PRACTICAL WIRELESS

PW

THE RADIO MAGAZINE

REVIEW
Topward 7021 Oscilloscope From Maplin Electronics

BUILD
A Pre-amp for 70 and 50MHz

Antenna Construction: Circular & Square Loops + Dual Band Antenna

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DECEMBER 1990
£1.60

ISSN 0141-0857

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A high-performance HF rig . . . with a great receiver and full-power transmitter. Light in weight and low in price.

This is Yaesu's FT-747GX.

Whether you're a beginner or a veteran, it's a great way to start. And a great way to go.

DX ready. The 747 packs a full 100-watt RF punch on 160 to 10 meters, with continuous receive from 100 kHz to 30MHz.

And its control panel is refreshingly simple. So you can hop around the band *fast* to nail those DX stations. While other guys are warming up their amplifiers, you can be working the DX!

Multimode versatility. The FT-747GX is ready to go on LSB, USB, CW, and AM. With provision for the FM-747 FM unit.

You get 20 memories to store frequency and mode. Dual VFOs with split frequency operation for DX-pedition work. And manual band scan plus auto-resume memory scan via the microphone up/down buttons.

Great receiver. Utilizing a directly-driven mixer, the FT-747GX receiver features superb overload protection. You also get factory-installed narrow CW *and* AM filters. A one-touch noise blanker. All-mode squelch. RIT. And a 20-dB attenuator for local QSOs.

Lightweight construction. Housed in a metallized high-impact plastic case, the FT-747GX weighs in at about 7¼ pounds! With the loud-speaker mounted on the front panel for maximum audio transfer. And internal heatsinking for the transmitter, rated at full power for FM, packet, RTTY, SSTV, and AMTOR when used with a heavy-duty power supply.

Available options. FC-1000 or FC-757AT Automatic Antenna Tuners. FL-7000 500-watt Automatic, Solid-State Linear Amplifier. TCXO-747 Temperature-Compensated Crystal Oscillator. FAS 1 4R Remote Antenna Selector. FRB-757 Amplifier Relay Box. FP-700 Standard Power Supply. FP-757HD Heavy-Duty Power Supply. MMB-38 Mobile Mounting Bracket. MH-1B8 & MD-1B8 Microphones. New heavy duty metal case MMB42A.

Discover the price/performance leader. Check out Yaesu's low-cost FT-747GX at your Yaesu dealer today. Because now, Yaesu puts priceless DX into *your* price range.

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

YAESU

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Editor
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Art Editor
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Technical Projects Sub-Editor
NG ("Tex") Swann G1TEX
Technical Artist
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Sharon George
Editorial Assistant
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Accounts Manager
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Accounts Assistant
Darren Howe
Clerical Assistant
Rachel Parkes

Advertisement Manager
Roger Hall G4TNT
PO Box 948
London SW6 2DS
☎ 071-731 6222
Cellphone 0860 511382
FAX 071-384 1031

Advert Copy and Make-up (Poole Office)
Marcia Brogan
☎ Poole (0202) 676033
FAX Poole (0202) 666244

Editorial and Advertisement Offices:
Practical Wireless
Enefco House
The Quay
Poole
Dorset BH15 1PP
☎ Poole (0202) 678558
(Out-of-hours service by answering machine)
FAX Poole (0202) 666244
Prestel 202671191

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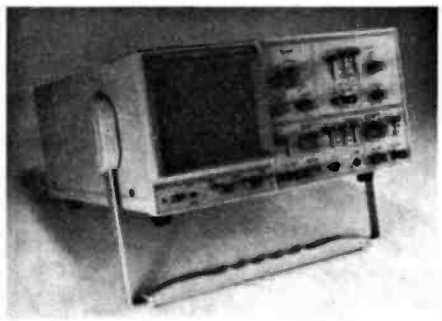

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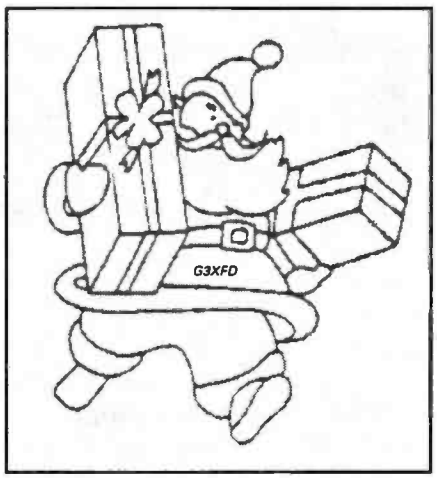

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Regular Features

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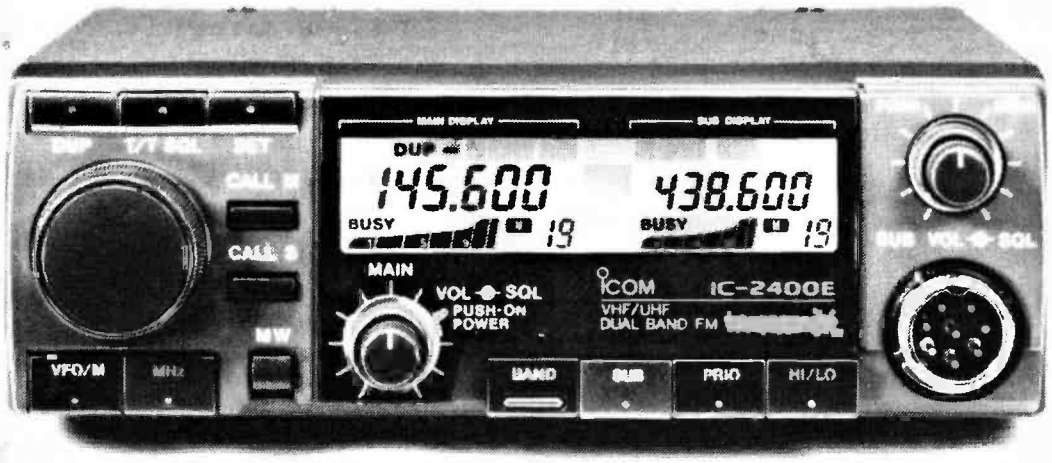
ICOM

DUAL-BAND FM TRANSCEIVERS



IC-2400
144/430MHz
2m 45W
70cm 35W

These new models from ICOM add a new dimension to the mobile scene. Enjoy the freedom of the open road and experience the advantages of simultaneous dual-band operation.

They are capable of receiving on both MAIN and SUB bands at the same time. While operating on one band, you can monitor a second band for activity. It is very easy to switch between the MAIN and SUB bands allowing you to reply immediately to calls received on either bands.

Full duplex operation lets you transmit on one band while receiving on the other for telephone style contacts. Each band can be independently regulated using separate volume and squelch controls.

Both models incorporate 20 memory channels and a call channel for each band, these memory channels store all the information needed for repeater operation.

For 23cms operation the IC-2500 features a AFC function which automatically tunes the receive frequency to the transmit station frequency. The AFC function eliminates the need to retune if a stations transmit frequency is off centre.

IC-2500
430/1200MHz
70cms 35W
23cms 10W

Icom (UK) Ltd.
Dept. PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. As from 1st September our showroom opening times will be Mon–Fri 09.00–13.00 and 14.00–17.30.

Count on us!

NEW MULTIBAND IC-970E Base Station

Designed for the serious operator on the 144, 430 and 1200MHz bands, Icom's new IC-970E has up-to-date technology for DX, digital and satellite communications.

The IC-970E is supplied as an all mode dual-bander for 144 and 430MHz bands. Optional units expand its capabilities to 1200MHz or wideband receiving from 50-905MHz.

Communications via satellites has never been easier. The IC-970E automatically tracks uplink and downlink frequencies as the tuning control is rotated also, ten specific memory channels for satellite frequencies.

The dual-band watch allows you to receive both MAIN and SUB band audio simultaneously, multiple scanning systems on the MAIN and SUB bands plus 99 memories, an easy to read central display and Icom's DDS sytem make this one of the most comprehensive multi-band transceivers available.

For more detailed information on the IC-970E Base Station or any other Icom radio equipment contact your local authorised dealer or call Icom (UK) Ltd.

Helpline: Telephone us free of charge on **0800 521145** Mon-Fri 0900-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
Visa & Mastercards: Telephone orders taken by our mail order dept. instant credit & interest-free HP.

SMC South Midlands Communications Ltd.

ROTATORS

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

ROTATORS		
AR200XL	OFFSET TYPE 3 WIRE	£49.50
G-250	BELL TYPE TWIST/SWITCH CONTROL	£78.00
G-400	BELL TYPE METER CONTROLLER	£139.00
G-400RC	BELL TYPE ROUND CONTROLLER	£169.00
G-600RC	BELL TYPE ROUND CONTROLLER	£219.00
T2X	BELL TYPE METER CONTROLLER	£499.00
G-800SDX	BELL TYPE 450 DEG VAR. SPD	£325.00
G-1000SDX	BELL TYPE 450 DEG VAR. SPEED	£368.00
G-2000RC	BELL TYPE ROUND CONTROLLER	£445.00
G-500	ELEVATION METER CONTROLLER	£149.95
G-5400B	AZIMUTH/ELEV DUAL CONTROL	£375.00
G-5600B	AZIMUTH/ELEV DUAL CONTROL	£435.00
RC5-3	BELL TYPE PRESET	£275.00
RC5-1	BELL TYPE ROUND CONTROLLER	£219.00
RC5A-3	BELL TYPE VAR. SPEED AND PRESET	£425.00
RC5B-3	BELL TYPE VAR. SPEED AND PRESET	£675.00
ROTATOR HARDWARE		
AR200AB	ALIGNMENT BEARING AR200XL	£17.50
KS505	ROTARY BEARING 1½" MAST	£19.95
GS-065	ROTARY BEARING 2" MAST	£29.95
GC-038	LOWER MAST CLAMP G-400, 600 etc	£16.95
9523	CHANNEL MASTER BEARING	£19.95
CK46	ROTARY BEARING 1.5–2.5 MAST	£34.95
MC1	LOWER MAST CLAMP RC5 SERIES	£25.00
ROTATOR CONTROL CABLE		
RC5W	5 WAY G-400RC, 800, 1000SDX PER MTR	£0.48
RC6W	6 WAY G-250, 400, 600, RC KR500 PER MTR	£0.66
RC8W	8 WAY HAMIV, T2X 2000RC RC SERIES PER MTR	£0.72

CARRIAGE:
ROTATORS £7.50, ROTATOR HARDWARE £3.50, ROTATOR CABLE £3.50 UP TO OVER 20 MTS, OVER 20 MTS £5.00.

SWR/PWR METERS

YS60

FS710V

FS710V	50-150MHz	15/150W	PEP £107.80
FS300H	1.8-60MHz	20/200/1000W	£53.40
FS210	1.8-150MHz	20/200W	Auto SWR £66.50
FS301M	2-30MHz	20/200W	£42.25
FS301MH	2-30MHz	200/2000W	£42.25
FS711H	2-30MHz	20/200W	Head/Display £43.65
FS711V	50-150MHz	20/200W	Head/Display £43.65
FS711U	430-440MHz	5/20W	Head/Display £43.65
FS711C	26-30MHz	10/100W	Head/Display £24.55
FS500V	50-150MHz	20/200W	£81.95
W720S	130-440MHz	20/200W	Head/Display £52.75
SWR50B	3-5-150MHz		£36.75
FS20DL	3-150MHz	1/10W	£43.65
FS20D	3-150MHz	5/20W	£43.65
SWR3E	3.5-150MHz	20/200/1000W	£28.75
JD110	1.5-150MHz	10/100W	£16.50
T435	144/430MHz	20/200W	£85.00
YMIX	3.5-150MHz	Rel. Power/SWR Twin meter	£31.50
OSCAR-171B	3.5-150MHz	Rel. Power/SWR Twin meter	£28.85
SP425	140-524MHz	5/15/150W	£119.95
YS60	1.6-60MHz	20/200/2000W	£93.15
YS500	140-525MHz	4/20/200W	£81.65

Carriage on all power meters £4.00

MORSE KEYS

MORSE KEYS			p.p.
HK702	STRAIGHT KEY	£42.75	£1.75
HK703	STRAIGHT KEY	£49.69	£1.75
HK704	STRAIGHT KEY	£26.35	£1.75
HK705	STRAIGHT KEY	£26.25	£1.75
HK706	STRAIGHT KEY	£28.95	£1.75
HK707	STRAIGHT KEY	£25.49	£1.75
HK708	STRAIGHT KEY	£26.45	£1.75
HK710	STRAIGHT KEY	£41.75	£1.75
HK711	STRAIGHT KEY KNEE MOUNTING	£41.75	£1.75
BK100	MECHANICAL BUG	£41.45	£2.00
MK701	SINGLE LEVER PADDLE	£38.35	£1.75
MK702	SINGLE LEVER PADDLE	£41.50	£1.75
MK703	SQUEEZE KEY	£37.00	£1.75
MK704	SQUEEZE KEY	£24.99	£1.75
MK705	SQUEEZE KEY	£32.78	£1.75
MK706	SQUEEZE KEY	£35.00	£1.75
HK802	DELUXE BRASS KEY	£99.95	£2.50
HK803	DELUXE BRASS KEY	£89.95	£2.50
HK804	DELUXE BRASS KEY	£95.00	£2.50
MORSE EQUIPMENT			
KP100	SQUEEZE KEYER	£109.25	£2.50
DEWSKEYSTD	STAR MASTER KEYER	£54.69	£2.50
DEWSKEY M	STAR MASTERKEY MEMORY	£94.99	£2.75
D70	MORSE TUTOR	£63.40	£2.50
DATA TERMINAL			
PK232/FAX	MULTIMODE DATA TERMINAL	£289.95	£3.50
PK232/MAIL	MULTIMODE DATA TERMINAL C/W Mail Drop	£319.95	£3.50

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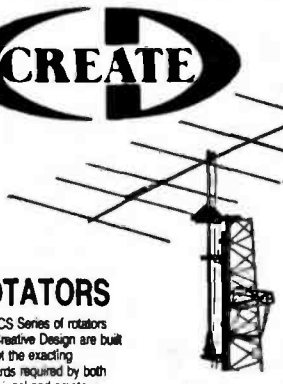
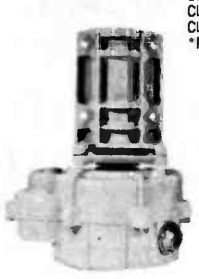


ROTATORS

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

RCS-1 ..... £219.00
RCSA-3 ..... £425.00
RCSB-3 ..... £675.00
CK-46 Rotary bearing £34.95

Carriage on:
Rotators £7.50
CK-46 ..... £3.50



6M BEAMS

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

CL6DX 5 ele 13dB* £115.00 P&P £8
CL6DXX 7 ele 14.3dB* £168.99 P&P £14
CL6DXZ 8 ele 14.5dB* £225.00 P&P £14
*Manufacturers figures

COMET & HOKUSHIN ANTENNAS

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

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

MOBILE ANTENNAS		
2QW	2m 1/2 wave	£4.95
2NE	2m 5/8 wave folding	£13.25
78B	2m 7/8 wave	£15.00
78F	2m 7/8 wave folding	£21.50
88F	2m 8/8 wave	£24.10
258	70cm 2 x 5/8	£29.37
358	70cm 3 x 5/8	£33.73
268E	70cm 2 section colinear	£32.80
DUAL BAND MOBILE		
CHL21J	Mini dual band mobile	£14.95
CHL23J	Small dual band mobile	£16.90
CA2X4KG	2m 2 x 5/8 70cm 4 x 5/8	£39.95
CA2X4MB	2m 4.5dB 70cm 7.4dB	£37.75
HS-727SS	Dual band mini antenna NEW	£16.95
HS-727VMS	2m 1/2 70cm 2 x 5/8 NEW	£25.95
VM-720SKR	2m 1/2 70cm 2 x 5/8 NEW	£24.95

DUAL BAND BASE ANTENNAS		
WX1	2m/70cm colinear	£54.99
WX2	2m/70cm colinear	£75.00
WX4	2m/70cm colinear, high gain	£99.00
CA2X4WX	2m/70cm colinear	£79.00
CA2X4MAX	2m/70cm colinear, high gain	£99.95
CF416MN	Duplexer 1.3-500/400-540MHz	£25.50
HS790DN	Duplexer Mess 1.6-150/410-460MHz	£25.50
ANTENNA MOUNTS		
GCCA	Gutter mount and cable	£14.25
HDTMCA	S/S trunk mount and cable	£19.50
SOMM	Mag mount and cable	£12.75
TBR	S/S hatch back mount NEW	£11.25
RS17	Mini hatch back mount NEW	£12.50
RS16	Mini gutter mount NEW	£12.50
SS-B1	Mini back mount & cable NEW	£26.50
CK-3LX	Cable assembly for RS16, 17, TBR	£19.95

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

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- ★ 40 multi-function, split freq memory channels
- ★ DTMF memory
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- ★ Built-in timer

TH-27E £249

TH-47E £269

TH-77E DUAL BANDER

- ★ World's smallest package for 2M/70cm dual bander
- ★ 5W & hi-low power output
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- ★ Built in DTSS and pager function
- ★ Larger dual displays
- ★ 40 multi-function memories

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Micro-size handheld scanner 150Khz/ 1300 Mhz

£399

NEW MK II AR1000

1000 channel Superscanner 8-1300Mhz

£249 inc. Dual band antenna nicads and charger

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'The *effective* aerial'

NEW

GPX2010 Highest Gain Dual Band Base antenna in the WORLD!! 7.9 Metres long 9.5dB/2M 13.2 dB/70cms £142.95

