C500. Frequency range of 138-174 MHz and 410 to 455 MHz. Receive, Amateur Band Transmit.

Ideal for the existing IC2E/02E owner as all accessories are fully interchangeable with previous accessories BP3, battery packs etc. Offered complete with standard battery and charger. **PHONE FOR PRICE.**

Yaesu FT767GX HF + 2m + 6m + 70cm.

Our latest batch direct from Japan guarantees you will not be investing in earlier production models. A complete ham station in one package. All band, all mode, built-in Automatic Tuning Unit, Power Supply Unit, General Coverage Receiver, Digital Power/SWR Meter 100W out, optional 2m/6/70cm modules which just plug in. Price: **£1,369.00** including MH1B8 microphone. Also available with one or all VHF modules fitted. Phone for unbeatable price or part-exchange.

Yaesu FT736R quad band multimode

The KING of VHF/UHF Base stations, the FT736R has all the facilities any discerning user may need, plus the two most important features: Uncompromised receive performance and a clean transmitted signal. A.R.E.'s continued policy of direct importing guarantees you an unbeatable price of **£1,289.00** including MH1B8 microphone; **£1,475.00** including 6m card and microphone.

STOP PRESS . . . DISCOUNTED PRICES ON KENWOOD TS940S AND TL922. BOTH AVAILABLE EX-STOCK.
PHONE FOR DETAILS. ALSO AVAILABLE, THE NEW JST 135. ONLY £1195.00.

PHONE 01-997-4476

Opening Hours Mon/Fri 9.30 to 5.30 Saturday by appointment.

Although infrequently mentioned in our advertising, A.R.E. Communications can supply the complete range of ICOM PRODUCTS. The fabulous ICR7000 and ICR71E receivers, IC735/275/475/575 transceivers, together with the new range of hand-held and mobile transceivers (including the IC32E Dual-bander), all available from stock. Remember, our "MAILBOX" system is still in use and enables us to mail any enquiries quickly and efficiently, plus the added advantage of selling all used equipment at realistic prices. Why wait to place an AD in a magazine? 73 Martin G4HKS

Buy it with Access

A.R.E. Communications Limited, 6 Royal Parade, Hanger Lane, Ealing, London W5A 1ET, England Tel: 01-997 4476 Fax: 01-991 2565

VISA

ommunications ltd. YAESU

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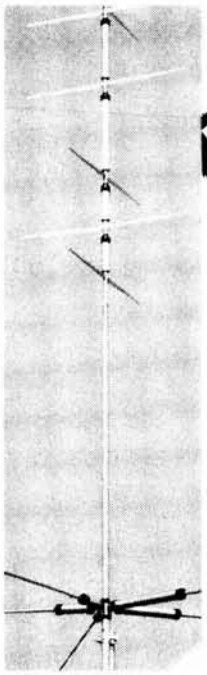


NEW

from COMET & HOKUSHIN

SMC are proud to present 1 new mobile and three new base station antennas incorporating the very latest in aerial technology to give outstanding durability whilst maintaining excellent performance characteristics.

CHA5	WX1	CA2X4 MAX	CA2X4 KG
HF Vertical	VHF/UHF Base	VHF/UHF Base	VHF/UHF Mobile
80-10m 5 band	144/432 MHz	144/432 MHz	144/432 MHz
C/W Radials	4.5/7.2dB Gain	8.5/11.9db Gain	6.0/8.4db
200W Pep	200W Max	200W Max	120W Max
£210.00	**£49.95**	**£99.95**	**£39.95**

Also still available the two best selling amateur antennas, the ubiquitous 78F 2m 7/8 wave £21.15 and the GP144W 2m base £42.00

CURRENT STOCKS ALSO INCLUDE THE FOLLOWING:

BASE ANTENNAS

ABC23	2m 3 × 5/8	£63.97
GP23	2m 3 × 5/8	£45.00
GPV144DX	2m 2 × 5/8 S/Steel	£53.13
GPV5S	2m 2 × 5/8 H/Duty	£45.50
GP432X	70cms 3 × 5/8	£47.50
GP714	70cms	£88.20
358FG	70cms 3 × 5/8 G/F	£57.75
HS965V	60-905MHz	£57.75

DUAL BAND MOBILE

70N2M	2m/70cms fold over	£24.95
727VM	2m/70cms fold over	£30.88
70N2DX	2m/70cms fold over	£37.75

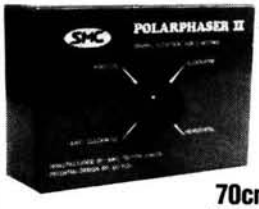
MOBILE ANTENNAS

2QW	2m 1/4 wave	£3.15
2NE	2m 5/8 wave fold over	£13.25
2SE	2m 5/8 wave fixed	£13.25
2VF	2m 1/2 wave fold over	£16.13
78B	2m 7/8 wave ball mount	£15.00
88F	2m 8/8 wave	£24.10
258	70cms 2 × 5/8 fold over	£29.37
268E	70cms	£32.80
358	70cms 3 × 5/8 fold over	£33.73

POLARPHASER

MARK II

NEW



70cms VERSION NOW AVAILABLE

Have you ever wanted to control the polarisation of your xy crossed Yagi from RH-LH, CIRCULAR, VERTICAL or HORIZONTAL, even whilst transmitting? Then this revolutionary product is what you have been waiting for!

The SMC POLARPHASER enables you to alter the polarisation of your aerials continuously through the full 360°. For satellite users the benefits to be obtained from instantaneous shack control of polarisation are obvious, enabling effective utilization of receive capabilities and power resources along with the ability to reduce or even totally eliminate co-channel interference for terrestial use.

	2 metre	70cms
VSWR	less than 1·5:1.	less than 1.3:1
Frequency	144-146MHz.	430-440 MHz
Power	150 Watts.	100 watts
Connectors	SO239 or 'N' (please specify).	'N' type

£49.00 inc VAT (SO239) **£69.00 inc VAT**

£54.00 inc VAT ('N') P&P £2.25

UK Patent No. 2157894A. Manufactured by S.M.C. Design by G2HCG

P.S.U.'s

NEW FROM SMC

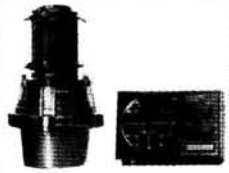
The Communicators

A range of 12VDC power supplies to suit all needs. Specially manufactured to the highest quality using only the best in components and materials. With a choice of either 4, 8 or 2SA continuous output (6, 10 & 35A surge handling) these P.S.U.'s are built to stand the rigours of everyday operation. Both the 8 and 25A units are fitted with overvoltage protection.

All the above power supplies are keenly priced and are available from all leading retail outlets.

		Carriage
3A	only **£19.95** inc VAT	£2.50
8A	only **£59.95** inc VAT	£3.50
25A	only **£175.00** inc VAT	£6.50

ROTATORS



Superb engineering standards combined with pin sharp setting accuracy means new technology from the rotator company

– SMC

ANTENNA ROTATORS

AR200XL	Offset type Twist/Switch control	£38.50
G-250	Bell type, Twist/Switch control	£78.00
AR40	Bell type, Turn/Push control	£155.00
G-400RC	Bell type, 360 deg. meter	£169.00
CD45	Bell type, meter readout	£219.00
G-600RC	Bell type, 360 deg. meter	£219.00
HAM IV	Bell type meter readout	£327.00
T2X	Bell type, meter readout	£449.00
HDR300	Bell type, Digital readout	£699.00
G-800SDX	Bell type, 450 deg. var. spd	£325.00
G-1000SDX	Bell type, 450 deg. var. spd	£368.00
G-2000	Bell type Meter ± 90 deg.	£445.00
KR500	Elevation, Meter ± 90 deg.	£149.95
KR5400	Azimuth/Elev. Dual control	£279.00
KR5400A	Azimuth/Elev. Computer cont.	£339.00

ROTATOR HARDWARE

9523	Support bearing Chan. Master	£19.95
9523/FU200	Support bearing FU200 etc	£21.95
9525	Rotary bearing Guy type	£19.95
KS050	Rotary bearing 1 5/8" mast	£19.95
GS065	Rotary bearing 2" mast	£29.95
GC-038	Lower mast clamp G-400/600	£16.95

ROTARY CONTROL CABEL

RC5W	5way for G-400RC etc. per/mtr	£0.48
RC6W	6 way for G-250/400 etc. per/mtr	£0.66
RC8W	8 way for CD45 etc per/mtr	£0.72

Free carriage on all rotators.
Prices are inclusive of VAT.
Carriage on Rotator Hardware £2.50
Carriage on Rotator Cable £3.50

GUARANTEE

Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-five years of professional experience.

Free Interlink delivery on major equipment.

Small items, Plugs, Sockets, etc. by post £1.75. Antennas, Cables, Wire & larger items. Lynx up to £5.00.
Interlink delivery available, upon request, for items other than radios, from £7.30 depending on weight.
Same day despatch whenever possible.

***FREE* FINANCE . . .**

On many regular priced items SMC offers.
Free finance (on invoice balances over £120) 20% down and the balance over 6 months or 50% down and the balance over a year.
Details of eligible items available on request.
You pay no more than the RRP price!

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

WATERS & STANTON

ALL MAKES OF EQUIPMENT STOCKED
BEST PRICES — FRIENDLY SERVICE

SONY AIR-7 HAND-HELD AM/FM 108-176MHz + LW/MW/FM UNBEATABLE VALUE

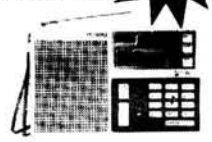
PRICE DOWN

The best VHF monitor there is. That's a fact! 108-176MHz plus LW/MW/FM broadcast. Covers air, marine, PMR etc. LCD display, memories, scanning, lockout priority etc. Supplies are short but we are the UK's largest stockist, so check with us!

£227 FREE SECURICOR

SONY ICF7600DS PORTABLE COMMUNICATIONS

PRICE DOWN

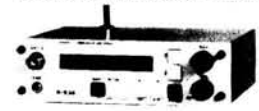


Not a toy, but a serious communications receiver. 150kHz-30MHz AM/SSB plus FM76-108MHz. Digital readout, memories, clock and provision for external antenna. Listen to the DX at work! Mains or battery.

New SW-1 in stock £249

£157 FREE SECURICOR

VHF/UHF AIRBAND MONITOR

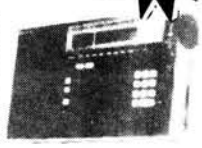


SIGNAL R535
£249
Carr. Free

This latest receiver covers both civil and military bands. Coverage is 108-143MHz & 220-380MHz AM. Featuring a 60 channel memory, the receiver will enable you to monitor virtually any air traffic. The 12 volt requirement makes it ideal for base, mobile or portable work.

SONY ICF2001D RECEIVER SUPER PORTABLE AM/SSB/CW + AIR BAND COVERAGE

PRICE DOWN



Described as "the best portable on the market" by a recent reviewer, it covers 150kHz-300MHz AM/SSC/CW plus AM VHF air band and FM broadcast. Memories scanning, etc. are all included. The SSB performance is superb and can match many base station receivers. 230/110v AC power supply included.

£299 FREE SECURICOR

OTHER SONY PRODUCTS

ICF7600DA Analogue SW receiver	£129.00
ICF-SW1S Micro short-wave receiver	£249.00
ICF-PRO80 SW/VHF receiver	£299.00
AN1 Active SW antenna	£49.00
AN3 Vertical for Air-7 receiver	£45.00
BP23 Ni-cad battery pack	£15.95
ACD4 Mains PSU/charger	£15.95
DCC127A 12v car PSU	£19.95

All our Sony stocks carry UK cards and do not have serial numbers etc. removed from boxes!

R537S AIR-BAND MONITOR 118-136MHz

This well known receiver is ideal for the serious air-band enthusiast, superb sensitivity and selectivity, this pocket size monitor is unrivaled in value for money. 2 fixed channels are possible and the squelch control ensures silent background. Complete with battery and whip.

£69.50 CARR. FREE

SCANNING AERIALS

Better than any pre-amp!

15dB Gain

CLP 5130 Beam

Illustrated above, this beam antenna covers 105-1300MHz. A forward gain of up to 13dB and a front to back ratio of 15dB provides the means of dramatically improving reception. With a VSWR better than 2:1 it can also be used for transmission up to 500 watts. Boom 6', longest EL.6'.

£89.00 plus post £3.00

CLP 5130 50MHz-1300MHz version in stock £179.00 + £7.00 carriage

D130N Discone

The D130 antenna is the leader in discones and used by military and research establishments. What better recommendation! Covering 25-1300MHz with low VSWR, it is supplied complete with 50 ft of ultra low loss cable and N plugs.

£82.50 plus post £3.00

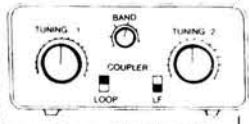
THIS MONTH'S OFFER
A Complete HF Station

£759

OFFER ENDS 8th OCTOBER

This month we are offering a complete HF station comprising FT747 and 30 amp AC PSU for a bargain price. With most rigs costing over £1,000 its nice to offer something a bit more realistic in price! Features include 100 watts output on all bands, Rx from 100kHz to 30MHz. 20 memories, dual vfo's wide and narrow cw filters, digital display, LSB/USB/CW/AM with squelch plus FM option. We have found it to be excellent and can thoroughly recommend it. The matching power supply is generously rated and fitted with thermal fan and full protection.

GLOBAL AT1000 AERIAL TUNER



The AT100 is a receiver aerial tuner designed to give you maximum performance from your receiver. Covering the frequency range 150kHz to 30MHz it matches all the modern receivers produced in recent years. Ideal for matching long wire, dipoles or balanced feeder.

£69.00 POST FREE

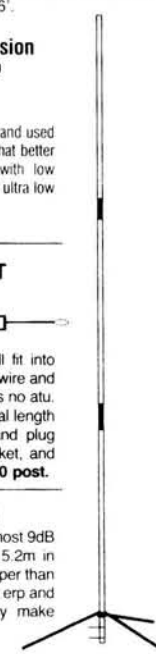
NEW MINI-DIPOLE KIT LF-8040 £29.95

A new low priced hf antenna that will fit into most gardens. The kit is complete with wire and provides a coaxial fed dipole that needs no atu. It covers 80 & 40 metres and has a total length of 70ft. Just follow the instructions and plug your coax feeder into the SO239 socket, and you are ready to go. **£29.95 plus £1.50 post.**

X500 "DOMINATOR" 2M/70cm

The new X500 from Diamond gives almost 9dB & 12dB gain on 2m/70cm. Height is 5.2m in white fibre glass with "N" socket. Cheaper than a linear! Just think, 25w on 2m = 200w erp and 400w on 70cm! Now you can really make yourself heard!

£129 + £3 carr.



BOOKS SPECIALLY FOR YOU!

NEW 1988 EDITION
COMPLETE VHF/UHF FREQUENCY GUIDE 26-2250MHz
£5.95 + £1.00 p&p

Completely revised and updated, this publication is one that should be on every enthusiast's bookshelf. The previous edition sold 6000 copies in 18 months. This latest issue is 25% larger and has been completely re-written with a new easy-to-read layout. No other publication offers you so much information for such low cost. It provides complete details of all the services in the UK that make use of the VHF/UHF spectrum with listings from 26 to 2250MHz without gaps, and additional listings to 56GHz. Each section begins with full details of the services that use each segment of the spectrum followed by details of individual services in frequency order. Users covered include the emergency services, marine, aeronautical, land mobile etc. Many of these services use duplex frequencies and full details of the splits are included for base and mobiles. Although many of the frequencies listed cannot be monitored without a licence, all listenders should find this book a mine of information. Tremendous value!

AIRBAND FREQUENCY GUIDE

The new edition of this famous guide will be available at end of August. Now running to 100 pages, it is crammed with gen that is essential reading for the airband enthusiast. Lots of editorial and pictures plus new cross reference of frequencies in alphabetical and numerical order. Order your copy today.

Price £5.95 +£1 P&P

NEW 1988 EDITION
UK LISTENERS CONFIDENTIAL FREQUENCY LIST 1.6-30MHz
£6.95 + £1.00 p&p
FIFTH EDITION

This famous listing is now in its fifth edition. Completely updated for 1988 and a lot thicker. Many additional frequencies have been added and of course some have been delted where the service is known to no longer exist. Packed full of information on all that happens between 1.6 and 30MHz, you will find this fascinating reading. Covering all aspects of the shortwave service, here is just a selection of the listings included: AVIATION, BROADCAST, MARINE, EMBASSY, MILITARY, RTTY, FAX, PRESS, and much more. Not only frequencies and stations, but in many cases times of transmissions as well. This is not an American import, but a UK printed manual specially for UK listeners. If you are one of the few people that haven't purchased one of these yet, then you really don't know what you have been missing. If on the other hand you have our previous editions, we know that you will want to get the latest edition. Available end of March. Order your copy today.

RECEIVERS (Free delivery)

R5000 Short Wave 150kHz-30MHz	£875.00
R2000 Short Wave 150kHz-30MHz	£595.00
VC20 VHF conv. for R5000	£167.00
VC10 VHF conv. for R2000	£161.95
FRG8800 150kHz-30MHz	£639.00
FRV8800 VHF converter	£100.00
IC-R71 Short wave 150kHz-30MHz	£825.00
Sony 7600DS Short wave	£159.00
Sony ICF2001D band Short wave + air band	£299.00
Lowe HF125 Short wave	£375.00
FRG9600 Scanner 60-950MHz	£509.00
IC-R7000 Scanner 25-2000MHz	£957.00
AOR 2002 Scanner 25-1300MHz	£475.00
Sony Air-7 VHF scanner	£227.00
Sony Pro-80 VHF + SW scanner	£299.00
R537S Air band monitor	£69.50
R535 Air band scanner	£249.00
R528 Air band xtal scanner	£125.00
WIN 008 Air band scanner	£175.00

HF Transceivers

Kenwood TS940S	£1995.00
Kenwood TS930S	£1695.00
Kenwood TS440S	£1129.00
Kenwood TS140S	£859.00
Yaesu FT757GX11	£959.00
Yaesu FT767GX	£1550.00
Yaesu FT747GX	£659.00
Icom IC735	£939.00
Icom IC751A	£1465.00

2M Transceivers

Kenwood TH21E	£189.00
Kenwood TR751E	£599.00
Kenwood TS711E	£898.00
Kenwood TH205E	£215.26
Kenwood TH215E	£252.00
Kenwood TH25E	£258.00
Yaesu FT290 MK11	£429.00
Yaesu FT23R + Pack	£255.00
Icom IC2E	£225.00
Icom IC02E	£269.00
Icom IC28E	£359.00
Icom IC275E	£1039.00
Icom IC3200E	£556.00
Icom IC Micro	£239.00

70cm Transceivers

Kenwood TH41E	£218.00
Kenwood TS811E	£998.00
Kenwood TH405E	£273.00
Kenwood TH415E	£298.00
Icom IC4E	£285.00

Station Accessories

Adonis AM 303G Mic	£49.95
Adonis AM 503G Mic	£65.95
Adonis AM 805G Mic	£96.00
Adonis FX8 Dash mic	£69.00
Sagant superod 2m	£12.95
Sagant stubby 2m ant.	£9.95
P300 30amp PSU	£149.00
Revex MS1 Monitor	£249.00
Airband Mag antenna	£29.00
HP4A TVI Braid Breaker	£7.95
HK708 Morse key	£21.95
G5RV Ant. complete	£16.95
New Diamond VSWR Meters:	
SX200 1.8-200MHz	£65.00
SX400 140-525MHz	£79.00
SX600 1.8-525MHz	£119.00

Carriage: Free on orders over £100. Under £100 add £2.50 for larger parcels & £1.00 for small packages.

POCKET GUIDE TO FAX & RTTY STATION FREQUENCIES
£2.95 + 90p Available now.

ALINCO
SAVES YOU MONEY & SERVES YOU WELL

★ 144-146MHz (Rx. option 140-170MHz)
★ 25 watts output. ("HE" model 45 watts)
★ 21 memories & 2 "call" channels.
★ Programmable Scanning & Priority channel
★ 12.5kHz & 25kHz steps.
★ Includes microphone & mobile mount.
★ Bright LCD display
★ Reverse repeater etc.

2m FM Mobile ALR-22E

£249

Designed for optimum performance combined with small size, the ALINCO ALR-22E reaches new heights in both technical performance and value for money. We've managed to keep the price down to a level that cannot be matched by any other manufacturer although we believe that a small increase will shortly be made to the price. What better time therefore, than now to purchase one of these super rigs. You won't see prices like this again! Technically it's superb and inside it looks very much like some of its more expensive competitors! Measuring only 5.5" × 6.5" it will fit into most places and if you ask, we will extend the frequency range to cover 140-170MHz on receive. We could bore you with the specification but frankly its just the same as all the others (apart from the price of course). We could tell you about all the various features it has, but again its not much different from the competition. Lets be honest, apart from being scorne £100 cheaper than some of its competitors and having an extended receiver coverage, it really is like most other rigs. So if money is no object and you only want 144-146MHz coverage, you probably won't be interested in the ALR-22E. If on the other hand these things are important to you. why not send for the full colour brochure today.

★ 2M FM 144-146MHz
★ RX 140-170MHz!
★ 3 Watts output
★ Battery Saver
★ 10 memories
★ LCD Readout
★ S-meter
★ Tone Burst
★ Priority
★ 12.5KHz steps
★ 12v DC operation!

Another winner from ALINCO. A true handy transceiver with no extras to buy! Unlike its competitors, you get the nicad pack (500mAH) AC charger, and provisions for direct 12v DC charge. Measuring 168 × 61 × 30mm it's a beauty! Optional accessories include speaker-mic, mobile bracket and high power packs. Get the facts today!

DJ-100E 2M FM

NEW

Available September

SEE PAGE 26 FOR REVIEW

ALD-24E 2m/70cm Dual Band FM
See colour photo on front cover

£449

★ 2m/70cm. Full duplex operation.
★ 25 watts FM on both bands.
★ Single antenna socket output.
★ 21 memories & 2 "call channels".
★ Programmable scanning and priority.
★ 12.5KHz & 25KHz steps.
★ Includes all hardware & microphone.
★ Bright LCD readout.
★ Reverse repeater operation.
★ 12 months warranty parts & labour.

OTHER ALINCO ITEMS

ALR22HE 50 watt	299.00
ALR72E 70cm mobile	299.00
MM1 mobile mounts	10.95
ALX2E 2m h'held	189.00
EBP3N Batt pack	28.95
EBP2N Batt pack	23.00
EDH10 DC to DC	16.95
ESC5 Case and clip	15.50
EDC2 Cigar charge cable	6.50
ELH230D11 30w Amp	75.00
ELH260D 50w Amp	119.00
DC1 DC leads for mobiles	5.95
DC2 DC lead for amps	4.50

NEW DUAL BAND HANDHELD!

The new ALINCO DJ-500E will shortly be available covering 2m & 70cm with full duplex. Features include 10 memories on each band and programmable offsets. Receive frequency can be extended from 130-169 & 420-469MHz approx. Measuring 58 × 176 × 30 mm it is pretty compact. As usual all the standard accessories are supplied at the basic price. Watch for our super opening price!

ALINCO DJ-500E 2M/70 cm

★ 2m/70cm Coverage
★ Full duplex
★ Extended Rx ranges
★ Programmable Memo
★ Scanning
★ Keyboard Entry
★ Compact size
★ No extras
★ Price? T.B.A.

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Tel: (0702) 206835, 204965
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Tel: (04024) 44765
Visa and Access by telephone. 24hr. Answerphone.

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PROGRAMMABLE SCANNING RECEIVERS

THE BEST CHOICE FOR YOUR HOME OR CAR

A **Realistic PRO-2004.** The ultimate in today's solid-state high-technology scanners! Delivers a wide range of frequencies not found on most scanners. Search mode finds new channels, selectable scan and search speeds, two-second scan delay. Lock-out key for temporarily bypassing channels. Squelch control and priority function. Continues tuning from 25-520 MHz and 760-1300 MHz. 300 channels for storing frequencies. Large LCD channel/frequency display with electroluminescent back lighting, built-in speaker, telescoping aerial. Jacks for external aerial, headphone, external speaker, tape record and DC power supply. Measures: $2^{3}/_{16}$ x $10^{11}/_{16}$ x $8^{11}/_{16}$". Mains operation (or 13.8 VDC neg. gnd. power cord, extra). Memory back-up requires 9v battery. **20-9119** **£329.95**

B **Realistic PRO-2021.** Features direct keyboard entry, search and scan in two speeds and two-second scan delay. Priority function will automatically switch to the priority channel when a call is received on it and individual lock-outs for temporarily bypassing channels. Scan up to 200 channels in these bands: VHF Lo 68-88 MHz, VHF AIR 108-136 Mhz, VHF Hi 138-174 MHz, UHF Lo 380-470 MHz and UHF Hi 470-512 MHz. Easy-to-read LCD channel/frequency display with electroluminescent back-lighting, squelch control and built-in speaker, telescoping aerial. Jacks for external speaker, external aerial, tape recorder and DC power supply. Size: $3^{1}/_{8}$ x $10^{1}/_{4}$ x 8". Includes mounting bracket for mobile use and DC power cord. Mains operation (or 13.8 VDC neg. gnd.). Memory back-up requires 9v battery. **20-9113** **£199.95**

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RAE Confusion

Heads very swollen at this end, in fact we shall probably have to alter all our doors to the Moorish style to allow my free passage through them. Reason—I am through the RAE!

The certificate arrived last week; two credits are mentioned all of which is in part due to the *PW* publication *Passport to Amateur Radio*. I think this is "A1", and as far as I am concerned is "essential reading" for any future candidate.

There seems to be a bit of confusion this year. Pink Pass Slips are definitely no longer issued. Instead two certificates are issued, one being a "you are through" certificate and the other tells just "how well you have done". As I had no Pink Pass Slip my application for an Amateur Licence was returned by the Radio Amateur Licensing Unit at Chetwynd House, Chesterfield. However, after a few phone calls I found out that the City and Guilds had not told Chetwynd House of the change of the art. Just how daft can you get? Chetwynd House need your "how well you have done" certificate in place of the hitherto Pink Pass Slip.

I feel that some mention of this fact in *PW* would not only help the next batch of would-be amateurs (Christmas is not that far off), but would also earn the appreciation of Chetwynd House who are, at the moment, doing their best to cope with a situation which is not of their doing.

N. S. Hemingway, Rochdale, Lancs.

We have had reports from several quarters on this problem, which was apparently due to some sort of brainstorm in the corridors of power at CGLI. We understand that the DTI, RSGB and RALU knew nothing of the change until the new paperwork began to arrive with licence applications at Chetwynd House.—Ed.

No Waiting in Nottingham!

In the penultimate paragraph of his letter "Waiting" in August *PW*, Mr Hawkings has a good point, though not quite accurate! As the college in the Nottingham conurbation which is the major supplier of Amateur Radio Courses, we have to plead guilty to failing to provide non-examination courses for the s.w.l. If Mr Hawkings could tell us where the bodies are we will be only too pleased to provide the facilities for him to run a course for us, as it is evident that he is no beginner. Indeed, his experience from the 1950s would be invaluable. He is not quite accurate in that there are no non-vocational courses, as we run a Constructors' course and have also attempted to run

PW COMMENT

Good Law—Bad Law

IN MY LEADER IN THE MAY ISSUE OF *PW* I talked about the problems being experienced in magazine publishing because of the way that readers use today's advanced photocopying technology, to make unauthorised copies of interesting articles for friends and workmates.

One American hobby magazine, not in the radio field but in model engineering, closed recently with an announcement in its final issue that this was largely due to the loss in sales which had resulted from readers photocopying articles for other hobbyists to use rather than buying their own copy of the magazine.

Similar problems exist in video recordings, where viewers make copies of hired videos to keep for themselves, or tape TV films either for "time-shifting"—to view at a more convenient time than the original broadcast—or to keep for their own collection.

Legislation currently under discussion in the UK, to improve protection for the rights of copyright holders, contained a proposal that video copies made by individuals must be wiped after 28 days. The idea—attractive on the face of it—was that "time-shifting" is alright, but making your own copies of commercial films or videos was to be stopped.

In fact the idea is laughable. Unless, of course, rented videos and TV films could be coded in some magical way, so as to cause the copy video to self-destruct in 28 days. Say! Wouldn't that be a great theme for a TV series!

I am glad to say that common sense won through, and our legislators decided that since there was no possible way that such a 28-day law could be enforced, they may as well drop the idea.

As I've remarked before, no matter how good the idea behind it, law that cannot be enforced is bad law. It invites defiance, and that defiance will soon spread. The present UK law on listening to the radio, as enshrined in the Wireless Telegraphy Acts, is bad law. It says that you may listen to authorised broadcasting stations and to licensed amateur stations, but not to any other sort of station unless you have a particular licence or permit for the radio service concerned.

Now unless you do something really stupid, it is very, very unlikely that you will get found out even if you do listen to other sorts of stations. It would need something of the organisation of a police state, with informers and roving inspectors, in order to enforce such a law.

One way of getting found out is, of course, to make use of information which you gain by listening to those "naughty" stations. Breakdown trucks which are first on the scene of a road accident because they've been monitoring the police, fire or ambulance channels, for example.

Surely it would make more sense to scrap the present listening provisions of the Wireless Telegraphy Acts and replace them by a law which prohibits you from making use of what you might hear. Such law already exists in some other countries, and it could be coming here, too. There have been several broad hints recently from the Radio Regulatory Department of the Department of Trade and Industry, that we may see just such a change announced this year. We'll keep you posted.

I doubt, though, that there will be any change to the provisions of the Interception of Communications Act 1985, which make it an offence to intentionally intercept communications on a public telecommunication system, which for the radio listener means the radio links of any public telephone or telegraph system (e.g. cellular, cordless or radio telephones). The penalty can be up to two years in prison and/or a £2000 fine.

★ ★ ★

I'm afraid we've once again come round to the time of year when we must increase our cover price—it's risen to £1.30 this month, as no doubt you've noticed. You've probably also noticed that some of our competitors have recently applied much larger price rises, which must make *PW* even better value for money by comparison—more pages for less money!

To try to cushion the blow, we're holding our present subscription rates for a further month. If you wish to take advantage of this offer, you have until 8 October 1988 to send in your subscription application or renewal if you are in the UK, or until 31 October 1988 if you are overseas. See page 28.

We're also having to revise some of the charges for our mail order services, to keep up with rising costs. For details see "Our Services" and our individual mail order service advertisements.

Geoff Arnold

an "After the RAE" course—without any success over the last three years.

For your information I enclose a listing of the amateur radio courses being offered by the College in the session 1988/89. *See 'News Desk" pages.—Ed.*

On the subject of Novice/Student licences, where are all the rumours coming from? RSGB deny all knowledge of any proposals! Yet there are documents circulating with suggestions for band allocations and even specimen questions. If these are serious specimen questions then I have the suspicion that with VERY little extra effort the third class recipient of a free—for in effect that is what it will be—handout from the licensing authorities, could obtain a proper licence.

As an RAE tutor over a number of years I know that an individual willing to put some work into their studies is in with an excellent chance. The problem nowadays is not the radio part of the RAE but that many students do not have sufficient command of the English language to decipher the questions; C & G please note!

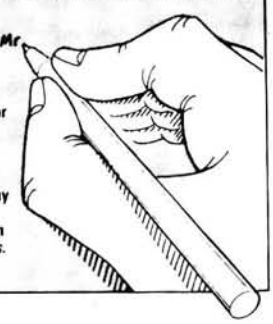
This vociferous minuscule minority who are prepared to give anybody anything are, in my opinion, on a hiding to nothing for, as a professional educator, I find that youngsters nowadays are not interested in anything, cannot communicate their thoughts, and are positively turned off by the thought of that good old Anglo-Saxon four-letter word WORK. I shall await with interest the flood of youngsters into our hobby.

R. G. Wilson G4NZU
Senior Lecturer i/c Radio Courses,
Arnold & Carlton College of Further Education,
Nottingham

There certainly seems to be continued confusion as to just what stage the Novice/Student Licence proposal has reached, with denials, leaks and rumours abounding. If there is no official announcement soon, the whole idea is in danger of descending into farce.—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*.



Broadcast Quality

I live about twenty miles as the wave wiggles from Droitwich. This means that there is a strong BBC signal on long and medium wave averaging about 750mV peak-to-peak from the antenna.

At this level, it is possible to get loudspeaker reception off a crystal set, in fact my 1926 Brownie No. 2 will provide enough urge for comfortable listening on a 2000Ω horn loudspeaker, and splendid results on headphones.

I have been surprised to find that the occasional heavy bass distortion I had noticed on pop and disco music on Radios 1 and 2 through a 1929 KB, and on other ancient and modern mains sets, was also present on the crystal set, so what are the BBC doing? Are they adding too much bass boost to suit ghetto-blasters and plastic squawk boxes, or is it something to do with compressing the wideband stereo signals into mono for the a.m. bands?

At its worst, the distortion sounds like intermodulation, with the bass chopping up the higher registers to give a raw sound like a portable set with failing batteries.

I had to put it down to distortion caused by the strong signal until I tried the crystal set. Perhaps it's a BBC plot to drive us on to f.m.! Has anyone else noticed?

Anthony Hopwood
Upton-on-Severn, Worcs.

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 most 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 68 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 £14 per annum to UK addresses and £18.50 overseas. For further details, see the announcement on page 28 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

NEWS DESK ... compiled by G4LFM and G8VFH

New 2m Rig

Navico have launched a new type of 144MHz band f.m. transceiver. There are two models, the AMR1000 and the AMR1000S.

The AMR1000 is a simple to operate fully channelised set, capable of both 12.5kHz and 25kHz spacing.

The AMR1000S has all the features of the 1000, but has full scanning and priority channel, memories, etc.

Both sets display either the frequency or channel selected, the power (5W/25W) and S-meter strength. The speaker is front facing for mobile use and the 600kHz duplex offset is automatically added for repeater channels.

There are a number of accessories available for these two rigs, extension loudspeakers (one's waterproof), a telephone style handset, a mains p.s.u. and antennas.

The AMR1000 with fistmic costs £215, with telephone handset £240. The AMR1000S with fist mic costs £260 and with telephone handset £279 (all exclusive of VAT).

Navico Ltd.,
Star Lane,
Margate,
Kent CT9 4NP.
Tel: 0843 290290.

Moves to Ban Illegal CB

A reply to a Written Parliamentary Question recently made interesting reading.

"I have tabled an Order under Section 7 of the Wireless Telegraphy Act 1967 banning the import, sale, manufacture or possession of 27MHz Citizens' Band Apparatus which cannot be legally used, and also updated Regulations requiring that 934MHz CB equipment conforms to the appropriate specifications. The widespread sale of unapproved apparatus has led to interference to authorised radio services including, most seriously, to emergency services. The introduction of these measures will ensure that unapproved equipment is removed from the market and that the range of approved equipment covers the new CEPT CB radio service, in harmony with the rest of Europe."

Better late than never, I suppose!

SILVAR Update

In the August issue we mentioned SILVAR (Student International Links Via Amateur Radio). Well, it was due to take place between July 20 and 22. Unfortunately, the schools involved have not achieved the high degree of co-ordination necessary in time. So it has been postponed until a later date, probably the third week in November.

If that gives you more time to organise yourself so you can help, contact:
P. Daly G0GTE,
48 Lincoln Road,
Stevenage,
Herts SG1 4PJ.

Data Service to Schools

The DTI and BT are jointly offering over £500 000 to help all secondary schools install telephone lines to access data services.

The offer means that every secondary school should now be able to install a telephone line to help teachers and pupils gain experience of the sort of data services that are already used extensively in industry.

In recent years, schools have made increasing use of the information services offered by Prestel, NERIS and the Times Network Systems. The DTI have supplied the micros and modems which enable schools to connect to data services, but many schools only make intermittent use of the equipment because there is no suitably located telephone line. The DTI/BT offer aims to correct this.

Local education authorities will be offered £100 towards the cost of installing a new line in every secondary school. The current total cost of installation is £115. Apparently, to qualify these lines must be ordered by the end of September 1988.

RNARS Awards

If you would normally send your application for RNARS awards to Don Walmsley G3HZL, you should note the new address.
Don Walmsley G3HZL.
15 Carter Croft,
Upper Tean,
Stoke-on-Trent,
Staffs ST10 4JB.

Snap-in Switches

ITW Switches have added another version to their Series 18 line voltage selector switches. The snap-in mount eliminates the need for associated mounting hardware. The panel cut-out needed measures 17.2 × 31.5mm.

The switches have an approved rating of 5A, 250V a.c./10A, 125V a.c. They also have a saddle slider arrangement which is lubricated for life, totally retained and enclosed.

For more information on the Series 18 switches, contact:
ITW Switches,
Norway Road,
Portsmouth,
Hants PO3 5HT.
Tel: 0705 694971.

HF Convention 1988

The lecture programme for the HF Convention on September 25 at the Belfrey Hotel, Milton Common, Oxford has been finalised.

1030-1130—"EMC—The Politics and the European Community Directive" by Dan Bernard G4RLE (EMC Committee Chairman) and Alan Dearlove G1WZZ (EMC Committee Member).

1145-1245—"HF Equipment-New or Secondhand?" by Angus MacKenzie G30SS.

1330-1415—Trophy Presentation by the President, Sir Richard Davies G2XM.

1430-1530-"QRP Forum" by Peter Linsley G3PDL and members of the G-QRP Club.

1545-1800—DX Slide Presentations: "Building a US Contest Super-station" by Paul Bittner WOAIH. "The 1988 DXpedition to Kingman Reef, Palmyra and Kiritimati Is" by Paul Granger F6EXV.

Doors open to the Convention at 9.30am and the admission is £3. Other attractions are a car boot sale, WAB stand, Southern 10m FM Group, RNARS QRQ c.w. tests, Doctor DX Computerised Contesting, Pile-up Copying Competition and there will be refreshments available and the bar will be open.

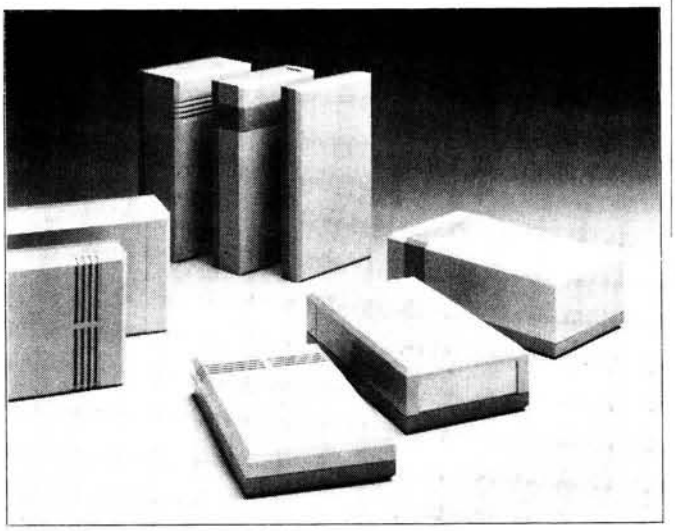
25 Years in Boxes

West Hyde Developments has been supplying the electronics industry with enclosures and accessories for 25 years now.

They are introducing a new range of plastics cases called Elegant. These are manufactured in West Germany by Bopla. The enclosures are moulded from high impact polystyrene with a two-tone light grey finish. There are seven different sizes available and the cases can be used free-standing, wall-mounted or for hand-held equipment.

There are various options available for each size of case, including ventilation slots; flat, aluminium or plastics end panels or clip-in trim pieces.

For more details on the enclosures, contact:
West Hyde Developments Ltd.,
9–10 Park Street Ind Est.,
Aylesbury, Bucks.
HP20 1ET.
Tel: 0296 20441.



The Ex-G Radio Club

The Ex-G Radio Club was founded in 1959 by Reg Cherrill W3HQO. He was a native of Kidderminster and had a love of, and respect for, Great Britain and its citizens. He was obviously not alone and so the Ex-G Radio Club was formed.

Full membership is open to amateurs born in Britain and now domiciled abroad, although present citizenship is not important. Associate membership is open to amateurs living abroad, not British born but whose spouse or parents were.

Ken Haswell GM2CWL has recently taken over the job of the UK secretary/treasurer from Frank Fletcher G2FUX. Ken is handling the distribution of the Ex-G Bulletin in the UK now. He is happy to supply details, application forms, etc., upon receipt of an s.a.e. at 6 Cameron Avenue, Balloch by Inverness, Scotland IV1 2JT.

The licence for the callsign G4EXG is being transferred to George Reid G4OIS. George is a regular participant in many of the club nets and he will be responsible for the proper use of the G4EXG callsign.

The club nets of interest to UK/European amateurs and s.w.l.s are as follows: Saturdays 1830Z, CW Net, 14.065MHz; Sundays 1730Z, Canadian Net, 14.150MHz; Sundays 1900Z, World-wide Net, 14.346MHz; Daily 1230Z, Family Net, 14.333, 21.410, 28.850MHz depending on conditions.

The editor of the Ex-G Bulletin is George Nixon GI3ION/W6, 1140 Sherman Avenue, Menlo Park, CA 94025, USA. George produces some 20 pages of articles and news every quarter and is looking for items of interest—preferably with a UK or Commonwealth flavour! If you can help, please drop him a line.

28/50MHz Capability

The Icom IC-575A transceiver covers two rather under-used bands, 28 and 50MHz. With the sunspot cycle approaching its peak over the next year or so, these bands are improving and many operators are thinking seriously about using them.

The transceiver is an all-mode set with the receiver covering 25 to 56MHz continuously. The transmit section covers 28–29.7 and 50–54MHz. It is also capable of dual band working.

As with many rigs of this type, the various functions are far too numerous to mention in the small space here, interested readers should send for the appropriate brochure for more information. A few of the facilities that caught the eye are that it has full and semi-break in capability on c.w. There are 99 memory channels and multiple scan functions available. The power output is a maximum of 50W for s.s.b., c.w. and f.m. modes and 25W on a.m.

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

College Courses

Birmingham: The Wythall Radio Club will be holding its popular RAE tuition classes again this year. They start on September 8 so you might be just in time. The classes start at 8.30pm in the Club Room, Wythall Park Community Centre, Silver Street, Wythall. Morse classes are available on Tuesday evenings. More details from: ***Chris Pettitt G0EYO. Tel: 021-430 7267.***

Nottingham: A full course for the May exam will run on Wednesday evenings from 6.30pm. The course starts on September 21. A short course aimed at the December exam is on Thursdays starting at 6.30pm. Another short course preparing for the May exam will start on January 12. Other courses available at the Arnold & Carlton College of Further Education, Digby Avenue, Mapperley, Nottingham are: a constructors class on Tuesdays at 7pm, starting September 20; a Morse class on Wednesdays at 7pm starting September 21 as well as a summer term programme with preparing for the RAE and after the RAE. These courses start after Easter 1989. ***Tel: 0602 876503*** for further details.

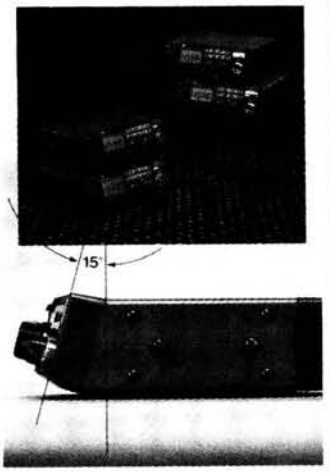
Reach: Both RAE and Morse classes started in September at Reach Village Centre. That's about 9km west of Newmarket. Further details from: ***John. Tel: Newmarket 742039.***

Bristol: The RAE course meets Wednesdays, 7–9pm at the West Bristol Adult Education Areas, Stoke Lodge, Shirehampton Road, Stoke Bishop, Bristol. The Morse course meets on Mondays, 7–9pm at the same venue. The tutor for both courses will be B. E. Carr G4UHQ and the fee for each course is £36.60. Tel: 0272 683112 for further details, if required.

Coventry: The Henley College, Henley Road, Bell Green, Coventry, are again running the RAE course. The classes are Thursday evenings from 7–9pm. Apparently after finishing this course, the college have two suggestions for students. You can either bite your nails waiting for the results or use your fingers on a Morse key and join the Morse course they run. More details from: ***T. Farmer, Tel: 0203 611021 ext 290.***

Solihull: An RAE course will be held at Light Hall School, Shakespeare Drive, Solihull, for the May exam. Enrolment is September 19. The tutor is R. A. Copsey G4TDF.

VHF/UHF & SHF Transceivers



South Midlands Communications have sent only details of the FT-?11 series of transceivers. I say ?11 because the type number depends on the band.

The FT-211RH is the 144MHz band version, the FT-711RH is the 430MHz band one and the FT-2311R is the 1296MHz band version. The range are f.m. mobile/base transceivers.

The reversible sloped front panel allows overhead mounting and has soft green back-lighting of all the controls. Operating features include both push-button and knob memory selection, tuning in selectable steps, ten memory channels storing repeater splits, reverse repeater, call channel recall, various scanning modes and priority channel monitoring.

The FT-211RH has an output of 5/45 watts, the FT-711RH is 4/35 watts and the FT-2311R is 1 or 5/10 watts. The price of the 1296MHz version is £475 including VAT and all are available from stock.

If you would like more details on any of these transceivers, contact:

South Midlands Communications Ltd., SM House, School Close, Chandler's Ford Ind. Est., Eastleigh, Hants SO5 3BY. Tel: 0703 255111

More Laminates

Avel have announced three additions to their range of laminated transformers. They are six 50VA clamp mounting types, six 100VA frame mounting types and five 20VA clamp mounting types with only single 240V primary winding.

All the transformers will conform to BS3535 and to BS415 and CEE15 where appropriate. They will also have options like p.c.b. tags plated for flow soldering, fine winding wires skeined to the tags for extra mechanical strength and insulated terminal covers.

The range has fully shrouded, double-section split bobbins made from 30 per cent glass filled nylon. The transformers are designed to operate at full rating at 25°C and with a maximum temperature rise of 55°C.

Each transformer is subjected to a 4kV r.m.s. flash test and to electrical, mechanical and insulation tests according to the requirements of the particular standards involved in the spec.

More details from:

Avel-Lindbeg Ltd., South Ockendon, Essex RM15 5TD.

Hampshire County Award

To promote activity between stations in the county of Hampshire and other amateurs, the Royal Naval Amateur Radio Society have created this award.

It is made on a points basis, gained for each station contacted within the county boundary. Two points can be gained by working G3BZU or any other RNARS sponsored special event station (such as GB3RN) provided it is operating within the county boundary.

The award is issued in three classes:

Class 1 UK—50 points, EU—20 points, DX—15 points. **Class 2** UK—30 points, EU—15 points, DX—10 points. **Class 3** UK—20 points, EU—10 points, DX-5 points.

All contacts must have been made after 1 October 1960. Log extracts and 50p (UK) or £1 (overseas) to ***Hampshire County Award Manager, G2GM. QTHR.***

More Scope with LCD

An instrument for recording, processing and displaying electrical signals on a liquid crystal digital and dot matrix display is now available from Universal Instruments. Combining the functions of a digital oscilloscope, transient recorder, signal averager and digital multimeter, the Iskrascope uses microprocessor control, a membrane keyboard and adjustable viewing angle screens to display a variety of signals.

The digital oscilloscope mode has a dot matrix display of 100 x 80mm, timer interval measurement from 5µs to 3.5h with the ability to output the register to a recorder for a permanent record. The Y sensitivity is from 5mV/cm to 20V/cm in 12 ranges with the time base going from 10µs/cm to 500s/cm in 24 ranges. Extensive trigger modes are available as well as an analogue output.

Voltage and resistance measurements are indicated on a separate $3\frac{1}{2}$ digit display with volts from 20mV to 650V and ohms from 200Ω to 20MΩ, both in six ranges.

When closed for transit, the instrument measures 83 x 331 x 294mm and weighs 5.1kg (including the rechargeable cells). The price, at £1185 plus VAT for the ODU0401, isn't quite in the hobbyist market, but it sounds like an interesting instrument. For more details, contact:

Universal Instrument Services Ltd., Unit 62, GEC Site, Cambridge Road, Whetstone, Leicester LE8 3LH. Tel: 0533 750123.

Master Class

Kevin Fox G4MDQ plans to start a c.w. master class in the all-mode section of the 144MHz band. From the press release it seems aimed at those in the South Yorkshire/North Nottinghamshire area. The purpose is to encourage people who've mastered the code and acquired a Class A licence to use the code on air.

He hopes this will achieve the following objectives: Improve key technique by regular sending practice. Improve copying and sending speed. Familiarise the budding h.f. operator with c.w. procedures and abbreviations by on-air simulation of an h.f. QSO. Provide "expert" tuition from local h.f. operators.

Members of the net will hopefully acquire the confidence and skills to become multi-talented h.f. operators, able to use both phone and c.w. as they choose. The speed of the net will be governed by the participants, and/or the slowest member(s).

Anyone interested in the appropriate area can contact Kevin on-air between 1730-1900 Monday to Friday.

Mercury Award

This was created to promote activity between Royal Naval Amateur Radio Society members and other amateurs. The basic certificate is issued in three classes: **Class 1** UK, 20 points required. **Class 2** EU, 10 points required. **Class 3** DX, 5 points required.

The certificate allows for increases in increments of 10 points. Band/Mode endorsements need an IRC or s.a.s.e. when applying.

One point is awarded for each contact with a member per band. Contacts with G3BZU or RNARS sponsored special event stations (GB3RN, GB3RM, GB3RNR, GB3HMS, etc.) are worth double points. So are contacts in the v.h.f. bands.

All contacts must be after 1 October 1960. Log extracts and 50p (UK) or £1 (overseas) to ***Mercury Awards Manager, G3HZL, QTHR.***

RMS Accuracy

The latest Hioki digital multimeter from Universal Instruments is a 19999 count $4\frac{1}{2}$ digit instrument with a basic d.c. voltage accuracy of 0.04%. Resolution for both a.c. and d.c. is 10μV and a wideband frequency response with true r.m.s. reading gives accuracy even with distorted waveforms.

The Model 3230 uses a large 12mm character size l.c.d. with function annunciators for easy reading. Measurements of d.c. voltages are from 10μV to 1000V and a.c. voltage measurements are from 10μV to 750V with specification accuracy provided to a bandwidth of 100kHz. Resistance is from 10mΩ to 20mΩ, both d.c. and a.c. from 1μA to 20A plus and audio/visual continuity and diode check.

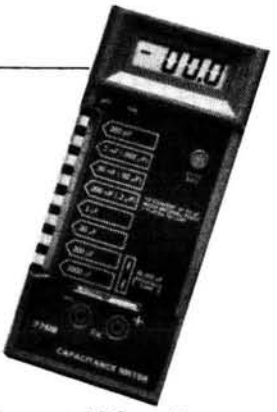
The unit can be run for about 70 hours from a single 9V battery or continuous use from a standard a.c. adaptor. The input impedance is greater than 10mΩ on all ranges, with the lowest range being better than 100mΩ. The multimeter comes complete with battery, test leads, spare fuses and instructions for £318.05 excluding VAT. More details from:

Universal Instrument Services Ltd.,
Unit 62, GEC Site,
Cambridge Road,
Whetstone,
Leicester LE8 3LH.

Digital Capacitance Meter

Levell Electronics has introduced a new, wide-range, hand-held digital capacitance meter. This instrument has a $3\frac{1}{2}$ digit, 12mm high liquid crystal display and will measure capacitors from 0.1pF to 20 000μF.

The accuracy on most ranges is ±0.5% reading ±1 digit. The meter is powered by a PP2 type battery with low battery and over-range readings indicated on the display. It weighs only 350g and measures 180 × 87 × 42mm. The case is made of high impact ABS and is provided with a tilt stand for bench use.



For more details on the 7705 capacitance meter, contact:

Levell Electronics Ltd.,
Moxon Street,
Barnet,
Herts. EN5 5SD.
Tel: 01-440 8686.

MK From STC

MK Products are now available from STC Electronic Services. On the leaflet they sent recently five different products were detailed.

There were filtered mains sockets, designed to combat the effects of voltage spikes and transients on the mains wiring. These can be very useful if you run computers and the like. The sockets provide "two-way filtering" so preventing a noisy piece of equipment from creating local transients.

Another product range are the residual current circuit breakers. MK produce both the type that plugs into any standard 13A socket outlet and the type which replace 13A sockets. In each case the trip current is 30mA.

For more details of these and the other MK products that STC now stock, contact:

STC Electronic Services,
Edinburgh Way,
Harlow,
Essex CM20 2DF.
Tel: 0279 26777.

Modular Enclosures

SRS have introduced two new versions of the Varicon 19in enclosure system. The 300 series is available in three different depth and nine height measurements. Doors and/or insert panels are provided with locking handles to allow the cabinets to be serviced from all angles.

The 500 series enables the components to be mounted onto a 180° swing frame allowing the entire contents of the cabinet to be reached easily.

Both series features include vent slots in blank doors and insert panels; cable entry plates for the bottom panel; earthing points in doors, side panels bottom panel, top plate and corner joints plus a decorative strip for name insertion. For further details, contact:

SRS Products Ltd.,
19 Mead Industrial Park,
Harlow,
Essex CM20 2SE.
Tel: 0279 418401.

Memory Problems Eliminated

One problem with NiCad cells is their gradual loss of capacity, brought about by recharging before the cells have first been totally discharged. This loss occurs because cells tend only to remember the level of charge put back rather than the original capacity.

Cirkit Distribution have manufactured the NC101 discharge/charge cycler to combat this problem. It is completely automatic from start cycle through to fully charged condition. Four current selectable ranges are available for a variety of battery packs.

Once the batteries have discharged to one volt per cell, charging commences under the control of a precision crystal oscillator at charging currents determined by electronic constant current control circuitry. When full charge is reached, charging stops and an indicator shows that the batteries may be removed.

The discharge period varies with the initial discharge state of the batteries. The maximum cycle time is 8 hours 33 minutes, but will normally be around 6 hours says Cirkit. The unit has two outputs, the first with fixed settings for an eight-cell NiCad battery pack of either 500 or 600mAh and the second for a four-cell NiCad battery with selectable capacity of 225, 500, 600 or 1200mAh.

For safety, outputs are short circuit protected, there is an audible warning of reverse battery polarity, open circuit protection and a split bobbin transformer and internally fused mains.

The NC101 is available ready built at £49.95 including VAT, or in kit form (comprising board level kit at £27.10 and hardware kit at £12.50, both including VAT).

For more details on the NC101, contact:

Cirkit Distribution Ltd.,
Park Lane,
Broxbourne,
Herts. EN10 7NQ.
Tel: 0992 444111.

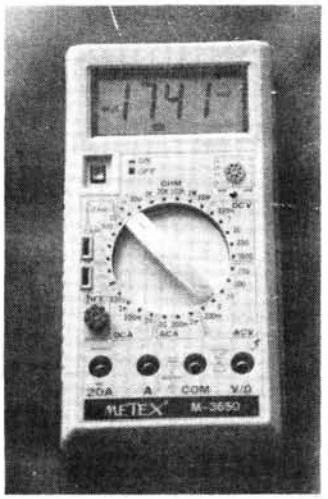
Multimeter Plus

The new multimeter from Alpha Electronics does more than the usual d.m.m. functions. It has the additional benefits of capacitance and frequency measurement too. The basic d.c. accuracy is 0.5%.

The 3650 has a large $3\frac{1}{2}$ digit liquid crystal display and is capable of measuring a.c. and d.c. voltages to 750 and 1000V respectively. Alternating and direct current can be measured to 20A and resistance is measured to 20MΩ. Capacitance, frequency and both audible and visual continuity tests, as well as diode and hFE tests are also possible.

The unit is powered by a single 9V battery and uses c.m.o.s. technology with a dual slope integrated a/d measuring system. It has an input impedance greater than 10MΩ.

The unit comes complete with battery, test leads,



spare fuse, solid carrying case and full operating instructions for £59.95 plus VAT.

For more details on the 3650 d.m.m., contact: ***Alpha Electronics Ltd, Unit 5, Linstock Trading Estate, Wigan Road, Atherton, Manchester M29 0QA. Tel: 0942 873434.***

Intelligent LCD Modules

Crotech is now stocking reflective, transflective and transmissive l.c.d. modules that display up to 160 alphanumeric characters. The modules are available with a choice of formats from 16 to 40 characters per line and up to four lines. Power requirement for all types is a single +5V line.

Crotech provides installation kits with each module that simplify mounting in standard rectangular panel cutouts. The kit includes a protective window and adjustment pots for contrast and back light level.

For more information on these l.c.d. modules, contact: ***Crotech Instruments Ltd, 2 Stephenson Road, St Ives, Huntingdon, Cambs. PE17 4WJ. Tel: 0480 301818.***

Special Event Stations

GB2WVR: This station will be on the air for the World Veteran Rowing Championships in Strathclyde Country Park, Motherwell. The dates for this event are September 5 to 11. For more details contact: ***Brian GM0EGI. QTHR, or Paddy GM3MTH. QTHR.***

GB1RLD: Two members of Radio Link—Derby Hospital Broadcasting will be operating the special event station from the outside broadcast caravan at the City Hospital, Derby. They will be using 144MHz v.h.f. on September 17 and 18 from 1000 to 1600. ***John Huddlestone G1UJX. Tel: Derby 676822.***

GB2LNM: The Loch Ness Monster special event station will be on the air over the weekend September 24 to 26. Operation will be on 3.5 to 28MHz using mainly 3.7MHz ±, 7.065MHz, 14.140-14.240 and other bands as conditions permit. The long awaited Nessie Appreciation Society Certificate should now be available, for more details, contact: ***Paddy GM3MTH. QTHR or Danny GM4LDU. QATHR.***

Rally Calendar

*PW/SWM in attendance

***September 11:** The Lincoln Hamfest will be held at the Exhibition Centre on the Lincolnshire Show Ground site. Admission is by lucky programme. All the usual attractions will be there.

September 20: The annual Amateur Radio Auction and Barbecue will again take place at the Cricket Pavilion "B" Building Entrance, BTI Radio Station, A5 Trunk Road, Hillmorton Rugby. It's organised by the Rugby ATS. The admission charge is only 20p per person and the large car park is free. Anyone may place an item in the auction, with or without a reserve price, free of charge. However, the Rugby ATS will retain 10% (£10 maximum) on all items sold.

September 24/25: The first EI Hamfest will take place at the Grand Hotel, Malahide. Co. Dublin. There will be a dinner on the 24th, with a grand draw at 5.15pm sharp on the 25th. The weekend will consist of sessions on all aspects of amateur radio together with lectures by Louis Varney G5RV and it is rumoured that Hugh Turnbull, the Director Atlantic Division of the ARRL will be giving a lecture too. Talk-in will be on S22. More details on all the events and available accommodation at the hotel can be obtained from: ***Christopher Yeates EI7AAB. Tel: Dublin 215145.***

September 25: The 1988 Harlow Mobile Rally will be held in the Harlow Sports Centre. Doors open at 10am and the admission has been held at £1 for adults, accompanied children free. There is ample free parking adjacent to the sports hall and there will be reserved parking for the disabled. Morse tests will be available and can be booked through the RSGB. Catering will be available in the new Time Out cafeteria and lounge bar. Details from: ***G4MIS. Tel: 0279 722622*** (evenings and weekends).

September 30–October 9: The BBC Radio Show will take place at Earls Court, London. Doors are open from 10am to 10pm except Saturdays and Sundays when it's 11am to 7pm. It's a "one-off" event, timed to celebrate 21 years of broadcasting by Radios 1, 2, 3 and 4 and local radio. The Show will have a central feature of a stage set complete with broadcasting studio. On this stage, almost continuous shows will be presented.

October 2:** The Welsh Amateur Radio Convention is at the usual venue, Oakdale Community College, Blackwood, Gwent. More details from: ***B. Davies GW3KYA. Tel: 0495 225825.

October 9: The Armagh Radio Rally is to be held in the Drumsill House Hotel. Doors are open from 12 noon to 6pm. For more details of this successful rally, contact: ***J. A. Murphy. Tel: Armagh 522153.***

TV Antenna Amplifier

An increasing number of households now possess two (or more) TV sets, most usually working off the one antenna. Maplin Electronics have introduced an antenna amplifier which serves to boost the signal to one TV set or overcomes the losses which occur when two TV sets are operated from one antenna.

The white amplifier box (151 x 79 x 52mm) can be fixed to the wall or left free-standing. It features an on/off switch and red "on" indicator light. The unit can be left on continuously, if wanted.

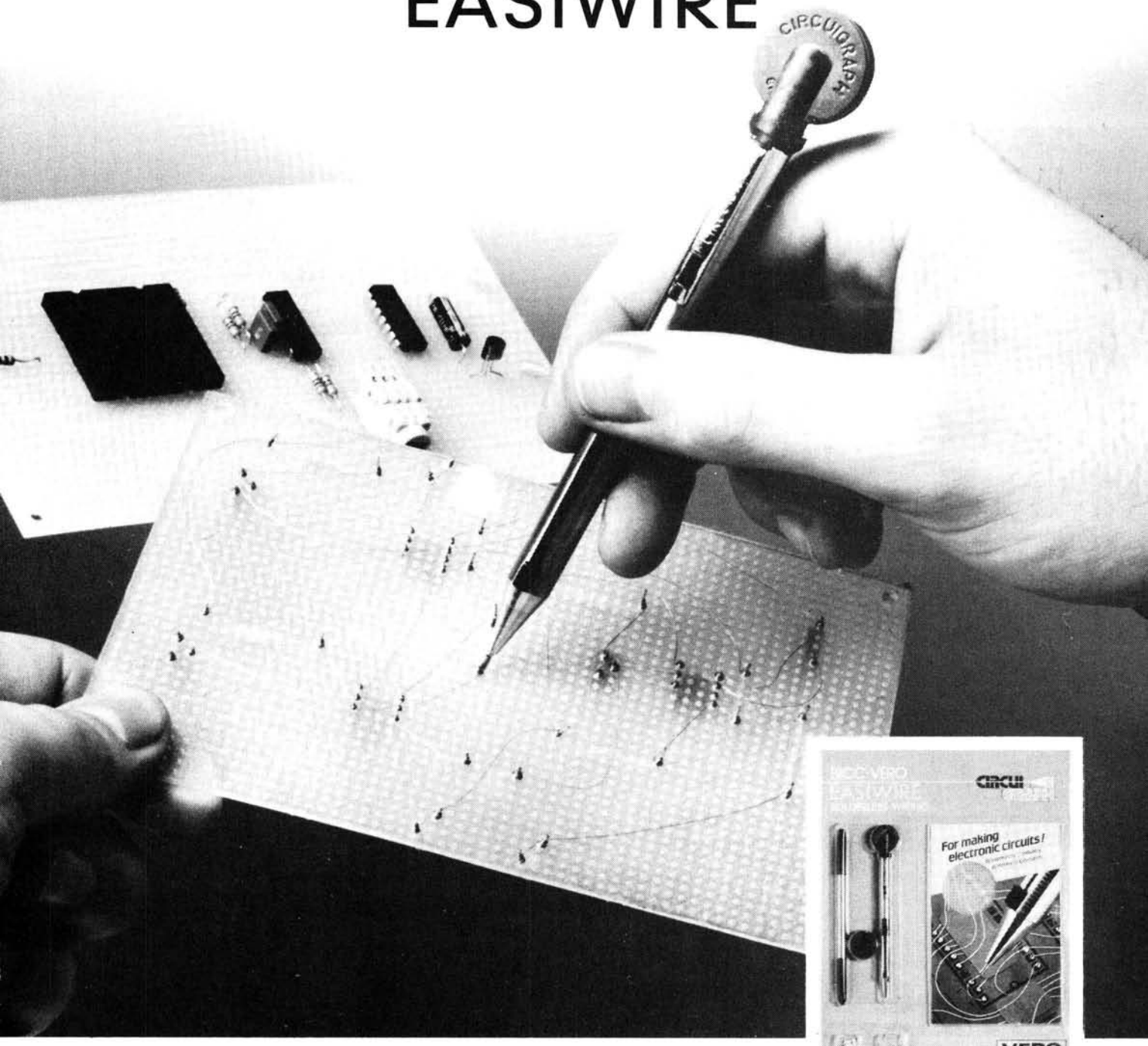
The amplifier has three coaxial sockets. The antenna lead plugs into one and the TV set/sets plug into the other two sockets. The 1.8m mains cable should be connected to a plug fitted with a 3A fuse.

Bandwidth: 470-860MHz
Typical Gain: 7dB
Maximum Output: 96dBμV
Input/Output Impedance: 75Ω
Cost: £11.95

For more details on the antenna amplifier, contact: ***Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR.***

SOLDERLESS WIRING

EASIWIRE



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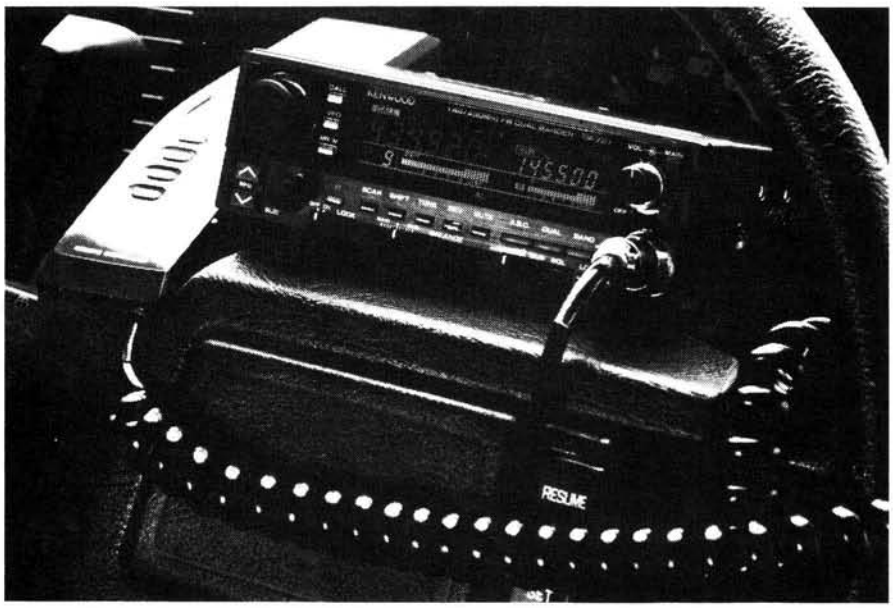
PW REVIEW

Kenwood TM-721E 144/430MHz Transceiver

Following on from his recent user review of the Alinco ALD-24E dual-band mobile transceiver, Ken Michaelson G3RDG turns his attention this month to the new dual-bander from Kenwood.



We recommend you don't wind the mic cable round the steering wheel like this!

The TM-721E is really two complete units in one box, with the facility of being able to tune in a station on each band and feed both signals to a common loudspeaker. Their relative levels can be manipulated by a balance control so that you can actually listen to two stations at the same time! It has two readouts of frequency on the display, the main band being used shown on the left-hand side in large numerals and the other band, termed the "sub-band", being in smaller numerals with the world SUB shown above it.

On first impressions I thought it was going to be a very complicated rig to operate, but after a few minutes of thought and careful reading of the instruction manual, everything fell into place.

Installation

The frontal area of the rig is the same size as a normal car radio, but the depth is greater, being 219mm with the substantial cooling fins on the back, so it might not be possible to mount it in the normal radio opening. I hung the review rig from the underside of the car fascia using the mounting bracket supplied, with the antenna and power leads coming in from under the carpet.

The antenna used for the mobile tests was a Diamond DP-EL770H dual-band whip, which was secured to the car roof by an SAGMS magnetic mount. Since the TM-721E has separate inputs for the two bands (SO-239 for 2m and "N" for 70cm), I had to use a diplexer which, in this case, was a Maldol type HS-780 unit.

Controls

The main tuning is done by a 20mm diameter knob on the far left of the panel. This control operates in steps, which are factory-set at 12.5kHz for the 144MHz band and 25kHz for the 430MHz band. Both these figures can be altered should the need arise, and can be set to 5, 10, 15, 25 or 12.5kHz. First the F (function) button is pressed and then the REV/STEP button. The current stepping rate will then be shown on the display. A different rate can then be selected by turning the tuning knob (or pressing the UP/DOWN buttons on the microphone). That's all there is to it. The actions to do this have to be completed within five seconds of pressing the F button, otherwise the unit reverts to normal operation. This gave me quite a surprise the first time it happened.

I should point out that the F button is coloured orange and the three functions which can be carried out after pressing it—L OUT, STEP and DIM—are also lettered in orange.

To the right of the main tuning control are three push-button switches arranged vertically. These are TONE, VFO and MR/M. The description of the operation of the TONE button is not quite clear from the instruction manual as it suggests that in the European version when the button is depressed "the repeater control signal of 1750Hz is activated", and in the UK version "the key is used to activate the 1750Hz tone burst". In fact, when the button is depressed the letter T appears in the display area, and when the p.t.t. switch on the microphone is pressed, a tone is automatically transmitted. The sending of the tone is cancelled by a further pressure on the button, at which time the letter T disappears from the display area.

The next button down, VFO, is used to return to the VFO mode after operating in the MR (memory recall) mode. The last button is MR/M, which is used to access the memory channels and also to store frequency and shift in the memories, of which there are 14, numbered 0–9 and A–d.

It is a simple matter to enter any desired frequency into the memory area. The frequency and shift should be selected using the VFO button. The F button is pressed next, and the memory channel indicator in the display area lights. The desired channel is now selected using either the main tuning knob or the UP or DOWN buttons on the microphone. Pressing the MR/M button again writes the information into the particular memory channel selected, the F indicator and the memory channel number illuminations go out and the unit returns to the VFO mode. All perfectly straightforward, the only thing being that all this has to be completed within five seconds, otherwise the TM-721E reverts to the VFO mode! However, after a little practice I found no difficulty in completing the operation within the required time.

Under the main tuning control are two buttons, one marked with an arrow pointing upwards and the other an arrow pointing downwards. These move the operating frequency in steps of 1MHz up or down. To their right is a small knob which is complementary to the main tuning control but acts on the "sub-band", moving it at the same rate as the main band. I found this very useful.

Beneath the display area are nine push-buttons, commencing with the previously mentioned F key. The others are as follows: SCAN—self-explan-

★ MAKER'S SPECIFICATIONS

GENERAL

Frequency range:	144–146MHz 430–440MHz
Emission mode:	F3E (f.m.)
Antenna impedance:	50Ω unbalanced
Supply requirements:	13.5V d.c. ±15% Transmit: 9.5A (max) Receive: 600mA (squelched)
Dimensions:	150W x 50H x 219D mm (overall)
Weight:	1.8kg (3.97lb) approx.

RECEIVER

Circuit type:	Double superhet IF1 16.9MHz (v.h.f.) 30.825MHz (u.h.f.) IF2 455kHz
Sensitivity	(for 12dB SINAD): <0.16μV
Selectivity	(–6/60dB): >12/>24kHz
Spurious responses:	>–60dB
Squelch sensitivity:	<0.09μV
Audio output:	>2W (8Ω, 5% t.h.d.)

TRANSMITTER

RF output power:	5W/45W (v.h.f.) 5W/35W (u.h.f.)
Maximum deviation:	±5kHz
Spurious emissions:	>60dB below carrier
Audio distortion:	<3% at 60% mod. (300–3000Hz)
Mic impedance:	500–600Ω

atory; SHIFT—selects the desired repeater offset; AL—switches the "priority alert" system on or off; REV—reverses the transmit and receive frequencies when on; MUTE—used, if required, to reduce the volume of the "sub-band" receiver output by approximately 20dB; ABC—allows you to exchange the contents of the "sub-band" and main band automatically whenever a signal is strong enough to open the "sub-band" squelch; DUAL—turns the "sub-band" display off and allows single-band reception; and BAND—used to change the contents of the main band, "sub" to "main" and back again.

In a horizontal row under these nine switches are three slide controls and one more push-button. From left to right they are: LOCK—which deactivates all functions except the p.t.t. switch; BALANCE—which controls the proportion of the total audio output volume from each of the two bands; SUB SQUELCH—adjusts the squelch threshold of the "sub-band"; and LOW—which selects the transmitter output power level.

In the normal course of operation, the rig emits a "beep" tone when any function is activated, but if the user prefers this can be cancelled by switching the unit off, then holding down the MUTE button whilst switching on again. Repeating this procedure will bring back the "beep" which, incidentally, has a rather unusual feature. It is programmed to sound a series of definite musical tones for various functions, as listed in the manual, and commencing with "A", followed by "A#", and then "B" right up the scale to "A", with high "F" being a key operation without effect. So anyone blessed with perfect pitch will know what button they have pressed without looking.

Operating

It is interesting to note that the TM-721E will perform perfectly in the packet mode, both on 144 and 430MHz, with no modifications. I connected it up to run through my AEA PK-232 modem, feeding the outgoing audio signal through the normal microphone socket, and taking the incoming signal from the external loudspeaker socket at the rear. Everything functioned as it should, and there was no difficulty in accessing several of the mailboxes on both bands. The antenna in use in this case was an Icom AH-7 discone, erected about 10 metres above ground.

I used the rig in the car for some time, completing several long journeys with everything working as it should have done, thought I must confess to having taken the manual with me as a memory-jogger. I used the fist microphone supplied with the rig, which was a dynamic type having UP and DOWN buttons on it to alter the frequency. This was most helpful as I could shift frequency without looking down at the set.

There was much less activity outside the London area, and I found it difficult sometimes to get a contact. The users of both bands appeared to be regulars having daily chats and it was quite hard to break in. Having managed it, the best I got most times was a report. However, all the signal reports were complimentary and, since the power output was quite considerable, I was able to get into repeaters which were situated at some distance from me.

I considered it inadvisable to transmit for any length of time while stationary, because of the substantial battery drain of around 9.5A at full power, so the majority of operating was done motoring along quiet a country roads. I experienced no problems with electrical interference, which must be partly due to the fact that the rig has been designed to suppress ignition noise.

Conclusions

Although the TM-721E is obviously intended as a mobile rig, I used it as a base station at the commencement of the review, and I must say that it performed very well. In my opinion, using it in this manner enabled far more use to be made of the very many facilities available. I know that this view might be challenged by mobile users, but the wealth of information given in the display area can only be appreciated, I think, when the set is stationary.

The price of the TM-721E is £699.00, and the Maldol 144/430MHz diplexer costs £23.29, both prices including VAT. Thanks are due to **Lowe Electronics Limited, Chesterfield Road, Matlock, Derbyshire DE4 5LE, telephone 0629 580800,** for the loan of the equipment for this review. ***PW***

Practically Yours

By Glen Ross G8MWR

Let me start with some abject grovelling. In the June issue I gave a computer listing for calculating distances from Maidenhead locators. In line 320 you will find:

(T$(4))=(ASC(T$(6)) etc.

The equals sign should be replaced with a plus sign and all will be well.