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CHL72S NEW 2/Band BNC whip for Dual Band handhelds £11.85

NON RADIAL: Mobile antennas independent of vehicle ground plane

CHL21J 144/432 Mhz, Unity/2.15dB,100W Only 29cms long £15.95

CHL23J 144/432 Mhz 2.15dB/3.8dB 100W Only .44 metres £17.95

CHL24J 144/432 Mhz 2.15dB/5 dB 100W 0.8 metres long £25.30

CHL250H 144/432 Mhz 3.0dB/5.5dB 200 Watt 0.95 metres long £32.80

2x4 Series + Triband mobiles and base station antennas

2x4M 144/432 Mhz 4.5/7.2dB 150 watt 1.53 metres £37.65

2x4 SERIES & DUAL BANDERS featuring the unique super linear converter system

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2x4WX 144/432 Mhz 6.5/9.0dB 200W 3.18 metres Glassfibre £79.95

2x4SUPER II 144/432 Mhz 6.0/8.4dB 200W 2.43 metres Glassfibre £77.35

2x4FX Compact 144/432 Mhz 4.5/7.2dB 200W 1.79 metres £55.80

DUPLEX & TRIPLEXERS Zinc alloy diecast

CFX5140 50/144/432 Mhz 800/800/500 Watt PEP 55dB isolation £38.10

CF413N 432/1296 Mhz 500/200W PEP 55dB Isolation "N" £36.65

CF416 144/432 Mhz 800/500 W PEP 60dB isolation £26.80

SR Series to order only. MONO BANDER MOBILE ANTENNAS

CA285 5/8 wave 3.5dB 300Watt 1.32 Metres Base loaded £15.00

CA287C 7/8 wave 5.2dB 200W 1.89 metres double co-phase £22.50

CA430TM 3 x 5/8 wave 432 Mhz 6.8dB 150W 1.47 metres £29.95

MONOBAND BASE ANTENNAS

ABC21 5/8wave Ground Plane 144 Mhz 3.4dB 200W 1.4 metres ... £24.50

ABC22A 2 x 5/8 wave 144 Mhz 6.5dB 2.87 metres £36.00

ABC23 3 x 5/8 wave 144 Mhz 7.8dB 200 W 4.5 metres £58.50

ABC71 5/8 wave ground plane 432 Mhz 3.4dB .54 mtrs £21.56

ABC72 2 x 5/8 wave GP.432 Mhz 200W 5.8dB 1.07 metres £34.65

CA712EF 432 Mhz Twelve x Half wave! 9.5dB 3.10 metres £55.00

HF & 50 MHZ

CHA-5 Vertical with Loaded Radials for 80/40/20/15/10 M 200W SSB 5.29 Metres. Features trifilar wound toriodal core £219.95

52HB4 4 El.HB9CV Beam 10.4dB for 50 MHz 400W SSB 3.2M ... £67.90

CBL30 HF 1.7 — 30 Mhz Balun 1:1 1kw £29.85

CRZ/DISCONE & HANDHELD ANTENNAS

CRZ12DB A Unique wide band Active antenna 500Hz to 1500 Mhz 1.24 Metres with controller £96.30

CDS180 Discone 28-1300Mhz + TX 6/2/70/23 ..... £69.50

CRZ-07 Mobile Wide-band Active £84.50

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IC-725 or 726

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YAESU FT 747

NOW **£499** Inc VAT

CW & AM Filters are available if required.

AVAILABLE WITH NO DEPOSIT AND 48 MONTHS TO PAY - £17.97

The FT747 HF Transceiver SSB/CW/AM (and optional FM) 100 Watts pep output on all HF Bands and general coverage on receive 100kHz-30MHz. Dual VFO 20 memories. Altogether a super economical HF Transceiver.

ONLY FROM US - WITH SSB **NOW ONLY** £499

ICOM

IC-R100

IC-R100 Mobile/Base Receiver now with **SSB!**

WHY SETTLE FOR ANYTHING LESS!

For the enthusiast who prefers a more permanent installation the IC-R100 is ideal giving full frequency coverage of 500kHz-1800MHz and AM/FM. FM wide modes of operation. The IC-R100 boasts 100 memory channels to store your favourite stations and has features similar to the little pocket receiver. 48 monthly paymensts of 17.97.

IC-R72

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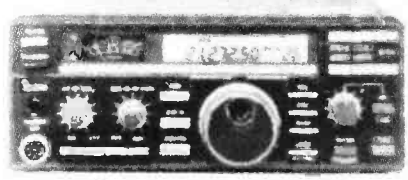

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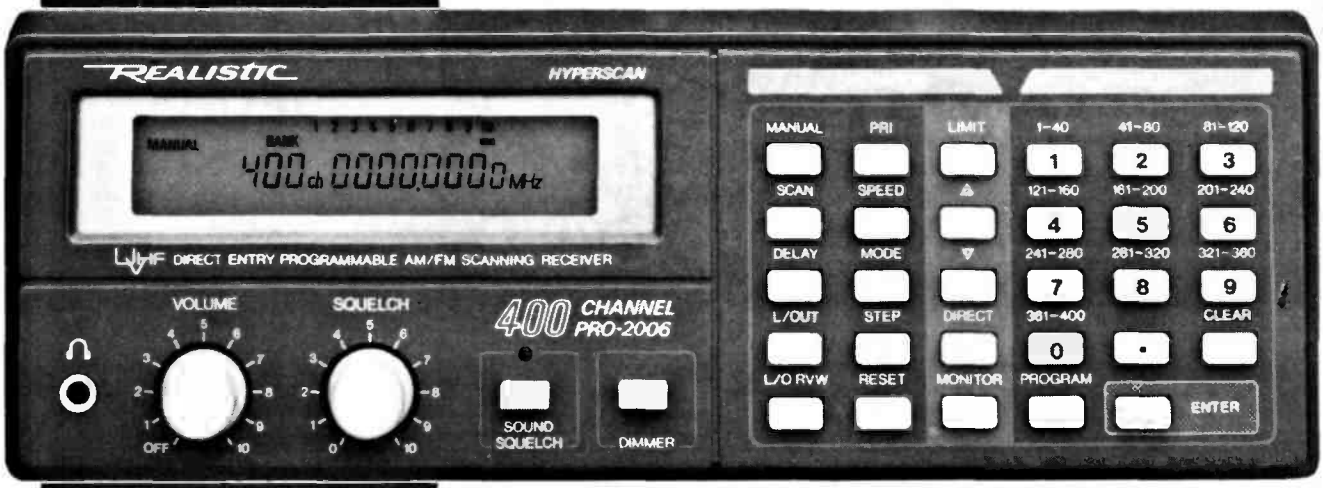

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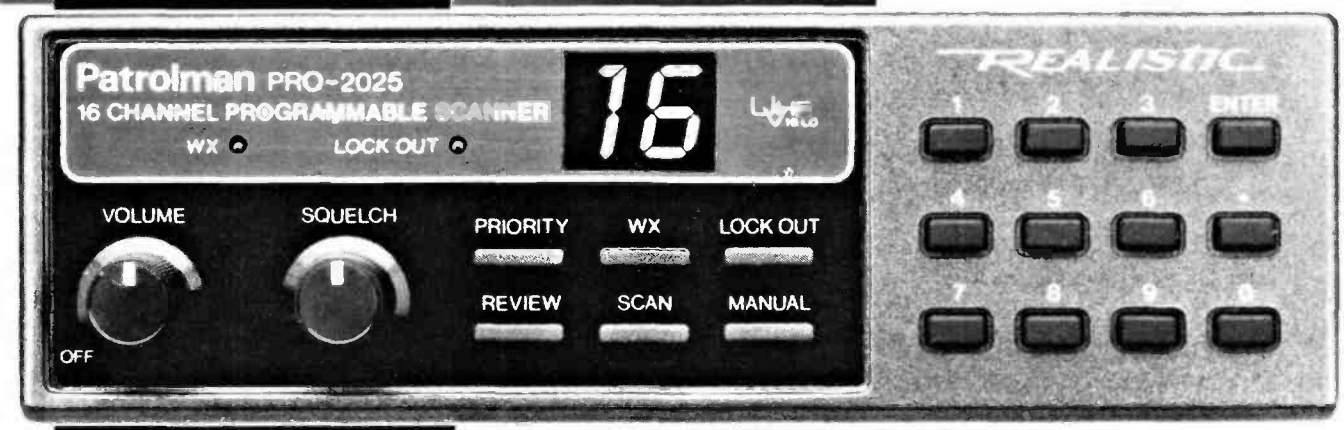

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Keylines

Several times during 1990 the media - particularly the 'Tabloid' press - has carried stories based on 144MHz repeater mis-use. The 'tabloids' thrive on this type of story but unfortunately for amateur radio, the facts are rarely accurately reported.

Repeater mis-use, whether it be foul language, rudeness in its many and varied forms or 'vendettas' against particular people or groups - is on the increase. It's also bad news for a hobby struggling to attract new blood in order to survive.

This dreadful problem is becoming so widespread that I feel sure there must be very few radio enthusiasts who have not come across this stupid behaviour. I've even heard some appalling behaviour myself on several repeaters in the south and in the north of England.

I have often been forced to turn my mobile rig off! I've also no doubt it's a big 'turn-off' for other amateurs and **NEWCOMERS** to the hobby. We must act quickly before the Department of Trade and Industry either say "Enough is enough" and remove the facility, or stipulate that remote shut-down facilities be fitted at **ALL** repeaters.

Amateur radio with a 'duty censor', ready with his blue button? Not for me! We must act and the RSGB must also act before others do (in ways we would not wish) and rid the hobby of this creeping evil before it damages amateur radio further.

Ringing The Changes

For the past year many of you will have had the chance to fill in a survey form to help us to help you, so to speak. Feedback from readers is essential and we must act on it if we are to achieve our aim and provide the best we can.

Space is always a problem in a monthly magazine and we try our utmost to avoid 'part 1' and 'part 2', etc, wherever possible. We now know what the majority of our readers want, and we're going to act on the information!

From the January issue, the editorial content of *PW* will reflect your requests as we put the results of the survey 'into gear'. However, in the meantime you have an extra chance to let us know **YOUR** wishes. Your letter won't be a waste of time - the 'What A Good Idea' feature has been introduced because of reader demand. So get writing **NOW!**

73s from G3XFD

Receiving You...

From the office of the Secretary and Chief Executive, Radio Society of Great Britain to the Editor of *PW*.

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

Dear Sir,

I refer to the support being given to the Radio Society of Great Britain which you expressed in your November 'Keylines'. Such support is warmly welcomed by Council, for the future success of amateur radio in the UK is closely linked to the ability of the RSGB, with its affiliated clubs and individual members, to gain new recruits to our unique hobby/service.

Quite simply, without new recruits amateur radio will die as we start to lose precious frequency allocations to expanding radio services if our numbers contract.

Your readers, who may not be members of the RSGB, may be interested to know that in February 1992 there is another major conference being held by the International Telecommunications Union in Spain. This conference could affect the future of some of our h.f., v.h.f. and microwave amateur bands.

Those that are members of the RSGB already support, through their membership fee, the work that the RSGB does to prepare for these conferences. Such work is essential and is at present only supported by just over half of the licensed radio amateurs in the UK.

The RSGB work of course, benefits every licensed amateur in the UK, in terms of the retention, we hope, of existing privileges. Without the RSGB work and that of other national Societies in the World, there is certainly a greater risk of having existing frequency allocations reduced or taken away.

An obvious conclusion is that there is more safety in numbers and that is why the RSGB urges all licensed non-members and active s.w.l.s to join the Society. The agenda for the 1992 Conference has only just been published and thus the amateur community only has 15 months to prepare. The support of all licensed amateurs and active s.w.l.s is needed now.

In the November 'Keylines' piece you also referred to the fact that the potential Novice Licence instructor has been asked to pay for his/her own teaching course manual. In fact, approved instructors will only pay £3 for the manual instead of £5. The RSGB has thus taken your point about sponsorship seriously and has already sponsored the manual to the tune of £2 per copy.

The society would be delighted to receive additional support and we wonder whether *Practical Wireless* would itself be prepared to match the existing RSGB sponsorship?

I believe that it is also worth mentioning that the RSGB Council is exceedingly generous, possibly to the society's own detriment, when it comes to membership fees. Concessionary fees are offered to the disabled, the young and the old. With other concessions this generosity cost the RSGB some £65 000 in its 1989/90 financial year. I believe that such actions are unequalled in the UK by any other organisation involved in amateur radio.

Apart from Government and International liaison, the RSGB also supports other major aspects of UK amateur radio. For example the UK repeater network (estimated cost to the RSGB of some £10 000 per annum) and special event stations (estimated cost to the RSGB of some £15 000 per annum), together with other services which include the QSL Bureau, RAYNET, Contests, Operating Awards, EMC and Planning advice, etc.

All in all, the RSGB subscription is excellent value for money and the RSGB already sponsors a considerable amount of work within amateur radio, which perhaps many have previously just taken for granted.

David Evans G3OUF
RSGB Secretary and Chief Executive

Receiving You...

★★★★★STAR LETTER★★★★★

Dear Sir

I happened to pick up my husband's copy of the July *PW*. the other day and on browsing through stopped at 'Receiving You'. There was a debate on about a CB page and you requested a vote. I don't know the outcome and I'm not really fussed but I thought I'd just add my 'two penn'orth'.

My husband passed his RAE after a short spell on CB which had aroused his interest in radio, but he was not happy with the 'goons' and 'bucket mouths' to be found on the CB channels.

With encouragement our daughter has also become interested. She is only eleven years old and we were very pleased for her. Despite this, she is unable to listen on the bands due to the constant barrage of foul language that blocks our local repeaters and channels.

When I say foul language, I mean disgusting, stomach churning comments. My husband is an ex-lorry driver and has served in the forces but this behaviour makes him ill. So if amateurs want to retain their 'upper-crust' superiority I suggest they do something to clean up their act!

I have also never been so 'battered' about as when I went to a rally (my first) last year. I mistakenly thought it would be a 'chummy' get together like the CB 'eye-balls'. Instead I was pushed about and trampled on by these so-called gentlemen. I'd rather go to a jumble sale or the January sales!

You probably won't want to print this as it is detrimental to radio amateurs, not all, but just the few who consider themselves above us 'mere mortals'.

Quite frankly, I personally will stick to CB as the people seem to have more personality and be far more genuine.

M. Littlewood
Warley
West Midlands

Editor's comment: Despite Mrs Littlewood's pre-conceived notion that we would not want to print her letter - we have! We also consider that it makes such a valid point that it warrants the 'Star Letter' position.

We MUST do something about the repeater abuse problem - before the matter is taken out of our hands. The DTI and the Radiocommunications Agency have recently met the RSGB to discuss this problem. As soon as we have more information on the outcome of this meeting (called by the DTI) we'll publish it.

I must also strongly agree with the last point in the letter. Why have so many rallies become akin to rugby 'scrummages'? They're not all like it by any means, but I'm often pushed and trodden on at rallies - and I'm very much larger and taller than the average man. The problem must be bad if Mrs Littlewood prefers the January sales to rallies!

G3XFD.

Dear Sir

I have been reading *PW* for eight years and have had little cause for complaint. I have tried others but none can touch the 'old faithful'. So I am not being hasty with the criticism but I do think you've slipped up of late. Why? The Novice Licence!

Up to now *PW* has done a fine job of reporting the major events in amateur radio, the opening up of 50MHz for example, without just repeating the RSGB party line. I am not an RSGB member and I accept that I have to pay the penalty of not having a voice on new developments, but I still like to know what's going on!

In addition to being a licensed operator I am a father and school governor so I have more than a passing interest - I would hope to be able to contribute to the implementation of a novice scheme. I have written to the RSGB for information but have not received a reply.

Due to this lack of information, I cannot speak with authority on the way ahead but I have to say that I think Dave Milne is way off the mark! (Oct *PW* 'Receiving You').

I would like to answer a few of his points using some observations I've made during the last eight years of my 'self-training'.

1 Type tested ('Black Box') equipment is so expensive that it has kept many a potential amateur from ever starting in the hobby.

2 Most v.h.f equipment is expensive to buy and difficult to build (even *PW* projects!).

3 Using keyboards (data modes) would be yet another financial hurdle to stop newcomers getting a 'foot in the door'.

The following suggestions for the Novice scheme would attract young and old to the hobby and hopefully once hooked - they'd be in for life!

1) Some basic 'building block' theory backed by simple construction.

2) Practical demonstrations of operational ability (a.m. phone and/or 5 w.p.m. Morse?).

3) Limited (spot frequency?) h.f and v.h.f. band space.

4) QRP operation to prevent QRM.

5) Limited time scale - two years maximum.

6) Supervision of training, operating and progress to full licence by sponsoring licensee.

So, where are we? Is there to be a novice licence? Will it be exclusive to RSGB members? What will qualification be? Who will supervise it? I realise you don't want to be caught out printing hearsay, but come on Rob - what's happening?

Steve Hartley G0FUW
Little Broughton
Cumbria

Editor's reply: With benefit of hindsight I must agree that Steve Hartley is right and it may appear that *PW* has ignored the Novice Licence proposals. However, I must firmly state my reasons and remind readers that - via 'Keylines' - I have attempted to continually draw attention to the horrendous confusion surrounding the Novice Licence, whether it be regulations, training or suitable training kits and specifications.

The full proposals were so confused that - at the time - I considered that if they were published in this magazine the Novice Licence could have been 'murdered' before it was even been introduced. Since then (I'm very pleased to say!) the various anomalies have been gradually - and continue to be - sorted out. I'm afraid to say that they way things were going - we were heading for a typical British 'Cock Up'!

As soon as we have a **FINAL** date with proposals that make sense, that cause no discrimination or confusion between A and B licensees, we will publish them!

At this stage we can firmly state that there is to be a Novice Licence. The DTI has not announced a start date yet, but the RSGB hopes that the first examinations will take place in the Spring of 1991.

It is planned - of course - so that ANYONE (RSGB member or not) can participate. The RSGB has (among other institutions) tendered for the contract to handle the examination, but the authorities have yet to announce who the examining body will be. The RSGB is planning to run the training courses - via the volunteer 'army' of instructors and as I understand the situation, membership of the society is not a requirement for instructors.

Finally, G0FUW will be pleased to note that some of his - common sense suggestions - are very similar to the official proposals and I hope he'll see them when we (as promised) publish the finalised details.

G3XFD.

Receiving You...

Dear Sir

Ref: Permitted power on amateur h.f. bands

It is reported in the September issue of the RSGB's *Radio Communication* magazine that 400W c.w. power is to be permitted on h.f. bands because "There is an anomaly (sic) whereby higher power is permitted on s.s.b. which is measured in peak envelope power output".

Surely the present s.s.b. power limit was set at 400W because it was recognised that the average power of an s.s.b. transmission is much less than the peak power. An anomaly will rather be created if the effectiveness of a c.w. transmission is increased by 6dB over the vast superiority which the c.w. test enthusiasts have assured us exists already.

Fairness would propose that any new limit should be on average power, which given the modern addiction to 50Ω resistive load, something akin to hot wire ammeter should be enough to establish, and less argument should arise about digital modes, f.m. and a.m.

If this thing is to be, does not the affront to the 'Morse-men' of a no-Morse h.f. licence become so minimal that such a licence should be instituted forthwith?

Alex (Sandy) L. Dick GM0IRZ
Dundee

The Radiocommunications Agency have sent us the following reply to Mr Dick's letter:

Dear Sir

Ref: Permitted power on amateur h.f.bands.

I refer to your letter of 25 August 1990 addressed to *Practical Wireless* and concerning the above. You kindly copied the letter to the Radiocommunications Agency (RA) for clarification and so, I thought you may like to have our comments on this matter.

The present level of 400W (26dBW) peak envelope power (p.e.p.) for single side band (J3E) was derived from the equivalent p.e.p. of an amplitude modulated (A3E) transmitter with a carrier output of 100W (20dBW). An A3E transmitter with 100% modulation has a p.e.p. output of 400W (26dBW)

A measurement of average power is inappropriate for speech waveforms. For J3E emissions, the p.e.p. under linear operating conditions of the transmitter is specified.

This encourages amateurs to use an oscilloscope to observe the output waveform and ensure there is no distortion (and consequent interference) due to overdriving. It is not possible to do this with a hot wire ammeter.

It is agreed that a c.w. (A1A) transmission has a considerable communications advantage over s.s.b. (J3E) in terms of signal-to-noise ratio, particularly if the narrow bandwidth of A1A (100Hz) is exploited by the use of narrow receiver filters. However, the Agency is not concerned with establishing 'fairness' between operating modes and will grant amateur facilities within operating modes and will also grant amateurs facilities (within national and international regulations) that can be used provided there is no risk of undue interference to other radio users.

We cannot agree with the point you make in the last paragraph of your letter. The increase of power for A1A (and the consequent further increase in communications advantage over J3E) is not relevant to the case for a 'non-Morse' h.f. licence. It is an international requirement for amateurs to be proficient in Morse code to qualify for a licence to operate on frequencies below 30MHz.

At a recent meeting of the Conference of European Postal and Telecommunications (CEPT) administrations, where harmonisation of amateur examinations was discussed, the majority of administrations were in favour of retaining the Morse requirement for the use of amateur frequencies below 30MHz.

I hope this has clarified the situation for you.

Richard D. Griffin
Radiocommunications Agency, London

Dear Sir

It's not very often you hear of praise for planners but my previous doubts have now been dispelled.

Having, in all innocence, erected a 144MHz beam antenna, a polite letter from the town hall followed shortly inviting me to discuss whether I needed planning permission. After a very helpful chat with a planning officer he advised me to apply retrospectively.

Did they require plans? No, a decent photo with relevant dimensions shown would suffice. Despite vociferously objecting neighbours, the planning committee were happy for my antenna to stay up and my hobby to continue.

So not all 'faceless' town hall people are anti-amateur!

Dave Neale G7DHW
Paignton
South Devon

Editor: We'd be pleased to hear of similar experiences. Perhaps other readers have met helpful local authorities?

THANKYOU READERS

We're pleased to say that readers responded in a very generous way to the letter from Asantha Cooray in Sri Lanka (star letter November PW). Asantha now has a full subscription to PW and we'll pass on all the letters and best wishes to him.

EDITOR

Services

Queries
We will always try to help readers having difficulties with a *Practical Wireless* project, but please note the following simple rules:
1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2: We cannot deal with technical queries over the telephone.
3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4: Make sure you describe the query adequately.
5: Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of *PW* for the past years are available at £1.65 each including post and packing.
Binders, each holding one volume of *PW*, are available price £4.50 each (£1 P&P for one, £2 for two or more).
Send all orders to the Post Sales Department.

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

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an 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 their own.
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP KITS, both of who advertise in the magazine.
The printed circuit boards are available, mail order, from the Post Sales Department.

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

Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 44p per minute peak time and 33p per minute off-peak. The number to ring is: (0898) 654632.

Wordsearch

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V	P	L	Q	T	I	S	G	Y	C	K	Q	H	S	Y	A	E	U	D	S	H	K	J	I	U
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C	O	J	T	M	L	B	K	X	V	U	W	G	O	S	U	M	M	X	C	T	O	S	S	I
R	B	H	O	B	P	X	H	W	S	J	L	S	A	Y	P	O	D	Q	O	S	G	D	Z	N
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A	P	M	T	D	C	R	N	V	I	U	C	P	X	N	J	H	G	B	Q	M	I	W	G	U
I	R	Z	A	L	T	J	E	B	M	L	M	Z	A	W	U	T	F	O	U	F	J	L	E	C
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Y	E	V	U	Y	K	Y	X	H	Q	K	Y	O	N	K	V	D	N	O	B	E	I	O	A	R
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W	C	S	Z	C	Z	O	Q	T	D	T	M	C	B	D	Q	U	B	I	H	J	E	Q	X	E
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U	H	X	U	Z	N	M	J	N	O	G	R	S	O	M	Q	S	U	Q	I	Y	F	C	S	M

Sixteen different 'radio' words have been hidden in the letter grid. They have been printed across (forwards or backwards), up and down or diagonally, but they are always in a straight line without odd letters in between. You can use the letters in the grid more than once for different words, and they're not all used. Once you have found all sixteen words, mark them on the grid and send in your answers.

Send your entry to PW Publishing Ltd., Dec 1990 Wordsearch Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. Closing Date last post received Friday 14 December 1990. The Editor's decision on the winner is final, no correspondence will be entered into.

First prize is a years subscription to Practical Wireless, two runners-up receive six months subscriptions.

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Newsdesk '90

Volt Converter

New from CDS is the Isis (Instrinsically safe isolated supply), which has been designed and manufactured to comply with BS recommendations and will run any 12V p.m.r. or cellular transceiver from a 24V source with full 1000V isolation. This small switch-mode converter (only 65x70x108mm) and weighing only 380g has a panel-mounted fuse and fast-on terminals.

At less than £30.00, CDS consider it is probably the most cost-effective isolated converter in the industry.

For further information, contact:

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Marconi Appointed

Marconi Marine, a division of Marconi Communication Systems, is the radio traffic accounting authority for the vessel 'Hoverspeed Great Britain', which during the summer completed the fastest crossing of the Atlantic Ocean by a passenger vessel.

The appointment, made shortly before the record-breaking attempt, means that Marconi Marine will be co-ordinating all the charges for bridge communications from 'Hoverspeed Great Britain' and providing itemised billing and administrative services to Hoverspeed (UK) Ltd. the craft's owners.

Unique Morse Key

G4ZPY Paddle Keys are making a 'Once in a Lifetime' offer - for a unique Morse Key.

Their first key on offer is for a 22ct gold-plated 'very high speed' twin-paddle key. All the components (except for the silver contacts which will be gold-plated) will be made from best quality brass. This includes the base, which will be slightly larger than their steel-based models.

The final touch - the perspex paddles will have gold half Sovereigns inlaid in them.

The price, hold your breath, a mere £750 sterling!

They are also making a limited number of all-brass twin-paddle keys marked 'Special' under the base. The price for this key is £68.95.

If you would like a special type of key, they are open to suggestions. How about a gold-plated key inlaid with diamonds?

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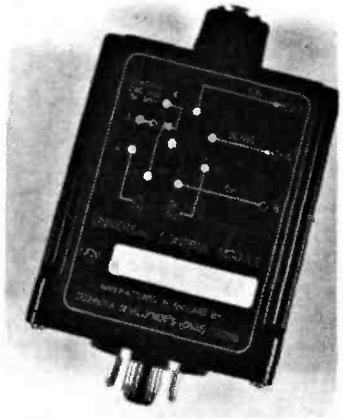
Lancs L40 7TG
Tel: (0704) 894299



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The Universal Control Module is the quick plug-in answer to thousands of sensing, control and interfacing requirements.

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The set of data sheets supplied illustrate the products versatility in numerous engineering environments.

A new range of low-cost plug-in power supplies is also available.

Stuart Richards
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Rackheath Ind Est
Norwich
Norfolk NR13 6NT
Tel: (0603) 720999

New Membership Secretary

BARTG are pleased to announce that Ann Reynolds G6ZTF, has taken on the task of their Membership Secretary.

Miss Ann Reynolds
G6ZTF
169 Bell Green Road
Coventry CV6 7GW.
Tel: (0203) 668491

Radio Club

Recently brought to our attention is an Electronics and Radio Club for Youth in Thanet, Kent. The average age for members is 13 and they'd be very pleased to hear from any interested young person. The person to contact is:

Ross Collins
37 Royal Road
Ramsgate, Kent

Newsdesk '90

Greenweld Catalogue

The 1991 Greenweld Catalogue is out now. It has 132 pages packed full of components and equipment at prices you'll really appreciate. Included in each catalogue are their famous 'Bargain List' pages, plus an extra 16-page supplement and reply paid envelope. The catalogue is available at £1.50. Just send cheque/p.o./cash/credit card no. to:

Greenweld Electronics Ltd
27B Park Road
Southampton SO1 3TB
Tel: (0703) 236363

Capacitors

Now available from Unitel is the Kemet T399 Series of resin-dipped solid tantalum capacitors. These miniature axial products offer a number of useful design advantages including compactness and low leakage/dissipation factor performance - making them ideal for filtering, bypassing, coupling, blocking and RC timing circuits.

The range is available in a capacitance range of 0.1uF to 100uF (±10% tolerance) and in voltages from 6.3 to 35V. For further details, contact:

Alan Coulling, Unitel Ltd, Tel: (0438) 312393

ARE Communications

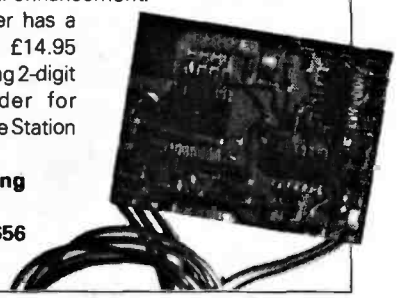
Brenda and Bernie Godfrey wish to point out that they are in no way connected with any other company and are still actively involved with ARE Communications.

Vehicle Identification

CDS Ltd have developed a low-cost vehicle identification system. The 2-digit encoder will send a 190 millisecond DTMF burst at the end of each over with a unique identity. The encoder can be programmed to one of 255 identities and will cut out 'horseplay' and despatcher confusion. This unit will operate on any two-way radio system (p.m.r., Band III repeater, etc) and its small size and price make it a useful enhancement.

The encoder has a dealer price of £14.95 and the matching 2-digit display decoder for fitting in the base Station is £49.95.

Stewart Harding
CDS Ltd
Tel: (0256) 83656



The Perfect Accessory

The New Maplin Electronics Portable Battery Powered Soldering Iron is a novel product which is powered by either 4 alkaline C cells or two NiCad C cells. The combined low voltage element/bit retracts when not in use. This serves both as a safety feature and also protects the element/bit from damage.

A conveniently placed push-to-heat button operates the iron and working temperature is reached in approximately ten seconds. A charging socket is provided so that NiCad cells may be charged in situ from an a.c. or d.c. adaptor (suitable type XX09K). Charging time is 12 to 16 hours.

The unit is supplied with two element/bits and solder, batteries are not included in the price of £4.95. Spare element/bits are available separately.

Maplin Electronics
Tel: (0702) 552911 Enquiries

Inlet Filter

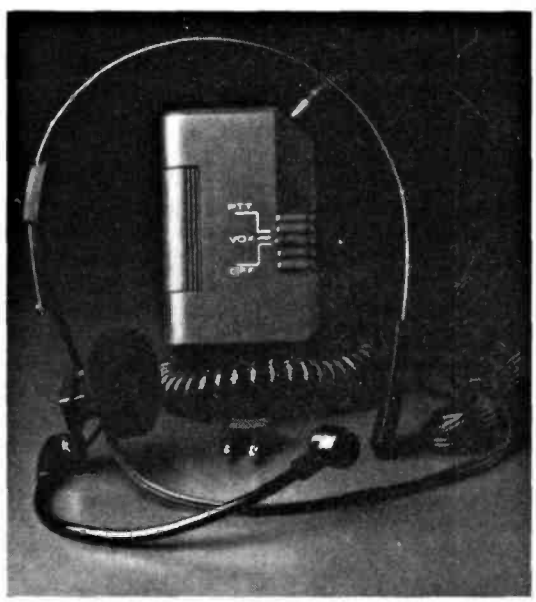
Introduced by SASCO is a Belling Lee inlet filter which incorporates both a line fuseholder and double-pole switch. Designed to protect business machines, computers and similar equipment from mains-borne interference, the Type L2144 can also be 'snap-fitted' into a panel, thus saving both space and mounting costs.

The filter can be supplied with either a red or green illuminated pushbutton switch and is rated at 1, 2 or 4A; 0-400Hz and 250V a.c. max. It will normally employ X and Y type self-healing metallised paper interference capacitors which are SEMKO, NEMKO, DEMKO and VDE approved. These are rated at 0.1µF between lines (Class X2) and 2200pF for each line to earth (Class Y).

Inductance/line is 1A, 7.0mH; 2A, 2.4mH; 4A, 1.6mH; 6A, 0.9mH and the switch has a life in excess of 50 000 operations.

For further details, contact:

Steve Bacon SASCO
Tel: (0279) 28700



Introducing the MA18

Nevada are particularly pleased to introduce the MA18, a new VOX headphone and boom microphone into the UK, where there has been an increase in demand for a safe and reliable method of controlling transceivers whilst on the move.

The MA18 has selectable p.t.t. controls that enable either automatic voice operation or manual operation of the transceiver. Full control of both delay and mic. sensitivity enables the unit to be used in many different environments. The microphone element has an electret capsule that gives particularly clear and crisp audio reproduction.

The MA18 retails for £45.00.

Nevada, 189 London Road, North End
Portsmouth, Hampshire PO9 9AE.
Tel: (0705) 662145

The Supa-Tuta Plus

The new Dewsbury Electronics Supa-Tuta Plus is the complete solution in learning to send and receive the Morse code.

The self-contained unit contains all one needs to learn Morse and learn it thoroughly. From absolute beginner to expert, all can make use of the onboard facilities.

For learning to send Morse, the Supa-Tuta Plus offers: socket for Morse key or paddle, unique 'echo' mode, allowing students to send Morse back to the Supa-Tuta Plus for comparison, variable speed 2-99w.p.m. and weighting 30-70%, Morse character/element check, relay output as standard, dot and dash memory with iambic/single paddle operation. After learning Morse you can then use the Supa-Tuta Plus as a Morse keyer by simply connecting to your transceiver and talking to the world - in Morse.

Dewsbury Electronics
176 Lower High Street
Stourbridge
West Midlands DY8 1TG
Tel: (0384) 390063

Newsdesk '90

Bruel & Kjaer

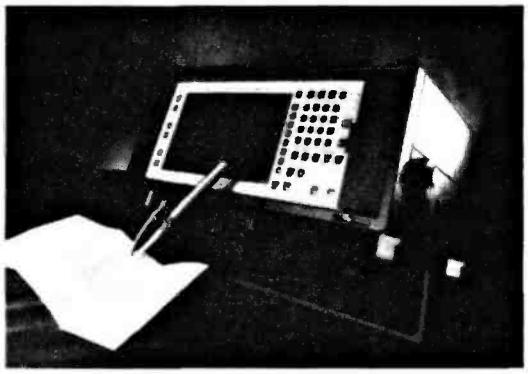
Bruel & Kjaer announce that a fast Fourier transform (FFT) option for its Type 2143 portable real-time analyser will be available later this year.