Diplexing

There are now several good dual-band (144/430MHz) antennas available. Unfortunately, many of the dual-band rigs which are available have separate antenna input sockets for each band. How do you cope with the problem of getting one plug into two sockets? The answer is a simple bit of circuitry called a diplexer. This is a device which sorts out the various frequencies and routes them to the appropriate rig. They are available commercially at a rather nasty price but those that I have measured, whilst safe to use, do not show up any too well on separation and also tend to have an unacceptable loss when placed in circuit.

The Circuit

The circuit of a home-made diplexer which is well within the construction capabilities of the newcomer to home-brewing is shown in Fig. 1. It consists of three coaxial sockets and four series-resonant circuits. Hopefully you will remember that a series-resonant circuit has a very low impedance at resonance and a high impedance off resonance. How does the circuit work?

Consider a 144MHz (2m) signal coming in on the antenna socket SK2. The tuned circuit L2/C2 is resonant at 144MHz and, having a low impedance, passes the signal to the 2m output SK1. The tuned circuit L3/C3, being resonant at 433MHz, exhibits a high impedance at 2m and so stops the 144MHz signal from reaching the 70cm output socket SK3. On 433MHz the opposite action takes place.

More Protection

The action already described will do a fair job but it can be improved upon. The tuned circuit L1/C1 which is connected from the 2m output to earth is series resonant at 433MHz and so any signal at that frequency which manages to find its way through L2/C2 is shorted to earth. As it has a high impedance off resonance, L1/C1 has no effect on the 144MHz signals. The tuned circuit L4/C4 is series resonant at 144MHz and removes any leakage at that frequency which reaches the 70cm output socket.

SHOPPING LIST

Capacitors

Trimmers (see text)

5pF	2	C1, 3
15pF	2	C2, 4

Inductors

Air-spaced, self-supporting

L1, 3	3 turns 22s.w.g., 6mm dia., 12.6mm long
L2, 4	5 turns 22s.w.g., 6mm dia., 20mm long

Miscellaneous

Sockets, BNC, N, etc., as required (3 off); die-cast box; nuts, bolts, washers and solder tags.

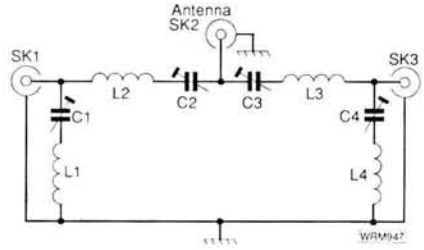


Fig. 1: Circuit diagram of the 144MHz/430MHz diplexer

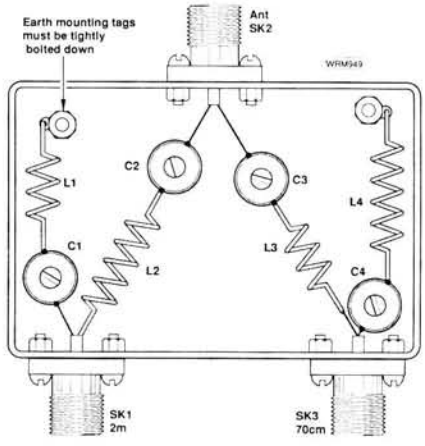


Fig. 2: A layout suitable for operation at fairly low powers

Specification

How well does the circuit do its job? Looking first of all at the insertion or through loss, this was measured at less than 0.1dB on 144MHz, and was slightly higher at 0.17dB on 433MHz. When you consider that you need a loss of 3dB to lose one S-point of signal strength, these losses can be disregarded. The blocking of 144MHz at the 70cm output, and of 433MHz at the 2m output was greater than 60dB. This means an unwanted output of 1 microwatt for every 1 watt of power applied, which is more than satisfactory.

Construction

The unit can be built in a small die-cast box, and a suitable layout is shown in Fig. 2. *Trimmer capacitor types required will depend on the transmitter powers to be used. Ceramic piston and compression types are suitable for low powers, for higher powers airspaced trimmers (e.g. Jackson C804 series) will be necessary.—Ed.*

Tuning the unit is simple. First connect the rigs to the correct output sockets. **Until all the following steps are completed DO NOT TRANSMIT.**

Tune the 144MHz rig to a strong signal and adjust C2 for the highest S-meter reading. Tune the 433MHz rig to a strong signal and adjust C3 for the best S-meter reading.

Now connect the 144MHz rig to the 70cm output on the diplexer and the 433MHz rig to the 2m output. Tune to a strong 144MHz signal and adjust C4 for **minimum** S-meter reading. Tune to a strong 433MHz signal and adjust C1 for **minimum** S-meter reading. For safety, run through all the above steps a second time then reconnect the rigs to the correct outputs and the job is completed. ***PW***

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A Constructor's Shack Test Gear

What kind of test equipment do amateurs have in their shack? P. Newton believes it depends on the kind of amateur.

Amateur Radio these days is very definitely a grouping of three distinct and separate activities: those who operate, those who construct things, and those who only natter over repeaters or on simplex f.m. Thus, the test equipment requirement for any station will vary somewhat. Let us take the chap who constructs (me!), and see what is in his shack, and what each box does.

Oscilloscopes If one were to be restricted to just one item, a decent 'scope with a 15MHz bandwidth, calibrated sweep speeds and calibrated Y amplifier would undoubtedly come first—for the very simple reason that it can be persuaded to do so many things. It can be a d.c. voltmeter, a.c. voltmeter, a.f. signal generator, distortion analyser and so forth.

General Coverage Receiver Any old receiver will do, provided it has a b.f.o. and has reasonable calibration. Here, I use a Heath GC1U. To measure frequency accurately on it, I have to inject a signal and use a counter. However, it serves well enough to find "where I am" when grid-dipping a tuned circuit for instance; as the detector element in the antenna noise bridge, for a general hunt-round for spurious transceiver outputs—and as a merry noise in the shack when a circuit won't perform as intended!

Multi-range Testmeter This should be of 10 000Ω/V sensitivity on d.c. ranges and 1000Ω/V a.c., or better. There are four here; one was home-made back in the "forties", one was bought in the early fifties and I have a couple of modern Japanese ones. One is endowed with a 2500 volts range, which is handy for checking one's valved linear h.t. supplies.

RF Signal Generator I have two here. One is a pre-WWII vintage American "standard" or laboratory generator, covering l.f. up to 30MHz. The other will go up to 144MHz on harmonics, but is by no means r.f.-tight and so is not a lot of good as a measuring tool, though it is still extremely useful.

AF Signal Generator An old, but very good generator giving an output up to around 25kHz and down to below 50Hz; it has a "self-check" system in that it has an inbuilt beat circuit against the mains frequency.

Frequency Counter This little box was picked up at a club junk sale; runs off 12 volts from an external p.s.u. and has a liquid crystal display.

GDO This home-brew item is a set comprising a p.s.u. and separately an h.f. grid dip oscillator going from m.w. up to about 85MHz, plus another one covering 144MHz and 432MHz.

Antenna Noise Bridge Invaluable for antenna measurements, particularly when used with the general-coverage receiver. This caters for Murphy's Law, which in this context states that an antenna designed to resonate in the band won't!

Coaxial Attenuators These were of Belling-Lee origin, back in the dawn of history and were calibrated by me against a laboratory attenuator of known accuracy.

BC221 Wavemeter Invaluable old box, rigged out with a mains p.s.u. Serves mostly as a precision signal generator in frequency terms.

Valve Voltmeter (with r.f. head) This is an old commercial unit, long since sold out of service as beyond economical repair; time, patience and some constructional work have restored it to adequate operation.

RF Field Strength Meter Just a tuned circuit, diode and meter, but so useful!

That summarises what I already have in the shack, over and above the station itself and its s.w.r. indicator, a.t.u. and so on.

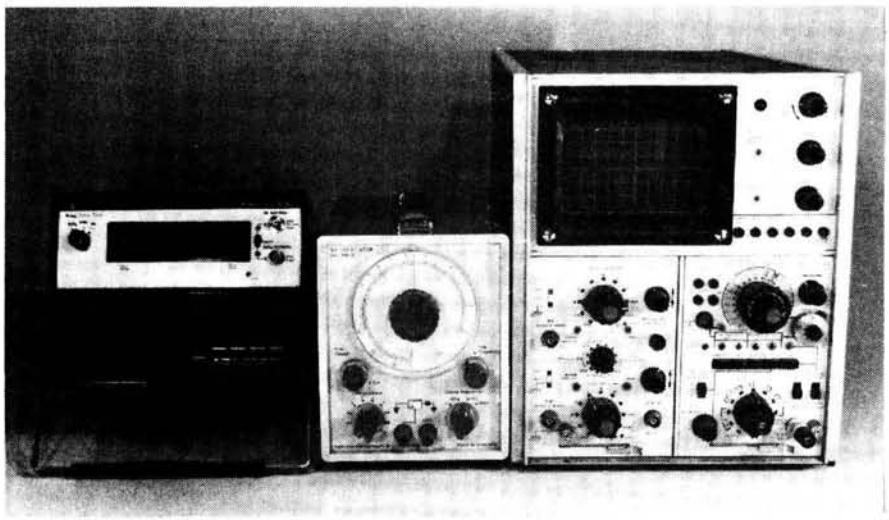
With this lot, I can do antenna measurements with some hope of success (items 2, 3, 4, 6, 7, 8, 9, 12). Receivers can be built, evaluated and transmitters likewise. I can construct equipment for special modes such as data communications, or SSTV, and I can have a lot of fun too. Above all, I have all that is required to service the station equipment.

Calibration

No test equipment is worth using unless you have a clear idea of its limitations. For example, that is the reason for the sometimes ridiculously inflated gain figures claimed in the pages of this and other magazines for antennas; people just don't know the limitations of their test facilities. Again, it's not a lot of use measuring the voltages around a stage if the testmeter is of unknown accuracy since it fell off the bench last week!

In the amateur radio scene, calibration is a matter of applied gumption. For instance, if you have a 144MHz handy-talky, you can measure the voltage of the battery at the end of a full charge and keep a note of the reading; next time the voltmeter needs calibrating on that range, repeat the exercise and compare the results. The oscilloscope with a built-in calibrator is a great help, but it doesn't take much to build a little box using, say, a 10MHz crystal oscillator and a squarer which can be checked for frequency on the station receiver or counter, and in voltage by checking the d.c. supplies; it can then be used on the 'scope input as a more severe check—and of course you will never put a 'scope probe on any circuit without adjusting the probe capacitor on the calibrator waveform.

Calibration of this simple nature is enough to keep reasonable hold of the

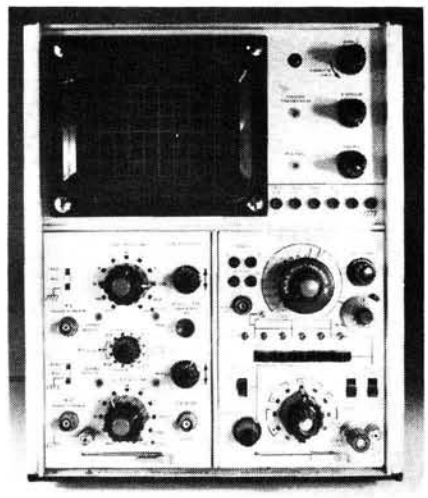


Some of the sort of test gear used in a constructor's shack

results you obtain from any experiment; but of course, it won't stop you making a Charlie of yourself in the way you interpret valid results, nor for that matter will it stop you making "measurements" that your test gear could never validate! The latter two forms of error are as inevitable as night follows day, and all you can do is to hope you will spot the fallacy before you open your mouth.

As examples of the latter, consider how many times people have said in the past ten years that the absence of a balun accounts for the "skewed" polar diagram of an antenna. It is interesting to notice that (a) the problem was never blamed on the balun when no one bothered to use a balun(!!) and (b) that if you do adequately controlled measurements in an r.f. anechoic chamber, then you find the balun has no skewing effect whatever, certainly up to 1GHz. Of course, the skewing effect is in fact caused by disturbing objects around the test site. For example, an apple tree flowering 200 yards to one side of the site, at 200MHz caused a 5 degree skew as compared with December; and a train coming round the hill at a half-mile behind the reception area of the test site would guarantee gain variations of ± 1dB or worse.

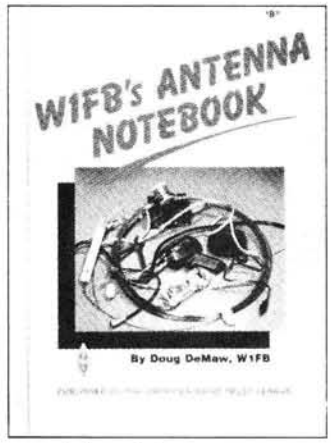
The moral is simple: having made your test equipment, and checked it regularly, you must treat all results with caution. If they defy the law of common sense, odds-on either they are inherently wrong, or the interpretation is wrong. If they defy Ohm's Law, look out! ***PW***



An oscilloscope from the second-hand market

BOOKSHELF

W1FB'S ANTENNA NOTEBOOK
by Doug DeMaw W1FB
Published by the American Radio Relay League
Available from the Practical Wireless Book Service
208 x 276mm, 123 pages. Price £4.95 plus 75p P&P



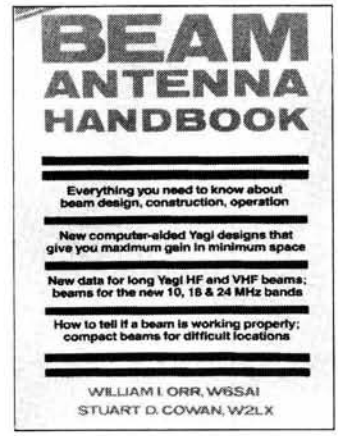
The book was written for enthusiasts rather than engineers, so readers don't have to have lots of previous knowledge before the book is useful.

It's mainly simple wire and tubing antennas that have been detailed as these can provide very satisfactory performance for a host of operating objectives. There is no high level mathematics in the book, only simple equations are used to either explain something or to calculate the length on an antenna element. Detailed drawings are used to help clarify constructional methods.

There are chapters on such types of antennas as dipoles, single-wire antennas, simple verticals, high performance wire antennas, limited space and "invisible" antennas and special receiving antennas. Other topics covered are matching techniques and simple antenna measurements.

One thing you notice about the book is the size of the print, much larger than usual and very easy to read. All the drawings are also well laid-out and very clear.

BEAM ANTENNA HANDBOOK
by William I. Orr W6SAI & Stuart D. Cowan W2LX
Published by Radio Publications Inc
Available from Practical Wireless Book Service
137 x 207mm, 268 pages. Price £6.75 plus 75p P&P
ISBN 0 933616 04 X



The authors of this book have followed the development of the Yagi antenna over the years and are ardent enthusiasts of this compact and efficient array. The information gained in their experiments, plus the work done by other enthusiasts have been gathered together in this handbook.

It covers all aspects of h.f. and v.h.f. Yagi antenna design, construction, installation, testing and operation. New information is provided on the effects of element taper, mounting hardware and matching systems. Dimensions are provided in both English and Metric measurements.

To help those who like to build antennas for bands they were not designed for, scaling information is provided too.

For more books on all aspects of the radio hobby, see our Book Service on pages 42–44

Doppler Shift on Satellites Part 2

In Part 1, Dave Tyler G1PEF, AMSAT UK3742, started to explain the effects of Doppler shift on the signals to and from the satellite. Now, in Part 2, we continue with the explanation and go through some worked examples.

Because we have an inkling that the Sat. TX frequency is going to be higher than the Gnd. RX frequency, we can transpose the formula that we used previously to show this:

Sat. TX f =

Gnd. RX f + $\left(\frac{\text{Relative Velocity}}{\text{Speed of Light}} \times \text{Gnd. RX f}\right)$

where:
Relative Velocity is in metres per second. Speed of light is in metres per second and TX and RX frequencies are in Hz.

When used with our values talked about in Part 1,

145 911 123 =

145 910 000 + $\left(\frac{2.31 \times 1000}{300\,000\,000} \times 145\,910\,000\right)$

This is just some 3 hertz out of our estimate that we calculated in Part 1. Not bad!

So, the satellite is required to transmit on 145.911 123MHz. Now, we can translate this for the uplink by:

581.0047–145.911 123=435.093 577

Already this is some 1123Hz different from our first uplink figure, not taking Doppler effect into account.

This 435.093 577MHz is the frequency the satellite must receive for correct operation. This time the station is transmitting to the satellite. So, as the satellite is moving away from the station, a greater frequency is required at the ground due to the Doppler effect, to arrive at the satellite at 435.093 577MHz.

The formula this time is:

Gnd. TX f =

Sat. RX f + $\left(\frac{\text{Relative Velocity}}{\text{Speed of light}} \times \text{Sat. RX f}\right)$

where:
Relative Velocity and Speed of light are in metres/second and f is in hertz

With values inserted,

435 096 927 =

435 093 577 + $\left(\frac{2.31 \times 1000}{300\,000\,000} \times 435\,093\,577\right)$

The ground station uplink frequency for Station 1 is 435.096 927MHz, some 2227Hz difference from the non-adjusted figure.

The Cornish station (1) transmits on 435.096 927MHz and hears his own signal on 145.910MHz, during which the Portuguese station (2) is tuning across the band and hears the Cornish one.

We can calculate the Portuguese Gnd. RX frequency as we already know that the Sat. TX frequency is 145.911 123MHz.

145 909 951 =

145 911 123 – $\left(\frac{2.41 \times 1000}{300\,000\,000} \times 145\,911\,123\right)$

This leaves a difference of –1172Hz, which is what we would expect from the beacon calculations.

The Portuguese station receives the Cornish station on 145.909 951MHz. To enable this station to talkback, the uplink frequency must reach the satellite at 435.093 577MHz.

Again the formula, using the calculated relative velocity factor for the Portuguese station (2):

435 097 072 =

435 093 577 + $\left(\frac{2.41 \times 1000}{300\,000\,000} \times 435\,093\,577\right)$

The Portuguese uplink frequency is therefore 435.097 072MHz.

Finally, the Uruguay station (3) hears Station 1 and Station 2 in QSO and wishes to join in. We can calculate the Uruguay Gnd. RX frequency, as the satellite is still transmitting at 145.911 123MHz.

Formulas again:

145 909 319 =

145 911 123 – $\left(\frac{3.71 \times 1000}{300\,000\,000} \times 145\,911\,123\right)$

Again some 1804Hz difference, as expected from the beacon frequency calculations.

The Uruguay station (3) has a Gnd. RX frequency of 145.909 319MHz, but to enable talkback we still require the satellite to receive a frequency of 435.093 577MHz.

So, allowing for the velocity:

435 098 957 =

435 093 577 + $\left(\frac{3.71 \times 1000}{300\,000\,000} \times 435\,093\,577\right)$

Station (3) at Uruguay therefore needs an uplink at 435.098 957MHz.

As you can see from this example, although 6 different up/down link frequencies are shown on the ground, only 1 corresponding pair are used on the satellite.

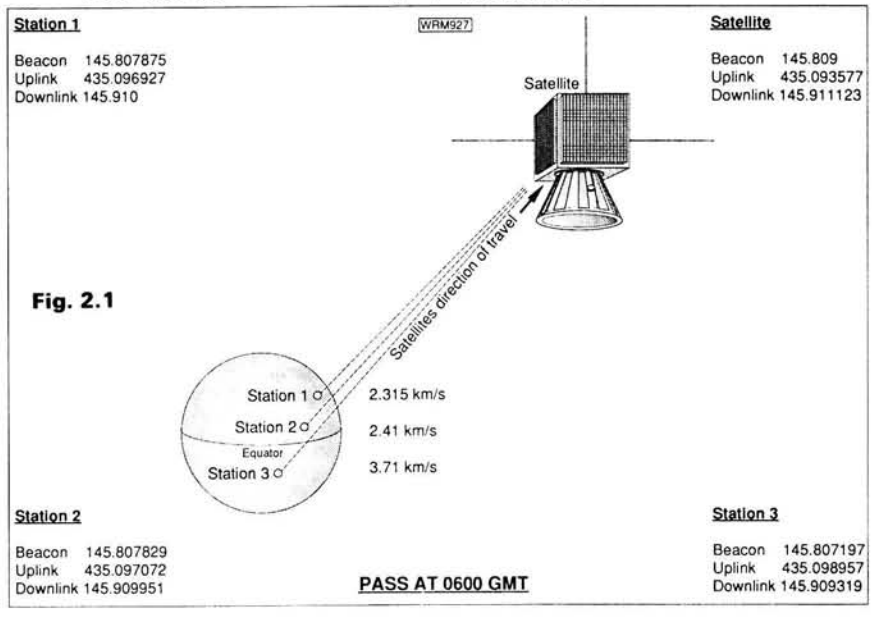


Fig. 2.1

Helpful Data

Sat.	Translation	Beacon Frequency
OSCAR-10	581.0047	145.809
OSCAR-12	581.8	435.797 Mode JA 435.910 Mode JD
RS 5	−116.5	29.451
RS 7	−116.5	29.501

Chart for 581.0047 translation frequency (OSCAR-10)

Beacon (MHz)	Rel. Vel.	Uplink (MHz)	Downlink (MHz)	
145.8078	2.46	435.1070	145.900	
145.8079	2.26	435.1068		
145.8080	2.05	435.1066		
145.8081	1.85	435.1064		
145.8082	1.64	435.1062		
145.8083	1.44	435.1060		
145.8084	1.23	435.1058		
145.8085	1.02	435.1056		
145.8086	0.82	435.1054		
145.8087	0.61	435.1052		
145.8088	0.41	435.1050		
145.8089	0.2	435.1048		
145.8090	0	435.1047		
145.8091	−0.2	435.1045		435.0945 145.910
145.8092	−0.41	435.1043		435.0943
145.8093	−0.61	435.1041		435.0941
145.8094	−0.82	435.1039		
145.8095	−1.02	435.1037		
145.8096	−1.23	435.1035		
145.8097	−1.44	435.1033		
145.8098	−1.64	435.1031		
145.8099	−1.85	435.1029		
145.8100	−2.05	435.1027		
145.8101	−2.26	435.1025		
145.8102	−2.46	435.1023		

Chart for −116.5 translation frequency (RS-series)

Beacon (MHz)	Rel. Vel.	Uplink (MHz)	Downlink (MHz)	
29.4503	7.13	145.9341	29.430	
29.4504	6.11	145.9335		
29.4505	5.09	145.9329		145.9229 29.420
29.4506	4.07	145.9323		
29.4507	3.05	145.9317		
29.4508	2.03	145.9311		
29.4509	1.01	145.9305		
29.4510	0	145.9300		
29.4511	−1.01	145.9294		
29.4512	−2.03	145.9288		
29.4513	−3.05	145.9282		
29.4514	−4.07	145.9276		
29.4515	−5.09	145.9270		
29.4516	−6.11	145.9264		
29.4517	−7.13	145.9258		

Chart for 581.8 translation frequency (OSCAR-12)

Beacon (MHz)	Rel. Vel.	Uplink (MHz)	Downlink (MHz)	
435.8080	−7.57	145.9373	435.8700	
435.8079	−7.50	145.9372		
435.8078	−7.43	145.9371		
435.8077	−7.36	145.9371		
435.8076	−7.29	145.9370		145.9270 435.8800
435.8075	−7.22	145.9369		145.9269
435.8074	−7.15	145.9369		
435.8073	−7.08	145.9368		
435.8072	−7.01	145.9367		
435.8071	−6.95	145.9367		
435.8070	−6.88	145.9366		
435.8060	−6.19	145.9359		
435.8050	−5.50	145.9353		
435.8040	−4.81	145.9346		
435.8030	−4.12	145.9339		
435.8020	−3.44	145.9333		
435.8010	−2.75	145.9326		
435.8000	−2.06	145.9319		
435.7990	−1.37	145.9313		
435.7980	−0.68	145.9306		
435.7970	0	145.9300		
435.7960	0.68	145.9293		
435.7950	1.37	145.9286		
435.7940	2.06	145.9280		
435.7930	2.75	145.9273		
435.7920	3.44	145.9266		
435.7910	4.12	145.9260		
435.7900	4.81	145.9253		
435.7890	5.50	145.9246		
435.7880	6.19	145.9240		
435.7870	6.88	145.9233		
435.7860	7.57	145.9226		

The BASIC program

```
10 PRINT "Enter Satellite Translation Frequency MHz"
20 INPUT TF
30 PRINT "Enter Satellite Beacon Frequency MHz"
40 INPUT BF
50 PRINT "Enter Received Beacon Frequency MHz"
60 INPUT RXDBF
70 RV = ((BF-RXDBF)/BF) x 300
80 PRINT "Enter Received Station Frequency MHz"
90 INPUT RXDSF
100 SATFTX = RXDSF + (RXDSF x (RV/300))
110 SATFRX = TF-SATFTX
120 IF SGN(SATFX) = -1 THEN SATFRX = -SATFRX
130 UPLINK = SATFRX + (SATFRX x (RV/300))
140 PRINT: REM CLEAR SCREEN
150 PRINT "Sat. Beacon fMHz                ";BF
160 PRINT "Rxd. Beacon fMHz                ";RXDBF
170 PRINT "Relative Velocity km/s          ";RV x 1000
180 PRINT "Downlink signal Sat. MHz        ";SATFTX
190 PRINT "Downlink signal Gnd. MHz        ";RXDSF
200 PRINT "Uplink signal Sat. MHz          ";SATFRX
210 PRINT "Uplink signal Gnd. MHz          ";UPLINK
220 PRINT: PRINT: GOTO 50
```

All this, of course, is instantaneous at 0600GMT, the satellite distance (slant range) is continually changing.

The next calculated relative velocities at 0615GMT for Stations 1, 2 and 3 are: 2.28, 2.37 and 3.31km/sec respectively. See Fig. 2.1 and 2.2 for the differences, while keeping Station 1 Gnd. RX frequency the same.

Our example took account of the near maximum Doppler shift which could occur during a pass, due to high relative velocities. However, this effect is reduced considerably on OSCAR-10, to such an extent that the shift is negligible and at a later stage the shift reverses direction as the satellite travels towards the stations. The principle can be used with any orbiting satellite.

For those who possess a computer, here is a BASIC program which has been kept simple to enable its use on most machines.

Charts are also shown for those who do not wish to use a computer. The principles are the same.

If they are used during a pass, we can achieve a QSO spot on frequency, first time more times than not, instead of all that hunting around for our own signals.

We saw earlier that we need to take into account the Doppler shift or, if you prefer, the relative velocity of the satellite with the frequency in use to the station. I also said that we have to calculate the relative velocity of the satellite. The method we used was to

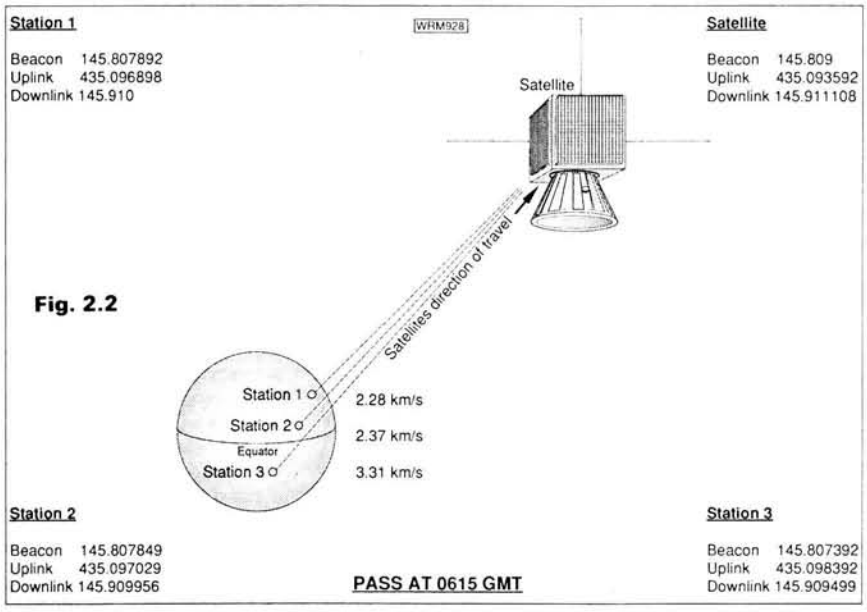


Fig. 2.2

subtract two successive slant ranges and divide by the time to give us km/sec. Then I showed you the formula:

Gnd. RX f =

$$\text{Sat. TX f} \pm \left(\frac{\text{Relative Velocity}}{\text{Speed of light}} \times \text{Sat. TX f}\right)$$

where:
Relative Velocity and Speed of Light are in metres per second and f is in hertz

If you look carefully, we can find all these factors except the relative velocity in m/s. Gnd. RX f = the beacon frequency received at the station in Hz.

Sat. TX f = the beacon frequency in Hz, listed in the satellite's technical notes.

Speed of light in metres per second = 300 000 000

Transposing the formula:

Relative Velocity =

$$\left(\frac{\text{Sat. TX f–Gnd. RX F}}{\text{Sat. TX f}}\right) \times 300\,000\,000$$

This is the basis of the program.

Line 80 means a station on the transponder band calling for a clear frequency. You can check the program works by using the values in Figs. 2.1 and 2.2 on the inputs.

Line 120 checks for a minus value at SATFRX which indicates a non-inverting transponder i.e. RS series, all it does is reverse the polarity of the frequency values on printout, if your computer does not have this statement, leave it out but remember the frequency will be in negative form, just ignore the minus sign.

If you are using the charts, check the beacon frequency at your station and look up the same (or close to it) value on the right chart for the satellite in use, then shown for a constant downlink are the varying uplinks.

If you change the downlink value by any amount (within the passband of the transponder) you must change the value of the given uplink by the same amount.

That is, using the translation frequency of OSCAR-12, 581.8 and its beacon frequency of 435.8075MHz, for a downlink of 435.870MHz the uplink is 145.9369MHz. If the downlink frequency is changed to 435.880MHz then the corresponding uplink will be 145.9269MHz and pro rata. As this has an inverting transponder any increase in the downlink frequency will decrease the uplink frequency.

Before operating on any satellite please find out its operational status, this information can be obtained by sending your request along with an s.a.e. to: AMSAT UK, London E12 5EQ. ***PW***

For up-to-the-minute information on satellites, read "Amateur Satellites" in On the Air, every month in *PW*

YOU COULD WIN A PRIZE!

1988
PW READER SURVEY

It's over three years since we last asked our readers about their involvement in the radio hobby, their interests, and their likes and dislikes. There have been a lot of changes during that time, the "CB boom" has come and gone, and new modes such as AMTOR and packet radio have arrived on the scene.

So, we thought it was about time we let you have your say again, about the hobby and about Practical Wireless *too. What you tell us will help to shape the magazine as we gallop towards the 1990s!*

CUT ALONG DOTTED LINE

1. Do you hold a current UK amateur transmitting licence?

Yes ☐ 01 No ☐ 02

If "YES" please continue with the following questions, if "NO" skip to Q4.

2. Which class of licence do you have?

"A" ☐ 01 "B" ☐ 02

3. How long have you held an Amateur licence?

Up to 1 year	☐ 01	11–20 years	☐ 04
2–5 years	☐ 02	21 years or more	☐ 05
6–10 years	☐ 03		

4. Do you hold a UK Citizens' Band licence?

Yes ☐ 01 No ☐ 02

5. How old are you?

15 and under	☐ 01	40–59	☐ 04
16–21	☐ 02	60 and over	☐ 05
22–39	☐ 03		

6. How old were you when you became interested in the radio hobby?

15 and under	☐ 01	40–59	☐ 04
16–21	☐ 02	60 and over	☐ 05
22–39	☐ 03		

7. About how many hours a week do you devote to the radio hobby?

Up to 1 hour	☐ 01	11–20 hours	☐ 04
2–5 hours	☐ 02	21 hours or more	☐ 05
6–10 hours	☐ 03		

8. How much do you use the h.f. amateur bands?

	Often	Sometimes	Never
1.8MHz	☐ 01	☐ 02	☐ 03
3.5MHz	☐ 04	☐ 05	☐ 06
7MHz	☐ 07	☐ 08	☐ 09
10MHz	☐ 10	☐ 11	☐ 12
14MHz	☐ 13	☐ 14	☐ 15
18MHz	☐ 16	☐ 17	☐ 18
21MHz	☐ 19	☐ 20	☐ 21
24MHz	☐ 22	☐ 23	☐ 24
28MHz	☐ 25	☐ 26	☐ 27

9. How much do you use the v.h.f./u.h.f. amateur bands?

	Often	Sometimes	Never
50MHz	☐ 01	☐ 02	☐ 03
70MHz	☐ 04	☐ 05	☐ 06
144MHz	☐ 07	☐ 08	☐ 09
430MHz	☐ 10	☐ 11	☐ 12
1.2GHz	☐ 13	☐ 14	☐ 15
2.4GHz–5.6GHz	☐ 16	☐ 17	☐ 18
10GHz	☐ 19	☐ 20	☐ 21
Above 24GHz	☐ 22	☐ 23	☐ 24

10. Which modes do you use?

CW	☐ 01	FAX	☐ 06
Phone	☐ 02	SSTV	☐ 07
RTTY	☐ 03	FSTV	☐ 08
AMTOR	☐ 04	Other	☐ 09
Packet	☐ 05		

11. Do you use:

Repeaters? ☐ 01
Satellites? ☐ 02
Moonbounce? ☐ 03

12. Have you submitted a planning application in connection with your radio hobby during the past 5 years?

Yes ☐ 01 No ☐ 02

If "YES" was it successful?

Yes ☐ 01 No ☐ 02

13. Have you experienced any TVI problems due to your transmissions during the past 5 years?

Yes ☐ 01 No ☐ 02

If "YES" have you managed to cure them:

Totally ☐ 03
Partially ☐ 04
Not really ☐ 05

14. How much money have you spent on the radio hobby within the past year? *(Include QSL expenses, books and magazines, club or society dues, and other incidental expenses)*

Up to £50	☐ 01	£501–£1000	☐ 04
£51–£250	☐ 02	£1001–£2500	☐ 05
£251–£500	☐ 03	Over £2500	☐ 06

15. Is your radio equipment separately insured? *(i.e. Not under a household contents policy)*

Yes ☐ 01 No ☐ 02

16. Is your interest in radio connected with your job?

It influenced my choice of job ☐ 01
It resulted from my job ☐ 02
No connection with my job ☐ 03

17. Do you own a home computer?

Yes ☐ 01 No ☐ 02

If "YES" please state which model..... 03

18. Do you use a home computer in conjunction with your radio hobby?

Yes ☐ 01 No ☐ 02

19. Do you consider that a Novice or Student Licence would be good for amateur radio in the UK?

Yes ☐ 01 No ☐ 02

20. Should UK Amateur Licences retain a minimum age requirement?

Yes ☐ 01 No ☐ 02

21. Do you consider that the ability to send and receive Morse code signals manually is still relevant?

Yes ☐ 01 No ☐ 02

22. Do you construct any of the following items of radio equipment?

Transmitters	☐ 01	Test equipment	☐ 06
Receivers	☐ 02	Power supplies	☐ 07
Converters/transverters	☐ 03	Antennas	☐ 08
Amplifiers	☐ 04	Digital equipment	☐ 09
Antenna tuning units	☐ 05		

23. How often do you indulge in the following?

	Often	Sometimes	Never
Contests	☐ 01	☐ 02	☐ 03
Nets	☐ 04	☐ 05	☐ 06
DXing	☐ 07	☐ 08	☐ 09
QSLing	☐ 10	☐ 11	☐ 12
Fox-hunts	☐ 13	☐ 14	☐ 15
Short-wave listening	☐ 16	☐ 17	☐ 18
TV-DXing	☐ 19	☐ 20	☐ 21

Continued from previous page

24. How many radio rallies/exhibitions do you visit each year?

None	☐ 01	2 or 3	☐ 03
1	☐ 02	4 or more	☐ 04

25. How would you describe your expertise in radio/electronics?

Beginner	☐ 01
Average	☐ 02
Advanced	☐ 03

26. Which of these radio clubs/societies/groups do you belong to?

AMSAT	☐ 01	RSGB	☐ 06
BARTG	☐ 02	Local radio society	☐ 07
BATC	☐ 03	Other radio-related	☐ 08
G-QRP	☐ 04	*State which*.....	
RAYNET	☐ 05	09	

27. Do you have any hobbies other than radio? If so, what?

.....

.....

28. How often do you purchase *Practical Wireless*?

Every month	☐ 01	Occasionally	☐ 03
Most months	☐ 02	I am a subscriber	☐ 04

29. Do you have any difficulty getting hold of copies of *PW*?

Yes ☐ 01 No ☐ 02

30. How many other people read your copy of *PW*?

None	☐ 01	3–5	☐ 04
1	☐ 02	6–8	☐ 05
2	☐ 03	9 or more	☐ 06

31. Which "added-value" editorial features do you prefer in *Practical Wireless*?

Extra pages	☐ 01
Datacards	☐ 02
Charts	☐ 03

32. How often do you read the following radio-related magazines? *(tick one box in each row)*

	All/most issues***	Some issues**	Rarely/never *
Amateur Radio	☐ 01	☐ 02	☐ 03
Elektor	☐ 04	☐ 05	☐ 06
Ham Radio Today	☐ 07	☐ 08	☐ 09
Radio and Electronics World	☐ 10	☐ 11	☐ 12
Short Wave Magazine	☐ 13	☐ 14	☐ 15
Radio Communication	☐ 16	☐ 17	☐ 18
73 (USA)	☐ 19	☐ 20	☐ 21
CQ (USA)	☐ 22	☐ 23	☐ 24
QST (USA)	☐ 25	☐ 26	☐ 27
Ham Radio (USA)	☐ 28	☐ 29	☐ 30
Other.....	☐ 31	☐ 32	☐ 33

****3 or 4 out of 4 issues **2 out of 4 issues *1 or less out of 4 issues*

33. How interested are you in reading each of the following features in *Practical Wireless*? *(tick one box in each row)*

	Very Interested	Quite Interested	Not at all
Write On	☐ 01	☐ 02	☐ 03
Comment	☐ 04	☐ 05	☐ 06
News Desk	☐ 07	☐ 08	☐ 09
Reviews	☐ 10	☐ 11	☐ 12
Modifications	☐ 13	☐ 14	☐ 15
Construction	☐ 16	☐ 17	☐ 18
Theory	☐ 19	☐ 20	☐ 21
History	☐ 22	☐ 23	☐ 24
On The Air	☐ 25	☐ 26	☐ 27
Advertisements	☐ 28	☐ 29	☐ 30

34. How interested are you in reading about the following aspects of radio in *Practical Wireless*? *(tick one box in each row)*

	Very Interested	Quite Interested	Not at all
Antennas	☐ 01	☐ 02	☐ 03
Test equipment	☐ 04	☐ 05	☐ 06
Beginners	☐ 07	☐ 08	☐ 09
Computing	☐ 10	☐ 11	☐ 12
Professional uses	☐ 13	☐ 14	☐ 15
Amateur radio in other countries	☐ 16	☐ 17	☐ 18

35. Have you bought any of the following as a direct result of seeing an advertisement in *PW*?

Major equipment (transmitter, receiver, etc.)	☐ 01
Accessories	☐ 02
Antennas	☐ 03
Components	☐ 04
None of these	☐ 05

36. Do you like *PW*'s covers?

Always	☐ 01
Often	☐ 02
Sometimes	☐ 03
Never	☐ 04

37. Which national daily newspaper(s), if any, do you read regularly?

The Star	☐ 01	*Daily Telegraph*	☐ 07
The Sun	☐ 02	*The Guardian*	☐ 08
Daily Mirror	☐ 03	*The Independent*	☐ 09
Daily Mail	☐ 04	*The Times*	☐ 10
Today	☐ 05	*Financial Times*	☐ 11
Daily Express	☐ 06	Other.....	☐ 12

NOTE – The information which you give in response to questions 1 to 37 will be stored and analysed using a computer database.

Your name and address will remain confidential, and will not be stored on the computer.

Your name and address:

.....

.....

.....

.....

We would welcome any other comment you would like to make about *Practical Wireless*

.....

.....

Thank you for taking the trouble to fill in and return this questionnaire. To show our appreciation, we will be holding a draw from all correctly completed questionnaires received in this office by Friday, 14 October 1988. The first ten lucky readers out of the sack will each win a voucher worth £10 against purchases from our PCB or Book Services, or on *PW* back numbers, binders or reprints.

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You do not need to put a stamp on the envelope. Please do not enclose anything else with the questionnaire.

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Kenwood RZ 1 New 500kHz-950MHz Wide and Narrow AM/FM	**POA**
Fox VHF-UHF Multi Function Mobile Scanner FM only	**£139.00**
Uniden-Bearcat UBC 50XL VHF-UHF 10ch. H/held Scanner	**£95.00**
Uniden-Bearcat UBC 70XL VHF-UHF 20ch. Miniature H/held	**£179.00**
Uniden-Bearcat UBC 100XL VHF-UHF-Airband H/held Scanner	**£189.00**
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*YAESU FT73R/FNB10 2.5W (5W) 70CMS C/W CHARGER	£299.95
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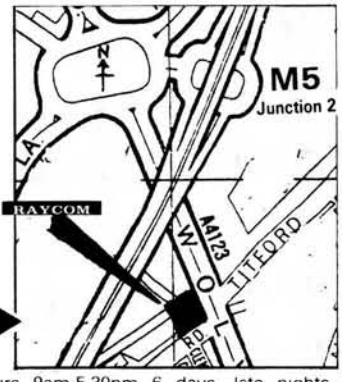

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Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

Last month, we started to look at the pieces that go to make a superheterodyne receiver. Now, in Part 8, R. F. Fautley G3ASG continues that process further into the receiver.

The H.F. Oscillator

The h.f. (high frequency), or r.f. (radio frequency), oscillator can take many forms. Some are designed especially for a very high degree of frequency stability and others to have very low noise, just to give you two examples. Some oscillators are used at a single frequency and others need to be variable over a wide band. In all types, a most desirable feature is that the frequency stays just where it has been set, usually within about 100Hz after allowing a short "warm-up" time.

A change of temperature is the most common cause of the frequency of an oscillator changing. This follows changes in the inductance and capacitance values due to temperature variations. Most components tend to increase their value as they get hotter and, of course, get smaller as they cool. Now, if both the inductor and the capacitor in an oscillator (or any other tuned circuit) are subject to an increase in temperature, unless special components are used, the effect will be that the frequency to which the oscillator is turned will drift downwards.

One method of reducing this effect is to use capacitors which have a **negative temperature coefficient**. This simply means that instead of increasing capacitance with a temperature rise, the capacitance is actually reduced. Obviously, if the inductance goes up and the capacitance goes down the net effect will be a reduced frequency change. As air-spaced variable capacitors have a normal positive temperature coefficient, C1 in Fig. 8.1, the other two fixed capacitors, C2 and C3, could be negative temperature coefficient types as they are both in parallel with the variable tuning capacitor and so will have an effect on the oscillator frequency.

Before confusion sets in, C2 and C3 are in series with one another, but theoretically they can be replaced by a single capacitor which would be in parallel with C1. Capacitor C1 is used as the front panel control to vary the oscillator frequency and tune the receiver to the required signal.

The connection to the transistor emitter from the junction of C2 and C3 has the same effect as the tap on the inductor L1 in Fig. 6.3. In this case it's a **capacitive** tap on the tuned circuit, having the same effect of providing input to the transistor gate from some of its own output, except that in this case the output is from the emitter. This is because it is a common collector circuit with the collector "earthed" to high frequency signals as the circuit in Fig. 3.9.

Why is it the same if the tap is on the inductor or the capacitor? Think of the tuned circuit at **resonance** when the whole lot (L1, C1, C2, C3 and the transistor base input capacitance as well as any "stray" capacitance) looks like a pure high value of resistance. If you've forgotten about that, look up in Part 6 about regenerative detectors. The tap is then a tap on a resistor, just like a fixed potentiometer. So, as long as the tap is on either the capacitor or the inductor it's the same thing.

Resistors R1, R2 and R3 provide the d.c. conditions for correct operation. Resistor R3 also develops the oscillator output voltage, which is taken from the emitter because it provides a low impedance output which is, to some extent, more isolated from the base input. This isolation is necessary to prevent any external stage to which it is connected (for example, a mixer) from influencing the frequency sensitive components in the gate circuit. Capacitor C5 passes the oscillator signal to a following stage whilst isolating d.c. voltages, and C6 bypasses the 12V d.c. supply and also provides a near short circuit to earth for the collector at signal frequencies.

The I.F. Amplifier

The i.f. amplifier in Fig. 8.2, shows a typical circuit using a m.o.s.f.e.t., bipolar transistors (the ordinary sort) can also be used. The f.e.t. is shown here because the application of a.g.c. (automatic gain control) to the stage can be seen more clearly. With the ordinary sort of transistors, the a.g.c. voltage has to be applied at the base input together with the biasing resistors making the circuit look a bit cluttered.

What is this a.g.c. all about? Automatic gain control is simply a means of altering the gain of a stage or stages dependent on the strength of the signal being received. If the signal is very weak, maximum gain will be required to make it readable, but for a very strong local station, the gain would need to be reduced to prevent the receiver **overloading**. Let's get overloading out of the way first.

The maximum voltage input to any stage obviously must be limited, it can't be expected to handle hundreds of volts without breaking! In fact, signals received by the antenna do not

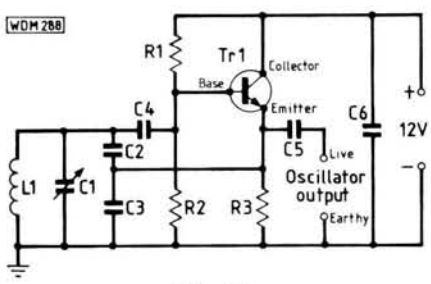


Fig. 8.1

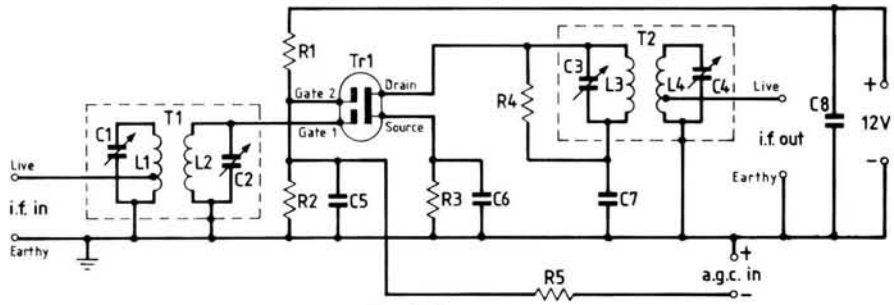


Fig. 8.2

often exceed about 100mV even if you live near to a broadcasting station. However, these signals are amplified by the r.f. and i.f. stages to produce up to a few volts from quite small signals of only a few microvolts. So, if a strong local station of about 1mV is tuned in it is likely that, after amplification, one of the receiver stages will have a signal at its input which is high enough to exceed the **dynamic range** of its active device (transistor or valve).

The dynamic range of a device refers to the highest input signal which can be applied to it without the introduction of distortion into its output. If the output waveform is not the same **shape** as that at the input, then it is distorted. The most usual form of this distortion is a flattening of one or both of the waveform peaks. This is due either to the collector current reaching its saturation level (maximum current of which the device is capable), or the peaks of the input signal exceeding the bias applied to the input to the device. The waveforms in Fig. 8.3 show the effect of overdriving a stage with a sinewave, the input is in (a) and the excessively distorted output at (b).

When listening to a signal, the introduction of distortion is usually easily discernible, especially to the hi-fi enthusiast! So that's the reason for a.g.c., it **automatically** reduces the gain when receiving strong signals and increases it for weak signals. Correctly designed, an a.g.c. circuit will prevent overloading and also maintain a nearly constant output level for a very considerable change of input.

The a.g.c. signals can be derived either from some point in the i.f. amplifier or from the a.f. stages, the principle being the same. For the reception of a.m. signals it is convenient to utilise the i.f. signals as the carrier is available, when rectified, to provide the d.c. signal even when no modulation is present. With s.s.b. and c.w. signals, there is no continuous carrier available but, even so, a.g.c. is still useable providing that means can be found to maintain the a.g.c. voltage during the very short breaks in signal between words or Morse characters. This is possible by using a long decay **time constant** on the a.g.c. system.

Fig. 8.3

The time constant of a circuit is a measure of the time taken either to charge or discharge it. A short time constant is obtained by using small values of R and C, and a long time constant by higher values. In Fig. 8.2, the values of R5, R2 and C5 will affect the time constant of the a.g.c. circuit.

The components C1, L1, C2 and L2 in the i.f. amplifier are both tuned circuits resonating at the intermediate frequency (i.f.). The broken line surrounding these components indicates that they are inside a **screening can,** usually made of aluminium. The reason for mounting the inductors and capacitors inside a can is to attempt to contain the "fields" around the components within the confines of the can and so prevent them from interacting with other fields. This is particularly important where other tuned circuits are operating at the same frequency (as in our case where C3, L3, C4 and L4 are also tuned to the i.f.).

Why is this screening so important? Before getting into the screening problem, let us take a look at the circuit surrounded by the broken line. All four components inside the can, together with the can itself, constitute an i.f. transformer. It is called a transformer because in this case the two inductors are mounted close to each other so that the magnetic fields surrounding each of them interact. Depending on the shape of the coil windings and their spacing from each other, the bandwidth or frequency response can, within limits, be controlled. Now, if the field surrounding other inductors were to impinge on the fields of the coils making up one transformer, at the very least they would change its selectivity characteristic and so alter its bandwidth. The worst that can happen would be that the stage would start oscillating around the frequency of the i.f. Why could it cause oscillation? That's because energy from T2 in Fig. 8.2, impinging on T1 is the same as feeding some output from an amplifier back to its own input, the very condition we discussed previously to make an oscillator oscillate. The feedback must, of course, be positive or add to the input (be in phase with the input) to cause actual oscillation, but even if negative it could be undesirable as then the stage gain would be reduced.

By surrounding each pair of tuned circuits (i.f. transformer) by a metal can, the fields external to the i.f. transformer caused by its tuned circuits can be very considerably attenuated. So, if each transformer is so "screened" the chance of oscillation or distorted bandwidth is almost eliminated. Nothing is 100 per cent, however, so the transformers are kept physically as far apart as practically possible to further minimise the risk of interaction.

Resistors R1 and R2 provide the bias necessary on Gate 2 and with R3, set the d.c. condition necessary for maximum stage gain. Other components, C7, C8 and R4 perform similar functions to those described in similar positions for other circuits, so you should be able to work those out for yourself!

The a.g.c. input needs some explanation. The idea of a.g.c. has already been covered, so just the application to the amplifier is required. A negative-going (with respect to earth) d.c. signal from a later stage is connected via R5 to Gate 2. A very strong received signal will apply a voltage from the a.g.c. part of the demodulator to Gate 2 which will oppose the quiescent bias on the gate, thus making its potential less positive. This will reduce the gain of the stage and so prevent overloading to some extent, but such a simple approach could not be expected to provide the best solution as it would probably introduce some distortion of its own. This is because the f.e.t. would be handling **larger** signals just when the a.g.c. had **reduced** the current through the device so also reducing the available current swing. However, the idea behind these articles is to enable the various circuits to be **recognised,** not designed for optimum performance.

Next, in Part 9, we'll finish looking at the superheterodyne receiver.

SWAP SPOT

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?

If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Enefco House, The Quay, Poole, Dorset BH15 1PP, for inclusion in the first available issues of the magazine.

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.

Have FT-708R 432MHz hand-held transceiver, complete with mobile mounting bracket, mobile mic and ext. speaker. This equipment has full 432MHz band coverage plus scanning. Would exchange for h.f. c.w. rig, single-bander, anything considered. Tel: 0664 60773. *E670*

Have 3½ inch Myford lathe, BG. SC. and accessories, all in good working order. Would exchange for Trio TS-530SE h.f. transceiver or similar, must be working. Geoff. Tel: Norwich 406331 evenings. *E708*

Have Sommerkamp FT-250/FP-250 240W p.e.p. h.f. s.s.b./c.w. transceiver with mic and manual, v.g.c. Would exchange for Sony CRF synthesised receiver, will also consider Panasonic RF-6300 or similar receiver. Tel: 061 7431570. *E709*

Have Bell and Howell 2146XL 8mm cine camera with shoulder case, plus Hanimex 808D projector both in mint condition. Would exchange for 144MHz transceiver. Alan. Tel: 0840 212177. *E718*

Have Collins 51J-4 with 3 mechanical filters and Siemens E-310a all-wave receivers. Would exchange for German WW2 ex-service equipment, W.S. No 1 or W.S. No 11. R. Otterstad OZ8RO, Vejdammen 5, DK-2840 Holte, Denmark. Tel: 010 452 801875. *E724*

Kitchen Konstruktion

In No.7 of his occasional series, Richard Q. Marris G2BZQ shows us how to make a "Table Hook". A device that will surely save your kitchen table from the rigours of electronic construction.

So far in this series, a number of very simple, low-cost ideas have been submitted, all of which can be made on the kitchen table. These were aimed at those who haven't the luxury of a workshop or bench.

It doesn't bear contemplation, the possible reaction of your nearest-and-dearest to you soldering or metal working on his or her delicate kitchen table or fitted worktop. *(Our illustrious editor had the misfortune to drill through his Formica kitchen worktop many years ago, and has not been entirely forgiven since!)*

So in the interest of preserving domestic harmony, you might like to construct yourself a simple working surface, on which you can do these rather unsocial activities.

Christened the "Table Hook" it is a derivation of the once popular and massive "Bench Hook", used by carpenters to hold pieces of wood steady whilst they were being sawn.

The "Table Hook" consists of a flat surface board, with a "back stop" and a "front stop" attached (Fig. 1).

Construction

The surface board should be as large as is convenient, for individual circumstances, and made of thick, good-quality plywood. No doubt the local timber supplier will have an off-cut from which a piece can be sawn.

Chipboard should be avoided as the edges crumble and powder, and wood screws and nails have a nasty habit of pulling out when put under stress.

Along the underside of the front edge of the board, a stout piece of wooden battening should be glued and screwed into place, using countersunk screws and woodworking adhesive. This "front stop", when the "Table Hook" is in use, is pushed up against the front edge of the kitchen table to hold the work surface in position. A "back stop" is fitted in a similar manner along the rear edge of the working surface. This performs two functions, the first is, it stops bits and pieces dropping off the work surface on to the table, and the second is, it acts as a firm edge to place chassis or panels against while they are being drilled or cut. While performing either of the last two functions you must lean against the "front stop" to hold the working surface of the "Table Hook" secure.

Refinements

The following refinements can be optionally added to the "Table Hook":

1. A longish steel rule can be screwed near the front edge for easy measurement of wire, etc., preferably marked in inches and metric measure.
2. A soldering iron stand can be made using a piece of wire coat hanger formed into an "M" shape, and then pushed into a couple of appropriate size holes made part-way through the working surface towards the rear right-hand side.
3. The underside of the "Table Hook" can be covered with cork tiles (easily cut with a sharp craft knife), glued into place. This will stop the whole assembly scratching the surface of the table.

When the "Table Hook" gets grubby, just wipe it down with a damp cloth and allow it to dry. It's not worth painting or varnishing its surface because in no time at all it will look tatty and scratched. Due to the "Table Hook's" low profile, it can easily be stored when not in use. There's no end to the refinements one could make to this device (see "Table-Top Workbench", *PW* August 1983); with a little ingenuity all sorts of jigs and clamps could be added for drilling and bending light-gauge sheet metal. ***PW***

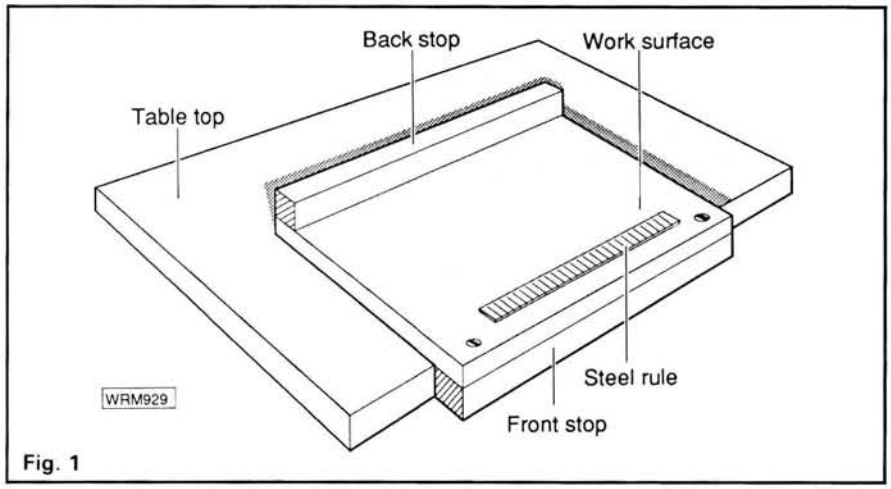


Fig. 1

SWAP SPOT

Have *Handbook of Wireless Telegraphy 1938* volume two. Would exchange for 144MHz v.s.w.r. meter or anything RX. Tel: 0993 811747 after 6.30 pm. *E618*

Have FDK-700 144MHz f.m., 144MHz and 432MHz Microwave Modules converters (28MHz i.f.). Would exchange for either Datong D-70, RTTY/c.w./FAX for Commodore VIC20 or transverters with 28MHz i.f. Write to, R. Jones, 37 Maes-Y-Bedol, Garnant, Ammanford, Dyfed SA18 2ER. *E626*

Have DST-100 MKII wartime receiver "Collectors item" 50kHz to 30MHz continuous tuning, in very good condition with workshop manual. Would exchange for smaller receiver, i.e. Realistic, Trio, Eddystone, etc. or w.h.y? Durham 0388 527700 *E644*

Have Yaesu FRG-8800 receiver with v.h.f. converter. Would exchange for a PRO-2004 scanner with AH-7000 antenna. Tel: 0443 755876. *E648*

Have Realistic PRO-2004 scanner as new. Would exchange for any 100kHz to 30MHz receiver with s.s.b. (l.s.b./u.s.b.)/c.w./a.m./f.m. modes. Mr J. T. Stephens. Tel: 0256 53896. *E649*

Have Sony CRF-320 32-band all-mode receiver, cost £780, original owner. Set has intermittent fault on short wave. Would exchange for American general coverage valved receiver, e.g. HRO-60, NC-400, HQ180. Tel: 0533 896391. *E657*

Have Racal RA17L general coverage receiver in good working order. Would exchange for good SLR camera or w.h.y? John Carver GM0IZC. Tel: 0224 780545 daytime. *E659*

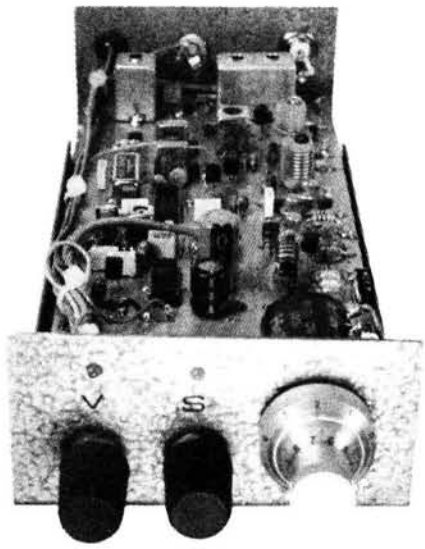
Have Polaroid "Polavision" movie outfit complete with zoom lens, camera and replay monitor. As new in original box. Would exchange for v.h.f. scanner or h.f. receiver or w.h.y? Tel: 01-906 4206. *E668*

The PW "Badger"

This tuneable f.m. receiver designed by Mike Rowe G8JVE is capable of covering the all-mode and f.m. sections of the 144MHz amateur band.

Unlike many other amateur v.h.f. receivers that have appeared over the years this one does not plump for the easy option; crystal frequency control. The receiver section which sets the "Badger" apart from most others, is the v.f.o. (Fig. 1). This is designed around a Vackar oscillator, running between 14.81MHz and 15.03MHz, tuned by a Varicap diode D2. To reduce oscillator drift the voltage supplied to the diode tuning network is stabilised by a 78L05 voltage regulator chip IC3. The output of the v.f.o. is buffered by Tr9 and Tr8, these help to minimise the effect of loading presented by following stages and thus further ensure good oscillator stability. The buffer is followed by two tripler stages, Tr7 and Tr6 (see Fig. 2), giving a final local oscillator injection frequency of 133.3 to 135.3MHz. This gives a receiver coverage of 144MHz to 146MHz using a first i.f. of 10.7MHz.

The receiver's signal frequency amplifier stage uses a dual gate m.o.s.f.e.t. (Tr1), which is inductively coupled by a band-pass filter arrangement, L3 and L4, to a single-gate f.e.t. mixer (Tr2). The 10.7MHz i.f. output from Tr2 is transformer coupled to Tr3 which together with Tr4 offers matching and roofing to a 10.7MHz crystal filter (FL1). Transistors Tr3 and Tr4 also offer some extra i.f. amplification.



The MC3357 integrated circuit (IC1) performs the following tasks; 2nd local oscillator 10.245MHz, mixer, i.f. amplifier/limiter, discriminator and squelch. The second i.f. selectivity is provided by a 455kHz ceramic filter, type CFM 455F, with a bandwidth of 12kHz.

The squelch circuit in IC1 provides a d.c. level, which when a signal is present, drives Tr11 into conduction and lights the "Busy" indicator l.e.d. (D3). The collector voltage of Tr11 is also used to drive Tr12, which in turn disables the little known mute facility of the LM380 (IC2). If pin 1 of IC2 is taken low the audio output of the chip

Fig. 1: Block diagram of receiver

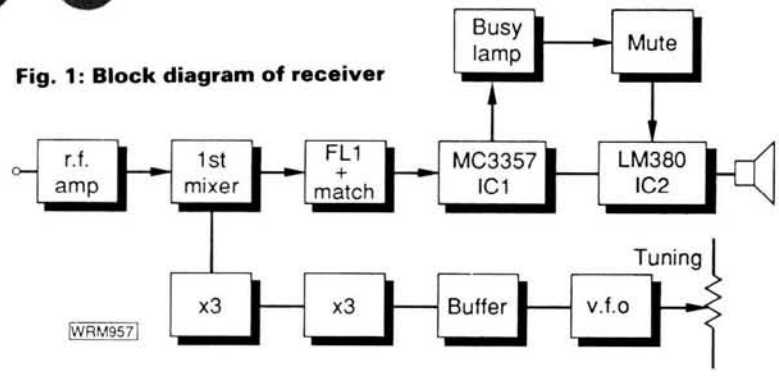
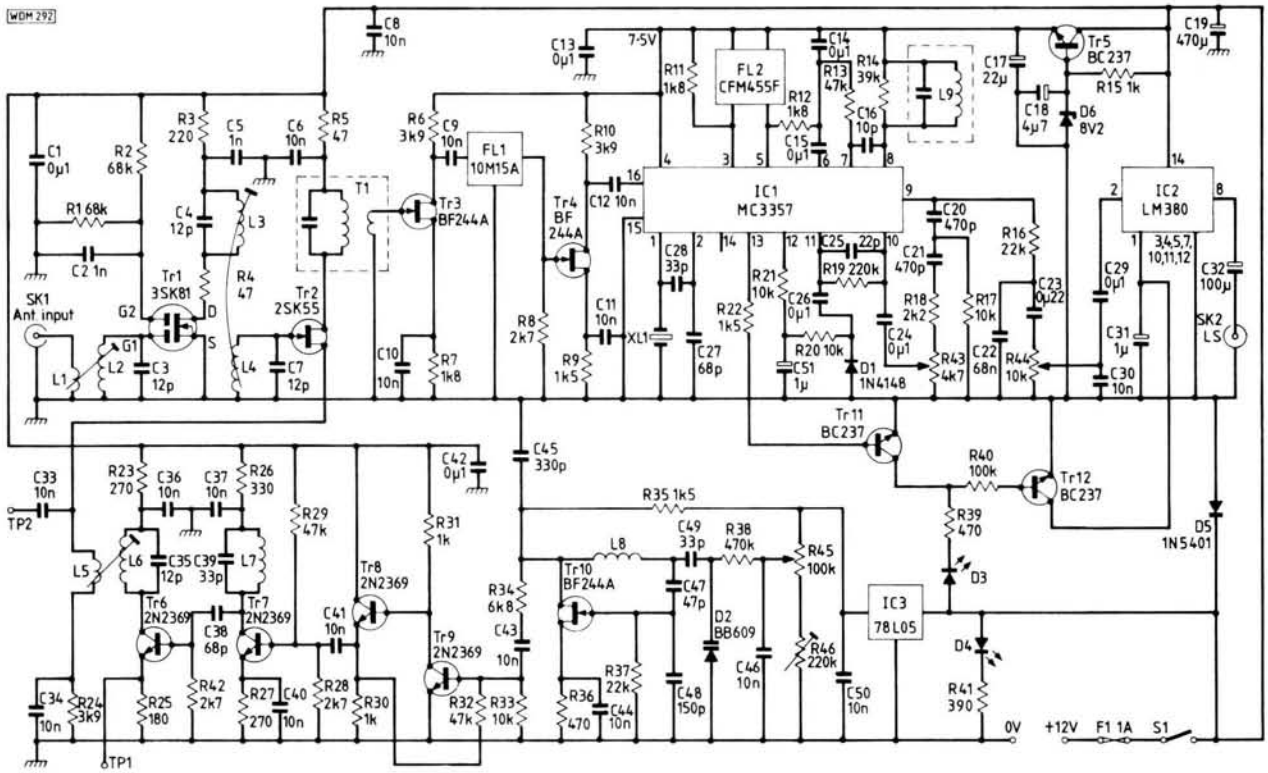


Fig. 2: Circuit diagram of receiver



SHOPPING LIST

Resistors

0.25W 2% Metal film

47Ω	2	R4,5
180Ω	1	R25
220Ω	1	R3
270Ω	2	R23,27
330Ω	1	R26
390Ω	1	R41
470Ω	2	R36,39
1kΩ	3	R15,30,31
1.5kΩ	3	R9,22,35
1.8kΩ	3	R7,11,12
2.2kΩ	1	R18
2.7kΩ	3	R8,28,42
3.9kΩ	3	R6,10,24
6.8kΩ	1	R34
10kΩ	4	R17,20,21, 33
22kΩ	2	R16,37
39kΩ	1	R14
47kΩ	3	R13,29,32
68kΩ	2	R1,2
100kΩ	1	R40
220kΩ	1	R19
470kΩ	1	R38

Potentiometer, vertical preset

220kΩ	1	R46

Potentiometer, Lin. 3W 10-turn type (Electromail code 173-445)

100kΩ	1	R45

Potentiometer, Log.

4.7kΩ	1	R43

Potentiometer, Log, with on/off switch

10kΩ	1	R44

Capacitors

Sub-miniature, ceramic plate

10pF	1	C16
12pF	4	C3,4,7,35
22pF	1	C25
33pF	2	C28,39
68pF	2	C27,38
470pF	2	C20,21

Disc ceramic

10nF	4	C36,41,43, 44

Monolithic ceramic

1nF	2	C2,5
10nF	12	C6,8-12,33,34, 37,40 46,50

Miniature polyester

10nF	1	C30
68nF	1	C22
0.1µF	8	C1,13,14,15, 24,26,29,42
0.22µF	1	C23

Polystyrene

33pF	1	C49
47pF	1	C47
150pF	1	C48
330pF	1	C45

Electrolytic, 16V single-ended, p.c.b. type

22µF	1	C17
100µF	1	C32
470µF	1	C19

Tantalum bead 35V

1µF	2	C31,51
4.7µF	1	C18

Semiconductors

Diodes

Green l.e.d.	1	D3
Red l.e.d.	1	D4
BB609A	1	D2(3)
BZY88C8V2	1	D6
1N4148	1	D1
1N5401	1	D5

Transistors

BC237	3	Tr5,11,12
BF244A	3	Tr3,4,10(4)
2N2369A	4	Tr6-9
2SK55	1	Tr2(1)
3SK81	1	Tr1(1)

Integrated circuits

LM380N	1	IC2
MC3357P	1	IC1(1)
78L05	1	IC3

Miscellaneous

FL1 10M15A(1); FL2 CFM455F Cirkit stock number 1645522; XL1 HC18U 10.245MHz crystal(1); Inductors(1) (see Table 1); Self-adhesive cabinet feet (4); p.c.b.; Knobs (2); 46mm precision multi-turn counter mechanism (Electromail code 509-428); A120 two-part aluminium case 76 x 102 x 254mm(5); SK1 single hole SO239 socket; SK2 mono 3.5mm jack socket; 20mm chassis mount fuse holder; 1A 20mm fuse; Hook-up wire; Miniature 2 core screened cable; Miniature 50Ω coaxial cable; Small grommet; 6BA Mounting pillars x 12mm long, nuts, bolts, washers etc.

(1) Cirkit Holdings plc, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: 0992 444111.
(2) Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: 0536 204555.
(3) Electrovalue Ltd, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB. Tel: 0784 33603.
(4) Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: 0702 554161.
(5) Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd. Tel: 076 676 2572.

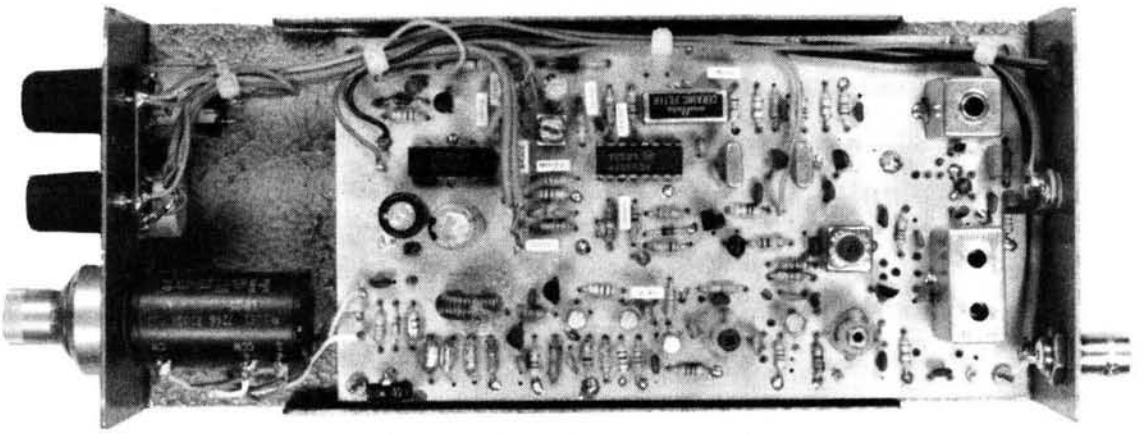
Table 1: Coil Data

Coil No.	Turns	Wire s.w.g.	Coil Former	Remarks
L1	1	—		1/0.6mm insulated hook-up wire wound over L2
L2			Toko S18	Orange with aluminium core
L3			Toko S18	Orange with aluminium core
L4			Toko S18	Orange with aluminium core
L5	1			1/0.6mm insulated hook-up wire wound over L6
L6			Toko S18	Orange with aluminium core
L7			Toko S18	Violet with Ferrite core
L8	21	24	T50-6	enamelled copper wire wound evenly around toroid (Cirkit 55-00506)
L9			Toko 7E	LMC4200A 455kHz a.m./i.f.
T1			Toko 10k	KACS1506A 10.7MHz f.m./i.f. (Cirkit 35-15060)
L1/L2 share single screening can(1) L3/L4 share double screening can(1)				

is muted and its operating current falls accordingly. The LM380 gives final audio amplification to loudspeaker level. Diode D5 provides protection against damage from supply polarity reversal.

Construction

It is suggested that construction commences by soldering in all the resistors. It should be noted that many components are soldered on both sides of the p.c.b. These are to provide both r.f. and 0V returns for track-side earthing networks. All through-board connections are shown on component placement diagram Fig. 3. Next fit all the capacitors taking care over the polarity of the electrolytic and tantalum types. Be careful not to overheat



Internal view of prototype receiver

the polystyrene capacitors in the v.f.o. circuit as these are easily damaged.

Now fit IC1 and IC2 (note IC2 has pins 3-5, 7 and 10-12 soldered to both sides of the p.c.b. to provide earthing and heat sinking). Fit all the transistors, IC3, XL1, FL1, FL2 and all the diodes (take care over polarity). Next wind L8 oscillator coil (see Table. 1), tin the ends and gently push them into their holes in the p.c.b. The finished coil assembly is secured to the p.c.b. with silicone rubber compound, as any movement of the coil will give rise to frequency instability in the v.f.o. Now fit L2-4, L6, L7, L9 and T1, wind L2 and L6 as per Table 1. Then fit suitable screening cans over L1/2 and L3/4. Where off-board connections are to be made fit Veropins (see Fig. 3).

As for the mechanical construction of the receiver, this is up to the individual. The size of the case will depend to some extent on the type of tuning system to be used. The author's prototype used a 10 turn potentiometer and multi-turn dial assembly, purchased at a rally. This arrangement is catered for in the component listing, but a cheaper though more complex design could use two epicyclic drives in series and a normal cermet pot. Details for such a system appeared in July 1985 issue of *PW*, Part 4 of the *PW* "Colne". Once the case has been drilled to take the p.c.b. and all off-board controls, the completed p.c.b. may be installed. Next wire up and connect, "Busy" light (D3), the power indicator (D4), the volume, squelch and tuning potentiometers.

Finally check for any short circuits or dry joints especially on the regulated lines. A short on the line to IC1 will almost certainly destroy Tr5.

Alignment

Connect 12V to the receiver preferably via a current-limited p.s.u., and check the current which should be less than 250mA. Should the current be any higher than the specified figure switch the receiver off immediately and investigate. Check the voltage on the regulated supply rails, the one feeding the v.f.o. should be 5V and that for IC1 approximately 7.5V.

Preset the cores of the following inductors; L2-4 set cores to approximately 0.5mm into formers, L6 and L7 set cores to approximately 1mm out of formers. Leave the adjustment of T1 and L9 for the moment.

Connect a frequency counter across R30 or listen on a general coverage receiver. With R45 at maximum frequency position carefully separate the turns on L8 for a reading of 15.03MHz. Next turn R45 to its minimum frequency position and adjust R46 to give a reading of 14.81MHz. Repeat the oscillator alignment procedure several times until the coverage of the v.f.o. is correct.

Following on, connect a voltmeter from TP1 to ground and adjust L7 for a maximum reading. Then with the aid of a diode probe (Fig. 4) on the multimeter, connected to TP2 adjust L6 for a maximum reading. If a frequency counter is available connect it from TP2 to ground and check the local oscillator swings between 133.3MHz and 135.3MHz.

Lastly using a signal generator (or local transmission) tune L2-4, L6 and T1 for best signal-to-noise ratio. Then finally tune L9 for best audio quality and signal-to-noise ratio.