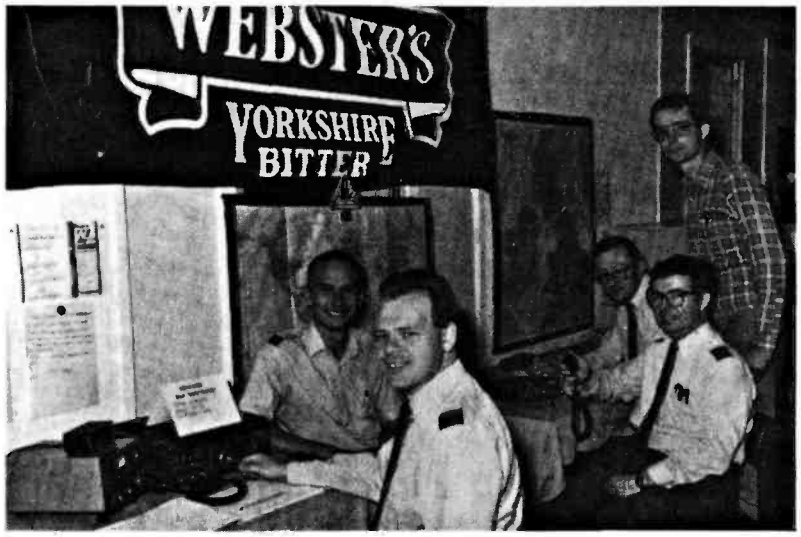
This firm-ware enhancement means that the 2143, introduced late last year by Bruel & Kjaer to transport laboratory performance in digital signal analysis into the field, will also offer faster FFT analysis than most mains-powered alternatives - indeed faster than Bruel & Kjaer's own bench-bound units.

Real-time operation (with 2/3 overlap and Hanning weighting) to 25kHz, variable number of analysis lines from 50 to 400 lines, 10x zoom anywhere in the frequency range and menu selection for ease of use - all in a battery-powered unit weighing less than 10kg will make the 2143 the ultimate tool for field analysis of noise and vibration.

For further information, contact:

Les Minikin
Bruel & Kjaer (UK) Ltd
92 Uxbridge Road
Harrow HA3 6BZ.
Tel: 081-954 2366





GB50 Battle of Britain

The special event amateur radio station, GB50BOB Battle of Britain, operated from the Battle of Britain Memorial Flight at RAF Coningsby proved a great success.

Operations started at 0001 Saturday September 1 and continued until 2359 Friday September 7. During the event 1176 contacts were made, all six continents were worked, with RAFARS members contacted in three different continents.

The event was also sponsored to raise money for the RAF Benevolent Fund. British Aerospace Ltd., and Mann Norwich Breweries were their main sponsors, with donations being made by Katie Pearce Dental Surgeon, Lloyds Bank Ltd., National Westminster Bank Ltd. and many other private individuals.

The call proved very popular and they send their apologies to anyone they missed in the pile-up. They received 75 QSLs direct during the week and a card will be on its way to every station contacted by the time this is published.

Plans are already underway for their next operation at RAF Coningsby.

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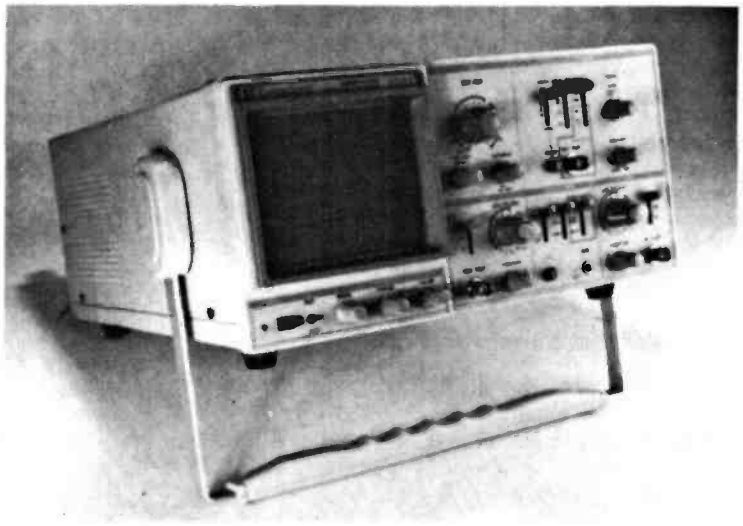
Topward 7021 Oscilloscope

The oscilloscope is perhaps the most versatile servicing and testing 'tool' to find its way into the radio enthusiast's workshop. Mike Richards G4WNC checks out the Topward 7021 from Maplin Electronics



The Topward TOS-7000 series of oscilloscopes distributed by Maplin Electronics has great appeal to the amateur and professional. The 7021 reviewed here represents a very popular model from the range that has particular appeal to the amateur. It features a 20MHz bandwidth, triple trace and a clear 150mm rectangular display.

So without more ado, let's take a closer look at the TOS-7021.

Facilities

The main rectangular display featured the usual controls with the intensity (brightness) and focus independently adjustable. There was also a variable panel light that could be used illuminate the graticule when working in poor light. Tilting of the display could be corrected by adjustment of a small pre-set that was accessed via the front panel.

The Y Amplifiers

Moving on to the Y amplifiers, these were both identical and featured standard b.n.c. input connectors. The input characteristics were at 1MΩ in parallel with 25pF, which again is standard. The great advantage of keeping to standards is that a wide range of oscilloscope probes can be connected with predictable results.

The Y amplifier sensitivity could be adjusted in steps from 5mV/division through to 5V/division. There was also the facility to continuously adjust the sensitivity using a concentrically mounted rotary control. When working with very low level signals the sensitivity could be increased to 1V/division by pulling out the inner section of the sensitivity control. The only disadvantage with this was that the bandwidth of the Y amplifier reduced from 20MHz to 15MHz. However, it was still a useful feature.

An extra facility associated with Ch. 1 was that the Y amplifier output was available via a b.n.c. socket on the rear panel. This was handy for feeding less sensitive test equipment, i.e. a frequency counter.

The input coupling could be set to one of three options - a.c., d.c. or ground. This is a standard oscilloscope feature that is essential for practical use.

Unusual Features

One of most unusual features of the TOS-7021 was the provision of a third trace. Although the input characteristics of this channel were the same as the others there were no coupling or sensitivity adjustments.

On the review model the sensitivity was fixed at 100mV/division. The only adjustment provided was the trace position and that was via a rotary control on the rear panel. Incidentally, I ought to mention that the third trace is turned on and off via a push-button on the front panel.

The TOS-7021 gives the operator several options as to how the outputs from the Y amplifiers are displayed. These are handled by two 3-way switches on the front panel. The first gives the option of displaying either one or both channels. The second switch controls how the signals are to be displayed.

With modern multi-trace oscilloscopes there is in fact only one trace available, the illusion of more is created by multiplexing the signals. The 7021 has three options - add, alternate or chop.

The add function simply displays the algebraic sum of the two input signals, so giving a single trace. Alternate and chop are the two multiplexing options. Alternate means the display alternates between the two channels after each complete sweep.

The chop option, on the other hand, changes between the two channels about 250 000 times per second. The choice between the two systems depends entirely on the frequency of the signal you are measuring. Generally speaking, chop should be used for low frequency signals and alternate for high frequencies.

Probe Calibration

The final point on the Y amplifiers concerns probe calibration. It is important that test probes are properly adjusted to compensate for the input characteristics of the scope, if accurate measurements are to be taken. The process is quite simple and involves displaying a square wave signal and adjusting the probe so that the signal is square with minimum under or over shoot (thus providing the squarest wave-shape). To facilitate this the TOS-7021 has an internal 1kHz squarewave generator that is accessed via a pin on the front panel.

The X Timebase

The X timebase operation was very simple comprising of a rotary control giving a variation of 0.2μS/division through to 0.5S/division in twenty steps. Continuous adjustment of the timebase was also available via a rotary control. Pulling this

REVIEW

control out gave a times ten magnification that could be very useful when monitoring high frequency signals.

An unusual but very handy extra was the ability to take the timebase signal from the Ch. 1 Y amplifier. When this was selected the external timebase signal was fed to Ch. 1 whilst Ch. 2 acted as the Y input.

The great advantage of this system was that you could adjust Ch. 1 amplifier sensitivity to suit the signal source. In many oscilloscopes the external X input is a fixed level point and is not always the easiest to use. From the amateur's point of view this facility is great for comparing two frequencies using Lissajous patterns.

Vital Synchronisation

One vital area for any oscilloscope is the triggering options. This is the section that allows synchronisation between the input signal and the timebase. Without this, it would be very difficult to obtain a steady display.

The 7021 gave the operator three areas of selection - mode, coupling and source. The mode defines the way in which the trigger is generated from the input signal. The options here were auto, normal and single.

Auto and normal were very similar, except that auto rejected signals of 50Hz and below. This is useful for signals affected by mains hum. The single mode gave a single sweep of the trace when a button was pressed and really only has an application when photographing the screen.

Rejection Option

Moving on to the coupling, as well as a.c. or d.c. there was an option to provide rejection of h.f. signals above 50kHz. This has particular application in the radio environment where the signal under test may have r.f. superimposed. If this is not removed it can be very difficult to get a steady trace on the oscilloscope.

The final coupling option enabled the 7021 to synchronise to television video waveforms and has obvious applications.

Once the trigger mode and coupling had been set there were two rotary controls to be adjusted. The first set the trigger point and could be set anywhere on the positive or negative part of the signal.

The second was an unusual addition to this type of oscilloscope and provided a variable hold-off. This puts in a variable delay between each sweep of the display and can be useful for synchronising some complex signals.

The Z Axis Option

The only feature not yet covered was the Z axis input socket on the rear panel. For those not familiar with this option, it gives the facility to modulate the brightness of the trace with an external signal. The input for this comprised a B.N.C. socket on the rear panel with a sensitivity of 3V p-p and a bandwidth of 5MHz. This input was also t.t.l. compatible, so could be driven directly from standard logic signals.

That about covers the operational features of the TOS-7021. So let's now take a closer look at just how it performed on the bench.

Operation

The first point I noted about the TOS-7021 was its very smart and well laid out front panel. The panel was very uncluttered with plenty of room around all the controls.

Another good point was that controls were grouped neatly into functional areas. The 150mm display used by the TOS-7021 has become an industry standard and presents a very useful sized image. The brightness of this display was good, but don't expect to be able to get a bright trace when viewing in sunlight!

Bandwidth Benchmark

Bandwidth of the Y amplifiers is something of a benchmark test among oscilloscopes. Because of this, I thought it would be appropriate to measure the performance of the TOS-7021.

Before I go into that however, I ought to explain what bandwidth is in this context. Because oscilloscope Y amplifiers usually operate between d.c. and some upper frequency limit, bandwidth is the term used to specify that upper limit.

As the oscilloscope is a measuring instrument, we also need to define how much the gain can drop at these higher frequencies before the accuracy is severely compromised. The standard used is to quote the frequency at which the gain has reduced by 3dB.

As this reduction is usually a gradual one you will find that many oscilloscopes can still operate as indicator well above their specified bandwidth. One important point to note though is that at the higher frequencies, fast rise time signals such as a square wave will be severely distorted.

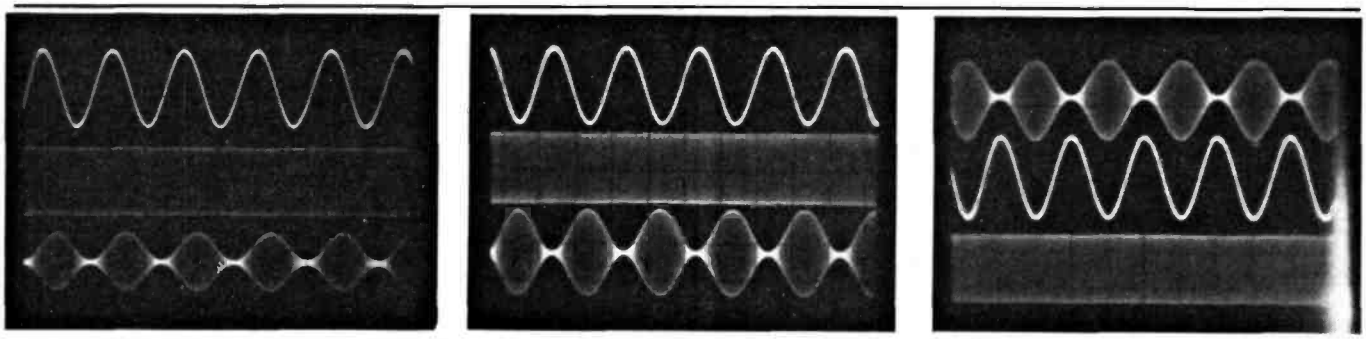
Excellent Performance

So back to the matter in hand and the performance of the TOS-7021. The Y amplifiers showed a very smooth gain roll-off with -3dB points of 31MHz and 37MHz for Ch. 1 and two respectively. This was an excellent performance and well within the advertised specification. This gain reduction continued smoothly up to 60MHz where both channels were -12dB. Above 60MHz the gain dropped very rapidly indeed.

With my testing of the two main Y amplifiers completed, I moved on to the Ch. 3 amplifier. This

Specifications

Sensitivity	
Ch.1 & Ch.2	5mV/Div. to 5V/Div. ± 3% 10 calibrated steps.
Ch.3	0.1V/Div. fixed.
Bandwidth (-3dB)	
Ch.1 & Ch.2	d.c.(a.c. 10Hz) to 20MHz
Input Chars.	1MΩ//25pF
Max. Input	
Ch.1 & Ch.2	400V d.c. + peak a.c.
Ch.3	100V d.c. + peak a.c.
Timebase	
Internal	0.2µS/Div. to 0.5S/Div. ±3%
External	5mV/Div. to 5V/Div.
Bandwidth	d.c. to 1MHz
Phase Error	
X/Y operation	<3 degrees, d.c. to 50kHz
Z Axis	
Sensitivity	3V p-p t.t.l. compatible
Bandwidth	d.c. to 5MHz
Impedance	5kΩ
Display	
Size	152 x 152mm
Effective Area	80 x 100mm
Phosphor	P-31
Power Supply	
Voltage	115, 125, 230 or 250V; 50 or 60Hz; 40W
Dimensions	314 wide x 165 high x 425mm deep
Weight	9kg approximately



A selection of waveforms from a variety of radio and audio frequency signals as displayed on the Topward TOS-7021.

was specified as having a fixed input sensitivity of 100mV/division with no bandwidth quoted.

The measured 3dB bandwidth of this channel was 5MHz, though the response continued as a smooth roll-off up to 20MHz. As this channel was configured more as an indicator than an accurate measure, this performance was adequate.

Whilst dealing with the Y amplifiers, I made some checks on the calibrator output. This was specified as having an approximately 1kHz output of 0.5V±5%. The review model was within specification having a frequency of 950Hz and giving a square-wave measuring 0.49V p-p.

I continued with several measurements around the timebase accuracy. These all proved to be well within the advertised specification.

Particularly Useful Feature

I spent some time using the TOS-7021 to examine many different types of signal and found no problems worthy of note. However, one feature that I found particularly useful was the ability to use Ch. 1 to supply an external X timebase.

This feature was really good for frequency comparisons using Lissajous patterns. The great advantage being the full adjustment of the X and Y axis sensitivities.

The only point I found slightly irritating was the placement of the Ch. 3 vertical position control on the rear panel. **PW**

Conclusion

The TOS-7021 certainly proved itself to be a very smart and capable instrument throughout the review period. Many of the measured performance areas exceeded the published claims, so making the TOS-7021 particularly good value for money.

The range of features included were well thought out giving the TOS-7021 excellent versatility. The amateur in particular will, I'm sure, find this oscilloscope fits the bill. However, if you have a particular interest in digital signals it may well be worth considering one of the TOS-7021's bigger brothers. There are instruments with bandwidths to 40MHz and delay timebases in the range.

The TOS-7021 is on special offer at £299.95 (£334.95 from 1 January 1991) and is available from Maplin Electronic Supplies.

My thanks to Maplin for the loan of the review model.

Construction

A Simple Pre-Amplifier For The 70MHz and 50MHz Bands

Is your 70MHz or 50MHz receiver a little 'deaf'? If so, Adrian Knott G6KSN suggests that you try this little pre-amplifier project to 'pep' it up!

Now that the 50 and 70MHz bands can be used by both A and B licensees, much of the surplus p.m.r. equipment suitable for conversion to the bands has found its way into shacks throughout the UK.

I bought a couple of surplus E band f.m. Pye Westminsters - at a very reasonable price. These were subsequently re-crystalled and re-aligned for the 70MHz band. It wasn't a difficult job and there were no problems. The transceivers have been working for some while, with (touch wood!) no faults as yet!

I found that for local working my dipole at 15m combined with my 13W (or should that be 11.14dBW?) of r.f. produced many interesting QSOs from stations who were up to 80km away.

Lacking Sensitivity

Despite the successful contacts, I noticed that stations using transverters, and the like, were giving me consistently better reception reports than I was able to give them. I put this down to the suspicion that the 'front end' of my converted p.m.r. rig was a little 'deaf' so to speak!

After some investigation I discovered that the receiver side of the rig used a pair of cascaded 2N3819s as r.f. amplifiers. Although the 2N3819 is an excellent f.e.t., their performance drops off at 50MHz and they are even less effective at 70MHz. So, after my discovery I decided that I had to find a cure for the problem.

Dramatic Increase

It's well known that in an f.m. system, even a modest increase in the carrier level can result in a dramatic increase in receiver quieting. In other words, this is the amount by which an un-modulated carrier reduces the demodulated audio noise level at, or around the receiver's threshold point.

With this in mind and the fact that the low v.h.f. bands have a high ambient noise level, I decided that a pre-amplifier based on a BF180 transistor would do the job - especially as they're cheap, have a reasonable performance and they lurk in abundance in old u.h.f. TV tuners in my junk box!

The Pre-Amplifier Circuit

The full circuit diagram is shown in **Fig. 1**, and to give some idea of the improvement - a 3dB quieting signal without the pre-amplifier was increased to over 20dB quieting! This certainly made the difference between a signal being awarded readability 2 and fully 5 on the RST gradings.