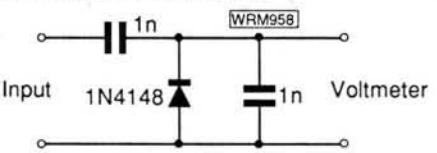


Fig. 4: Details of diode probe

Trouble Shooting

No problems have arisen with the prototype receiver, but in the event of trouble the following d.c. voltages in Tables 2,3 and 4 were obtained on the prototype using a high impedance meter. Receiver supply voltage set at 12V.

Table 2

Device number	Drain	Gate 2	Gate 1	Source
Tr1	7.7	6.0	0	0
Tr2	11.9	***	0	0.8
Tr3	4.8	***	0	1.2
Tr4	5.7	***	0	0.7
Tr10	2.2	***	0	0.8

Table 3

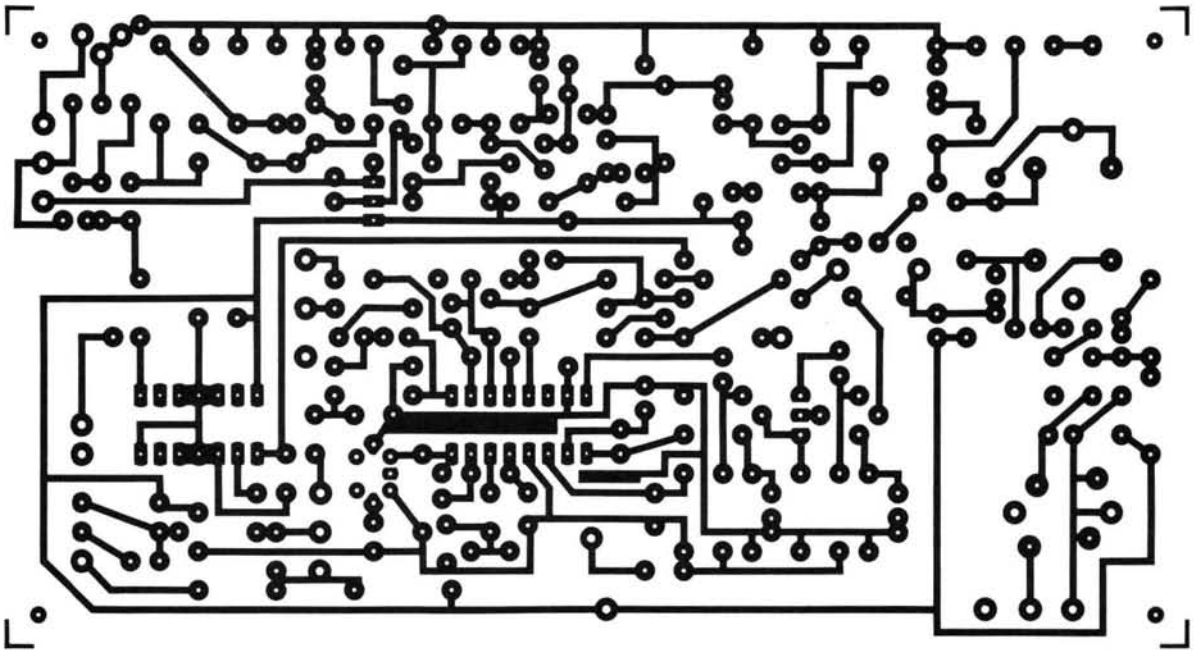
Device Number	Emitter	Base	Collector
Tr5	7.5	8.2	12
Tr6	0.3	r.f.	11.6
Tr7	0.3	0.6	11.6
Tr8	7.7	8.4	12
Tr9	0	0.7	8.4
Tr11	0	0.7	0.1 Squelch open
Tr11	0	0	10.3 Squelch closed
Tr12	0	0.1	6.2 Squelch open
Tr12	0	0.7	0 Squelch closed

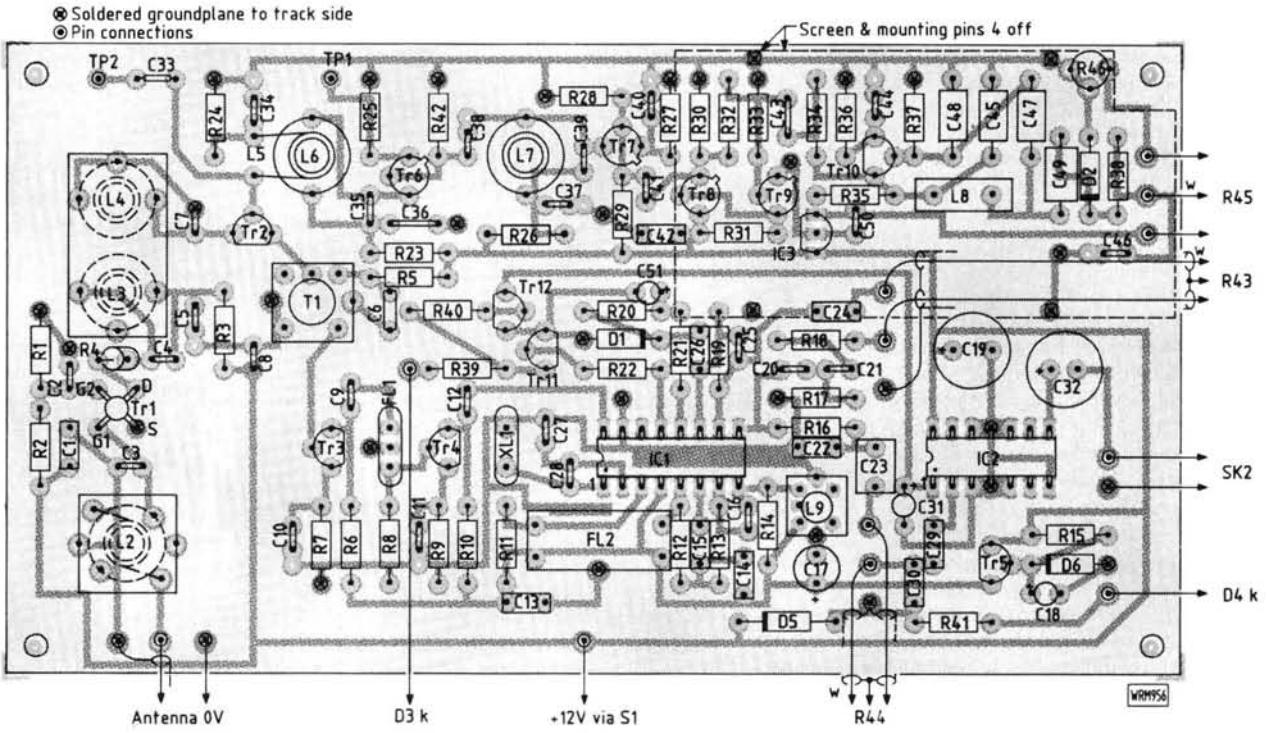
Table 4

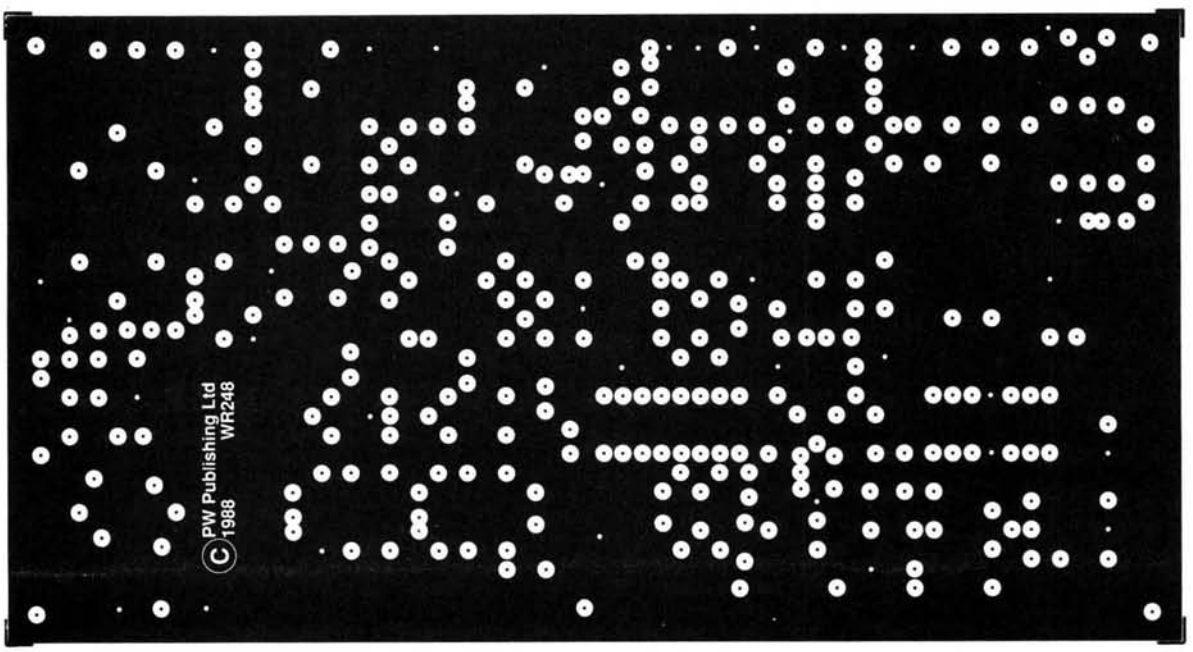
Pin Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IC1 *	7.5	6.8	7.1	7.5	1.0	1.0	1.0	7.5	3.0	2.0	2.0	0.5	2.60	0	0	2.0
IC2 *	6.20	0	0	0	0	0	0	6.01.8	0	0	0	0	0	12		

*=Squelch closed

Fig. 3: Full-size double-sided track pattern and component location diagram of receiver. Screen made of single sided p.c.b. material suspended below main p.c.b., copper side away from track, with 4 short lengths of wire soldered through holes in main p.c.b.

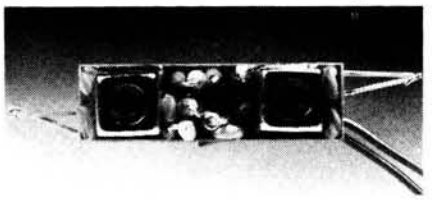






PW REVIEW

Garex 50MHz Pre-amplifier



With activity on 50MHz increasing, Mike Richards G4WNC puts a miniature 50MHz pre-amplifier through its paces.

The first thing that strikes you about this pre-assembled 50MHz pre-amp from Garex Electronics is its size. At a mere 35mm long, 10mm wide and 15mm high, I was frightened that if I dropped it the Hoover might "gobble" it up! Seriously though, the small size does mean that it should prove very easy to fit inside a rig, which is how Garex intended it to be.

The pre-amp design actually started life with Timestep Electronics, but the design and manufacturing rights are now held by Garex Electronics. I'm sure there are many of you who will be pleased to hear that this popular design is now readily available again. In fact the pre-amp is available for a whole range of spot frequencies from 40MHz to 200MHz with the amateur bands and 137MHz (WX Satellites) being stock items.

The review sample was supplied ready-wired with 25mm tinned leads for the input, output and ground connections. The red and blue power leads were somewhat longer at 150mm. Also included with the pre-amp was a single-sided A4 instruction sheet which gave a very brief circuit description and details of the connections. A circuit diagram was also included, along with a p.c.b. layout. If you are interested in using the pre-amp at the masthead then you can power feed the pre-amp via the coaxial cable by implementing a couple of simple mods which are also described in the instruction sheet.

Getting Started

The first thing to do is to find a suitable enclosure, as it is very important to provide adequate screening when dealing with such a high gain circuit. Fortunately I had a 50mm square die-cast box available which was ideal, though I must admit that the pre-amp looked quite lost when finally mounted inside. If you would rather "home-brew" a case then a very effective screened enclosure can be built using double-sided p.c.b.

In order to obtain maximum performance it is also essential to ensure that good quality connectors are used for the r.f. input and output, though if you are hard wiring the pre-amp into a rig, the leads should be kept as short as possible.

The final connection is the power supply which should be between 8 and 17 volts and well smoothed.

One final and essential point to remember is that the pre-amp does not have any transmit/receive switching so make sure that you either provide your own switching or, if fitting inside a rig, fit it on the receive side of the TX/RX relay.

Circuit Description

The Garex 50MHz pre-amp uses a well established design which has been used successfully on 144MHz for some time. The active device is a Philips BF981 dual-gate m.o.s.f.e.t. which is biased for optimum performance at 50MHz. There are two tuned circuits, one on the input and one on the output, with the 50Ω matching provided by capacitive taps. The power supply is fed through an *RC* filter to reduce the risk of instability and to attenuate power supply noise.

Performance

As mentioned earlier, the pre-amp was mounted in a small die-cast box and used at the shack end of the feeder for all the review tests.

The first test was to evaluate the gain of the review sample, which was achieved by using a signal generator with an accurate attenuator. First the generator was connected directly to the 50MHz receiver and tuned to the desired frequency. The attenuator was then adjusted to give a reading of S9 on the receiver. The attenuator reading was noted and the pre-amp was then connected between the generator and the receiver. The attenuator was then re-adjusted to give the same S9 reading on the receiver's S-meter. The difference between the two attenuator readings represents the gain of the pre-amp. These tests revealed that there was a 7dB gain spread over the range 50 to 52MHz. The actual figures were 22dB at 50MHz, 19dB at 51MHz and 26dB at 52MHz. This is actually a very high gain and probably more than required for most applications.

The current consumption was dependent on the supply voltage and ranged from 9mA at 7 volts to 10.5mA at 14 volts. Despite the apparent supply tolerance, the biasing values were optimised for 12 volts so this should be used if possible. The review sample showed a tendency to self oscillation if the input and output were left open circuit. I managed to trace this problem to long power leads, the cure being to provide some additional power supply decoupling. This emphasises the point that great care must be taken when installing any high gain v.h.f. device. The main thing is to ensure that all the connections to the unit are kept as short as possible.

I had a few problems with the on-air performance as the extremely high gain caused overloading of the front-end of my 50MHz rig when there were strong signals about (yes, there are strong signals on 50MHz!). I can't really blame Garex for this, as the pre-amp was actually performing as designed. I'm sure Garex are only responding to the market demands in producing a such a high gain pre-amp. It seems to be a fact of life that some people gauge the performance of a pre-amp by the amount of gain it provides, whereas the important point is the noise factor. In practice a gain of around 10 to 15dB is more than adequate for most 50MHz rigs.

Conclusion

The pre-amp design is well tried and has survived the test of time quite well. I still have reservations concerning the high gain, but you can of course pad down the output to reduce it to a more manageable 10 to 15dB. The mechanical construction was sound and the alignment was good, so if you're looking for a small pre-amp either to mount inside your rig or, with a bit more effort, to masthead mount then the Garex 50MHz pre-amp would make a very cost effective choice.

The Garex 50MHz pre-amp costs £11.45 inc. VAT and is available from ***Garex Electronics, 7 Norvic Road, Marsworth, Tring, Herts. PH23 4LS.*** My thanks to Garex for the loan of the review sample.

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Valved Communications Receivers The BC-348 (Part 2)

This month, Chas E. Miller continues his in-depth description of the US Air Force BC-348 series of receivers, covering various modifications to augment their performance and versatility for civilian use, plus notes on servicing and realignment.

It is unlikely that many of these receivers still exist in unmodified form, but as is unfortunately the case with all too many such exercises, the quality of the workmanship and the performance obtained may leave something to be desired. The following notes will assist the owner of a BC-348 to realise the maximum performance. They are based entirely on practical experience with sets spanning a period of some three years.

Power Considerations

The provision of a mains-derived power supply has always been the prime object in the modification of the BC-348, as few domestic locations could tolerate the whine of the dynamotor, quite apart from the difficuluty of providing the necessary 24V d.c.! Some informed opinion leans toward having the mains power pack external to the receiver itself, probably in the same cabinet as the loudspeaker, to avoid heat within the set, and this is certainly a point worth consideration. However, if one is prepared to provide a ventilation louvre in the cabinet top, it is perfectly possible to fit a power pack in the space vacated by the redundant dynamotor.

The standard policy for the heaters of the valves was to rewire them for 6.3V parallel operation, in which case they will consume some 2.5A, to which must be added the current drawn by any dial lamps, etc. To be on the safe side the transformer rating must be at least 3A, and preferably somewhat more. An unmodified set could have its heaters supplied by a 24V–28V transformer rated at 0.75A or a little more. The h.t. line being around 225V, a transformer giving at least 250–0–250V is required to allow a drop through the smoothing arrangements. A point that must be noted is that negative bias is employed for the output valve, derived from resistors in the h.t. negative line. Therefore, the normal practice of earthing the h.t. negative supply rail cannot be followed, and the connection must be made to the terminal formerly used for the dynamotor. It may be more convenient to use standard earthed-can electrolytics rather than the type with an insulated negative, in which case they may be wired as normal (Fig. 2.1), but with the centre-tap of the h.t. winding disconnected from earth and taken to the h.t. negative terminal. A 50µF, 50V electrolytic wired across from h.t. negative to chassis will eliminate any hum that might occur.

Loudspeaker Matching

As with many military receivers, the BC-348 was designed for use with headphones, the output transformer catering for alternative load impedances of 500 or 4500Ω. It is possible to use another transformer to match one of these outputs to a standard loudspeaker, or to replace the original transformer by a conventional type. The 41 or 6K6GT requires a load of approximately 8000 ohms under its conditions of use in the BC-348; the transformer ratio must, of course, be chosen to suit the impedance of the loudspeaker to be used. If the original transformer is to be retained the additional transformer must be suitable for matching 4500Ω to the loudspeaker impedance The ratio of the windings is found from the well-known formula

$$\sqrt{\frac{\text{Ra}}{\text{LS Impedance}}}$$

For example, a 40Ω loudspeaker requires a transformer of 45:1 turns ratio to match it to the 6K6GT.

Extra A.F. Sensitivity

The above-mentioned use of headphones made it possible for the BC-348 to deliver ample output without the

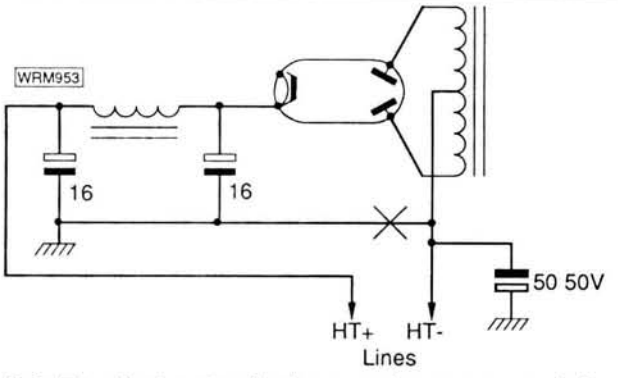


Fig. 2.1: To adapt a standard a.c. mains power pack for use with the BC-348, break its chassis connection at point "X" (only essential features shown)

need for an a.f. voltage amplifier prior to the output stage. It will be found, however, that a.f. sensitivity is just a little too low for really satisfactory loudspeaker work, and improvements in this respect are most desirable. The time-honoured method used was the construction of a small amplifier stage using, say, a 6J5 triode, and built on the ex-dynamotor mounting plate.

There are other options available which may be more attractive, especially if the room on the plate has already been taken up by the a.c. mains power pack. One possibility is to replace the 6K6GT with a high-slope output valve such as the 6AG6. This has a mutual conductance of 10mA/V as compared with the 2.3mA/V of the 6K6GT (or 41) and would greatly increase the a.f. sensitivity. Note though that the bulb size may cause problems in some marks of the receiver, and that the comparatively heavy heater current (1.5A) may require the services of a larger mains transformer.

The Mullard EL33 has a slope of 9mA/V for a heater current of 0.9A and is also worth consideration. Replacement of the 41 by either type just mentioned will, of course, necessitate a change of valve-holder.

If the power pack has been mounted externally to the receiver there will be no shortage of space for another valve stage in the set, but rather than having to carve holes in the dynamotor plate the owner could consider relocating the output valve to a position on the power pack, leaving its vacated holder to accommodate an amplifier triode, such as the 6J5.

In the later marks where a 6SR7 is used as detector/a.g.c./b.f.o. valve an interesting and highly effective modification is possible. This is to replace the final i.f. amplifier (6SR7) with a 6B8 double-diode-pentode as used in the earlier sets; it is fitted into the 6SR7 holder in order that the wiring to the detector and a.g.c. diodes shall remain undisturbed. The alterations to the holder for the pentode section of the 6B8 are minor and easily carried out.

Since the new valve has a top cap for its control grid, the i.f. transformer must be slightly modified to provide a lead from the top of its can instead of the bottom. The construction of the transformer makes this a very simple process which may be achieved with only the removal of the two can-securing nuts; the stout wires to which the windings are soldered travel the full length of the can and the grid connection is available immediately. All that is required is a small extension to the existing trimmer access holes to accommodate the top cap lead. The valve base vacated by the 6SJ7 may now be used to accommodate a 6SN7 double-triode; one section takes up the duty of b.f.o., the other becomes the extra a.f. amplifier. The writer can vouch for the excellent performance obtainable from this modification. (See Fig. 2.2).

Increased I.F. Sensitivity

The gain of the i.f. stages of the –J and later marks may be increased dramatically by replacing the existing coupling/neutralising coil by a tightly-tuned alternative, and dispensing with the crystal filter, if, indeed it has not already been removed by a previous modifier! The coil will be found mounted on a small paxolin panel just above the b.f.o. coil assembly, and may be removed from the front panel. The coil should be put to one side for possible future use, as it makes an excellent b.f.o. coil itself should the existing one fail. The replacement should be wound on a former of similar diameter, into which a portion of an old ferrite antenna rod may be slipped to increase the inductance. About 125 turns of 36 s.w.g. wire will be found to be suitable; it should be shunted by a fixed trimmer of about 270pF, and a variable of 0–100pF. It must be stressed that these values depend a lot on the exact way in which the coil has been wound (pile winding is simple and effective) and may have to be varied to suit the individual. No difficulty should be experienced, however, in producing a coil which will tune to the 915kHz i.f. with a sharpness that will bring a very considerable increase in the gain of the stage.

Separate Gain Controls

The original method of having the r.f. and a.f. gain controls mounted on the same shaft and operating them alternatively is not altogether satisfactory for normal s.w.l. use. When the mode switch is set to "AVC" the r.f. gain control is by-passed to earth via a 100Ω resistor, and is rendered ineffective. Likewise, selecting "Manual" shorts out the a.f. gain control to give maximum gain, the output of the receiver being controlled only by the r.f. gain control. A better system may be achieved by installing a separate r.f. gain potentiometer (10kΩ) on the front panel, and transferring to it the leads from the original, so that it may be operated independently of the a.f. gain. At the same time the fixed 100Ω resistor should be removed and discarded, whilst the lead from the top end of the a.f. gain potentiometer to the mode switch should also be disconnected. Both gain controls will then work normally whichever mode is selected.

Fitting an S-Meter

The method described in previous articles in this series, and in "Versatile Valve Monitor and S-Meter" (*PW*, May 1986) may again be successfully employed. Alternatively, a system that was much in vogue with BC-348 owners many years ago may be revived. This depends on the change of screen grid current in the 2nd i.f. amplifier when the a.g.c. comes into operation. (See Fig. 2.3). It is fairly easy to disconnect the relevant electrode from the common G2 supply line and to take it to point B on the diagram. It will be seen that a simple bridge circuit is formed, one arm being the current path through the valve. The meter should have an f.s.d. of around 500μA–1mA, the exact value not being critical, as the value of R2 may be altered to provide the desired degree of sensitivity to suit the instrument. The zero-set potentiometer VR1 may be replaced (if a 1kΩ type is not available) with a 5kΩ type shunted by a 1.8kΩ resistor. Do not omit the decoupling capacitor for the valve G2, which should be connected directly between the relevant pin and the nearby earth point.

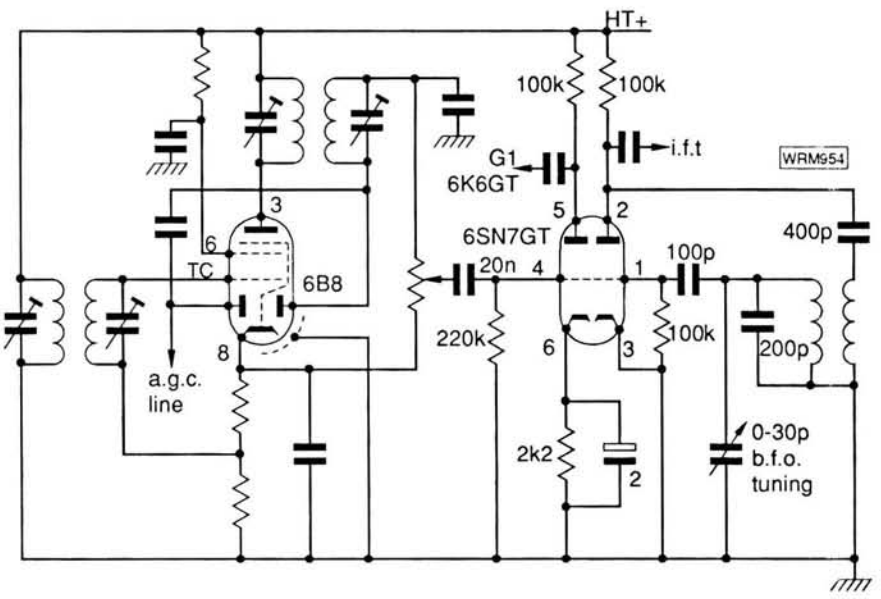


Fig. 2.2: Modifications to the last i.f./b.f.o. stages (-J and later marks) to include an extra a.f. amplifier, plus a continuously variable-tuned b.f.o. for s.s.b. reception. New components have values shown; existing components do not. The b.f.o. coil is the redundant i.f./xtal coupler removed from set (see text)

Adding Medium-wave Coverage

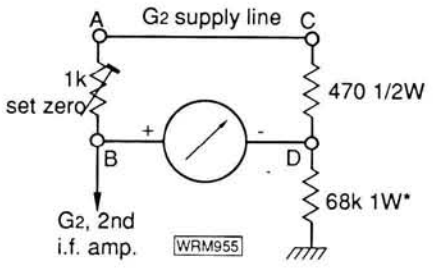
This is a much more ambitious project and should not be attempted unless the owner/modifier has ample experience in the construction and adjustment of tuned circuits. For this reason, the following notes will be of a general nature as it is felt that the degree of skill required will make highly detailed data superfluous.

The conversions of the near-useless 200kHz–500kHz band to m.w. coverage would be much simpler were it not for the 915kHz i.f. which, of course, is bang in the middle of the m.w. broadcast band! Even with a fairly narrow i.f. bandwidth it is all too plain that strong stations from about 890–940kHz (337–319m) are likely to prove to be an acute embarrassment unless the most stringent precautions are employed to exclude them from the i.f. section of the receiver. Unfortunately the main contender will be the BBC Radio 2 network on 909kHz, with transmitters of up to 140kW power.

To ensure sharp tuning, all r.f. tuning coils should be double-wound and fitted with iron-dust cores for accurate alignment at the l.f. end of the band. The existing trimmers, for the high end, should prove to be adaptable for the new coils. A very necessary adjunct is a series antenna filter or rejector. This may be made up in a similar manner to the i.f. tuning coil described above, and is adjusted for minimum response with an input at i.f. from a signal generator, and perhaps subsequently with an antenna input from a very strong transmitter which is posing interference problems. In practice, excellent coverage throughout the greater part of the m.w. band may be achieved, making this admittedly lengthy conversion job very rewarding in the long term.

General Servicing Note

These receivers were made to very high mechanical and electrical standards and are likely to give little trouble in either respect. It is the writer's experience that the most probable source of faults will be previous unsatisfactory modification work. For this reason it is desirable that all existing "mods" should be closely examined when a receiver is first acquired. The connection of the h.t. negative lead mentioned earlier is one item that may easily be overlooked by a modifier unused to the negative-bias arrangement. Another common fault is the use of too thin a gauge of wire for the valve heater supply, particularly when an external power pack is used. There can be a significant voltage drop along thin cables which may reduce the actual heater voltage to well below 6V, and thus impair the efficiency of the valves. Similarly, when the original power supply socket of the receiver is used for the new p.s.u., even a very small degree of poor contact between plug and socket can affect the l.t. voltage markedly.



*Adjust value to suit meter sensitivity

Fig. 2.3: "Traditional" BC-348 S-meter circuit. Voltage across C–D for values shown is 0.7V approx. The SET ZERO preset is adjusted for the same voltage across A–B

The bane of so many old receivers —leaky h.t. decoupling capacitors —does not appear to affect the BC-348 to any great degree, making it one of the most reliable of sets in this respect. Consequently the risk of burned-out or changed-value decoupling resistors is also small. The only major component which is likely to be a little troublesome is the band-switch. It has been found that in some cases good contacts cannot be established with certainty when the knob is rotated clockwise, but much better results may be obtained when a counter-clockwise movement is used. This is worth bearing in mind if the sensitivity on one or more bands seems far below par.

Alignment

The BC-348 must be one of the very easiest receivers to line up. There are no complicated damping operations to be carried out on the i.f. transformers, only the last needing a certain amount of extra care. The r.f. alignment is particularly straightforward.

I.F. Alignment: Connect the signal generator output to the grid of the mixer/frequency-changer valve. This is more easily done by clipping the live lead to the appropriate section of the tuning gang. Connect an output meter across the loudspeaker terminals and adjust the first three i.f.t.s for maximum at 915kHz. The fourth transformer requires slightly different treatment. For this operation the signal generator is connected to the grid of the last i.f. amplifier via a 0.1μF capacitor, and is set initially to 910kHz. The primary winding and then the secondary winding are tuned for maximum with the cores turned in a clockwise direction, i.e., towards the centre of the coils. The generator should then be tuned through 915kHz to 920kHz, where another peak of the same amplitude as at 910kHz should be obtained. This will indicate that the correct "double-hump" response has been achieved. Some slight re-adjustment of the cores may be required to obtain equality between the two "humps". If a wobbulator and oscilloscope are available the job will, of course, be greatly facilitated.

R.F. Alignment: The exceptionally easy adjustment mentioned previously is due to there being but one trimming frequency for all bands other than the lowest. All trimmers are available through holes in the r.f. coil cans, and are clearly marked to correspond with the Band numbers. For example, the trimmers marked 1 on the antenna, r.f., and oscillator cans all apply to Band 1. There is one extra trimmer for Band 1 which is mounted away from the others and is unmistakable. Commence with this trimmer with the receiver and generator tuned to 200kHz. Adjust for maximum, then proceed to the other Band 1 trimmers at 500kHz. Repeat these operations until no further improvement is possible. The high bands are all adjusted at their maximum frequency, e.g., Band 2 is adjusted at 3.5MHz, Band 3 at 6MHz, and so on. Since the padders are of fixed value there is no adjustment possible at the lower ends of these bands, and only if there should happen to be severe discrepancies in the dial readings will it be advisable or necessary to investigate further.

B.F.O. Problems

Normally the permeability-tuned b.f.o. assembly gives no trouble, but cases are known of a sudden and complete failure to oscillate which is almost impossible to "pin down". Where time is of the essence it may well be easier to scrap the existing coil and either wind another or use the redundant crystal coupling coil mentioned earlier. When this is done (see Fig. 2.2) a small variable capacitor will take the place of the coil assembly on the front panel; in practice this will be found to be rather more convenient than the former b.f.o. control. The control knob can be marked to indicate upper or lower side-band for s.s.b. reception. When the r.f. gain control modification has been carried out as well, it will be found that the BC-348 can acquit itself very well indeed on s.s.b. as well as for general listening purposes. ***PW***

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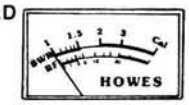

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73 from Dave G4KQH, Technical Manager

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Crops and Coils Part 3

Measurements, Mains Eliminators and Battery Chargers

A scientist was once described as a person who measured things. Having said that, measuring the length or frequency of a radio wave required ingenuity and practical skills in addition to sound technical knowledge. So, there were few better ways for budding scientists to develop their talents than to become a radio experimenter, says George Pickworth.

The early radio pioneers used their skills to develop a means of generating signals of known frequencies. Probably the best approach was to use a high frequency alternator but such machines were expensive and extremely difficult to make. Moreover, the upper frequency limit of the very best was only about 100kHz. A less costly approach was to use a high speed "interrupter" in a d.c. source, but this was a failure.

Nonetheless, before the First World War, high frequency alternators, or "wave mills" as they were called, were used both for transmitting and as local oscillators in receivers where the beat note was produced mechanically in specially designed headphones. It was the most sensitive design at that time, but further development was abandoned as experimenters moved to higher frequencies.

However, high frequency alternators were used until recent years to superimpose a "tone" on a.c. power lines. This was used to switch street lights on or off or to change domestic meters from the cheap to normal rates during the peak period. They operated at a few kHz and could be heard on a low cost loudspeaker connected to the mains through an isolation transformer.

Calibration

Meanwhile, spark transmitters using tuned systems and operating between 0.5 and 1MHz continued to be developed, but frequency measurement was beyond the capability of mechanical devices. So operators had to either precisely measure the physical features of the coils and condensers, and by using already well established formulae, calculate the resonant frequency, or, measure the actual length of the wave by observing when an antenna of known length was in resonance.

As the latter required little more than a tape measure and a hot wire ammeter it is no wonder that it was favoured by experimenters and commercial operators. Even experimenters first exploring the ultra short waves (those between 1 and 10 metres) had little option but to use basically the same technique. Indeed, with refinements, it was used almost to the beginning of the Second World War.

Because the length of a wave can be visualised far better than its frequency, specific parts of the radio frequency spectrum are still referred to by wave length.

While it is still perfectly satisfactory to measure the length of long waves, a point is ultimately reached where the unit of length is too small to be meaningful, the alternative is to measure the frequency, but this technique had to await the development of crystal standards.

Unfortunately, the cost of standard crystals was beyond the resources of young experimenters wishing to accurately calibrate their receivers in 1938. Instead, they used broadcast stations which periodically announced their frequency. The usual method was to make a graph by plotting the frequency of as many stations as possible against the dial readings.

I preferred the Raymart Logging Dial because it had a 100 to 1 reduction drive with a dual pointer system which gave extremely high resolution. This enabled "spot" frequencies to be accurately recorded and special high definition graphs covering sectors of particular interest to be prepared in addition to an overall graph for each plug-in coil. But unfortunately with even the best equipment it was impossible to reinsert a tuning coil into its holder in exactly the same position each time it was changed and this slightly affected the calibration of a receiver. Incidentally, graphs were used with the famous HRO receivers, which also used plug-in coil units, until about 1946.

Calibration was laborious, extending over a considerable time and if a receiver was modified, as was usually the case with experimenters, calibration was upset and the graphs were useless. To overcome this problem, serious experimenters made their own "wave meters".

They were usually simple single valve tunable oscillators, constructed with high quality components and a rigid "hard wired" tuning coil, covering typically 6 to 12MHz on fundamentals and up to 24MHz on harmonics. They were calibrated by tuning to zero-beat with stations of known frequency so that a graph could be prepared and used to calibrate other receivers.

My wave meter was solidly constructed on an extremely rigid aluminium panel. The tuning condenser

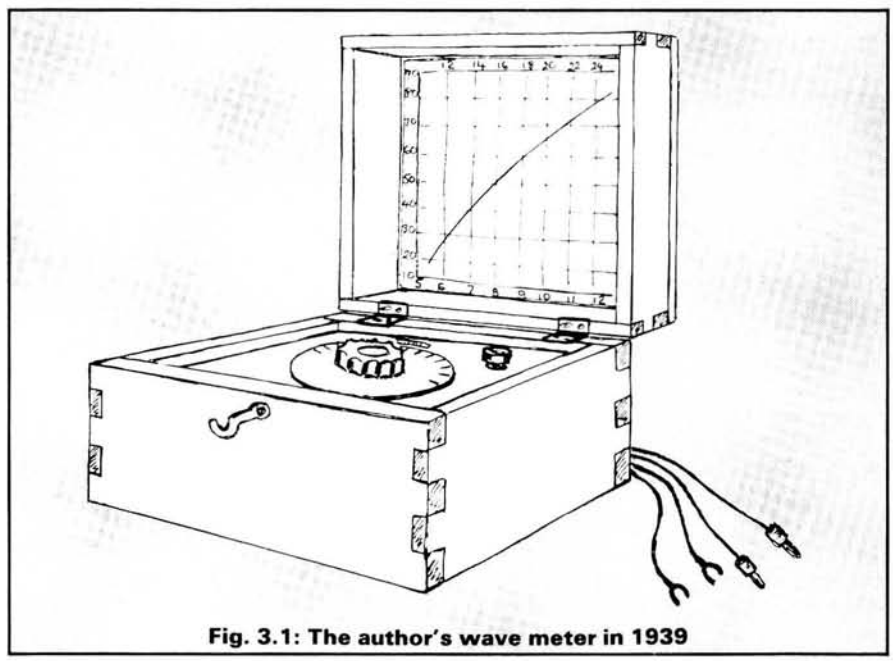

Fig. 3.1: The author's wave meter in 1939

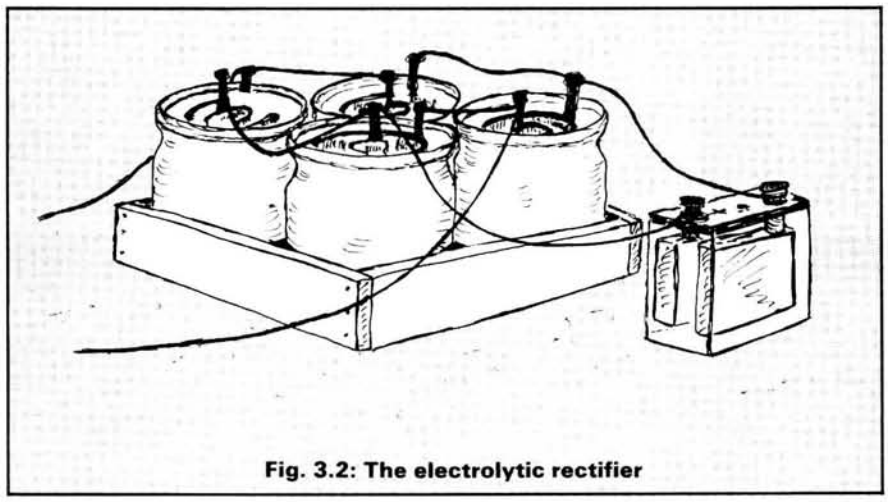

Fig. 3.2: The electrolytic rectifier

(capacitor), of instrument quality, was mated to an Eddystone vernier dial. The complete instrument was protected in an old crystal set cabinet with a hinged lid which held the graph. To eliminate loading effects which could upset calibration, a low power battery output valve was used as the oscillator which generated sufficient r.f. energy to make physical contact with the receiver unnecessary. As it became operational almost immediately, it only needed to be switched on for the time required for a zero-beat.

Eliminators

A large proportion of the population still used battery operated receivers in 1938 and many continued to do so throughout the war years, no doubt because they cost less than all-mains sets. So there was a large demand for batteries which in turn reduced their cost which was much to the advantage of experimenters.

The numerous taps on the 120 volt high tension (h.t.) batteries allowed individual valve elements to be supplied with the correct voltage without recourse to resistance networks, but the penalty was five or more h.t. leads, and three or four grid bias leads (g.b.), all having their own identification tags.

After using batteries, I was more than pleased to be given a "battery eliminator" when its owner decided to graduate to an all-mains receiver. It was simply a power supply unit delivering about 150 volts smooth d.c. from the 250 volt a.c. mains and after installing additional filtering condensers, was used to power my short wave receivers. I could now use larger output valves and by using resistor networks, use just a single pair of h.t. leads. "Automatic" grid bias was possible and could be adjusted for optimum sound quality now that it was no longer necessary to over-bias to economise on battery drain. Moreover, noise, caused by electrolytic action in "dry" batteries was absent.

Much of my listening had been with a pair of high impedance S. G. Brown Headphones connected as the anode load of the output valve, but it was dangerous to continue this practice when using the "eliminator". But as I had advanced from a high impedance balanced armature loudspeaker to a low impedance moving coil type which required a matching transformer, it was logical to use its primary winding as an audio frequency choke to divert signals through an isolation condenser to the phones. To revert to loudspeaker listening, the headphone jack plug was removed and the transformer's secondary winding reconnected to the loudspeaker.

Accumulators

While the "eliminator" provided smooth h.t., there was no comparable device to give smooth low tension (l.t.) for the filaments. Large capacity condensers were unavailable so it was virtually impossible to obtain smoothed d.c. current directly from rectified a.c. A commercial device did claim to do this, and while suitable for medium wave reception it was not satisfactory for the short waves. So there was really no option other than to continue with 2 volt accumulators.

As the current demand by a typical domestic receiver was only about 0.5A, the accumulators used a pair of thick self supporting plates instead of multiplates typical of car batteries. Some had hydrometers, featuring a pointer or coloured balls, to indicate the state of charge.

A drawback was corroded terminals and the fear that acid might escape and damage furniture, although this could be reduced by using a jelly electrolyte developed for use in early transportable receivers. The biggest drawback was having to take them 4km to the radio shop to be charged. So, disenchanted with transporting accumulators in my cycle pannier bag, I decided to construct my own charger.

But I could not obtain a suitable rectifier although they were advertised by the Westinghouse Company. Charging accumulators was a significant part of the radio business and may well have been the reason for them not selling rectifiers. So I decided to make one myself.

Rectifiers

My first effort used a piece of clock spring tuned to the 50Hz mains as a crude vibrator type rectifier. Although it worked, it was noisy and the contact points, salvaged from old telephone switches, quickly burnt out. Contact breaker points from a motor car would have been better.

Then I tried an electrolytic rectifier. This consisted of four one-gallon earthenware jars filled with a solution of ammonium phosphate. The electrodes were large sheets of lead connected to form a bridge circuit. Although cumbersome and messy, it actually worked, albeit inefficiently.

It was not operated from a transformer, but directly from the mains using the houselights as a ballast. The fuse box in the pantry facilitated breaking into a suitable circuit. Shades of the days when the mains were d.c. and it was quite common to charge accumulators in this way. The advantage of this method was that it maintained a constant current (depending upon the number of lights switched on), irrespective of the state of charge of the accumulator. It avoided the problem with transformer systems in that a flat accumulator is equivalent to a short across the charger.

Even when all the lights in the circuit were switched on, the total load was only about 250 watts, well within the limits of the rectifier. Most of the time it was much less.

I made a great mistake by not anticipating that grandmother would revert to plugging her old electric iron into the sitting room light socket now she had a 15 amp socket installed in the kitchen especially for her new iron. It was a very early lesson on not to assume anything.

The result was disastrous. The rectifiers boiled over making a terrible mess and smell. It was the smell that alerted grandmother, otherwise there may well have been a serious fire.

Grandmother had got over the much earlier traumatic experience of uncle shorting the accumulator leads of her first radio and setting the curtains on fire. She had come to terms with me cluttering the box room with wires and all sorts of things which she did not understand. She had reluctantly tolerated the rectifier in her pantry, but this latest episode was too much for her. Moreover, it alarmed me and I never used it again. But more important, it stimulated my desire to advance to all-mains receivers.

In Part 4—
LEARNING FROM THE PIONEERS

On The Air

On The HF Bands

Reports to Paul Essery GW3KFE
PO Box 4, Newtown, Powys SY16 1AR

What a month! Wind, rain, thunder, lightning, poor conditions for much of the time, two rigs to be mended and a keyer in need of repair—ugh!

Seriously, the month of July is hardly a time when one expects much compared with, say, mid-September through October and early November. This period was definitely below expectations but, as always, there are flashes of light in the gloom.

First, the Malyj Vysotskij Island DXpedition. This station, signing 4J1FS, was a joint Russo-Finnish expedition to an island owned by Russia but leased to Finland: operators OH2BH, OH5NZ, UZ3AU, UR2AR and UW3AX. The 4J1FS callsign was jointly agreed upon and it seems that the DXCC ruling that this could be a new country goes as far back as 1970. However, the DXCC it seems are now wanting to renege on that decision to the extent that they want to run everything through the mangle again against the current country criteria which have been amended since then to legislate out some anomalies. The 4J prefix was chosen as it is not used in mainland Russia but only in Antarctic areas where the presence of a Russian contingent does not imply a sovereignty claim; by the same token the suffix was chosen to imply Finland and Soviet. Regardless, everyone is talking about M-V island, of course!

Talking of DXpeditions, that 4W0EA effort seems, at the time of writing, to have turned into a "Busted Flush". Their visas have not been received and word had it that if they were not to hand by July 21 . . . finito. The latest news has it that the passports had been "mislaid" by the Yemeni authorities.

South Orkneys: VP8BRT is on S. Signy Is and I understand he will be there until June 1989.

The activity from 7Q7 is now apparently nil. 7Q7LW is back in UK as G3JSU, while 7Q7AE is still licensed but QRT. On the other hand, Pitcairn Is activity is at an all-time high now. VR6HJ is the fifth YL active, so that the YLs now outnumber the OM operators! Check for them around 0630Z, with a scan of the region around 14.140-14.150MHz.

Svalbard hunters could do worse than look for SP5DRH/JW on 7 or 14MHz, c.w. and s.s.b. QSLs go to Jacek's home QTH.

9L1GG has been dishing them out, especially on c.w. for a long while now, but is now preparing for a retirement to Paraguay.

Phoney!

That C31IU on Top Band back in February was Andorra Slim; the real licensee hasn't been there in years says QSL Manager W8JAQ.

That GB75DXN from DXNS Editor G4DYO was only valid for March 11-April 7. However, Bren has been getting some cards for c.w. on July 8. Don't waste pasteboard!

Contests

Turning to the Contest scene, we find the first two weekends of October set aside for the s.s.b. and c.w. legs respectively of the VK/ZL/Oceania Contest. 1000Z Saturday to the same on Sunday: operate to a maximum of twelve one-hour blocks (1000-1100Z, 1400-1500Z for example). All Bands 1.8-30MHz except WARC bands. They work the world, we work VK/ZL/Oceania stations. Same station can be worked on each band for QSO and multiplier credit. Exchange RS (T) plus serial from 001 upwards. Two points per QSO; multiplier is each VK/ZL/Oceania prefix worked. Final score is total QSO points times multiplier on each band. SWL entries combine c.w. and s.s.b. leg scoring for final total. Entries to NZART Contest Manager ZL1AAS, 146 Sandspit Road, Howick, New Zealand to be received no later than 15 February 1989.

October 29-30 is down for the CQ WW DX SSB Contest, while the October 9 date is for the RSGB 21/28MHz SSB Contest. October 16 is Jamboree-on-the-Air, and the RSGB 21MHz CW Contest.

WAB

From G8XTJ, I have a note of the WAB doings. Look for them around 3.76 and 7.06MHz at almost any time of day. ZS6BBY was the first to claim the Overseas Introductory Award by working 25 areas in ten different counties. For the UK mobiles on h.f. the new ACCLAIM Award (Activating Counties Large Area Island Mobile) seems to have given a boost to the number of applicants. All the details on the WAB programme can be obtained from Brian Morris G4KSQ, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED. Don't forget the uses to which the funds so raised are put.

The 3.5MHz Band

The only reporter this time is **G0HGA** (Stevenage) who has 80 watts out on this band. Angie mainly uses this band between 2000 and around 0200. She found many G stations out to around 160km, DJ7OM, DF2YK, Y22FK, PA3DCW, G3MCK, PA3CWG, SP9EQS/1, HG60HQ, DF5XN, DK2OY/TF for a new one on the band, ON4CW, GW4YYY, Y24EA, PA0WKI, GM3TMK for a natter, SM0LPC, SP6BFK, HA5PD, HA6OJ, OK1DUX, DJ3WM, DJ4NT, G0DRT (QRP both ways) and DL6ZBA.

The 7MHz Band

It must say something about conditions this period that 7MHz seems to have been so popular! **G3NOF** (Yeovil) found EI1000 for the thousandth anniversary of the foundation of Dublin and added EJ4GRC on Inishbofin. Don noted my comments on "insurance contacts" and says that on quite a few occasions he has received QSLs from stations when he himself hadn't bothered to send a card as he doubted he'd made the contact; and a rather similar proportion of his QSLs outgoing have come back marked "not in log". G3NOF says that nowadays he always notes the contacts in front of and after his own, so that he has some extra detail in case of a query.

Ted **G2HKU** (Sheppey) made it, using c.w., to W1PL, CM5ON, ZL2UW and ZL2AGY. He says he found both the conditions and the static variable this month!

G4KKI (Swinton) has been off the air for a rebuild. The main rig now is an HW7 acquired last year cheaply as a non-runner. Since then it has been first brought back to life in the original form and since redesigned. It now has a stepped attenuator, switched band-pass filter, double balanced mixer, r.i.t., a four-pole audio filter and an S-meter. On the transmit side the rig now has a pair of 2N3866s with a watt on 21MHz, two on 14MHz and a little more on 7MHz. This lot runs attached to a T-Match a.t.u. via a Monimatch to a half-sized G5RV. On 7MHz the results included c.w. contacts with G3KVA, G3GXI/P, FD1NRY, PA3CLX, SM7FHJ, G3XAP, GM3VTH who was using the OXO transmitter design of the QRP Club, an R2000 and an indoor trap dipole, G3MBN (QRP), G3IJV (QRP), GM3HBT (QRP), G0CHC (QRP), F6IFH (QRP) and DJ0PJ (QRP).

G0ISN (Ruislip) is ex-G1MOG and runs a Yaesu 767 into either a trap vertical or a G5RV. This set-up accounted for s.s.b. contacts with IK2LFF, SP9KAG, YU3JI, YO9FAF, RA4OR, UB4WZA, DL7UR/M, GI0BFO, GM4XYF, EI5M, GD4XWH and UZ9WXA.

G0HGA now runs 70 watts of c.w. to a 29m wire. On 7MHz, Angie managed lots of DLs, PAs, ONs, Fs, GM and GW when there was a path, a few OZs, many USSR stations there for the picking, many Ys, a few EAs and Is, GB75CCC in the IARU contest with G3JKS at the helm and EA6ZY, who will be recalled by OTs as G6ZY.

The 14MHz Band

G0HGA has antenna problems on this band, so she has to be a bit wary. Many contacts were made, but after midnight when she can get on, usually the Yanks she is after are snapped up by Russians. However, a couple of interesting ones included U19PK for a Moscow special-event station of some sort and DK2OY/TF for a new one on the band.

Turning to G0ISN we find that he made it on s.s.b. to UC1WWO, N3FIB/MM, UQ1GWC, 4X4JU, TF5BW, W3GIS, 8P6OV, WB3KBZ/VP9, CP6XH, 5T5NU, CO6CD, UZ9FZZ, VP5HM and XE1GGO on Packet.

G2HKU managed contacts with OH0/K8MFO, VK2QL, WB5BIR, WM5G, KL7Y, W3LPL, W1RM, AX4XA, K2OZ, 5N0ELT, VE3PR, KH6IJ, VI88WIA, VK3KS, WB8E, VE1CIL, K6DC, NN7U, 7X4VUK, K4FU, N4LS, K3MGR, TA2D, 9H3IJ, UA6HSD/UA0Q and W6WQX, all on c.w., plus an s.s.b. QSO with 4J1FS on M-V Island.

Next we have G3NOF's letter. Don says he noticed s.i.d.s disturbing the band and also noted that after 0730Z conditions were changing very rapidly. 0530–0730Z saw long path openings to VK and short path openings to W6/7. Some Pacific stations came in between 0730–1000Z, Africans around 0730 and again in the early evening. Asians appeared

1600–1800Z. Contacts on s.s.b. were made with AX0NE (Macquarie Is), CP5HK, DL3LAB/TF, CU3AA, EJ1000, FO5EC, HI8EMD, HK0EFU, HV1CN, IK7JWX/IJ7, JW6WDA, K7ZM, KB0NL (N. Dakota), KH6EV, KH6FKG, NL7V, OD5KV, OE1RUA/YK, RA4HT/UM, RZ1OWA (Franz Josef Land), S0RASD, T5GG, TI2VVR, TN4NW, TR8SA, UA0KB, UL7FG, V21WW, VR6YL, VU2RX, VKs, XE1EEF, ZB2GR, ZK1DD, ZL4OD at 2234Z, 4J1FS, 4K0D, 5T5NU, 5V7TM, 5Z4BP, 6Y5IC and 8Q7MT.

G4KKI and his revamped version of the HW7 were able to work VI88NSW, N3RD, KR2Q, SV2AAG, KI1B, K2TQC, WA2IUO, UL8GW, KA2SZA, VK5NM, SP5YQ/QRP, UA3ARE/A, RA6LOK, while UA0SCJ came back but was lost twice.

The 21Mz Band

Conditions, says G3NOF, have been down, though the Pacific short path has been open between 0800–1000Z, with the same route taking in JA, and YB/YC between 1200–1500 and occasionally as late as 1800. The only VK heard was noted at 2200Z on short path. The few N. American openings seem to have been around the same time too. Africans have been heard at various times of the day. QSOs using s.s.b. were completed with AL7JG/3D2, CE3BRA, CE4ETZ, CM6CG, DL3LAB/TF, DX1CW, FH8CB, HB9ANQ/HC5, HC2DZ, JAs, KA2DD/JD1 (Minami Tori Shima), SP5DRH/JW, T30BC, T46CL (=CO land), TN4NW, UA0WZ, UW0LAP, WY5L/KH3, YCs, ZK3RVC, 3C1JPF, 4J1FS, 4M5T, 4U1VIC, 5T5NU, 9Q5MC and 9V1WP.

G4KKI's rebuild was tried out on 21MHz c.w. and it made contacts with LZ2KHN, DH1IAL, UB4MXR, UB5FDO, RA6LOK, UA6BPM and K1VGW with about one watt of r.f. output. Bill says there was lots more on the band, but for some reason he didn't spend much time working them!

Turning to G0HGA we find Angie in the IARU contest with QRP to a 20m wire or a vertical: on July 10 she managed NR5M, SM0JSN, SM0DPZ, HA5KF/1, HA1XY, W1AW through a pile-up, Y42SA/P and YU3DXK who came back to a CQ.

Now G0ISN who is a s.s.b. addict; the G5RV and Yaesu FT-767 resulted in bookings with VE1ATP, KI4WU, OX3SG, W1CWV, W200XX, W3ARK, W2BYK, VE3ODC, VE3NDO, NC7K, UZ9UWZ, 5B4WB, EA6MQ, ZC4EE and 5H3ZO (Packet).

An all c.w. month on all bands for G2HKU, who mentions his 21MHz contacts with W6ALO, XE1ISE and WB6QPG/HR2.

The 28MHz Band

Here of course, the rise of the sunspot count and the seasonal doldrums have reduced activity. Don G3NOF says he found little DX on the band, skip was short most of the time, with plenty of strong European signals about. He made his mark with TN4NW and TR8CA for his only log entries on the band.

Turning to G0ISN, he stuck to s.s.b., and managed contacts with EA6BE, OZ7JV, SM0OWX, HB9BRU, EA5FYH and 4X4JU.

G0HGA had a little play in the IARU Contest of July 9, using QRP only on this band, including HG6OHQ, SP5KUW, OK2KDS, IO8RFD, DL7RAG, Y32CN, HA5KBM, SK6AW, Y35L, OK7AA, HA8KV, Y37ZE, OK1BZJ, IK8EJN, DL3LU, HA0MM, SP8NR, Y31EM, HA5HH, OK2KR, HA5KBM, Y43CO, OK1FFU, Y27FN, OK1OFM, PT2KT (2-way QRP), I2CZQ, IK2GSN, LZ7A, DL1GHX, OH7AA, HA8KVK, HA5KKZ, DJ0MB, DL2OBF, HB9BYZ, DK2OY/TF (2-way QRP), OK2KR, Y38I, HA1SE, OK2PDT, OK1DZJ, Y61HQ, HA8KZL, HA5DA, I6IBE and UQ1GWW, with PS7BX and CE2LZR as gotaways. The latter disappeared back into the noise while Angie was standing by to call him. So—who says QRP can't raise 'em?

WARC Bands

A couple of reports this time. First, G0HGA who says her five watts of QRP c.w. wasn't good enough to raise LU5DJO, who was in any case in heavy QSB at the time.

G2HKU found VK3BXN, ZL2AGY, N4PHH/9, VK2HW, VK3NC, N1FQB and VE3AJD on c.w. of course.

Antennas

A discussion of antennas among the locals arose from a Sunday-morning natter on 3.5MHz. Just about everyone has either Best Bent Wire jobs, or the G5RV/trap dipole where centre-feed is used. One station changed from trap dipole to G5RV, and it raised interesting thoughts: his signal was far improved on the G5RV, BUT, 1. He had slightly changed the orientation of it, and 2. Everyone on the net was reporting quite heavy QSB. QSB is pretty normal on this "local" net, as there are mountains in every direction, and one relies on the high-angle skywave. So . . . was the change of antennas, or of orientation, or both, an improvement?

That, I hope, supplies a clue towards the answer for an s.w.l. who wrote asking why one so often hears the statement that "a new antenna should be used for a long period before a decision is made to keep it or scrap it".

Mailing Address

Some readers may have heard I've taken over the amateur bands column in Short Wave Magazine. Justin Cooper kindly "gave" me his PO Box number so, the address for your letters is now: E. P. Essery GW3KFE, PO Box 4, NEWTOWN, Powys SY16 1AR. Post them to arrive by the deadline date at the head of this piece. Meantime, all the best, and keep those letters rolling in with your DX.

The next three deadlines are: Sept 21, Oct 26 and Nov 24

VHF Up

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

The main headlines this month are of a major 144MHz Sporadic-E opening on July 10, a new record "first" QSO on 144MHz between GI and EA8, another first on 50MHz between GM and PJ0 and, sadly, of the death of Serge Canivenc F8SH

Vale Serge Canivenc F8SH

There can be few v.h.f. enthusiasts, who are interested in propagation studies, who will not be familiar with the work of Serge Canivenc F8SH. For many years Serge was the IARU Region 1 Coordinator for the study of Sporadic-E.

He accumulated a vast amount of data on this subject compiled from the thousands of reports from v.h.f. operators and had embarked upon a comprehensive computer data base program to record it all.

His reports also covered field aligned irregularity mode and he gave a lecture at the VHF Convention on this topic in 1983. Much of his work was filed with the CCIR and it has always seemed a great pity to me that it never got the exposure it deserved in National Society journals.

Serge lived in Perros-Guirec in Brittany and died in Grasse on the Côte d'Azur on July 5 whilst on holiday. It will be a very difficult task to find someone who will carry on his work with such dedication and enthusiasm. He really was a true radio amateur who spent thousands of hours on voluntary research, motivated by curiosity, that we might better understand this intriguing mode of propagation.

Award News

Congratulations to **Keith Hewitt G6DER** (YSS) who was elected to membership of the 430MHz QTH Squares Century Club on July 26 with exactly 100 confirmed. One QSO was via Auroral mode, the rest being on tropo. It has taken since 1982 to accumulate the cards, ten more being awaited from countries EI, F, D, GM, OK and SM.

His station comprises a transceiver driving a transverter with a 2C39BA amplifier. He has a 3SK97 pre-amp and the antenna is a 21-ele Yagi. His certificate is number eight and he is also a member of the 144MHz QTHCC since August 1984.

Irwin Brown GI1JUS (ATM), member No. 81 of the 144MHz QTHCC, was awarded his "125" sticker on July 27. Thirteen QSOs were on tropo, 7 via Es, 4 on m.s. and 1 by Ar propagation.

His list includes SM6AFH/MM (AO), GM4DMA/A on tropo in July 1987, YT3ET (GF) and YT3AU (HG) via Es on 20 July 1987 and IK0FEC (GD) at 1858km on June 4 this year.

For G3FPK, July 19 was a good day when my 200th card arrived for 144MHz QTHCC No. 1. It took from November 1984 to get these last 25 QSLs, not that I QSL all that aggressively.

Any reader wishing to claim either the QTHCC, which is available for all v.h.f./u.h.f./s.h.f. bands, or the VHFCC for working 100 different stations on all bands except 144MHz, should send an s.a.e. to the Poole address requesting a copy of the rules and an application form.

Beacon Notes

G6DER writes, "We now have the licence for GB3BSY on 2320.88MHz to be co-sited with GB3SY. It will be on the air as

soon as I can sort out an Alford slot." GB3SY is the Barnsley u.h.f. repeater and Keith promises more beacon details later.

From South Africa, I see from ZS6WB's *VHF News* No. 88-11 that ZS1STB (KF05) is now on 50.904MHz running 25W to a 4-ele Yagi pointed to Pretoria. ZS5SIX (KG50) is in continuous operation from the QTH of ZS5BN on 50.075MHz and runs 10W to a halo antenna. ZS2SIX on 50.005MHz (KF25) runs 25W to a dipole firing north/south but was temporarily off the air at July 3.

Contest Details

The sixth and final leg of this year's 10GHz Cumulatives is on Sept 11, 0900–2100UTC. There are three contests: narrowband, wideband and fast scan TV. Submit your logs for all sessions in which you took part and send them, postmarked no later than Sept 26, to G4FRE at 15 Ferry Lane, Cavendish Park, Felixstowe, Suffolk IP11 8UR.

For 70MHz fans, Sept 18 is the day of the Trophy and s.w.l. contest from 0900–1600UTC. Three sections: F for single-op fixed stations, O for all others and L for the listeners. Usual radial ring scoring but with county and country multipliers. Entries to G4NBS at 10 Quince Road, The Limes, Hardwick, Cambridge CB3 7XJ.

The weekend Oct 1/2 sees the RSGB and IARU u.h.f./s.h.f. contest covering all bands from 432MHz to 47GHz, starting at 1400 for 24 hours. Single-op and multi-op sections for the RSGB version plus a listeners' one with scoring at one point per kilometre. Entries go to G4WAD at Tanglewood, Bridge Street, Lower Moor, Pershore, Worcs.

The first two of the five sessions of the 432MHz Cumulatives are on Oct 6 and 22, 1930–2200UTC and are two section events, F for single-op fixed and O for all other stations.

The 50MHz Trophy Contest is on Oct 23, 1000–1700UTC with F and O sections. Radial ring scoring up to 650km, thereafter 25 points per QSO. County and country multipliers.

OSCAR-13

OSCAR-13 was successfully launched on June 15 and is now in its desired orbit. Full information was found last month in Pat Gowan's G3IOR Amateur Satellite feature. The reason for mentioning this in VHF Up is that adverse comments have been made about the use of part of the 144MHz s.s.b. segment for uplink transmission.

The situation is that because eastern bloc countries do not have an amateur allocation at 1269MHz, the uplink region for Mode L, 50kHz of parallel Mode L operation has been provided in the 144MHz band. This is termed Mode JL and the uplink is 144.425–144.475MHz. This was explained on page 61 of the July *PW*.

In both cases, the downlink is in the 435MHz region of the 70cm allocation. Because the translator on O-13 inverts the signals, the 2m uplink is on lower sideband.

In April 1987 there was a Region 1 IARU Conference and its Committee B dealt with v.h.f. band planning amongst other topics. I can find no reference to the proposal that the 144MHz band plan be amended to accommodate any satellite uplink, other than in the top 200kHz of the band.

Even so, there is no reason why anyone should object to s.s.b. signals directed to satellites using this part of 144MHz, any more than there is when m.s. operators use it for pre-arranged schedules.

However, what cannot be tolerated is stations with very wide signals swishing their v.f.o.s around in an attempt to find their signals on the downlink and in the process interfering with other QSOs.

To comply with Clause 4(1) of the amateur licence you must listen first before transmitting to ensure you are not interfering ". . . with any wireless telegraphy." From what I have observed so far, this is not being done and certain operators are "W-h-a-a-a-l-l-o-w-i-n-g" for ages so ruining other QSOs.

The 145.8–146.0MHz part of the band has long since been an exclusive satellite band under the worldwide IARU band plan. But 144.425–144.475 MHz has not suddenly become an exclusive satellite subband, a point some OSCAR users seem to have conveniently overlooked.

My own feeling is that in countries where amateurs do have access to the 1269MHz part of the 23cm band, they should stick to Mode L and refrain from using Mode JL. I would like to hear from any readers who are suffering from unnecessary, or even deliberate, interference from O-13 users.

A New Tropo Record?

Weather map watchers on July 15 will recall that there was a long, thin wedge of high pressure stretching from off the west African coast, northeastwards right up the Irish sea. Either side of it were active depressions and some humid air for good measure.

This resulted in a "first" for **Brian Sheepwash GI4KIS** (IO86VR) when he worked EA8BEX (IL27GX) at 2305UTC. My computer reckons the QRB as 3064km–true ellipsoidal–and a new European and probably IARU Region 1 tropo record for 144MHz.

Signals of S5 to S9 were exchanged on c.w. and s.s.b. Brian tried to alert other GIs by telephone with little success, one being GI1JUS who never heard it ring. One can imagine why Irwin felt as sick as the proverbial parrot when he heard the news later.

At 2335 Brian worked EA8BML also in IL27GX who had been working various EIs. This QSO went on till 0055, signals ranging from S3 to 10dB over S9. EA8BML was using a Yaesu FT-480R, 60W amplifier, GaAsf.e.t. pre-amp and 17-ele Tonna Yagi 9m a.g.l. GI4KIS was using an FT–290R, 100W amplifier, 3SK124 masthead pre-amp and four 9-ele Tonna Yagis at 18m a.g.l. Congratulations to all concerned.

The 50MHz Band

Clive Penna GM3POI operated -/A from Deerness (IO88OW) at the beginning of July. At 2144 on the 9th he worked the Saba Island DXpedition PJ0M for an undoubted "first". The operator was WB2CZB from New Jersey whom Clive had worked before. The locator was not mentioned but I make the QRB around 6660km.

At 2150 **Mike Devereux G3SED** (HPH) worked PJ0 and his letter to Clive WB2CZB said he also worked G4GLT in this brief, five minutes opening. These were the only two-way 50MHz QSOs made into Europe and would seem to be via multi-hop E-layer.

However, G3SED had been monitoring 28MHz some half hour earlier and heard

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G8GXP	45	151	331	527
G3XDY	81	137	185	403
G4FRE	63	136	84	283
G3JXN	87	133	175	395
G1LSB	—	126	125	251
G3UVR	75	125	224	424
G3IMV	42	122	406	570
GJ4ICD	59	119	253	431
G0DAZ	—	114	249	363
G4KUX	—	112	367	479
G6DER	78	110	183	371
G4RGK	38	107	262	407
G4TIF	—	107	193	300
G4XEN	—	106	264	370
G8HHI	31	106	148	285
G3COJ	44	103	186	333
G4NBS	59	103	102	264
G6HKM	31	101	190	322
G8PNN	63	98	128	289
G1EZF	32	93	249	374
G1KDF	35	93	163	291
G8ATK	45	91	143	279
G4MUT	28	90	149	267
G6MGL	59	89	141	289
G6DZH	—	87	149	236
G4SSO	—	83	219	302
G1EGC	11	80	192	283
HB9AOF	55	80	141	276
G3NAQ	—	80	160	240
G0EHV	—	75	137	212
G8LHT	4	71	133	208
G1GEY	—	68	158	226
G6STI	21	66	127	214
G6XVV	25	64	211	300
GM0BPY	—	57	129	186
G6AJE	5	57	95	157
G4CQM	—	52	100	152
G8MKD	—	49	142	191
EI5FK	—	47	168	215
G4FVK	20	46	75	141
G4AGQ	1	41	104	146
GJ6TMM	—	39	133	172
G4DEZ	44	36	246	326
G6MXL	10	36	81	127
G4MJC	—	33	184	217
GM4CXP	—	31	184	215
G4ZTR	29	29	37	95
G0FEH	—	24	88	112
G1VTR	—	23	32	55
GM0GDL	—	19	66	85
PA3EUS	—	18	57	75
G1IMM	—	13	98	111
GW6VZW	—	6	106	112
G8PYP	—	6	61	67
G2DHV	2	6	31	39
G4DHF	—	—	307	307
G4SWX	—	—	293	293
I4YNO	—	—	270	270
G3FPK	—	—	232	232
G4IGO	—	—	223	223
G4SFY	—	—	222	222
G4MEJ	—	—	213	213
G8LFB	—	—	205	205
G4YCD	—	—	197	197
GW4FRX	—	—	191	191
G4DOL	—	—	183	183
GI1JUS	—	—	174	174
ON1CAK	—	—	172	172
G4TGK	—	—	118	118
G8XTJ	—	—	108	108
G7ANV	—	—	103	103
G1SMD	—	—	93	93
GI4OWA	—	—	91	91
GM0HBK	—	—	75	75
G0HEE	—	—	73	73
GU4HUY	—	—	67	67
G1CRH	—	—	62	62
G0HDZ	—	—	61	61
G1NVB	—	—	49	49
G7AHQ	—	—	34	34
GM0JOL	—	—	29	29
GM1ZVJ	—	—	21	21

Starting date January 1 1975. No satellite or repeater QSOs.

weak signals from W4, TI2, HP and 6Y5 from the same area. Mike writes, "I believe the 28/50MHz openings in this case were using the same propagation mechanism and occurred at the 'grey line' peak, probably by enhanced F2 layer as a result of high solar flux and a low A index."

On July 10, following a major Es opening on 144MHz, Mike worked/heard twelve stations for the W2, 3 and 4 call areas around the same time. He also reports openings to North America on June 6, 25, July 4, 5 and 9. He worked LA6HL/TF (HP94BD) on June 26 at 0745 with fully quieting f.m. signals. He learned that TF3JP has applied for a 50MHz permit.

Bob Nixon G1KDF (LNH) lists several Fs worked on July 6, 9 and 10 and it now seems that a number of them have their permits. Other QSOs were with CT4KQ/M, LA and OH. He lists DL8LAQ (EN) on the 24th but since there is no likelihood of any German 50MHz licences for a long time, such QSOs cannot be accepted for table scores.

Ian Galpin G1SMD (DOR) has filled many pages in his log book with 50MHz QSOs recently. He mentions OG2C, a Finnish special event station, and the good signal that GM1SMI/P (YT) was putting in in the mid-July period.

Ian checked the band at 0122 on the 22nd and worked LA1K (JP53EK) who faded out till 0134 when signals were much stronger. LA6QBA/P was contacted at 0226 (JP61BJ) and again at 0310, the second QSO lasting till 0536. There was a huge Ar at the time in Norway and 'QBA's signal had a very distinct echo. G1SMD uses an FT-690 at 2.5W or 10W with an amplifier and a dipole antenna.

John Palfrey G4XEN (NHM) worked OG2C (KP20) on July 21 and OH2HK. GM3JIJ (IO68) in WIL was a new county via Es on the 24th. Welcome to **Vic Van Den Bergh G6DIF** (LDN) who is a keen c.w. operator. He contacted YU3ES on June 25 and G4XEN on July 10 and will doubtless add more in the coming months.

Ela Martyr G6HKM (ESX) now has 39 squares on the band. July QSOs included F6DRO (JN03) and GI8YDZ (IO65). She heard N2CEI and W2CAP/1 on the 10th, GM1SMI/P (OKE) on the 21st and LA3TQ (JP99) on the 23rd.

Colin Redwood G6MXL (DOR) worked some GMs on the evening of July 10. **Gerard Elliott GI4OWA** (LDR) worked several Fs on July 6 and on the 10th EA1MO (IN71PP) who, I am told, insists he has a 50MHz permit. He also worked LA3TQ on the 23rd and 9H1EL (JM75FU) the next day, all being Es QSOs.

John Hilton GM1ZVJ (LTH) has been on the band since June 21 using an FT-690R Mk 2 at 2.5W to its quarter wave whip antenna. Best DX were FC1GXV (IN94) on June 28 and FC1FNH (IN96) on July 20 and he is suprised at such results considering his modest station so far.

Dave Lewis GW4HBK (GWT) added SV1DO and LA6HL/TF for a couple of new countries via Es on June 28. Finally, a reminder that the t.e.p. season is now underway, the peak month being October. So listen to the south for African stations for there are many in ZS in particular anxious to work into the British Isles.

The 70MHz Band

The second issue of Roger Banks's G4WND Four Metres Newsletter *QSB* has arrived and features a report from John Wilkinson G4HGT on the highly successful Squarebashers Contest Group's trip to Gibraltar. They completed 168 contacts with 104 different stations in EI, G, GJ, GU and GW, best DX being G0EHV (TWR) at 2103km.

Other topics covered in *QSB* are a d.i.y. 6-ele 70MHz Yagi and a review of an R.N. Electronics transverter. There is a list of European stations QRV for cross-band working. The next issue is due in early October so why not drop Roger a line at Rivendell, Kiln Way, Polesworth, Tamworth B78 1JF for more details?

Eddie Ashburner's G0EHV (TWR) new interest is 70MHz and he uses a Kenwood TS-830, Spectrum transverter and QQV07-50 p.a. The antenna is a 4-ele Yagi and his QTH is 150m a.s.l. As previously reported, he was the best DX from ZB2IQ and vice versa. He reckons GM and GI activity to be very low, best chance to work these in contests.

John Jennings G4VOZ (LEC) has been in Scotland with portable gear and now appreciates why so little is heard from GM. He had great difficulty working from hilltops and reckons some enhancement is necessary to get signals to middle England.

As for NFD, he felt activity was down on 1987 and that there were several poor quality stations around. Six countries were workable and he mentions GD3FLH/P (IOM). Another noteworthy station was EJ1000 on Dalkey Island (IO63XG), the Dublin Millenium station, operated by EI9FK. John worked it on July 23.

G6MXL confirms John's sentiments about NFD. **Ron Reynolds G6WEM** (ESX) gave away points in NFD and gained a couple of new countries. On July 12 in activity night he called CQ for 100 minutes with no takers and suggests Tuesday nights should be called hibernation nights!

GW4HBK worked a few new stations in July and also EJ1000. Dave has been doing a lot of cross-band to CT, D and OK.