Obviously this improvement would not be obtained with a modern receiver using up-to-date techniques. In fact, the performance of such equipment could be degraded rather than enhanced, but the change in performance of older Pye equipment has to be heard to be believed.

The improvement would be even more marked if the amplifier was used in conjunction with one of the much older Pye Cambridges or Westminsters - and I've no doubt that there are many of those still in circulation.

How It Works

The input signal is fed to the tap at 1.5 turns up from the earthy end of L1, which is resonated by C3. Correct matching to TR1 is provided by the auto-transformer action of L1.

The capacitor C1 acts as an r.f. coupling capacitor for the input to TR1, and as a d.c. block so as not to interfere with the transistor biasing. TR1's bias supply is obtained from potentiometer R4 which can be a fully variable or of the 'trimpot' type with C2, acting as a low-pass filter to help prevent instability.

The resistor R2 provides d.c. stabilisation while C4 effectively decouples the emitter of TR1 at r.f. The collector of TR1 is fed to the resonant combination formed by L2/C6 and the r.f. output is then taken from the tap on L2 via the coupling capacitor C7.

Power for the amplifier is fed to the circuit via R3 with C8 and C5 de-coupling the 12V supply lines at l.f. and r.f. respectively.

Because high gain is available from the amplifier, instability could result from r.f. coupling between L1 and L2. To prevent this, a simple tin-plate screen is fitted so that neither coil can 'see' the

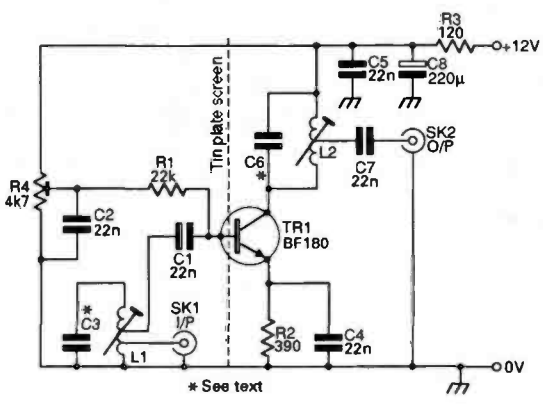


Fig. 1. Circuit diagram.

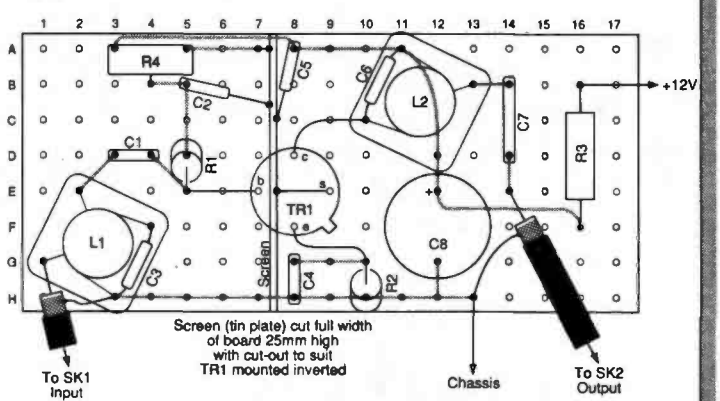


Fig. 2. The overlay built on 0.1in. perforated matrix board.

other and is soldered (with care) directly to the 'can' of TR1.

Construction

Building the amplifier should be quite easy and very straightforward if standard v.h.f. construction practices are followed. You should keep all leads as short as possible, bearing in mind that the one lead you do leave slightly longer than necessary - will be the one to cause you problems later!

Extreme care must be taken when the tin-plate screening is soldered directly to the can of TR1. The soldering iron must be in contact with the transistor for the shortest time possible. I thoroughly recommend that a large heat-sink is used immediately afterwards, or that you have an ice-cube (suitably wrapped in a corner of a water-proof plastic bag) ready to place on the rather warm device!

Alternatively, you may prefer a safer method utilising the shield connection from the BF180, which can then be soldered directly to the tin-plate screen as shown in the diagram.

Setting Up

With the amplifier installed, you'll be ready to start testing and setting-up the amplifier. If you have access to a suitable signal generator it should be set to initially provide a fairly strong signal output. Alternatively, you could arrange that another (preferably local) amateur be on stand-by to provide a test signal.

To adjust the amplifier, you should turn the spindle of R4 to its middle setting and 'trim' the cores of L1 and L2 to achieve the best 'quieting'. Repeat this operation until no further improvement can be obtained.

You should now adjust R4 for optimum 'quieting', which will probably require the potentiometer to be somewhere near its mid-value setting.

The pre-amplifier is now aligned and ready for you to hear weaker stations that were previously 'down in the noise'.

Six Metre Option

Since the 50MHz band is not too far removed in frequency terms from 70MHz, it's only a simple matter of changing the resonating capacitors C3 and C6 from 33pF to 68pF. No other modifications are necessary.

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Shopping List

Resistors

5% 0.4W carbon film

120Ω	1	R3
390Ω	1	R2
22kΩ	1	R1

Variable Potentiometer

4.7kΩ	1	R4 (See text)

Capacitors

Ceramic Miniature Plate

33pF	2	C3, C6 (See text)
22nF	5	C1, 2, 4, 6, 7

Electrolytic 16V Working

220µF	1	C8

Coil Data

L1 6 turns 24s.w.g. wound over 15mm on 5mm former, tapped at 0.5 and 1.25 turns

L2 6 turns 24s.w.g. wound over 15mm on 5mm former, tapped at 1 turn

Semiconductor

BF180	1	TR1

Miscellaneous

Screened metal box, perforated matrix board, tinned copper wire, coaxial plugs and sockets to suit, power supply leads.

Conclusions

On 70MHz with the pre-amplifier fitted to former p.m.r. rigs, I get very good results. The 13W from my transceiver into a home-brewed 3-element beam produces many interesting QSOs, especially as I can now hear the more distant stations!

Mobile 'flutter' on 70MHz is also much reduced and reception is generally very much improved. All these factors make 70MHz the ideal band for inter-G and mobile working. I'm now beginning to explore 50MHz and with the gradual easing of restrictions, I'm sure there'll soon be much more activity on that band too! **PW**

Theory

Valve Technology & Characteristics Part 4

This month Peter Buchan G3INR deals with the methods of calculating the gain of pentode audio stages.

The circuit of **Fig. 4.1** shows a pentode valve circuit complete with anode cathode, and screen resistors. The cathode and screen resistors are de-coupled to earth. We note that the pentode is an EF86 (this valve followed on from the popular EF37A) and those more familiar with valves will remember that the EF86 was designed to be a very low noise audio amplifier valve.

What can we deduce about this circuit, apart from the fact that it is an amplifier? The value of coupling and de-coupling components might give a clue about the bandwidth of the circuit, but will not tell us much more. Perhaps if we stretch the imagination (just a little!) we can assume that we have the circuit on the bench before us, made up on a chassis complete with a power supply.

Now we can take measurements of the supply voltage, the anode, screen, and cathode voltages, and from these calculate the currents flowing through the valve.

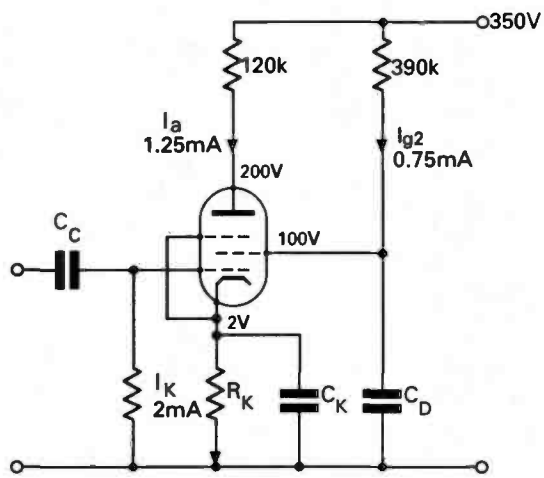

Fig 4.1: Shows an EF86 pentode valve with anode, cathode and screen resistors and the various voltages that constitute the d.c. conditions.

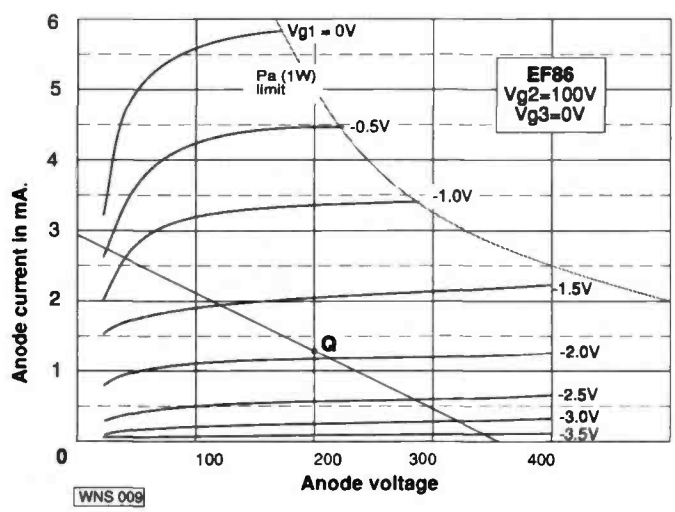

Fig. 4.2: Characteristic for the EF86 with 'Q' point set at a V_{g1} of -2V.

Power Limit

On the diagram, **Fig. 4.2**, you will notice printed on the characteristic curves a line titled (at the upper end) $P_a$max 1.0W. This is the valve maximum dissipation curve. Any setting of anode current and voltage must lie below this curve. This is for the Class A operation of the valve as an amplifier.

Although desirable for high fidelity applications, class A is nevertheless inefficient. From this grew the AB_1 or AB_2 class of operation for valves. In this particular class, two valves are used in 'push-pull' operation.

To achieve this, each valve is biased towards its 'cut-off' point and operates over one half signal-cycle only. One valve taking care of the positive going half-cycle and the other valve the negative half cycle.

Voltages

Starting with the supply voltage V_s we find that it is 350V, the anode voltage V_a, 200V, the screen voltage V_{g2}, 100V, and finally the cathode voltage V_k, about 2V. The control grid voltage g_1, being tied to 0V is about -2V with respect to the cathode. (Note; you will see that the grids have been given numbers, i.e. the control grid being g_1, the screen grid g_2, and finally the suppressor grid g_3. Some valves have more than three grids but the same system still holds).

So - where do we go from here? Well first let's calculate the anode current I_a. Noting that the supply voltage is 350V and the anode voltage 200V, then the drop across the anode load resistor (R_a) is 350-200=150V. Dividing this difference by the anode resistor, 120kΩ, gives an anode current of 1.25mA.

Moving now to the cathode, we see that there is about 2V dropped across a 1kΩ resistor, so the cathode current is in the region of 2mA. But in the triode both the anode and cathode currents were the same, so why is there this discrepancy?

Extra Grids

Don't forget we are dealing with a pentode and there is an extra grid, g_2, which draws some current. Can this difference of about 0.75mA, be the screen current? Let's see!

The difference between the supply voltage and screen voltage is 250V, the value of the screen resistor is 390kΩ, and hence the screen current is about 0.64mA, which is close to 0.75mA, the 0.11mA can be considered as being due to experimental error.

Characteristics

Look now at **Fig. 4.2**, which shows the EF86 characteristic. A load line has been drawn through from slightly under 3mA (2.92mA) on the I_a axis, to 350V on the V_a axis. The chosen working point, often called the 'Q' or quiescent point, is set at almost -2V. V_{g1}, indicates an anode voltage of 200V and an anode current of just about 1.25mA.

So, you can see that the calculated values tie up nicely with the graphical ones. What we have done is to establish the d.c. conditions for the valve.

For the valve to function as desired it is essential that the d.c. conditions are correct. This would be one of the first things you would want to find out if you were looking for a fault in an audio amplifier.

Incidentally, what would you need to know about the meters you used to measure these voltages with, especially the screen grid voltage? (You'll be able to check to see if your answer was right at the end of the article).

Calculating Gain

So much for the d.c. conditions then, but what about the performance of the valve as an amplifier? It is possible to extract the constants r_a, g_m, and μ, from the graph but better perhaps to take advantage of the fact they are to hand with the characteristics.

The manufacturers figures are r_a=2.0MΩ, g_m=2.2mA/V, and by calculation μ, is 4400. Do you remember the equation for voltage gain for the triode? Don't panic - there's no need to worry as it's the same equation for the pentode!

$$Av = \frac{\mu}{1 + \frac{r_a}{R}} \quad (250 \text{ without other stage loading})$$

Putting in the values for r_a and R in the above equation, yields a voltage gain of about 250. This is only the stage gain without the following stage load.

To be of any use we must include this extra load for the amplified signal. This is usually the grid circuit of the following stage.

It is from here that we modify the circuit to that as shown in **Fig. 4.3**, where we see the familiar pentode circuit but with additional components. One of these components is the anode-cathode capacity C_{ak},(about 5pF) the second is the coupling, or d.c. blocking capacitor C_1(10nF) and the third is the following stage g_1 grid resistor R_1(1.0MΩ).

The fourth component is the grid-cathode capacitance of the following valve, C_{gk}, which is approximately 4pF. Finally the stray capacitances C_{Stray} must also be considered. These components have a definite effect on the bandwidth of the amplifier stage, and it's this effect that we must now examine.

Equivalent Circuits

To help with this investigation, an equivalent circuit is often drawn. Unfortunately, this sometimes seems to cause more confusion than assistance!

Despite this, it does in fact make the matter clearer, so persevere and remember that to the signal, the supply voltage line appears to be 'earth' by virtue of the fact that the smoothing capacitors in the p.s.u., have a very low impedance at the signal frequency.

So study the figures **Fig. 4.3** and **4.4** and see if you can understand why the anode resistor, R_a, is in parallel with the valve r_a, not forgetting the following grid resistor together with the capacities C_{ak} and C_{gk} as well.

The coupling capacitor C_c is in series with the stages and affects the low frequency performance. All these components constitute the load into which the EF86 transfers its energy.

Don't worry too much about how the three equations for low, mid and high frequency performance were arrived at, unless you feel inclined that way!

However, I do recommend that you try and use the equations because they are very enlightening and are very similar to those used for transistor circuits.

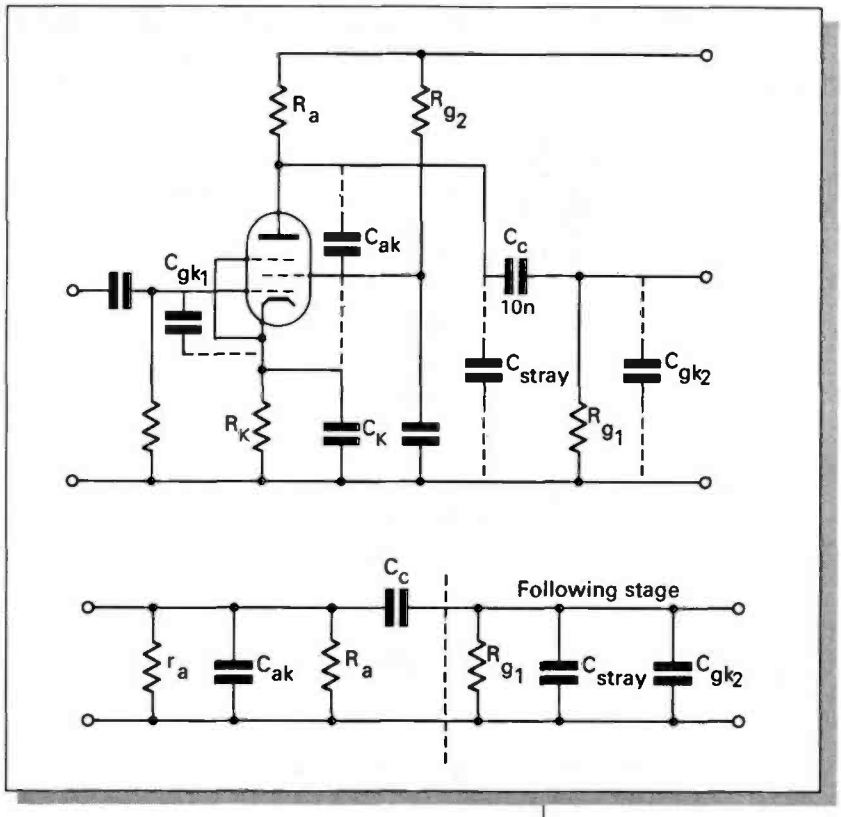

Fig. 4. 3. Circuit showing the various capacitances C_{ak}, C_{gk}, and the 'strays' plus the following input components with the equivalent a.c. calculation criteria shown underneath.

You will now realise that the bandwidth of the amplifier is calculated utilising three performance characteristics. Starting with the mid frequency performance, followed by either the upper or lower frequency performance.

Current Source

The equivalent circuit used to describe the pentode valve circuit is usually a current source, by virtue of the fact that the pentode looks and behaves like a current source. Remember the characteristic? The current source drives current into the combination of resistors and capacitors.

At mid frequencies - say from 500Hz to about 20kHz - some of the components have virtually no effect on the performance of the valve as an amplifier, so they are not used in calculations.

The small diagram **Fig. 4.4** shows the mid-band load equivalent. Above and below the mid frequencies other components become significant and they must be taken into consideration. You will see this from the different circuits, **Fig. 4.5** and **Fig. 4.6**, which are used to describe the performance of the valve above and below the mid-frequency range.

Mid Band Gain

Always start from the mid-band range and you can see from the calculation:

$$\text{Calculating } R_{Total} \text{ using } \frac{1}{R_{Total}} = \frac{1}{r_a} + \frac{1}{R_a} + \frac{1}{R_{g_1}}$$

R_{Total} = 102kΩ.

At mid-band the stage gain then becomes :

$$Av = \frac{\mu}{1 + \frac{r_a}{R_{Total}}} = 214$$

that the theoretical amplification, using a figure of 1MΩ for R_{g1}, is 214, about 15% lower than that without this load. At each 3dB point the amplification will have fallen to a factor $^1/_{\sqrt{2}}$ times the mid-band gain figure. In **Fig 4.5,** the high frequency circuit equivalent is shown with C_T shunting the load circuit and the 3dB point is calculated:

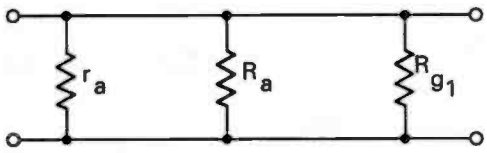

Fig. 4.4: The circuit which describes the conditions for mid-frequency amplification.

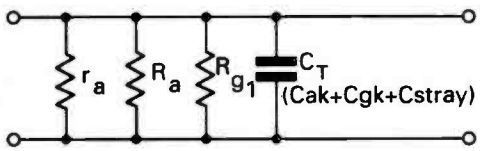

Fig. 4.5: High frequency gain equivalent circuit.

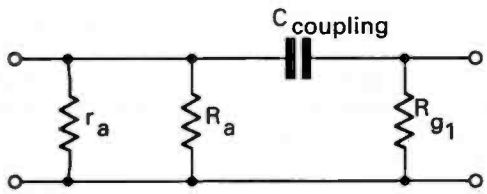

Fig. 4.6: The low frequency equivalent circuit.

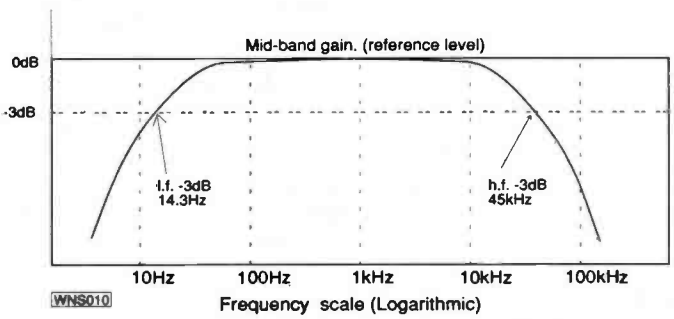

Fig. 4.7: A graphical representation of the gain bandwidth curve.

$$f_{3dB(h.f.)} = \frac{1}{2\pi \times R_{Total} \times C_T}$$ where C_T are strays

If we assume C_T to be about 25 - 50pF (35pF used) then the high frequency - 3dB point is :

$$f_{(h.f.)} = \frac{1}{6.28 \times 1.02 \times 10^5 \times 3.5 \times 10^{-11}} = 44.6\text{kHz}$$

Some improvement could be made to the high frequency response by careful dressing of the wiring. The figure of 25pF for the 'strays' was an arbitrary choice, but serves to demonstrate the general idea behind the subject. In practice the 'strays' are found by plotting the amplifier performance and deducing from that what stray capacity is present.

At the lower frequency **Fig. 4.6**, the equivalent circuit is shown with $C_{Coupling}$ limiting the voltage developed across R_{g1} and here the low frequency 3dB point is calculated.

$$\frac{\text{Gain at low frequency}}{\text{Gain at mid frequency}} = \frac{1}{\sqrt{1 + (\frac{Xc}{R_{Total(l.f.)}})^2}}$$

where $R_{Total(l.f.)} = R_{g1} + \frac{r_a \times R_a}{r_a + R_a} = 1.1\text{M}\Omega$ and

X_c is the reactance of $C_{coupling} = \frac{1}{2\pi \times f \times C_{coupling}}$

When $X_c = 1.1\text{M}\Omega$, $f = 14.3\text{Hz}$

Perhaps you will also notice that the l.f. -3dB point is really very low in frequency. This is due to the fact that the 10nF capacitor used as coupling capacitor is quite a large value. A 1nF capacitor would have been satisfactory and would have given a 3dB point at about 143Hz, which is a sufficiently low a frequency for all practical purposes. The gain/bandwidth parameters are shown diagrammatically in **Fig. 4.7.**

So much for the pentode at audio frequencies, in Part five we will explore the use of a pentode valve in an r.f. circuit.

Measuring Grid Voltages

As with any measuring method, the loading of the test equipment causes changes in the condition(s) to be measured. A voltmeter of greater than 20kΩ/V should be used on at least 200V f.s.d. (and even this could cause a 10% lower than expected reading.)

To be continued

Radio Diary

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

***November 18**: The Bridgend Annual Amateur Radio Rally will be held in the Leisure Centre, as last year but in 1990 they are taking over the whole of the building! **Don Chennell GW4DUY. Tel: (0656) 863084.**

December 9: The Leeds & District ARS have their Christmas Rally in The Civic Hall, Dawsons Corner, Pudsey (junction of the Leeds Outer Ring Road and Bradford Road A647). Talk in on S22. All usual facilities. Admission is by program only, 50p. Doors open 10.45. **Geoff on Leeds (0532) 585801.**

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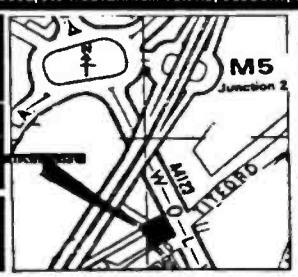

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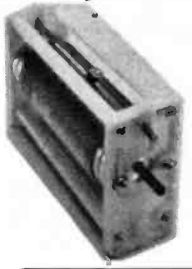

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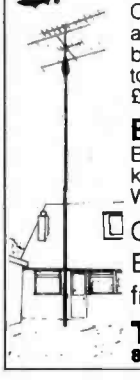

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A Novel Dual Band Antenna

Construction

Eighty into two will go, and Noel Orrin G3BBK shows you how to achieve this magical feat!

I've used a 144MHz ground plane vertical antenna at the top of a 20m fir tree in the rear garden for some four years. Its prime use has been for local working via repeaters or simplex. Nothing new in that you say!

Up A Tree

However, I wanted to use the 3.5MHz band without the disadvantage of a rather low dipole (in terms of high angle radiation). It occurred to me that because of the height of the feeder up the tree, there was the potential for operating the vertical run of the feeder as a $\lambda/4$ wave vertical for 3.5MHz. The plan envisaged cutting the feeder at the base end of the tree so that the overall vertical height, inclusive of the ground plane antenna, was correct for the centre part of the band, i.e. a little over 20m, then joining the outer braid of the coaxial cable to its inner conductor. Make sure your 144MHz antenna is insulated from its mounting. Having produced a vertical for 3.5MHz, all that is needed is some method of switching between these two dissimilar methods of feeding, as shown in **Fig. 1.**

Join the braid of the coaxial cable to as many radials as you have the patience for, or space to apply. In my case, I ran one length of wire 20m long, and three others of random length (averaging roughly 13m) at approximately 90° to each other.

Laying Radials

These radials, in my case, are of 1.25mm wire and start off fairly close to the ground. Anything substantial will do. Initially, I pinned these radials at the foot of the tree, stretched them out tight and twisted the last few centimetres of each around a large nail, before pushing the nail into the ground. This minimised the chance of my XYL tripping over them, and was good enough to try the system out.

I found that without an a.t.u., a 1:1 v.s.w.r. was obtained at 3.650MHz, this did not rise over 2:1 at either end of the band. My TS-930S has a built-in a.t.u., so there was no problem in correcting to 1:1 anywhere on the band. Most rigs should work reasonably efficiently at 2:1, even without an a.t.u.

End Results

Results were, and have continued to be, most satisfactory. Good reports have been obtained from both near stations - British Isles and Europe - and DX when the band has been open.

However, I've jumped ahead a little, and need to describe the finalised installation. First I buried the radials, a little tedious, but not too bad. Because the radials were laying across the lawn under a degree of tension, I found a very convenient way to to bury the radials. Use a piece of clear plastics material some 100 x 150mm and about 3mm thick. Place this tool edge-on along the radial wire and hit it smartly with a mallet.

A few taps and the radial was soon buried just under the surface of the grass with absolutely minimal disturbance to the lawn. Working this way along the length of a radial is quite quick, providing the wire has been laid under tension.

Switch-Over

The next step was to install a relay. In my case, I used a 12V 100Ω d.p.d.t. change-over type with 3A contacts that I had spare. A single-pole change-over would be fine, but if one has the extra contacts paralleling them is worthwhile. The relay contact wiring was arranged as shown in the circuit diagram, **Fig. 2.**

In its de-energised state, it restores feed to the vertical as if the coaxial cable had never been cut. In other words, the 144MHz ground plane antenna workes in the normal manner. Energising the relay from a separate pair of wires laid from the shack, immediately transfers the system to the 3.5MHz vertical configuration.

As an extra bonus in terms of radials, I arranged to feed the d.c. to the relay so that one leg was at earth and connected as a *pseudo* radial. I enclosed

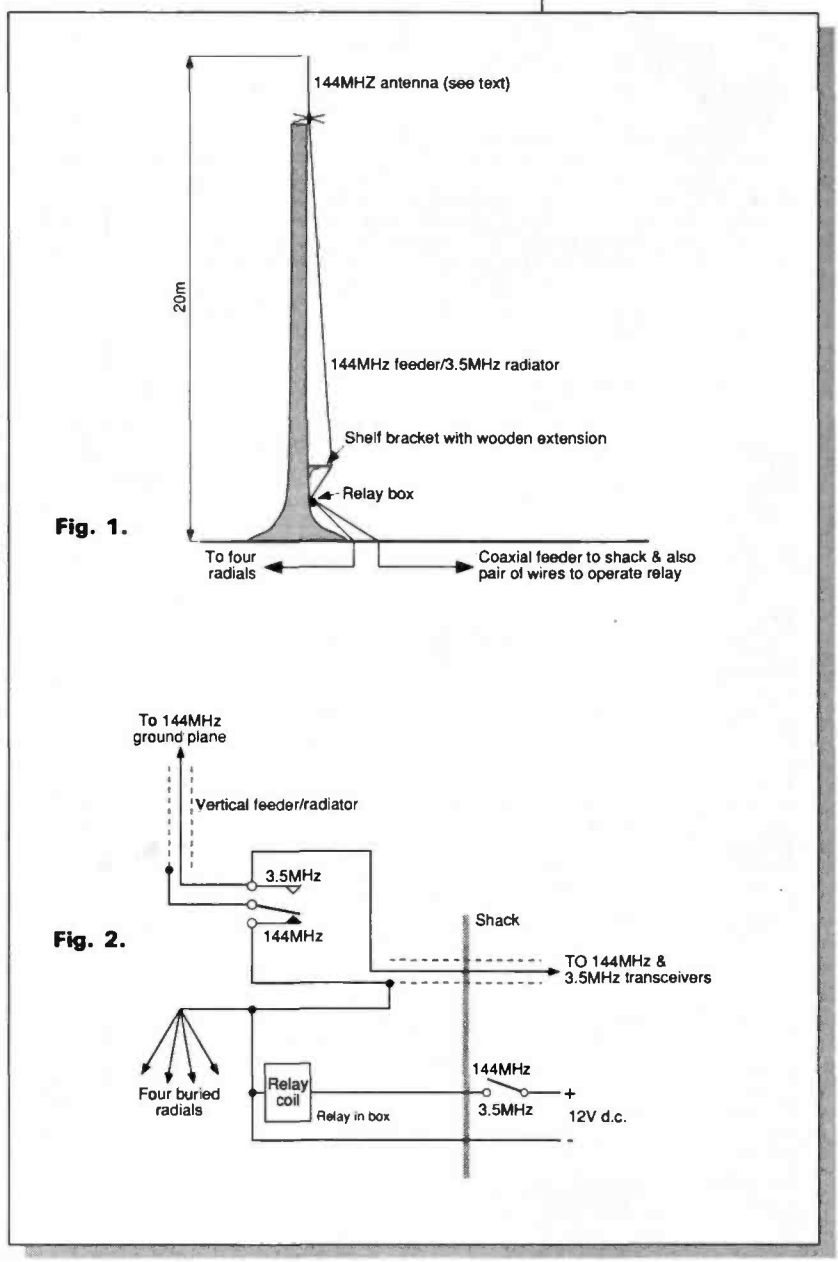


Fig. 1.

Fig. 2.

the relay in a die-cast box to protect it. Any plastics box would be just as good. Spread a little sealant around the point where the cables enter the box to keep moisture out.

I also thought that it would be useful to hold the vertical feeder clear of the tree as much as possible, particularly at the lower end. The diagram, **Fig. 1**, shows how I nailed a shelf bracket to the tree about 1.8m from the ground, with a strip of wood about 0.5m long attached to hold the feeder quite clear.

No Tall Tree Around?

If you've read this far, you may be thinking, "fine but I haven't got a 20m tree around in the garden". Well a smaller tree, or even an attachment to the side of the house, could probably be worth considering. If you can't run to a quarter wave for 3.5MHz, consider a vertical of around 10m for use on 7MHz. Whatever band you choose to tailor the vertical for, don't forget to include the length of your ground-plane antenna on the top. Obviously, it's better to over-estimate by initially cutting it longer than you expect to need, then check it for 1:1 tuning. At least if you've over-estimated, it will mean cutting a bit off, rather than having to add more wire! Although I haven't tried it, I believe the top antenna could even be a 144MHz Yagi, and the whole thing would still be tuneable for the chosen lower frequency band.

Ground-plane radials, or whatever, at the top will tend only to act as a capacity-hat loading system.

Try a bit of experimentation, it costs virtually nothing except your time. **PW**

WHAT A GOOD IDEA

Eliminate Mistakes

Some equipment has a low voltage external power supply connection. When operated from the mains supply, a battery eliminator type of power supply can be used. Now how about operation in a vehicle?

The first step is to design the pre-regulator stage of the p.s.u. to operate from a transformer with a secondary r.m.s. voltage about the same as the vehicle battery voltage. Then take the input of the bridge rectifier via a change-over switch to the vehicle battery supply. A suitable connection point would be the cigar lighter socket.

As the vehicle supply is connected before the bridge rectifier, it is immaterial which polarity is used. This minor dodge could save you an expensive mistake, which is why I think it is such a good idea.

Dr. G.L. Manning
Edgeware,
Middlesex.

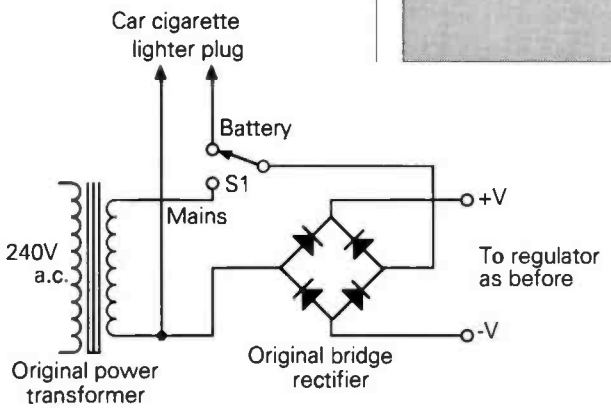


Fig. 1

Innovation Into Investment

We've always been proud of our authors and their work. Now you can join in - and win £25 - by sending circuits and projects to 'What A Good Idea'. It's the ideal solution to the advice often offered by friends who suggest that 'You should publish that!'

Circuits - accompanied by the minimum of text - must be **neatly** and **clearly** drawn in ink. Wherever possible the idea must be original, although your suggestion might be a significant improvement based on another idea. In which case you should always quote the original source. All entries will be acknowledged. Send your entry, with your name and address, to: **'What A Good Idea', Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

PLEASE NOTE: that we at *PW* may not have built and tested the circuit, but present it on an 'as-is' basis. We do take the greatest care in preparation of the article, but cannot be held responsible for the suitability of the original suggestion, or for any damage that may occur to property or equipment in implementing this idea.

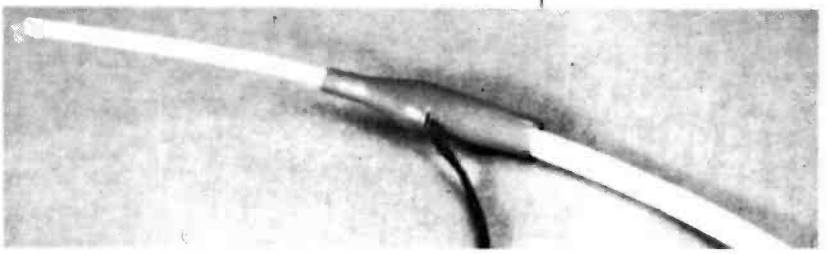
Booting The Weather Out

Many people use coaxial cable to connect to the centre of a dipole. One problem that can occur, and usually does, is that water will eventually find its way under the outer cover of the coaxial cable and virtually destroy the signal carrying capabilities of the cable. This is especially true if the dipole is used for transmission.

The following idea ensures a watertight connection at the feedpoint and the materials are very cheap. All that is required is silicone grease and the vinyl insulating cover from a large crocodile clip. These are available in various sizes from most car accessory suppliers.

Begin by making a small hole in the side of the vinyl boot. Then stripping away the cable outer about 80mm, separate the outer braid and twist it and solder it along all the exposed length. The prepared end of the cable is inserted in through the large hole that the clip jaws would occupy. The soldered braid is taken out through the small hole made in the side of the boot, leaving the smaller original hole for the inner of the coaxial cable.

It is important that the boot chosen is a good tight fit on the inner of the coaxial cable. Apply the silicone grease liberally to both inside and outside of the boot. This forms a good weather-proof seal which should be just as successful as the one which has been in use for seven years at my location.