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

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Total Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1KDF	38	16	—	—	83	18	57	11	25	6	254
G1SWH	38	17	—	—	88	17	48	7	—	—	215
G6HKM	24	12	—	—	71	26	44	11	20	6	214
G4XEN	40	14	—	—	63	28	46	9	—	—	200
G8LHT	8	6	6	1	58	27	39	11	5	2	163
G0IMG	28	11	25	3	40	10	24	3	—	—	144
G1IMM	26	8	—	—	52	11	31	2	—	—	130
GM0EWX	53	12	—	—	49	13	—	—	—	—	127
GW6VZW	35	10	—	—	62	11	—	—	—	—	118
G1EZF	—	—	18	2	67	23	—	—	—	—	110
G4DEZ	26	5	—	—	24	8	24	5	12	5	109
G4VOZ	18	11	46	6	—	—	21	7	—	—	109
G4YCD	—	—	—	—	83	23	—	—	—	—	106
G6MXL	15	8	10	3	35	13	14	3	3	1	105
G0EHV	—	—	35	5	45	19	—	—	—	—	104
GW4FRX	—	—	—	—	69	28	—	—	—	—	97
GM0HBK	26	8	—	—	46	15	—	—	—	—	95
G6MGL	19	10	—	—	49	10	—	—	4	2	94
G3FPK	—	—	—	—	74	20	—	—	—	—	94
G7ANV	—	—	—	—	66	21	—	—	—	—	87
G4ARI	—	—	16	2	58	9	—	—	—	—	85
G8PYP	13	9	2	1	38	12	6	2	—	—	83
G1SMD	21	17	—	—	25	18	—	—	—	—	81
GI4OWA	14	16	—	—	38	13	—	—	—	—	81
GW4HBK	22	18	36	5	—	—	—	—	—	—	81
G4ZEC	—	—	—	—	56	23	—	—	—	—	79
G1DOX	16	2	19	2	22	5	5	2	2	1	76
G1CEI	—	—	—	—	59	12	—	—	—	—	71
G4AGQ	—	—	13	1	35	7	12	2	—	—	70
G8XTJ	—	—	—	—	53	11	—	—	—	—	64
G2DHV	5	1	12	1	28	6	7	1	—	—	61
ON1CDQ	—	—	—	—	46	15	—	—	—	—	61
ON1CAK	—	—	—	—	44	13	—	—	—	—	57
GJ6TMM	8	9	—	—	27	9	2	1	—	—	56
G3EKP	12	3	16	4	7	4	5	1	—	—	52
G4WHZ	3	2	—	—	31	12	—	—	—	—	48
GM0JOL	—	—	—	—	30	10	—	—	—	—	40
G4ZVS	—	—	—	—	34	5	—	—	—	—	39
G0HGA	—	—	—	—	30	5	—	—	—	—	35
G0HDZ	—	—	—	—	30	5	—	—	—	—	35
GU4HUY	—	—	—	—	23	10	—	—	—	—	33
GM1ZVJ	3	3	—	—	13	6	—	—	—	—	25
G8PNN	—	—	20	3	—	—	—	—	—	—	23

The 144MHz Band

Most readers have suggested that the Es event on July 10 was the best of the year. It lasted around three hours and stations all over the British Isles were able to make QSOs. Countries "on offer" included HG, I, IT9, OE, OK, YU, YO and UB5.

Dave Thickett G0FEH (DYS) worked 19 stations, in HG, OE, YO and YU, in six new squares. **Andrew Salt G0HEE** (YSS) discovered the event at 1446 and with QRP on c.w. he worked YU7VA and YU7AS (KF) and HG5AB/3 (IG).

G1KDFs tally was nine Is, three OEs, two YOs and 35 YUs between 1424 and 1629 in twelve new squares. G1SMD got nine new squares and three new countries in the opening. Ian worked one each OE, OK, YO5 and UT5 plus several HGs and YUs between 1400 and 1610.

Peter Atkins G4DOL (DOR) caught the brief morning event and between 1024 and 1037 worked Italians in GB, HA, HB and IY squares and IT9SBZ (HY). He did not get on till 1543 for the main Es when new squares were OK3YDZ (JI), YO5DJM (LH), UB5DAA, UT5DL and RB5DC (LI) and OK3AU (KI).

G4XEN was on from 1410 to 1622 and John completed 48 QSOs; 19 YUs, 15 HGs, four Is and five each OEs and YOs. New squares were I2EA/7 (JN81), YO7DL (KN14), IV3GBO (JN66), YO5BP/P (KN16), YO5DJM (KN17) and UO5OB (KN45CW) at 2203km for a new country.

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He found the main reflecting area brought in the HG, OE and YUs at QTE 104–111° but that two smaller patches provided propagation for short periods to Italy and Moldavia.

G6HKM did not get on till 1522 and worked 17 stations, the last QSO being at 1548. A CQ call at 1540 brought three HGs and two each from OE, OK and YO. New squares for Ela were JN87, JN96 and KN06.

Howard Staddon G6STI (LDN) was busy with the 432MHz WAB contest so only made one QSO to UT5DL at 1623. G6WEM was on between 1412 and 1552 and Ron lists a dozen QSOs with HG, I, OE, OK, YO and YU stations.

Stephen O'Malley G7ANV (NLD) has written for the first time to show that some G7s read this piece. Up to mid-July he had worked 103 squares and in the July 10 Es event he lists YU3C (JN76), OE8HIK (JN76) and YU1ADN (KN03).

Ian Harwood G8LHT (YSS) worked many stations between 1432 and 1621, mainly YUs but ". . . nothing exotic was heard . . ." Ian was called by YO2BBT but the QSO was not completed; it would have been his first YO.

Frank Holland GI0AIQ made four Italian QSOs between 1440 and 1500 in FE, FF and IB squares from Armagh using 80W to two 9-ele Tonna Yagis.

GI1JUS lists 31 stations worked between 1414 and 1636. Irwin's best DX was YU1GT (KN04LP) at 2216km. New squares were YT2GL (JF), I2AE/7 (IB), I4BXN (FE), IK2DDR (FF), YU1LR (JE), YU2EZA (IG), OE6AHD (HH) and HG1WD (IH). The last contact was YO2IS for a new country.

GI4OWA lists six Is and two YUs in this event and Gerard's new squares were I3LDS (FF), IK4GBZ (FE), IK4GNG (GE) and YU1EN (JE). Unfortunately rain static gave reception problems.

GM1ZVJ, using just 2.5W to a 10-ele Jaybeam Yagi, worked YU3C and YU3OU in HG between 1525 and 1540. John heard many YUs from South Queensferry.

Roger Sarre GU4HUY (GUR) operated between 1435 and 1552 working 38 stations in HG, OE, OK and SP, the only contributor to mention a Polish QSO. His best DX was UT5DL. Roger runs 40W of s.s.b. to a 10-ele Yagi.

Mervyn Rodgers GM0GDL (CTR) telephoned a report and worked YUs in HF, HG, JE and KD squares. For once G3FPK was around at the right time and five new squares were worked. It certainly was an exciting event and in the London area every couple of kilohertz was occupied by very loud local or DX signals.

Sheldon Hands GW8ELR (DFD) used his Icom IC-202 at 3W and worked 22 stations in HG, IV3, OE, YO and YU. It must be wonderful not to have many very QRO stations on your doorstep in these events.

There was an afternoon opening via Es to southern Spain on July 8. G4DOL worked EB7NK and EA7s CVC, CVD and GNO all in new square YW between 1630 and 1646. G6HKM had three QSOs, one to YX and two to YW, both new squares.

G6WEM's timing was 1704 when he worked EA7BHO (IM87EE) but he also heard EA7FTH at 1740 and EA7AJ at 1755. G4XEN mentions a five minutes Es opening at 1325 on July 20 when he worked YZ5XMA and YU5QG (KN02) a new square. John heard an LZ who quickly disappeared.

On the tropo scene there was a major, widespread opening on July 18/19. **Peter Hirons G1CEI** (HPH) is a new contributor presently running a Yaesu FT-726R, 80W amplifier and 14-ele M.E.T. Yagi at 11m. The lift provided him with six new squares in the southern part of France.

G1KDF worked two GUs and three FS, one in JN04 for a new square. That was F1JGY/P also worked by G1SMD. On c.w. G4AGQ worked F6EPO (ZH), FD1GTR (ZG), F6DRO (AD), F5DE (AF), FE1JNA (AE) and F6GOY (BH).

G6HKM worked F6HLW/P (AE) and Ela hopes he will QSL. G6STI heard mostly squares already confirmed but Howard did find FC1JUC/P (DF) at 2151 and FC1BPK (AD) at 0007 for two new ones.

G8LHT reckons the real DX went over his head in this lift; it certainly did in London, Ian, where he heard GMs working to the south of France exchanging S9-plus reports.

GI0AIQ worked FC1FMU (ZI), F1FHI and F6ETZ (ZH) plus GU and GJ stations. GI1JUS found a couple of new ones, FC1FVV (ZE) and FC1BPK (ZD). GI4OWA lists nine distant QSOs the longest to F6GPT and FC1ADT in ZE square which was new for Gerard, as was FC1DXP (AF).

GM0GDL worked F5IL (AJ) in this event. My take-off to the south is not too brilliant so I concentrated more to the west as there were lots of Irish stations QRV. I had a struggle with EI5FK at 1443 and appreciated help from Martin Lowe G4YCD (AVN) in getting some table figures from Charles. Conditions were much better late at night and I worked EI4AQB (VN) in Galway and EI4DQ and EI7BA in County Cork.

Some late news. On July 31, Band II was full of f.m. broadcast stations from Europe via Es. At around 1835 EA8BEX (IL27GX) was heard and worked by stations in the west and northwest parts of England at least.

John Nelson GW4FRX (PWS) heard virtually nothing from EA8 but Colin Mister G0DAZ (HRW) did work him as did G4KUX (DHM), G4PBP (WMD), G6HCV (SFD) and G8XVJ (CHS). He is sure a GM1 in YP square also worked EA8BEX.

I understand there was some very short skip Es propagation with GWs in the west and north working HB9. Apparently it was over by 1900, so your reports on this event are awaited with great interest for next month.

The 430MHz Band

G1KDF worked GM1SMI/P (OKE) on July 17 and now only needs Shetland for all 78 counties starting with the G prefix. In the tropo lift on the 18th Bob worked GU1HTY (GUR), GJ6BUK, F1FHI and F1DED (BI).

Pat Billingham G4AGQ (SRY) worked F6APE (ZH) on July 18. Swiss beacon HB9F was S9 with Pat the next morning but no other signals were heard. G4XEN wrote the 432MHz was hardly worth reporting but John did add G0BLB (AVN) and GW8KQW/P (CWD) for new table counties.

G6DIF is QRV on the band but is disappointed at the lack of c.w. activity. G6HKM still finds the band very quiet but did work GM8TFI/P (DGL) on July 2 in NFD. Ela did not work any GMs in the 1987 event. On the 18th she worked FC1ADT. GM0GDL found F1FHI the same day.

G8LHT worked GJ for the first time in the southerly lift on July 18/19.

The Microwaves

Precious little to report here, I regret. G0FEH is building a transverter for 1.3GHz and has got the RX and TX converters working. However the oscillator drifts so Dave has now got an oven for the crystal.

On 1.3GHz G1KDF added new station G8ESB (YSN) on July 10. On the 17th Bob worked EI4CI/P (Meath). He advises that Pierce and EI9ED should be QRV on the band from their home QTHs soon. On the 18th, G8KBQ (SOM) was his 46th county.

G6HKM worked eleven stations on NFD on 1.3GHz which provided four more 1988 counties and GM for a new country. It took Ela nine minutes to exchange the information with GM0FRE/P (DGL) but perseverance finally paid off.

Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G4ZEC	—	—	474	—	474
G4OUT	—	—	191	—	191
G0HGA	—	—	176	—	176
G0HLT	13	—	161	—	174
G4AGQ	—	35	83	8	126
G4VOZ	24	79	—	17	120
G4WHZ	6	—	106	—	112
G0HEE	—	—	95	—	95
G4ARI	—	10	80	—	90
G4ZVS	—	—	80	—	80
G0DJA	11	—	64	—	75
G2DHV	10	33	24	—	67
G3FPK	—	—	63	—	63
G0GKN	—	—	52	—	52
GW4HBK	21	30	—	—	51
G1SMD	21	—	15	—	36
G6DIF	2	—	30	—	32
GU4HUY	—	—	22	—	22
G1DOX	3	5	—	—	8

Number of different stations worked since January 1.

Liechtenstein Operation

Reg Woolley GW8VHI, currently in Germany as DA4RG, says he and some German friends will be operating from the Principality of Liechtenstein during the major IARU contest on Oct 1/2. He will be signing HB0/DA4RG.

Operation will take place on 144/432/1296 and 2320MHz and on 10GHz. Afterwards they will be concentrating on 144MHz m.s. giving priority for skeds to those who have been on DXpeditions themselves. Nice thought that. I assume they will be on the 14.345MHz European v.h.f. net for arranging "instant" skeds.

Giant Antenna Masts

Julie Yates G8MKD (WMD) sent me a clipping from a local newspaper following the successful planning application for a 10m tower. There are references to ". . . a giant aerial mast . . ." and "the monster aerial . . . which will stretch to a height of 33 feet when in use."

She wonders what the reporter would have written had they got permission for a 60 foot tower. As she says, this kind of reporting does little to further the radio amateur's cause.

Worked All Britain

From G8XTJ, the Publicity Officer for WAB, comes the August press release. On v.h.f., G0JHC has received the first Class II Counties Award for working 55 counties on 50MHz s.s.b. For WAB details send an s.a.e. to G4KSQ who is QTHR.

Keying Problems

Angela Sitton G0HGA is a dedicated c.w. operator but had been getting many

reports of faulty keying. It seemed satisfactory from her sidetone oscillator but the signal as received by another station was corrupted.

She eventually traced the problem to too much r.f. in the shack, some of it getting into the keyer which tended to do its own thing. It has to be appreciated that high impedance c.m.o.s. circuits are very susceptible to minute whiffs of stray r.f. so you need to ensure everything is properly shielded and grounded.

This example highlights the need to be able to monitor your transmitted signal otherwise how can you be certain your c.w. or speech is not distorted?

A Bit of a Spoof?

Under stations worked via Es, one reader has listed at 1327 on June 19 SPOOF in JO92EA. As far as I was aware, there was no Es propagation towards Poland that day and no other reader mentioned any. Furthermore, I have never heard an SP0 and, according to the Operating Manual, the Polish call areas are numbered one to nine for normal amateur calls.

This rather reminds me of a classic spoof in the late 1940s when a station signed as G02HEL with the QSL address given as Obois, Ubinad, Lafter, Orkneys. Anyone remember that?

The next three deadlines are: Sept 21, Oct 26 and Nov 24

RTTY

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

The "New" Licence

With all the fuss being made about this licence, I thought I would take a look at it from the data operator's point of view. This first thing I noticed was that although mailbox operation is now allowed (provided authority is obtained from the RSGB), unattended operation of mailboxes is still not allowed. I think it's a shame that this issue hasn't been resolved, as a properly regulated mailbox network would be a great asset for the dissemination of news and a whole assortment of other information. As it is, I expect the networks will continue to operate outside the licence.

One commendable aspect of the new licence is that they have used common names for the data modes, i.e. RTTY, AMTOR, etc. This helps to make the conditions much easier to understand.

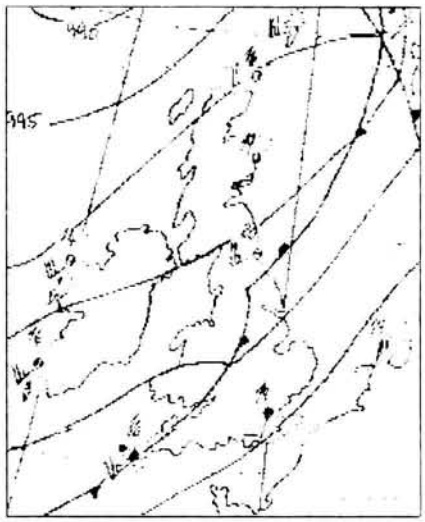
Another important point is that data is accepted as a separate mode and is defined as "digital codes representing numbers, text, speech, images, measurements, computer programs or other information authorised by the licence". This is a nice open definition and leaves plenty of scope for future experimentation, which after all is what amateur radio is all about. We have even gained an extra segment of the band, 1.810–2MHz is now available for data modes. I await details of your first contacts on this segment!

My final point on the licence concerns the various classes of emission for the data modes. These have been a source of confusion for some time and it's good to see someone has actually put pen to paper to set the record straight. I know they were published in the supplement last month, but they bear repeating here:

RTTY/AMTOR
Direct frequency shift keying of the carrier **F1B**
Frequency shift keyed audio tone (f.m. transmitter) **F2B**
Frequency shift keyed audio tone (s.s.b. transmitter) **J2B**
Packet/Data
Direct frequency shift keying of the carrier **F1D**
Frequency shift keyed audio tone (f.m. transmitter) **F2D**
Frequency shift keyed audio tone (s.s.b. transmitter) **J2D**
Facsimile
Frequency shift keyed audio tone (s.s.b. transmitter) **J2C**

Band Plans

Brian Waddell GM4XQJ has written complaining about the poor operational standards of data enthusiasts, particularly h.f. mailboxes. Brian's main complaint,



An example of a chart using the J&P program, received by a reader

being a keen QRP operator, is with the use of 7.030MHz which is the c.w. QRP calling frequency.

Unfortunately, this frequency has been commandeered by several AMTOR mailboxes, which has got the QRP community up in arms on several counts. First, the very nature of the mailbox means that it doesn't listen before transmitting, it only responds to calls from other users. Consequently the poor QRP operator frequently gets flattened by 100W of AMTOR! To compound the problem, many of the QRPers are using very simple, home-brew, crystal-controlled equipment so they can't even QSY.

Fortunately, I do have some good news, the G3PLX mailbox has now moved to 7.036MHz and is issuing a message to all users mentioning the problem. I would reinforce Brian's plea for a frequency change and if by chance you find a mailbox operating on this frequency, please leave a message for the Sysop explain the situation. Regular readers will no doubt have noticed that I published this frequency as a mailbox frequency when I listed all the current mailboxes recently—apologies to the QRP world.

FAX

Whilst at the RSGB Exhibition in Birmingham, I managed to find time to look around at the various FAX software packages. Two very different options caught my eye, for reasons you will soon see.

At one end of the scale is the J&P Electronics[1] FAX program which runs on the Spectrum. The program only handles "standard" transmissions using an i.o.c. (index of co-operation) 576 and a speed of 120 r.p.m. But this is adequate for the majority of weather FAX and will also handle amateur transmissions with some distortion. One of the main attractions of this program is the price, which at £9 represents a cheap way of trying out FAX reception. There's always a snag and in this case you'll need a drum speed generator in addition to the program, which will cost £24. You need this because the computer's internal clock is not accurate enough to ensure properly aligned pictures.

At the other end of the scale is the Amiga-FAX from ICS Electronics[2]. This program is a full-blown FAX transmit/receive package which runs on the Commodore Amiga computer. This program makes full use of the high resolution screen of the Amiga to give 640 x 400 (250 000) dots with 16 grey levels. As you can imagine, this is a bit different to most of the programs available to the amateur today. Other features are that you can use the paintbrush files on the Amiga to draw your FAX pictures to be transmitted, images can be manipulated before or after reception and you can use a mouse to control the program. If you're interested in weather maps, charts with up to 3840 dots per line can be saved in memory and then printed in strips. With 500MByte memory expansion, maps with 4 million dots may be captured, and that's a lot of dots!

As you have probably guessed, this program is a little more expensive than the previous one I mentioned! The cost is £99.95 including VAT, but of course you need to have an Amiga first. I'm not actually sure how much they cost, or how many amateurs have access to them. Still if anyone does run this program perhaps they'll let me know how they get on. You never know if it catches on there might actually be some FAX activity around.

Readers' Letters

First letter this month deals with a plea for help. **Terence Craig VK6PQ** has written asking for information about AMTOR software for the Amstrad 464. Unfortunately, I don't know of any available, so I'm hoping that another reader will be able to help. If you can, drop me a line and I'll pass the information on to Terence.

Next, I heard from **Raymond Hounslow** who blames me (doesn't everyone) for reviving an old interest in RTTY. At first glance, his station would seem to be a non-starter, that's until you look into the subject. He has a 15-year vintage BARTG ST5 transistor terminal unit and a Toshiba HX10 MSX computer.

The terminal unit was originally designed to drive a "real" teleprinter (a clanking and whirring machine that usually smelt awful), so this will obviously need modifying as these machines used to work on ±80V. I don't think that today's computers would think much of that. There are two options here, you can either contact BARTG[3], who I'm sure could help or alternatively you could work out the modifications for yourself. The object is to end up with an output signal that swings between zero and +5V maximum as opposed to the ±80V.

As for software, I know of two possible sources. J&P Electronics[1] are one as they have Morse and RTTY programs for MSX (1) and the other possible source the MSX Software Shack[4]. An s.a.e. to either source is worth while to check that you're both talking about the same machine.

"Where's all the RTTY activity on 144.6MHz," asks **Jason G4KVT**. From this QTH, the only time I really hear very much on that frequency is during a v.h.f. RTTY contest, where everyone goes between contests is a mystery. Jason has been busy though listening around on h.f. In about an hour one evening he logged the prefixes YU, SP, IK, DF, UT, OE, W4, YO and DJ—all on 14MHz. His last comment was about software for Packet and AMTOR for the Spectrum. My suggestion was to contact SARUG (Sinclair Amateur Radio Users Group), but if any readers have details of this kind of software for the Spectrum I'd like to hear from them.

I received a very interesting letter from **Michael Greig GM1YSI** about the Maplin TU1000 and MBA-TOR program from

The next three deadlines are: Sept 21, Oct 26 and Nov 24

AEA. Michael is very active on v.h.f. where he uses a Trio 9130 transceiver and an eight element Yagi antenna. The computer in use is the Commodore C64 with a disk drive and a printer to complete the set-up. My first thought when I read his letter was, at last someone using RTTY on v.h.f.! It would seem that there is a quite a lot of v.h.f. activity in the Kirkcaldy area as you can apparently find RTTY or Cambridge Packet stations most evenings. If you live within r.f. contact of the area you may like to join in. The normal scenario is to all meet up on 145.525MHz (S21) for a chat and then to move down to either 145.275MHz or 145.325MHz for operation on RTTY or Cambridge Packet. Although Michael doesn't make it clear in his letter I would assume that, in that segment of the band, the modulation type would be audio frequency shift keying (F2B or F2D if you want to be clever).

Michael finds the TU1000 to be very good for his v.h.f. working. He bought it as a kit and built it himself without any real problems. The TU1000 has three preset shifts on it, 170, 425 and 850Hz, and the variable resistors needed to be set using a frequency counter. After that he had to set up the internal clock to drive the two filters, then the tones were set up. Michael says, "this sounds all very simple, but it took me the best part of the week to get it up and running, but all the work was worth it."

It's always good to hear from readers who are getting on really well with their terminals or programs. So, if you think others would be interested in your set-up, drop me a line.

I haven't had a great deal of time for getting on the band this last month, it's the dreaded decorating season. Still I did hear/work one or two interesting stations. Top of the list came CE3FHR, that was Elias in Santiago in Chile. I managed a short chat on AMTOR with him whilst testing a rig out. Other interesting callsigns were (on AMTOR) K9MFI, VE2FK and WA1FBI, on RTTY there were only two of note, the EA7BTQ mailbox and KP4KC. All stations were worked/heard around 7 or 8pm towards the end of July.

Don't forget to send in your reports, no matter how mundane they seem to you.

(1) J&P Electronics. Unit 45, Meadowmill Estate, Dixon Street, Kidderminster DY10 1HH.
(2) ICS Electronics Ltd. PO Box 2, Arundel, West Sussex BN18 0NX. Tel: 0243 65655.
(3) BARTG. Pat & John Beedie, "Ffynnonlas", Salem, Llandeilo, Wales SA19 7NP.
(4) MSX Software Shack. 2011 Kensington Flats, Morningside, Durban 4001, Natal, South Africa.

Amateur Satellites

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

AMSAT-OSCAR-13

As many readers will already have noted, our brand new, and first near-Molniya orbit, satellite is now in orbit for the next millenia. The last pictures from AMSAT-DL of the satellite on earth appears first as Fig. 1. It shows Dick Daniels and Werner Muller looking like real spacemen in the suits that protect them from the toxic, highly explosive, fuel and oxidant, filling the kick-motor tank with fuel. Next comes Fig. 2, the completed spacecraft with the entire AMSAT crew in their "clean-room" suits at the ESA launch site in Kourou, French Guiana. From left to right we see (standing) W. Gladisch, H. Wagner, W. Hass, D. Sunderland, G. Metz, D. Daniels, then (sitting) W. Muller, K. Muller, K. Meinzer, J. King, and O. Belser. The Ariane IV launch vehicle, with all satellites aboard and under countdown is shown the night before lift-off in Fig. 3, and Fig. 4 shows the lift-off of rocket itself at countdown plus 5 seconds, on its first step into space.

Tracking

Since the second kick motor firing, which burned off all the remaining fuel and even imparted a little additional velocity by exhausting the helium pressurising gas through the hot exhaust nozzle, the close to optimum orbit has been achieved. The latest set of RADAR derived Keplerian elements to hand follow, which can be used to give reasonable accuracy of passes with your computer program. Readers may wish to predict the shape and duration of passes for three and a half years' time, when the apogee point becomes that of the inclination, e.g. 57.654 degrees, to explore what an amazing coverage then evolves for the northern hemisphere stations.

Epoch Year:	88
Epoch Day:	193.0
Inclination:	57.6540 degrees
Right Ascension:	247.5380
Eccentricity:	0.6538919
Arg. of Perigee:	187.2210
Mean Anomaly:	357.2170
Mean Motion:	2.09697960 orbits per day
Decay:	0
Orbit No/Rev:	57
Semi-major Axis:	25783.070
Period:	686.701959 minutes
Apogee:	36264.507 km
Perigee:	2544.826 km

Our Fig. 5 list of passes for the UK given for September 7 to 21 inclusive are based on this set of Keplerian elements, and evolve from the AMS-81 program. They show, reading left to right, the date, the time(s) of acquisition of signal, the time of loss of signal and the time of maximum DX range, all in UTC/GMT time. Under DX is given that mutual ground distance across the footprint, whilst under AZ comes the direction in which your beam should be pointing at this time.

The fifteen minute interval step-by-step tracking for the UK from acquisition of signal on Sunday 18 September 1988 is shown in Fig. 6 (a), (b), (c) and (d). It reads those cities in mutual communications range marked by an asterisk, at the time, phase (mean anomaly) and satellite range given, then the time, the probable mode, and indicating arrow showing if OSCAR-13 is going up or coming down from Apogee, followed by the azimuth and elevation at those times. The then mode of operation, e.g. "B", "L", "JL", "S" or beacon telemetry cannot be confirmed, as it may well be moved slightly by the command team at AMSAT-DL to allow for eclipses and sun-angle before this set of passes comes into being.

Frequencies

On the first day of operation, your scribe worked JR3RRF on c.w. for a solid QSO on Mode "B". It was then discovered that the passband relationship, as expected, had suffered a change of some ten kilohertz since being measured and metered prior to launch. To the nearest kHz, the uplink to downlink Mode "B" transponding at zero Doppler shift is as follows:

Uplink	Downlink	
435.576	145.823	This section of the band will normally be used for A1 c.w.
435.569	145.830	
435.559	145.840	
435.549	145.850	
435.539	145.860	
435.529	145.870	
435.509	145.880	This centre part will normally be employed for mixed-modes, RTTY, SSTV, Packet, etc.
435.499	145.900	
435.489	145.910	
435.479	145.920	This section will normally be utilised by A3J s.s.b. QSOs. and so on to the band end.
435.469	145.930	
435.459	145.940	
435.449	145.950	
435.439	145.960	

Note, that the low-end c.w. mid-section mixed and upper section s.s.b. is recom-

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URM67	low loss coax 50 ohm	per metre	0.75	(0.25)
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4mm	Polyester Guy Rope (400kg)	per metre	0.25	(0.10)
50mtrs.	16 swg hard drawn copper	wire	6.95	(2.00)
75ohm	Twin feeder light duty	per metre	0.20	(0.10)
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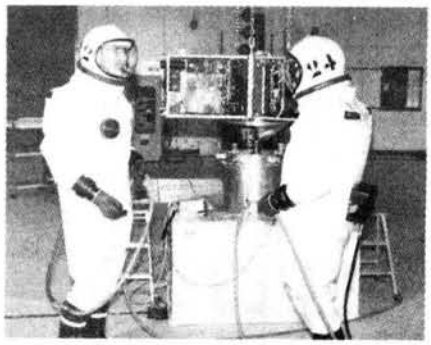


Fig. 1

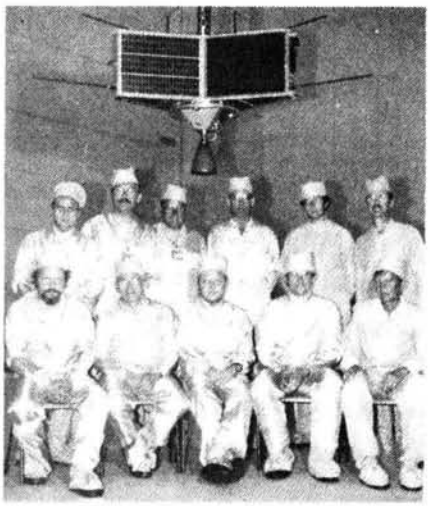


Fig. 2

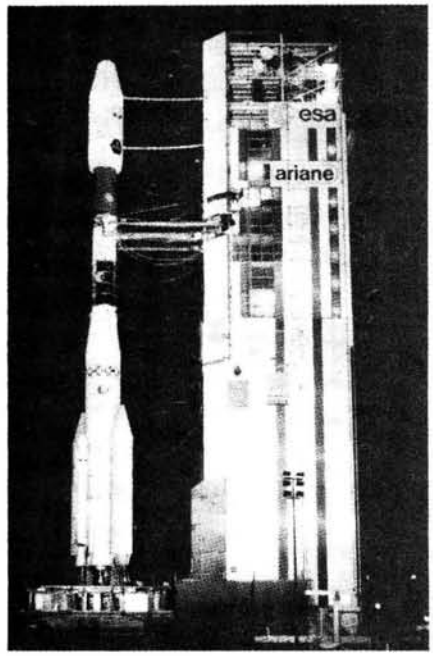


Fig. 3

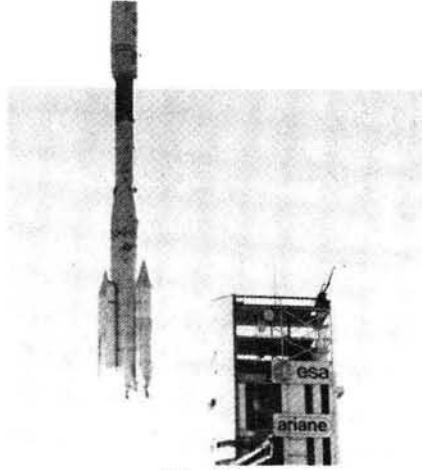


Fig. 4

AMSAT AMS-S1 TRACKING SYSTEM
ACCESS SKED FROM: 08SEP88 000000
>>G3IOR VIA OSCAR 13 <<

DAT	AOS	LOS	MA*	D* EL	AZ
07SEP	1643	0150	2015	16027	238
08SEP	1027	1237	1027	17716*	052
08SEP	1533	0041	1909	15304	222
09SEP	1009	1125	1009	17298*	038
09SEP	1428	2332	1802	14772	202
10SEP	0943	1001	0943	16609*	019
10SEP	1335	2222	1655	14567	180
11SEP	1248	2112	1549	14752	159
12SEP	0757	0822	0757	15725*	349
12SEP	1211	2002	1442	15270	139
13SEP	0635	0733	0635	16290*	346
13SEP	1141	1852	1336	15984	122
14SEP	0511	0634	0511	16731*	339
14SEP	1118	1742	1229	16769	107
15SEP	0343	0532	0343	17117*	329
15SEP	1051	1632	1122	17571	094
16SEP	0150	0427	0150	17612*	313
16SEP	1034	1522	1034	18118*	083
16SEP	1904	0320	2142	17614	266
17SEP	1017	1412	1017	18066*	073
17SEP	1719	0213	2036	16804	254
18SEP	1000	1301	1000	17941*	063
18SEP	1554	0104	1929	16009	239
19SEP	0941	1151	0941	17718*	052
19SEP	1444	2355	1823	15278	222
20SEP	0917	1038	0917	17369*	038
20SEP	1341	2246	1716	14734	203
21SEP	0857	0925	0857	16601*	019
21SEP	1248	2136	1609	14517	181

Fig. 5

TRACKING DATA PHASE 3C ON: UTC M AZ EL
SU 18SEP88

D* AT 10:30					
› LONDON	*	10:30	B↓	058	01‹
NEW YORK		10:45	B↓	058	03
S FRANCISCO		11:00	B↓	057	06
RIO		11:15	B↓	056	08
CAPETOWN		11:30	B↓	054	09
SINGAPORE	*	11:45	B↓	052	11
HONG KONG	*	12:00	B↓	048	12
TOKYO	*	12:30	-↓	037	10
DARWIN	*	12:45	-↓	029	06
PERTH	*	16:00	B↑	190	03‹
SYDNEY	*	16:15	B↑	191	07
WELLINGTON		16:30	B↑	193	11
HAWAII		16:45	B↑	196	14
FAIRBANKS	*	17:00	B↑	199	16
		17:15	B↑	202	19
PHS 155		17:30	B↑	205	21
RNG 36184 km		17:45	B↑	208	22
		18:00	B↑	212	24

Fig. 6(a)

TRACKING DATA PHASE 3C ON: UTC M AZ EL
SU 18SEP88

D* AT 10:30					
› LONDON	*	10:30	B↓	058	01‹
NEW YORK		10:45	B↓	058	03
S FRANCISCO		11:00	B↓	057	06
RIO		11:15	B↓	056	08
CAPETOWN		11:30	B↓	054	09
SINGAPORE	*	11:45	B↓	052	11
HONG KONG	*	12:00	B↓	048	12
TOKYO	*	12:30	-↓	037	10
DARWIN	*	12:45	-↓	029	06
PERTH	*	16:00	B↑	190	03‹
SYDNEY	*	16:15	B↑	191	07
WELLINGTON		16:30	B↑	193	11
HAWAII		16:45	B↑	196	14
FAIRBANKS	*	17:00	B↑	199	16
		17:15	B↑	202	19
PHS 155		17:30	B↑	205	21
RNG 36184 km		17:45	B↑	208	22
		18:00	B↑	212	24

Fig. 6(b)

TRACKING DATA PHASE 3C ON: UTC M AZ EL
SU 18SEP88

D* AT 18:15					
› LONDON	*	18:15	L↑	215	25
NEW YORK	*	18:30	L↑	219	26
S FRANCISCO		18:45	L↑	223	27
RIO	*	19:00	L↑	227	27
CAPETOWN	*	19:15	L↑	230	28
SINGAPORE		19:30	L↓	234	28
HONG KONG		19:45	L↓	238	28
TOKYO		20:00	L↓	242	28
DARWIN		20:15	L↓	246	28
PERTH		20:30	L↓	250	28
SYDNEY		20:45	L↓	253	28
WELLINGTON		21:00	B↓	257	28
HAWAII		21:15	B↓	260	28
FAIRBANKS		21:30	B↓	264	28
		21:45	B↓	268	28
PHS 100		22:00	B↓	271	28
RNG 35046 km		22:15	B↓	274	28
		22:30	B↓	278	29
		22:45	B↓	281	30

Fig. 6(c)

TRACKING DATA PHASE 3C ON: UTC M AZ EL
SU 18SEP88

D* AT 23:00					
› LONDON	*	23:00	B↓	284	31
NEW YORK	*	23:15	B↓	288	33
S FRANCISCO	*	23:30	B↓	291	35
RIO	*	23:45	B↓	294	39
CAPETOWN		MO 19SEP88			
SINGAPORE		00:00	-↓	297	44
HONG KONG		00:15	-↓	301	52
TOKYO		00:30	-↓	305	66
DARWIN		00:45	-↓	107	79
PERTH		01:00	-↓	123	15
SYDNEY		10:15	B↓	045	01‹
WELLINGTON		10:30	B↓	043	02
HAWAII	*	10:45	B↓	041	04
FAIRBANKS	*	11:00	B↓	037	05
		11:15	B↓	033	05
PHS 206		11:30	-↓	026	03
RNG 36585 km		14:45	B↑	174	01‹
		15:00	B↑	175	06
		15:15	B↑	176	10

Fig. 6(d)

Fig. 8

Fig. 7 ▼

Value of "n"	Telemetry Channel (Hex	Desig)	Function	Equation	Value Obtained	Units
245	00		Solar panel out and BCR input voltage	(n-10)•167	39245	mV
7	01		70 cm xmtr average power output	(261-n)²/724	0	W
147	02		70 cm rcvr temperature	(n-120)/1.71	15.8	C
132	03		(Reserved)		.	.
192	04		BCR output and main battery voltage	(n-10)•79.5	14469	mV
7	05		(Special Purpose)	xxxxxxxxx	.	.
138	06		2 m xmtr power amplifier temperature	(n-120)/1.71	10.5	C
48	07		+ 14 volt rail current to xponder	(n-15)•24.27	800.9	mA
200	08		+ 10 volt regulator voltage	(n-10)•53.2	10108	mV
126	09		Helium tank high pressure	(n-14)•6.56	734.7	Bar
137	0A		IHU temperature	(n-120)/1.71	9.9	C
7	0B		+ 14 volt rail current to magnetorquers and antenna relay	(n-15)•4.854	0	mA
96	0C		BCR oscillator #1 status	0 = Off; N > 10 = On	On	.
134	0D		He tank low side pressure control volt	(n-15)•.117	13.923	Bar
143	0E		BCR temperature	(n-120)/1.71	13.4	C
47	0F		+ 10 volt regulator current	(n-15)•4.854	155.33	mA
7	10		BCR oscillator #2 status	0 = Off; N > 10 = On	Off	.
143	11		N2O2 tank pressure	(n-106)•0.733	27.12	Bar
138	12		SEU temperature	(n-120)/1.71	10.5	C
7	13		Battery charge current	(n-15)•12.135	0	mA
14	14		Top (+Z) photocell sun sensor	(n-10)•8.53	34.12	mV
99	15		Motor valve status	102 = Closed, 118 = Open Closed		
136	16		Auxillary battery #1 temperature	(n-120)/1.71	9.4	C
56	17		Active BCR ouput current	(n-15)•24.27	995.07	mA
7	18		Bottom (-Z) photocell sensor	(n-10)•8.53	0	mA
7	19		XXXXXXXXXX		0	.
135	1A		Auxillary battery #2 temperature	(n-120)/1.71	8.8	C
7	1B		Active BCR input current on 28 volt bus	(n-15)•12.135	0	mA
116	1C		Spin rate if n < 139,	r = (131-n)•0.85 + 20	32.75	rpm
			or if n > = 139	r = 479/(n-109)-2		rpm
7	1D		L rcvr AGC	(n-75)²/-1125	0	dB
137	1E		Main battery temperature	(n-120)/1.71	9.9	C
7	1F		Solar panel #6 current	(n-15)•4.854	0	mA
206	20		2m xmtr average power output	(287-n)²/1796	3.653	W
136	21		He tank temperature	(n-120)/1.71	9.4	C
134	22		Solar panel #1 temperature	(n-120)/1.71	8.2	C
7	23		Solar panel #5 current	(n-15)•4.854	0	mA
69	24		70 cm rcvr AGC	(n-71)²/2465	0	dB
131	25		70 cm xmtr PA temperature	(n-120)/1.71	6.4	C
138	26		Solar panel #3 temperature	(n-120)/1.71	10.5	C
35	27		Solar panel #4 current	(n-15)•4.854	97.08	mA
107	28		Special purpose	xxxxxxxxx	.	.
140	29		24 cm rcvr temperature	(n-120)/1.71	11.7	C
138	2A		Solar panel #5 temperature	(n-120)/1.71	10.5	C
7	2B		Solar panel #3 current	(n-15)•4.854	0	mA
226	2C		+ 14 volt regulator voltage	(n-10)•66.8	14429	mV
137	2D		RUDAK temperature	(n-120)/1.71	9.9	C
129	2E		Top (+Z) skin temperature of arm #1	(n-120)/1.71	5.3	C
7	2F		Solar panel #2 current	(n-15)•4.854	0	mA
178	30		Mode B transponder + 9 V supply voltage	(n-10)•54	9072	mV
134	31		Wall temperature in arm #2	(n-120)/1.71	8.2	C
122	32		Bottom (-Z) skin temperature of arm #1	(n-120)/1.71	1.2	C
7	33		Solar panel #1 current	(n-15)•4.854	0	mA
111	34		Special purpose	xxxxxxxxx	.	.
133	35		Wall temperature in arm #1	(n-120)/1.71	7.6	C
137	36		N2O4 tank temperature	(n-120)/1.71	9.9	C
137	37		Reserved		.	.
15	38		Auxillary battery voltage	(n-10)•78.5	392.5	mV
122	39		Mode S transponder temperature	(n-120)/1.71	1.2	C
129	3A		+ Z platform temperature (SERI exp)	(n-120)/1.71	5.3	C
.	3B		Reserved		.	.
206	3C		Mode L transponder + 9 V supply voltage	(n-10)•45.4	8898	mV
.	3D		AZ-50 tank temperature	(n-120)/1.71	.	C
.	3E		Nutation damper temperature	(n-120)/1.71	.	C
.	3F		Reserved		.	.

mended, as in the normal IARU band-plan recommendations. It is not absolute, as many countries are plagued by amateur f.m., RADAR, military use, etc., that make specific sections of the downlink bands unusable. It is then logical for the operator so hit to use those frequencies that he can sucessfully transpond to. No priority frequencies for news broadcasts have been set, but these are expected to be used later close to the top edge of the downlink. Although unmeasured, the Mode "L" transponding relationship appears to be as earlier published. Mode "J" has been measured, and found to be very close to nominal. No frequency equivalents have yet been reported for Mode "S".