J. C. Peerless G3JPJ
Edgeware,
Middlesex.

Feature

What Is Propagation?

Ron Ham suggests methods of radio 'forecasting' when propagation is about to pick up due to Sporadic-E.

Sporadic-E

Generally speaking, the 'E' region of the earth's ionosphere, about 100km above us, forms at sunrise and disperses at sunset. However, during the period May to August, called the Sporadic-E season, this region is liable to break-up suddenly into clouds of more densely ionised gas and deflect radio and television signals far beyond their intended range. A typical example of the strength of these signals is the Czechoslovakian test-card, **Fig. 1**, received by **David Glenday**, in Arbroath, on Chs. R1 (49.75MHz) and R2 (59.25MHz) at 1130 on August 10.

The most vulnerable area of the spectrum to be influenced by even a mild dose of Sporadic-E is around 50MHz. Here, such signals can appear in the 50MHz amateur band and on the nearby television channels E2 (48.25MHz) and R1.

Paradise

This would be a DXers paradise if only they knew when this was going to happen. However, readers with scanners or v.h.f. communication receivers can have an early warning of Sporadic-E by listening for synchronising-pulses on Chs. E2 and R1 or on their respective sound channels of 53.75MHz and 56.25MHz. Under normal conditions in the UK, only the receiver background noise should be heard on these frequencies until Sporadic-E is present and then the signals begin to appear.

At first they are weak and bursting, but soon become very strong before dying away. Although the average life for an 'in-season' event is three to four hours, such a disturbance to terrestrial radio signals can last from as little as 15 minutes to a mammoth 15 hours. It is interesting to hear the deep and sharp fading at the beginning and towards the end of each major event.

The 1990 Season

By the time you read this, the 1990 Sporadic-E season will be over. The amateur and v.h.f. broadcast band DX enthusiasts, CBers and TV DXers will now be looking for those brief and sudden openings which often occur during the winter months. Only a few of these events are likely to follow the usual 'in-season' pattern. It can gradually extend its influence from 50MHz downwards, to open up the 27MHz Citizens Band and the 28MHz amateur band, and upwards, through the v.h.f. television Band I (48-68MHz), the East European broadcast band (66-73MHz) and tail-off toward the end of Band II (87.5-108MHz). In mid-summer, the latter can go as high as 200MHz and give fantastic DX opportunities to the amateurs on 144MHz and the television buffs at the lower end of Band III.

End to End

To illustrate this point, **Simon Hamer** (New Radnor) received pictures from the USSR on Chs. R6 (175.25MHz) and R7 (183.25MHz) during a massive disturbance on June 1 and from Algeria on Ch. E7 (189.25MHz) on the 3rd. At the opposite end, **Leon Greenfield** (Storrington), received very strong CB signals on 27MHz from stations in Ireland and Scotland at 1030 on August 2 and between 1600 and 2300 on the 20th.

Ern Warwick (Plymouth) heard one CBer say that he was receiving TV pictures from Czechoslovakia and Portugal. At midday Ern made contact himself with stations in the Midlands and Norfolk. The 27MHz band was also influenced by Sporadic-E during the mornings of the 3rd and 4th. Again, he logged signals from Northern Ireland and Scotland. In addition, he copied signals from Germany and Holland at 1930 on the 9th and worked/heard stations in Scotland and Wales during the morning of the 12th. Then there were Ireland and Scotland around 1100 on the 13th, Scotland again at 2048 on the 14th and North Wales at 1700 on the 23rd.

25 Years Ago

An intense Sporadic-E opening occurred early on 4 July 1965 and its peak coincided with the start of a 144MHz portable contest organised by the RSGB. Can you imagine the surprise, when UK competitors warmed up their sets around 1030 and heard amateurs calling from Hungary, Yugoslavia and remote parts of the UK. The signals were amazingly strong while the event lasted. Afterwards, I wrote to HG5KDQ who acknowledged my letter with his QSL card, **Fig. 2.**

Equipment

Obviously, matching the correct antenna to the receiver or transceiver will give the best results. Readers wishing to just listen, or view, while

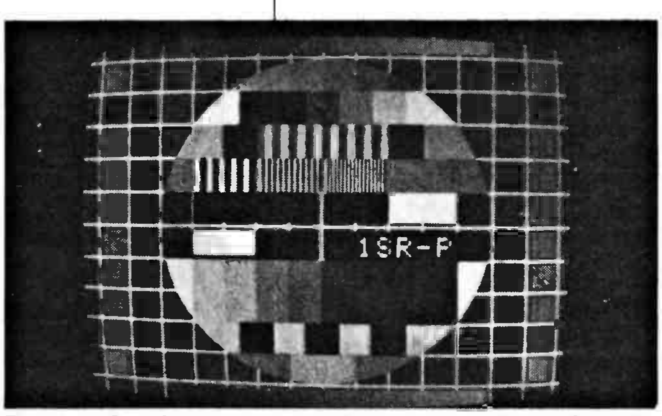


Fig. 1: A Czechoslovakian test card received in Arbroath by David Glenday.

Fig. 2: A Hungarian QSL card of 25 years ago confirming a report submitted by Ron.

Sporadic-E is present, can get reasonable results with a dipole cut to work between 50 and 70MHz. But, because the signals are so strong, the telescopic rod fitted to portable sets for v.h.f. TV and Band II, and many scanners, may well suffice.

Barry Bowman (Prestwich) uses his 27MHz CB antenna for Band I television. For monitoring Bands I and II, I use a dipole, **Fig. 3**, made with the insulator block and rods from a redundant TV antenna. Operating under Sporadic-E conditions is both scientifically interesting and good fun, because the unexpected can happen at anytime while the event is in progress.

Do let me know how you get on. **PW**

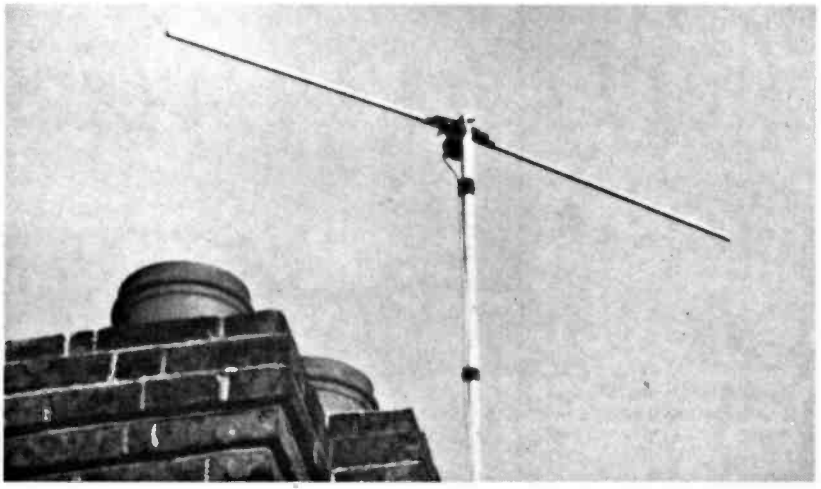


Fig. 3: The simple dipole, made from an old TV antenna, to monitor Bands I and II.

CB CORNER

This month, Rick Maybury looks into the depths, but ends on a high note for CB and includes a list of the countries with CEPT agreement.

Reputations Again

I had hoped to concentrate on the positive side of CB through this column and thankfully good news still outweighs the bad. However, not everything in the CB garden is rosy - as if you needed telling. I was saddened to receive a letter from a regular reader who lives in the Peak District - he wishes to remain anonymous for reasons that should become obvious. This elderly gentleman - we'll call him Mr B - is a regular and dedicated hill-walker. He quite sensibly purchased a hand-held CB transceiver for use in emergencies. However, after listening to the 'conversations' of a number of foul-mouthed locals, (we won't go into details), Mr B was in no doubt that any call for help would either be completely ignored, promote a torrent of abuse or get him into even deeper trouble. A very sorry story indeed, and precisely the kind of thing that has been damaging CB's image with the general public for the past ten years.

I doubt if these individuals ever read *PW*, or indeed if they can read at all, but the message must go out to them and their like. Their actions in blocking what could be a vital, and potentially life-saving, communications medium - especially in that part of the country - are wholly unacceptable and must stop! I trust the Radio Investigation Service will receive enough complaints to encourage them to find time to visit that part of the country. I hope no-one will have any hesitation in reporting blatant abusers to the authorities, whatever your personal opinion of CB.

Short Range?

In the United Kingdom, we tend to think of CB as an uncomplicated local, short-range, communications system and long may it be so. But, as anyone who has crossed the great divide to amateur radio, or even just listened to it, will know there's a whole world out there just waiting to chat over the airwaves.

At the risk of sounding controversial, it's worth pointing out that CB also has a role to play in international communications. Even as I write this I can sense hackles rising - relax, I'm not about to advocate illicit s.s.b. and high-power operation - that's a big subject for another day. I'm talking now about the European Conference of Postal and Telecommunications (CEPT) recommendation T/R 20-02 and 20-07. In essence they say that UK CB rigs which conform to the MPT 1333 specification, and have received type-approval, can freely be used in a number of European countries. Of course, this comes with the proviso that operators adhere to normally accepted codes of behaviour and practice, and that users carry their UK licence with them whilst abroad. Ah... now how many of you have one of those I wonder?

CEPT Countries

The current list of participating countries who are complying with the CEPT directive comprises Austria, Belgium, France, Germany, Luxembourg and The Netherlands. There may be a very slight question-mark hanging over Germany - the agreement certainly applied to the Federal Republic, but there's no indication at the moment how this will have been affected by the recent Unification. Hopefully not at all, or preferably by extending the facilities to the eastern area of Germany. This means that legal UK CB users are now fully entitled to take their rigs on holiday with them, to spread their unique message across the breadth, and much of the depth of Europe. A daunting prospect, or a real break through in international relations? Only time will tell. It's a small, but encouraging, step towards European unity - let's just hope that this facility is used responsibly and the small, but noisy, element that persists in giving CB a bad name, leave their rigs at home. We've enough problems with this country's reputation abroad without CB adding to its troubles!

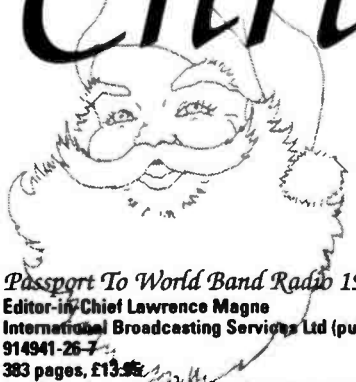
Now The Good News

Just time for some good news. A number of companies associated with manufacture, importation, distribution and retailing of CB equipment have recently formed the Citizens' Band Radio Trade Association. The Association aims to provide the industry with a much needed voice, and hopefully some muscle too. They will be able to draw upon well-established relationships with the DTI and Radiocommunications Agency, as well as large and influential user groups. Until now there has been little or no opportunity for the trade to put their point of view across, or liaise with the DTI, particularly when decisions have been taken that have resulted in important changes in legislation.

Trade associations have a vital role to play in many industries, but CB has been sadly lacking since the early formation, (and eventual dissolution) of a number of unco-ordinated organisations back in the mid 1980s. The CBRTA shows that the CB business is alive and kicking. According to their own figures, it provides jobs in over 500 companies throughout the UK. For those that may be interested they can be reached at: **CBRTA, 50-54 Mina Road, Bristol, Avon BS2 9JX**, or by telephone on **(0272) 541254**.

PW

Christmas Stockin



Passport To World Band Radio 1991

Editor-in-Chief Lawrence Magne
International Broadcasting Services Ltd (publishers) ISBN 0-914941-26-7
383 pages, £13.95
Available from *PW* Book Service, 85p post and packing

Unlike many handbooks - for that's what this extremely useful book is - this one is very readable. In fact, this book seems to be the ideal reference book to have for 'armchair' listening as it contains a great deal of information ranging from the programme, times and frequency details to a truly excellent 'buyer's guide'.

Although 'Passport' is well known for its buying guide, it also contains a good 'choose your receiver' section and very comprehensive frequency listings. An unusual - and very helpful guide for the newcomer and 'old hand' alike is the 'When and Where to Listen' type of feature which guides you through the bands - hour by hour. This section alone would make the book a good buy for the keen listener as it helps you to find where and when to listen and who you should be able to hear.

The ARRL UHF/Microwave Experimenter's Manual

Various Authors
American Radio Relay League (publishers) ISBN 0-87259-312-6
446 pages, price £13.50
Available from *PW* Book Service, 85p post and packing

This new book has been worth waiting for! A truly excellent manual for the keen microwave enthusiast and for the budding 'microwaver'. If you've had doubts whether or not you could manage the techniques involved 'up there' - this thoroughly comprehensive manual will dispel any doubt.

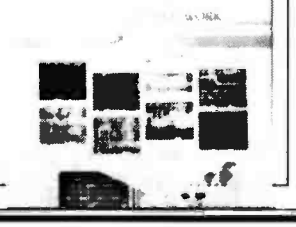
With contributions from over 20 specialist authors covering techniques, theory, projects, methods and mathematics, this book has everything. Of particular interest is the fascinating historical section where the use of hardware store 'funnels' adapted for use a microwave horns is covered! All in all this book could be the instigator of as boom in microwave activity in the UK. A must for your bookshelf!

Oscilloscopes How To Use Them How They Work

Ian Hickman
Heinemann Newnes ISBN 0-434-90808-8
248 pages, £12.95
Available from the *PW* Book Service, 85p post and packing

This book - the 3rd edition - has earned itself a place on many bookshelves due to its clear, concise and well illustrated format. Ian Hickman's practical approach is supported by the good quality graphics and clear styling.

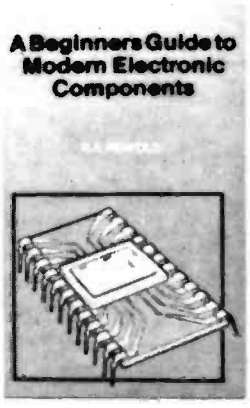
Even if you have never used or owned an oscilloscope, this book will introduce you to what must be the most versatile 'tool' to be found in any radio amateur's workshop.



A Beginner's Guide to Modern Electronic Components BP285

R. A. Penfold
Bernard Babani (publishing) Ltd ISBN 0-85934-230-1
166 pages, £3.95
Available from *PW* Book Service, 85p post and packing

This is a book which could become a standard for those involved with the new Novice Licence. As befits a book for beginners and those who intend teaching beginners, the chapters are limited in number. This small, but information packed, pocket-book has but four chapters. These chapters are 'Passive Components', 'Semiconductors', 'Integrated Circuits' and last but not least 'The Rest'.



The information contained within this small volume however, is not limited to a mere skimpy description. Each subject, be it resistor, capacitor, audio transistors or high speed digital i.c.s is dealt with in a simple 'no nonsense' way, with large clear diagrams included where they help the text.

Do you want to know about pyroelectric detectors, or such so-called mundane items as plugs and sockets? It's all here in this book ready and waiting to be found by any keen beginner.

Electronic Pocket Book 5th Edition

Edited by E. A. Parr
Newnes ISBN 0-434-91519-X
315 pages, £8.95
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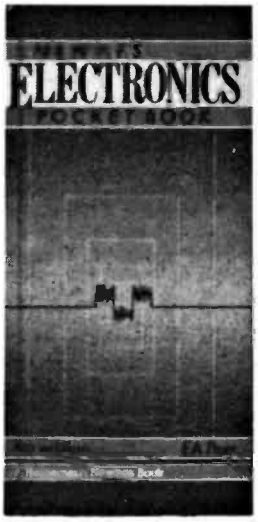

This long, narrow hard-backed pocket reference book covers topics for everyone. Some of the 17 chapters deal with components, amplifiers, oscillators, i.c.s, optical devices, transmission and reception information. There are other chapters on servo mechanisms, digital and analogue computers, p.s.u.s , maintenance and safety. The section about safety is particularly welcome as few publications deal with this essential subject in such an easily understood way.

So comprehensive is the information in the book that the section on computers even explains the workings of printers, disk drives, memory and other storage devices.

The communication section has information and diagrams from CB to satellite communications, video recorders to the humble telephone's working. The subjects covered in this pocket reference book are tabulated in a comprehensive nine-page index at the rear of the volume.

Few pages escape without an illustration of one kind or another, and many have more than one diagram on them. An excellent and unobtrusive reference book to carry with you at all times.

The Radio Amateurs World Atlas

Radio Amateur Callbook Inc.
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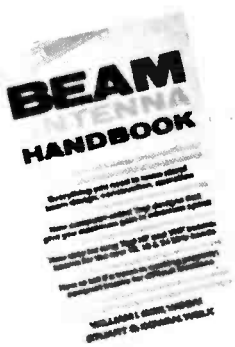
This slim atlas opens out into 17 double-sided 420x276mm maps featuring all the radio areas of the world. Shown on the detailed maps are the names, call prefixes and the major towns and cities of each country. Continental boundaries, DX zone numbers are all found along with the limits of both DX zone and callsign prefixes. Hidden away unobtrusively on the map, but still visible, are the relative local time zones with respect to UTC so you can gauge what time it is at the other station. The last page also carries a useful list of callsign prefixes in alpha-numeric order.



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This handy little book is jam-packed with lots of who wish to build their own transformers, be it a frequencies. The 16 chapters cover such topics a coils and transformers for various general projec design is the area dealt with in greatest detail.

The book could prove invaluable for those of you looking for help in renovating that fascinating old radio bought at that last car boot sale! There are sections dealing with power transformers, low frequency chokes, r.f. and i.f. transformers.