Operation

OSCAR-13 is in excellent health, with all systems working, and is now giving excellent communications to the world amateur radio satellite community. Transponded signals on Mode "B", "J" and "L" are adequate, and despite a little signal strength variation that limits really perfect QSOs, all seems well. The improvement of the 435MHz downlink compared to OSCAR-10 is quite dramatic, with substantial signals from quite modest uplinks resulting from both Mode "J" and "L". Mode "S" is reported to sound like a broadcasting stations to those equipped to receive the s.h.f. signal downlink, with a fade-free smooth fully quieting signal resulting.

Dr. Karl Meinzer DJ4ZC, at the July 5/6 AMSAT-UK colloquium at the University of Surrey reported that all bar a few minor annoyances, OSCAR-13 is performing to AMSAT's satisfaction. He explained that the "spin modulation" noticeable is not due to the same reasons as OSCAR-10. It's caused by the u.h.f. antenna offset swinging through the field producing a re-radiation pattern, as it, as well as the whole body of the spacecraft, is resonant at 145MHz. **Werner Haas DJ5KQ**, explained in a long conversation that a few problems have been encountered with the function of the "RUDAK", but that he hoped all would be well following further testing and commanding.

Telemetry

The c.w. telemetry at the hour and half hour is keeping up with the input of information to provide updates for listeners, as is the RTTY at the quarter and three-quarter hours transmissions. For this u.s.b. is needed for the correct space and mark tones. An early copy of the BPSK telemetry taken at 0147 on July 11 by Vern Riportella WA2LQQ, AMSAT's president, is shown in Fig.7. With the exception of Channel 01 and 1C all is well, but channel 01 probably should be (261–n)/1724 instead of the /724 given. Channel 1C, the spin rate, is at odds with that detemined by QSB rotation measurement on earth, and new software is being developed.

Copious amounts of information is coming in about the new satellite, but we need to keep a little space for the other satellites too, so a wider profile of who is on, when, and working who, should evolve next month. Just let it be said that we have a wide new set of DX bands now available, to "A" and "B" licensees alike, who should not miss the opportunity presented by OSCAR-13.

RS Satellites

RS-1 is still being heard, after ten years in space. In a letter to **Don Shirreff G3BGM**, the operator of the RS command station, **Andy Mironovy RS3A**, said that they had been trying to command on the transponders of RS-5 and 7, but with only a modicum of success. Whilst RS-7 remained deaf to all instructions fom the reconstituted command assembly, RS-5 did respond, and stayed on for a full orbit on July 9, upon which RS3A made QSOs with F2JA and F9EA. Unfortunately, the satellite has failed to execute all attempts to command since that date, or, to quote Andy, " . . . I believe that these were the last QSOs over RS-5. I will try to switch it on again – let us hope ! . ."

RS-10/11 remains well populated, with every pass providing lots of QSOs for all. Mode "T" has been very quiet, but it is hoped that a schedule of use can be provided to perform the multi-satellite hop proposed by G4CUO when a common overlap window transpires.

During an all-too-short three day stay at the G3IOR QTH, **Leonid Labutin UA3GR** explained the future plans of the RS satellite building group. "Next year," said Leo, "We shall launch RS-12, which will be a very similar transponder, orbit and system as RS-10/11. It will only differ in the telemetry, which will be simplified with common prefixes and a following identifying letter to indicate the channels monitored, an increase in the memory capacity, and in having up to 8 watts of downlink power.

After this, in about three years time, we hope to have a Mode 'B' RS-13 in a 1000km polar orbit."

"The third plan," explained Leo, "is to build a joint satellite, with a Czechoslovak made command system, the power assembly from Bulgaria, the internal housekeeping unit from Hungary, Packet radio from the German Democratic Republic, and the actual satellite, transponders and solar cell assembly from the USSR group: It will be a Mode "J" and "L" linear and digital transponder, with some 40 watts of power available, in a Molniya type orbit "

FO-12

Mr.Shozo Hara JA1AN, President of the JARL, writes to assure us that we shall have no problems with the concern earlier expressed due to the potential use in Japan of f.m. in the satellite sections of the bands. He explains that the reaction evolved from a discussion paper produced to the deciding committee, which has since not only rejected the proposition, but extended the section of the bands for satellite uplinks and downlinks.

Yoshio Arisaka JA1HQG, also a Director of JARL, attended the University of Surrey AMSAT-UK colloquium, and explained to G3IOR some of the problems associated with maintaining a regular operating schedule with FUJI-OSCAR-12. Despite the difficulties involved with limited solar-cell power production on such a small satellite, they will try to get to us a long-term provisional plan when the satellite will be active on particular modes, in time for publication. The JARL and JAMSAT will soon now begin work on JAS-1B, which will have a tight power budget, and better antenna directivity in order to accomplish a flatter pattern and smoother operation. Our Fig. 8 photograph from JA1AN shows the command station for FO-12, with operations in progress.

We will try to catch up on station news and the other information in next months pages, plus the latest OSCAR-13 news.

The next three deadlines are: Sept 21, Oct 26 and Nov 24

Propagation

Reports to Ron Ham
Farnday, Greyfriars, Storrington, West Sussex RH20 4HF

By the beginning of 1970, it was obvious that my simple radio telescope was working well and more than able to provide the information about the "active" sun that I wanted. From the start I kept a daily log of the solar events that occurred during my observational time and, from these archives, I prepared a bar-chart, Fig. 1, showing the total number of days each year when some form of solar noise was recorded.

In addition to a variety of individual bursts which manifested throughout 1970, noise storms were recorded from January 3-6 and 11-13, February 19-21, June 15-17, July 21-25, August 16-21, September 5-8 and 23-27, October 20-23 and 27-31, November 11-22 and December 17-23.

The sun was active every day from October 9 to November 5 and then went

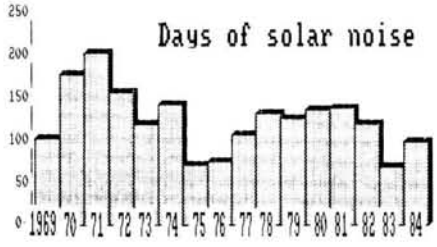


Fig. 1

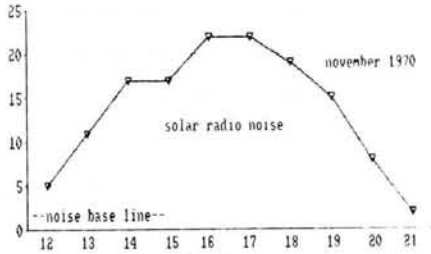


Fig.2

quiet until the 11th, when a few tiny isolated bursts appeared on the chart. Next day, the receiver noise base-line increased and decreased as the sun passed through the antenna beamwidth. By switch-on time on the 13th a noise storm was in progress and the base-line was half way across the chart. This line was higher and the noise more intense on the 14th and 15th and peaked on the 16th and 17th when the pen spent most of the observation against the upper stops, Fig. 2 and only declined a little on the 18th. Although still strong the base-level was about midway on the 19th and 20th and then gradually returned to normal, with slight noise and a few small bursts, on the 21st and 22nd.

This solar activity was responsible for many fadeouts on the h.f. bands and after sunset on the 16th, the background noise on these bands was exceptionally high. It sounded as though the whole atmosphere was still charged after its excessive bombardment from the sun. Perhaps the ionosphere, or even the earth's surface was re-radiating the solar noise I thought, however, a fellow radio-astronomer suggested that it was the moon deflecting the solar noise towards earth after sunset. Another good possibility because the sun was still pumping the stuff out and I don't think the earth's ionosphere was in any state to stop the noise getting through.

Whatever the cause it was a fantastic natural event from which I learnt a lot and then realised that this must have happened a million times before in the earth's history, but without radio, there was no means of detecting and/or knowing about it.

During this storm, the media was carrying the story of the flood disaster in East Pakistan. On the 17th I noted a piece in the *Daily Telegraph* newspaper which began, "Pakistan's tidal wave disaster was caused by the influence of sunspots, Prof. Raffaele Benandi, director of the Faenza Geophysical Observatory in Italy, suggested yesterday."

"Why not," thought I, there may still be unknown particles coming from the sun, which, as yet, man has not found an instrument to detect. After all the sun has been transmitting radio waves for millions of years, but science knew nothing of this until the invention and development of the short wave radio receiver earlier in this century. The Telegraph's report continued, "Prof. Benandi said that four separate groups of sunspots were moving across the Sun's face, the largest of them containing about 20 spots. The biggest group passed through the central meridian yesterday. (Remember that peak of noise on the 16th.) It will disappear over the Sun's western horizon on Nov. 22."

Over the years I found that noise storms always produced something of great interest for instance; my home is situated on the northern slope of the South Downs which rise sharply by approximately 120m, about 400m to the south of my garden. This has some advantages but during the mid-winter months the sun, being low in the sky, sets quite sharply behind the hill in a similar way to the sunset shown in Fig. 3. Now to the point of this example: The sun was radiating a high level of radio-noise on 9 January 1971 and as it set behind the downs and the source of radio noise was gradually cut off from the telescope's antenna, a rough profile of the hill was drawn on my recording chart. Next month I plan to look at the records for 1972, but now back to a very active period in 1988.

Fig. 3

Solar

Between June 6 and July 9, **Patrick Moore** (Selsey) found gaps in the often cloudy sky on 24 days to check for sunspots and the drawings he made showing their positions, at 0930 on June 19, 0830 on the 29th, 1900 on July 1 and 0545 on the 9th, are illustrated in Figs. 4, 5, 6 and 7.

"The sun became particularly active towards the end of the month when some massive sunspot groups developed to appear in the centre of the disc at the beginning of July," wrote **Ron Livesey** from his observatory in Edinburgh. Here, he uses a 2.5in refractor for his astronomical studies. Ron makes measurements on a scale personal to his telescope and noted the presence of 3 sunspot groups on June 18, 20, 23, 24, 25 and 26; 4 groups on July 2 and 5 groups on July 8.

In Bristol, **Ted Waring** counted 63 sunspots on July 1, 20 on the 6th, 34 on the 13th and 32 on the 18th.

For the safety of your eyes, NEVER LOOK DIRECTLY AT THE SUN THROUGH ANY TYPE OF OPTICAL EQUIPMENT. Get advice from or join your local astronomical group, or the British Astronomical Association before making any solar observations.

Cmdr Henry Hatfield (Sevenoaks), using a spectrohelioscope, logged 1 large spot, 1 chain of 7 spots, 1 medium sized spot, 1 large group of about 20-30 spots over 23 degrees long with a very active plage, 10 filaments and a small flare in the large group around 0915 on June 30. At 1500 on July 1, he noted that the large group was crossing the central meridian and observed a small flare in its north-west corner. His entry for 1445 on the 7th read, "The large group is going round the west-limb. To my surprise there are no prominences over it. In addition there are 2 spot groups, 2 single spots and 9 filaments." He also logged 1 group of 7 spots, 1 double spot and 8 filaments at 0955 on the 9th; 2 groups both with many small spots, 1 single spot, 16 filaments and a large active plage at 1350 on the 18th; 20 filaments and a very large active plage on the 19th; 1 large group with active plage, 1 double and 1 single spot, 15 filaments and 1 small flare at 1137 on the 21st; and 2 double spots, 15 filaments and a large "loop prominence" on the north-west limb at 1050 on the 24th. "As you can see the sun has woken up with a vengeance! The very large group of June 30 (Figs. 5 and 6) was coming round the north-east limb again on July 24. I think it may have declined," said Henry.

I was not surprised when he recorded "violent" and "very large" bursts of solar radio noise at 136MHz on June 30, followed by a continuous noise storm, with much bursting, from July 1 to 5 inclusive. He also recorded "intermittent noise with isolated bursts on days 7, and 8, large bursts on 11, 12 and 23 and noise storms on 16, 17, 18 (violent), 19 and 21.

"The mean sunspot number for June was 101.8, the first mean monthly figure above 100 this cycle with a low of 66 on the 14th and a high of 217 on the 8th," wrote **Neil Clarke G0CAS** (Knottingley). He reported that the solar flux for June began at 150 s.f.u., reached 165 on the 9th and fell back to 108 by the 14th. It then rose to 119 on the 22nd and sharply on to its peak of 184 on the 30th. Neil's computer print out of the daily figures for solar and magnetic activity and the m.u.f., can be seen in Fig. 8.

Dave Coggins (Knutsford) heard solar radio noise while monitoring the 50MHz band, with his 2-element quad facing south-east, from 0814 to 0850 on July 2. "Noise levels were up and down with many "peaks and dips"," said Dave. He reports that the "hiss" rose to S6 at 0826. He was beaming east around 0600 on July 9 and heard small individual bursts on the 28MHz band. (Dave's beam was pointing toward the rising sun).

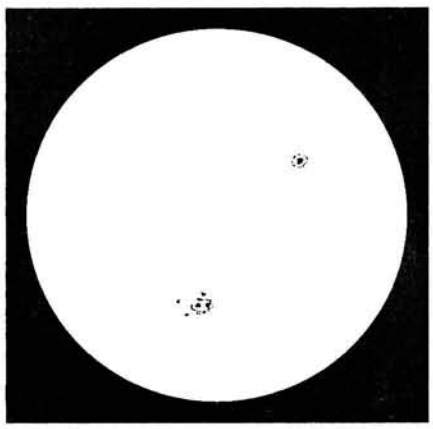


Fig. 4

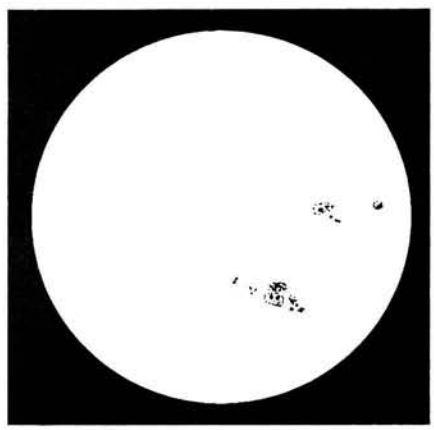


Fig. 5

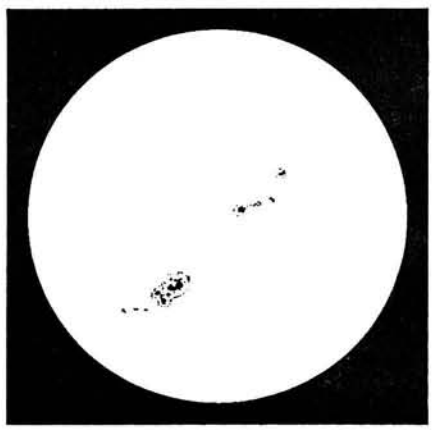


Fig. 6

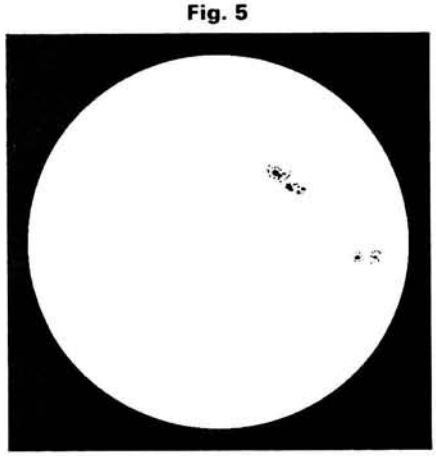


Fig. 7

Magnetic

Neil Clarke tells me that during the 3 minor magnetic storms recorded on days 14, 25 and 29/30, the Ap index was 37, 48 and 45-49 respectively. He said that most days in June were unsettled and that the only quiet day was the 5th when the Ap index was 9. The magnetometer used by **Karl Lewis** in Saltash was very unsettled for periods on June 20, 22, 27, 28 and 30 and recording storm levels on days 18, 19, 24, 25, 26, 29 and 30.

Aurora

Ron Livesey, the auroral co-ordinator for the British Astronomical Association, points out that the summer twilight prevents the observation of aurorae in the UK and it may be some weeks before overseas observations reach him. Overcast skies are also a problem to visual observers therefore it is important that radio enthusiasts send a report to Ron, the RSGB, or myself each time tone-A signals are heard. If nature prevents our seeing the auroral display then we can at least know of its existence by the effect it has on radio signals.

Sporadic-E

During an intense Sporadic-E opening at 1730 on June 27, I counted over 40 very strong f.m. signals from East European broadcast stations who normally operate between 66 and 73MHz. At the same time I received pictures and sound on Ch. R3 77.25MHz and 83.75MHz respectively. Later, between 1900 and 2000, **Ken Lancaster** (Rotherham) logged Italian and Spanish stations in Band II and while a similar event was in progress at 2130 on July 6 **John Parry G4AKX** (Northwich) heard a number of Spanish broadcast stations within the band. Around 0930 on July 12 at least 10 Italian stations were audible from 87 to 102MHz. Some 24 East Europeans were again very strong between 66 and 73MHz around 0900 on July 20 and over 35 at 1845 on the 23rd.

The 50MHz Band

Signals from Portugal, Finland, the USA and France were received by Dave Coggins on June 19, 24, 25 and 27 respectively as well as both France and Finland on July 9. While Sporadic-E was present during the evenings of the 20th and 23rd, I tuned between picture pulses on Chs. E2 and E3 (48.25-55.25MHz) and heard amateur stations, in the 50MHz band, from Norway and Finland respectively on s.s.b. Both were very active and I think that the latter was OG2C, a special event station in Helsinki.

The 28MHz Band

Dave Coggins logged short skip signals from Europe, the Middle East and Scandinavia on June 25, 26, 27, 28, July 2, 3, 4, 6, 9, 10, 11, 12, 13, 14 and 15 and DX from South America on July 2, 4, 5 and 9. Apart from a station in Sweden, Dave found the band "almost dead" on June 29 which is not surprising after looking at the sunspots and the solar flux level for that day. (Figs. 5 and 8).

John Levesley G0HJL (Bransgore) received signals from Europe and Scandinavia on June 25, July 9 and 23. He worked two Germans in the Lower Saxony Contest on June 25 and stations in Argentina, Czechoslovakia, Hungary, Portugal and Spain on July 9. John also heard f.m. signals from Denmark and Sweden on the

DATE	SUNSPOT NUMBER	SOLAR FLUX	AP INDEX	PENTICTON MAX
880601	117	150	014	093
880602	110	144	013	084
880603	112	145	011	088
880604	132	147	013	093
880605	152	147	009	089
880606	176	154	019	
880607	198	160	015	
880608	217	163	015	
880609	203	165	015	
880610	177	145	016	
880611	139	134	016	
880612	123	122	010	
880613	094	112	013	
880614	066	108	037	
880615	089	111	018	
880616	121	116	014	081
880617	113	121	021	075
880618	095	122	021	071
880619	088	116	033	074
880620	113	115	035	070
880621	119	121	016	072
880622	109	119	022	071
880623	119	125	017	075
880624	135	135	031	075
880625	139	150	048	074
880626	143	155	029	072
880627	158	155	021	075
880628	166	178	022	081
880629	166	183	045	076
880630	191	184	049	072

Fig. 8

16th and all of Scandinavia plus Holland and the Budapest repeater (HA5BE-29.680MHz) on the 23rd.

Propagation Beacons

As usual my thanks are due to **Chris van den Berg** (The Hague), Dave Coggins, **John Coulter** (Winchester) Henry Hatfield, **Don Hodgkinson G0EZL** (Hanworth), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), **Patrick Wagemakers** (Schoten) and Ted Waring for their 28MHz logs and for their dedication to supplying information for our monthly beacon Chart, Fig. 9.

In addition to the beacons listed in Fig. 9, Don Hodgkinson heard 5Z4ERR (28.240MHz) and Ted Owen heard WA4DJS (28.295MHz) (Florida) on July 9. It was Don, plus John Coulter and Fred Pallant that enabled me to add PI7ETE (28.302MHz) to the chart.

Dave Coggins received signals from the 50MHz beacon in Portugal (CT0WW) on June 17, 19, 27, July 8 and 9. He described the signals from the beacon at Potters Bar (GB3NHQ-50.050MHz) as "not unlike slightly auroral" at 1150 on July 5, "slightly rough note" at 1152 on the 6th and "rapid rhythmic" type QSB" at 1201 on the 8th. Dave added that signals from the Inverness beacon (GB3RMK-50.060MHz) had a "rough note with an odd meteor scatter burst," at 1152 on the 6th. He also kept an ear on the 24MHz band and logged the beacons in Brazil (PY2AMI-24.900MHz) and Italy (IK6BAK-24.915MHz) on July 9, 10, 14, 15, 17 and 18. Ted Owen also heard the Italian beacon at 549 around 0749 on June 30 and July 3 and again at 0929 on the 9th.

Tropospheric

The slightly rounded variations in atmospheric pressure, measured with my barograph in Sussex throughout this period, can be seen in Fig. 10. Ted Owen's barometer indicated highs of 1020mb (30.15in) on June 26 and July 12, 16 and 19 and a low of 992mb (29.3in) on July 3.

934MHz

"A fairly quiet month," wrote John Levesley UK627, for the period prior to July 24. However, he did make contact with GY-186 in Guernsey on July 5 and 9 and heard SB-91 from Andover, DB-19 from Gloucester and TG-15 from Swindon who were visiting his area. He also worked TR-26/P from Canford Cliffs; "Nothing remarkable in the 10 mile copy", said John, "except for the fact that he was using a hand-held with a rubber duck."

During the 934MHz National Field Day, the winners of the multi-operator section were UK-1268 for the longest QSO (170km) and UK-1999/2000 for maximum number of contacts (70) and highest points scored (206). In the single operator section UK-1132 was first in all 3 divisions with the longest contact of 182km and gained 183 points from 64 QSOs. Our congrats to the leaders and thanks to John Levesley, the NFD manager, for the information.

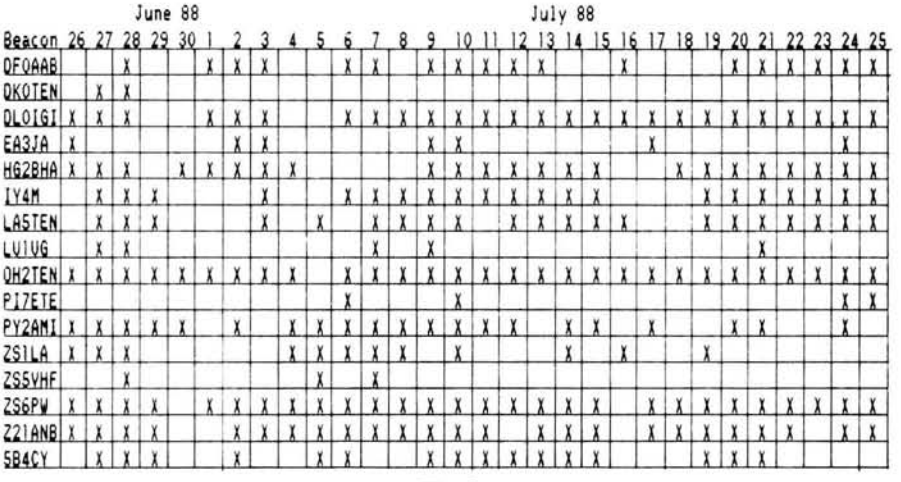


Fig. 9

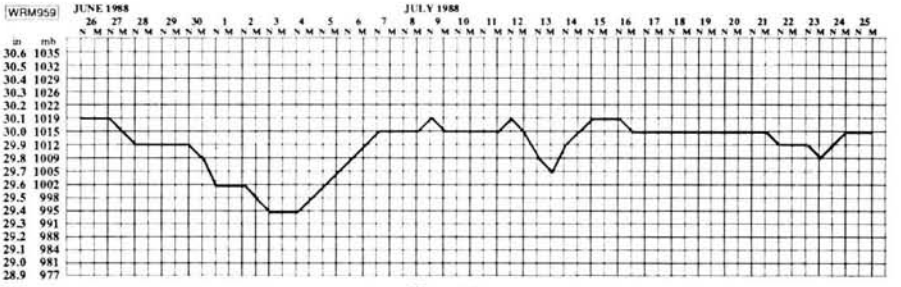


Fig. 10

Broadcast Round-up

Peter Shore

Any reports for Broadcast Round-up should be sent to the PW offices

It has been pleasant recently to receive some correspondence from readers of this column, together with their monitoring observations. **Mr R F Merrall** of Dunstable wrote this month, telling of his return to short wave listening, and saying that he finds this feature "invaluable to the process of sorting out, 'who is where and when'— in conjunction with the more detailed round-up in . . . *Short Wave Magazine*". I'm glad that we are of help, Mr Merrall.

Last month we reported on the agreement for relay exchanges between Radio Canada International and Radio Beijing. It seems that this will take the form of a daily two hour exchange, starting in April 1989. RCI is also moving in to the domestic Chinese market, by providing an English language teaching course which will be broadcast in Shanghai, Beijing and Guangzhou starting in September.

A new 100kW transmitter has been inaugurated by Kossuth Radio in Hungary on 6.025MHz. The service carried on this h.f. channel is designed for Hungarians abroad and was first heard in November 1985, but with a power thought to be 20kW.

Israel Radio has dropped its daytime foreign language programmes, with the exception of English and French. Easy Hebrew has been removed from Kol Israel's schedule, and replace by Yiddish broadcasts.

The Voice of America's audibility programme continues apace, with the announcement that Marconi Electronics Incorporated, a subsidiary of the British firm, has won the contract to build ten 500kW transmitters for the Morocco relay station. Altogether, VoA intends to have 108 500kW transmitters around the world in both new and existing relay sites. Additional Marconi transmitters could also be installed in VoA sites in Botswana, Thailand and Sri Lanka. The Voice of America relay station in Sri Lanka is under construction in Puttalam, and is expected to be completed in five years.

Also in Sri Lanka, the Deutsche Welle relay station in Trincomalee, which suffered seige conditions during the civil war in the country, is now back on the air with test transmissions using three 250kW short wave transmitters and a 600kW m.f. sender. Tests are between 1200 and 1400 on 1.548MHz, 1430-1650 on 1.548 and 6.17MHz with Urdu 1430, Hindi at 1520 and English at 1610. The relay on DW's Chinese programmes continue on Radio Veritas in the Philippines, broadcast between 1230-1350 on 9.69MHz. Deutsche Welle hopes eventually to improve its South East Asian coverage by hiring additional time on R Veritas.

Meanwhile Swiss Radio International is now using transmitters at Radiobras for Central American coverage. SRI's Press Officer, Walter Fankhauser, explained that the relay started on July 1 and will probably continue until the end of the year. It will be extended afterwards if the results prove successful. The current tests are on the air 0130-0300 on 17.73MHz using a 450kW transmitter.

The new BBC relay site in the Seychelles, designed to improve reception in East Africa, will begin operations on September 25. Tests on the two 250kW senders will be made before the official opening, but QSL cards will only be sent for reports made from within the target area!

Radio Austria International was heard on the 21 metre band channel of 13.73MHz during July, apparently with tests of this hitherto unexplored band for the ORF. It remains to be seen whether the station will make permanent use of this short wave frequency.

The American AFRTS network is to end short wave transmissions at the end of September, we learn. Now is the time to verify the station, if you collect QSL cards. Here in Europe, 15.265 is well received during the morning and 15.43 during the evening period. AFRTS programmes for overseas commands are now carried on satellite, and the h.f. links were mainly used by ships, or as a backup in the event of a satellite failure. Now ships are equipped with satellite receiving equipment, the short wave transmissions can be dispensed with, much to the disappointment of others abroad who enjoy listening to news from ABC, NBC and so on.

The Irish Government has told pirate stations operating in the Republic to close by 31 December 1988, prior to the shake up of broadcasting in the country next year.

Europe

All times are UTC (=GMT)

In addition to the 13MHz tests mentioned earlier, Radio Austria International is currently evaluating a new modulation compressor. The new compressor is deployed between 0000-0500 on the North American service on 9.875MHz (s.s.b. to the West Coast from 0300), 0500-0700 on 15.45MHz to Australasia, and 0400-2300 to Europe on 6.155MHz.

Radio Caroline's 558kHz frequency now carries RN 0600-1800, with Caroline heard at other times. The new RN service will move to 819kHz during August.

Radio France International has retimed its Arabic service, now 1400-1500 on 21.49 and 11.845MHz. Radio Norway has made some frequency changes: 1300 uses new 21.70 from 17.80MHz, and at 1400 there is a new 15.19 from 21.705MHz. Despite a misleading printed schedule, the 1500 broadcast on Mondays on 1.314MHz medium wave carries the Sunday English language programme.

Vatican Radio's Overseas Service at 0700, which includes English from 0715, has moved to 17.73MHz in parallel with 15.19MHz.

A harmonic of the Soviet Baku station, whose nominal frequency is 6.11, is heard around 1500 on 18.33MHz.

Africa

The clandestine, Radio Bardai, hostile to the Chadian Government, has been unheard on its usual 6.009MHz channel for some weeks. Operation seems to be very erratic, perhaps because of the war situation in the region. Listen out at 1100 and 1800UTC to see if it comes back.

We mentioned the Voice of Ethiopia last month. This station continues to be heard at 1800 on 7.315MHz Friday to Sunday and on 9.66MHz Monday to Thursday. Programmes are reported to be beamed to East Europe 1800-1830 and to Western Europe 1830-1900.

Ray Merrall reports RTM Morocco with slow speed English between 1705 and 1720 on 17.815MHz with "English for International Co-operation" through until 1745. This is also carried on m.f.: 1.325, 1.197, 1.188, 1.026MHz and 828kHz.

Radio RSA in English at 1800 is now using 15.405 and 11.915MHz, replacing 15.365 and 11.875MHz.

Middle East

The Palestinian Al-Quds Radio now has a short wave channel of 7.46MHz between 0600-1100 and 1300-1600, and an untraced 4.32MHz between 1600 and 1800.

Iran's Flag of Freedom Radio, a clandestine hostile to the Khomeni regime, is now on 11.315MHz at 1630, possibly a test frequency.

Syrian radio transmissions from Damascus have moved to new 9.95MHz in parallel with 15.095MHz including English at 2100.

Turkey's strange out-of-band channel of 14.88MHz, which was heard in parallel with 11.96 has now been replaced. Between 1000 and 1500, the new frequencies are 9.46 and 11.955MHz. English is reported by Mr Merral at 0305 on 9.445MHz.

Asia

Afghanistan has moved from long-established 4.450MHz to new 4.760MHz, with domestic and external programmes relayed. Audible in Europe during the evening, together with 4.740MHz.

Ray Merrall has been listening to R. Australia's 2100 Chinese programme on 11.73MHz from the Darwin site, with "Oz by Radio", as he describes the station's English course, at 2110-2130.

Radio Bangladesh uses new 17.71 and 15.195MHz for the 0800 and 1230 transmissions. At 1815 English is heard on 7.505MHz.

Radio France International's relays from Japan which began on 1 August are as follows:

0930–1130 on 15.215MHz to North Asia
1000–1100 on 17.705MHz to South East Asia
2300–0030 on 17.710MHz to South East Asia

Radio Nepal uses new 7.165MHz (ex 3.23) 0015-1715, in parallel with long running 5.005MHz.

With the Olympic Games scheduled for September, I thought it might be interest-

ing to provide transmission details for both North and South Korea . . .

KBS, Seoul
0145–0200 on 15.575 & 9.640MHz
0500–0600 on 9.57, 7.275 & 6.06MHz
0700–0800 on 13.67 & 7.55MHz
0815–0830 on 13.67 & 9.57MHz
1000–1100 on 15.575MHz
1015–1030 on 11.74 & 7.275MHz
1230–1245 on 11.74 & 7.275MHz
1300–1400 on 15.575, 9.75 & 9.57MHz
1445–1500 on 9.87, 9.515 & 7.275MHz
1500–1600 on 9.87 & 5.975MHz
1615–1630 on 9.87MHz
1700–1800 on 15.575MHz
1930–2030 on 15.575, 7.55 & 6.48MHz
1945–2000 on 9.87 & 5.975MHz
2230–2330 on 15.575MHz
2345–0000 on 15.575 & 7.275MHz

Radio Pyongyang
0000–0050 on 15.16 & 15.115MHz
0400–0450 on 15.18, 15.16 & 15.115MHz
0600–0650 on 15.18, 15.16, 15.115 & 13.65MHz
0700–0750 on 15.34 & 13.75MHz
0800–0850 on 15.18, 15.16, 11.83 & 9.54MHz
1100–1150 on 11.735, 9.60 & 6.576MHz
1300–1350 on 9.60, 9.345 & 9.325MHz
1500–1550 on 11.74, 9.977, 9.64 & 9.325MHz
1700–1750 on 11.74, 9.977, 9.64 & 9.325MHz
2000–2050 on 9.977, 9.64, 9.345 & 6.576MHz
2300–2350 on 13.65 & 11.735MHz

Radio New Zealand, according to Ray Merrall, is heard 1830–2115 on 12.045MHz, and 0145–0315 (seasonal for sports), 0330-0730, 1830–2115 and 2345–0145 on 15.15MHz, all for the Pacific; to Australia and Melanesia on 12.045 MHz between 0330-0730, and on 6.10 and 9.54MHz from 1000 to 1215. Ray reports a QSL in just 10 days in late June for 12.045MHz at 0330-0730.

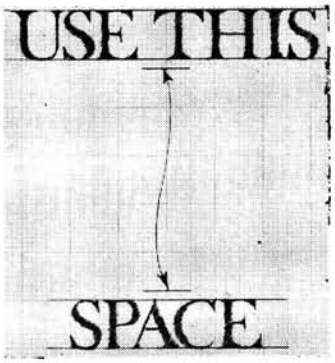
Radio Pakistan's English service at 1700 on 15.27MHz gives a good signal here in the UK.

SLBC in Colombo is heard on 15.435MHz at 0100 with an English *Morning Show* with records and requests, through to 0200.

Any reports for Broadcast Round-up should be sent to the PW offices

The Americas

Radio for Peace in Costa Rica now uses 13.66MHz between 0415 and 0700. WRNO is on 13.76MHz 2300–2400 with announced 7.355MHz from 0000.



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