Spread throughout the book are many worked examples to help with calculations. These and the many diagrams and tables make this book very worth while at its price.

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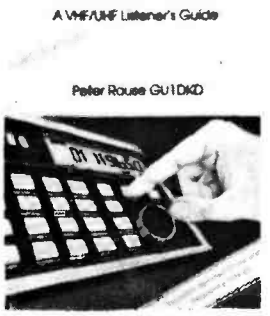

If you are planning to ask Father Christmas for a scanning receiver this year then don't forget to include this book on your list. The technical manuals may be a source of information but they often don't tell you what to expect from your gleaming new scanning rig.

In the early part of the book Peter discusses radio waves, antennas, propagation, modulation and general frequency bands. He also offers advice on the pros and cons of headphones or loud speakers.

There's a glossary and description of the meaning of the somewhat baffling terms confronting the newcomer to the scanner hobby. These carry clear explanations of terminology, like VOLMET, TACAN, p.m.r. CT2 and other expressions in current and frequent use.

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American Radio Relay League (publishers)
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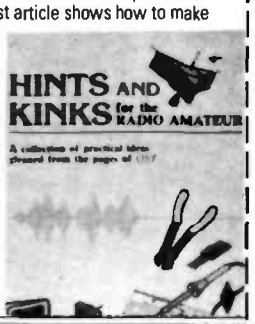
The best practical ideas straight from the pages of *QST*, the ARRL magazine, brought together in one publication. The 12 chapters cover such diverse topics as antennas, c.w. computers, p.s.u.s, portable operations and testing.

You'll find hints about modifying commercial rigs to make them even better and ideas about making your own circuit boards. To help those who have to use 'the kitchen table' - the first article shows how to make an operating desk from covered chipboard!

The book tells you how to modify an antenna system to suit your own location. Then you learn how to feed the system with balanced feeder and make your own balun transformers. Then you find out more about traps, trees and toroids.

This book is so full of ideas that it would take almost as many pages to describe as there are in the book itself. A highly recommended source of information for your bookshelf.



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Feature

Circular And Square Loop Antennas

Beginning in this issue Fred Judd G2BCX looks at loop antennas and examines both the circular and square forms.

This feature is concerned with vertical single-turn square and circular loop antennas which, relative to the wavelength of operation may be considered large or small. In order to function efficiently for receiving, or transmitting, or both, this type of antenna must be either self-resonant or tuned to resonance for an operational frequency within a given frequency bandwidth. This includes so-called 'magnetic' loop antennas for h.f. bands operation.

Early Loops

One early reference to the use of loop antennas for receiving may be found in the 1927 edition of the *Admiralty Handbook of Wireless Telegraphy*. Though Heinrich Hertz might well have been the first to use a self-resonant circular loop antenna for receiving during his experiments with 'wireless waves' in 1888. (*PW* December 1988).

A vertical circular loop antenna has defined directional properties. When used for receiving it may be orientated as to intercept a maximum or minimum portion of an incident radio wave. Also the magnitude of the induced signal is increased as the area (πr^2) of the loop, is increased, or the number of turns are increased. At low, medium and high radio frequencies the physical dimensions of a loop are usually small compared with the wavelength, so it becomes necessary to tune it to resonance with parallel capacitance in order to obtain maximum efficiency.

The induced r.f. voltage from a passing radio wave is maximum when a loop intercepts the maximum number of magnetic flux lines. That is when the field is normal to the plane of the loop as illustrated in **Fig. 1.1(a)**. Because of this, vertical loops of small diameter (or area) respond to a vertically polarised wave travelling in the direction of the plane of the loop. If the loop is rotated through a right angle the magnetic flux no longer couples with the loop and the received r.f. signal falls to zero. The signal reception pattern, therefore, has a figure-of-eight shape, **Fig. 1.1(b)**.

Very Small Loops

Untuned loops of very small circumference, e.g. a few hundreds of millimetres diameter and not directly related to the wavelength at operational frequency, are useful as 'search loops'. These may be used to pin-point a source of radio interference that is otherwise known only approximately. I used a small loop of this nature to find the absolute point where harmonics, generated by a 2kHz pulse modulator, were occurring from an otherwise screened microwave marine radar equipment. The harmonics were causing severe interference to a number of the ship's h.f. radio communication channels.

Small loops of this nature can also be used as a pick-up device. Coupled to a suitable detector and meter they are suitable for checking current and

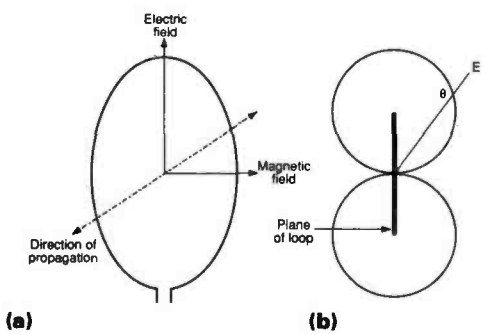


Fig. 1.1: (a) **The relationship between electric and magnetic fields in a small receiving loop antenna.** (b) **The polar 'pick-up' pattern of this loop (see text).**

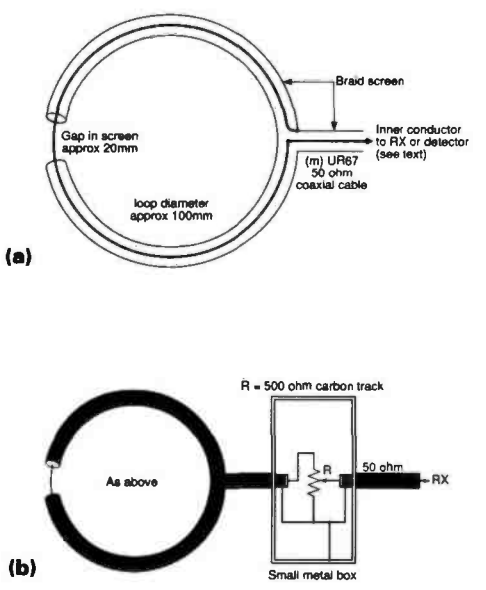


Fig. 1.2: (a) **Construction of a small 'search' loop.** (b) **The attenuator described in the text.**

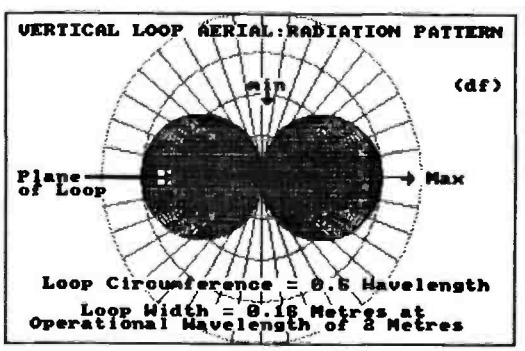


Fig. 1.3: Computer produced polar radiation pattern of a small circular loop.

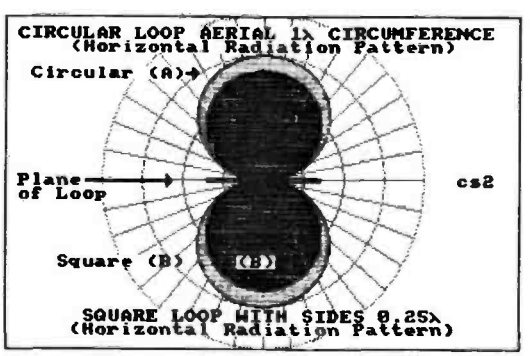


Fig. 1.4: Computer produced patterns of: (a) **circular loop antenna one wavelength in circumference.** (b) **a square loop with sides λ/4 long.**

voltage distribution along a linear antenna, or standing waves on a transmission line. Search loops are usually almost completely screened and may be coupled to the antenna input of a reasonably well screened portable receiver via a short length of low impedance coaxial cable.

A small search loop can be made from coaxial cable as shown in **Fig. 1.2(a)**. If the receiver used has no r.f. gain control, a suitable simple attenuator, as in **Fig. 1.2(b)**, may be connected at the loop antenna, or at the receiver normal antenna input.

Small Self-Resonant VHF Loops

Circular loop antennas with a circumference of 0.5λ and self-resonant at operational frequency, radiate (or receive) vertically polarised waves. The pick-up and/or radiation pattern is a figure-of-eight (cosine) with sharp nulls at 90° to the plane of the loop as in **Fig. 1.3**. These have proved successful for direction finding in v.h.f. 'Foxhunts' when the transmitter is normally vertically polarized. Constructional details for a 144MHz band direction finding loop were given in *Out of Thin Air* §. Provision is made for obtaining minimum v.s.w.r. so it can also be used for transmitting over short ranges.

A self-resonant circular loop one wavelength in circumference also produces a figure-of-eight radiation pattern. Radiation is *horizontally* polarised and in this case, it is a maximum at 90° to the plane of the loop. The nulls are therefore in line with the plane of the loop as in **Fig. 1.4**. Used for reception the pick up pattern and polarisation make it useful for direction finding when the incoming signal is also horizontally polarised. Incidently, such loops can also be equipped with a sensing antenna connected to the loop (in anti-phase) to change the pick-up pattern to a cardioid, i.e. a pattern with a single null for determining the general direction of a signal with respect to the loop.

A Loop Beam Antenna

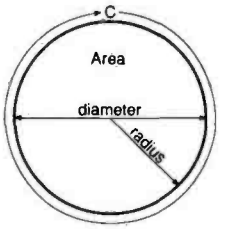
A circular loop with radiation pattern as in **Fig. 1.4** may also be employed as the driven element, when, with a passive loop reflector or director, this can become a compact v.h.f. beam antenna. A design known as the 'Ring Beam For The 144MHz Band' (measured forward gain a little over 8dBd) may be found, with full constructional details, in *Wires and Waves* §.

Omni-Directional VHF Loops

Self-resonant, omni-directional circular loops are little used now but were popular at one time for v.h.f. mobile operation. One design, 0.5λ in circumference and known as a 'Halo', operates horizontally and is suitable only for transmitting and receiving horizontally polarised radiation. Details on this antenna may be found in most books dealing with antennas.

Square Loops

Square loops were more generally known as 'quad' beam antennas and used as a driven element or as passive reflector and directors, ref: *Cubical Quad Antennas* §. The far field radiation patterns of square or circular loops with the *same area* are identical when the loops are small with respect to the working wavelength. This property depends on the area of the loop only and its shape has no effect



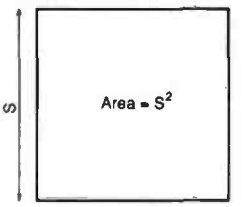


Fig. 1.5: The relationship between sizes and areas of both types of loop (see the text for more information).

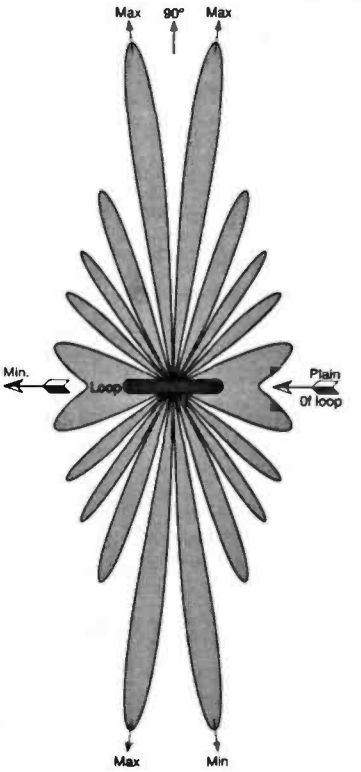


Fig. 1.7: Polar radiation pattern of a circular loop antenna with a circumference 15.7λ long. (from *Antennas* by J.D. Kraus Ph.D)

Fig. 1.6: Polar radiation pattern of a circular loop antenna one wavelength in diameter.

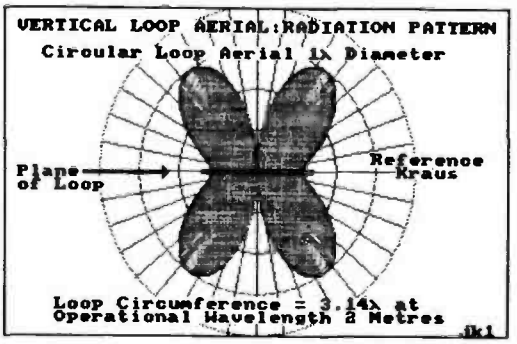


TABLE 1.1:

Sizes of circular and square loops with similar enclosed areas.

Area (m^2)	Circum (m)	diameter (m)	length S (m)	S x 4 (m)
0.02	0.5	0.159	0.141	0.564
0.029	0.6	0.191	0.169	0.676
0.039	0.7	0.223	0.197	0.788
0.051	0.8	0.255	0.226	0.904
0.064	0.9	0.286	0.254	1.016
0.08	1.0	0.318	0.282	1.128
0.096	1.1	0.350	0.310	1.240
0.115	1.2	0.382	0.339	1.356
0.134	1.3	0.414	0.367	1.486
0.156	1.4	0.446	0.395	1.580
0.179	1.5	0.477	0.423	1.692

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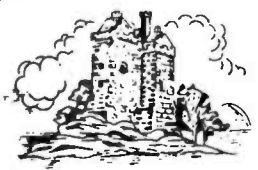

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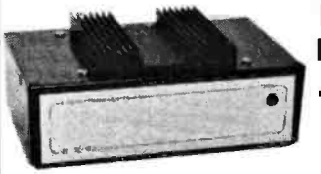

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6BA7	5.00
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6BH6	2.50
6BJ6	2.25
6BN6	2.00
6BQ7A	3.50
6BR7	6.00
6BR8A	3.50
6BS7	6.00
6BW6	6.00
6BW7	1.50
6B26	2.75
6C4	1.25
6C6	3.50
6C06A	2.50
6CD6GA	5.00
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6CG7 GE	5.25
6CH6	8.95
6CW4	8.00
6D6	3.50
6DQ6 GE	12.00
6DQ6B	4.75
6EA8	3.00
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6F6	3.00
6GK6	3.50
6H6	3.00
6HS6	4.95
6J5	4.50
6J6	2.00
6J7	4.75
6J36A GE	9.50
6JE6C	6.50
6JS6C GE	11.25
6K6GT	2.75
6K7	3.00
6K8	3.00
6KD6 GE	11.95
6L6G	7.50
6L6GCSYL	9.00
6L6GC Siemens	4.50
6L6GC GE	9.50
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6Q7	3.75
6RHH8/6KN8	12.00
6SA7	3.00
6SC7	2.75
6SG7M	2.50
6SJ7	3.25
6SK7	3.50
6SL7GT	3.00
6SN7GT	3.00
6SS7	2.75
6U8A	2.25
6V6GT	4.25
6X4	3.00
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12BH7A GE	6.50
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30P4	2.50
30P19	2.50
30PL13	1.80
30PL14	1.80
572B	70.00
805	45.00
807	3.75
811A	18.50
812A	52.50
813	27.50
8417 GE	11.50
866A	35.00
872A	20.00
931A	18.50
2050A GE	9.95
5763	10.00
5814A	4.00
5842	10.00
6080	8.00
6146B GE	15.00
6550A GE	15.00
6883B GE	15.95
6973	8.75
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when the loop is small as stated. The radiation pattern of a square loop is as shown in **Fig. 1.4(b)**. Note that the gain at maximum directivity is slightly less than that obtained with a circular loop.

There is further relationship between small circular and square loops which stems from the fact that if the length of a side (S) of a square loop equals $\sqrt{\pi}$ x (radius of a circular loop with the same cross sectional area) then the area of both loops will be the same. Refer to **Fig. 1.5**. The radius (r) of the circular loop is calculated from $C/2\pi$. The area enclosed by the loop is πr^2 although the square loop has a circumference (4 x S) greater than the equivalent circular loop. A selection of examples are shown in **Table 1.1**. However, when the circumferences are the same, the circular loop, by virtue of enclosing a greater area, will have slightly higher directivity gain, as shown previously in **Fig. 1.4.**

If a small circular or square vertical loop antennas, fed at the base, is rotated through 90° (in the plane of the loop) so that the feed point is on a side, then the polarization of radiation will be changed from vertical to horizontal.

Large Dimension Loop

As the diameter of the circular, or the width of a square loop becomes large in terms of wavelength at the working frequency, four major lobes are produced much the same as with long wire antennas one or more wavelengths in physical length. Diagram **Fig. 1.6** illustrates the horizontal radiation pattern of a circular loop one wavelength in diameter, or $\pi\lambda$ in circumference. It shows a four lobe pattern similar to that of a one wavelength linear antenna but without side lobes.

Considering linear antennas several wavelengths long (working frequency), there are still four major lobes and each may have considerable directivity gain. There will also be a variety of side lobes depending on the length of the antenna. The far field radiation patterns of circular loops several wavelengths in circumference, also show four major lobes. These are at shallow angles either side of 90° to the plane of the loop, with a number of side lobes at other smaller angles as in **Fig. 1.7.**

A square loop with sides each 4.4λ long, has a radiation pattern consisting of two main lobes with

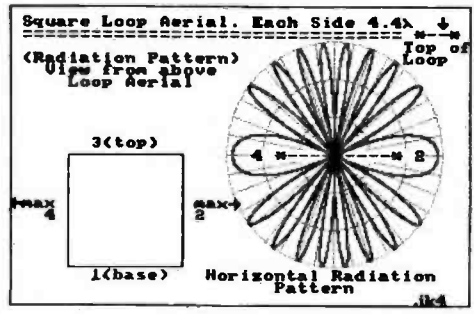

Fig. 1.8: Polar radiation pattern of square loop with sides 4.4λ long (computer produced).

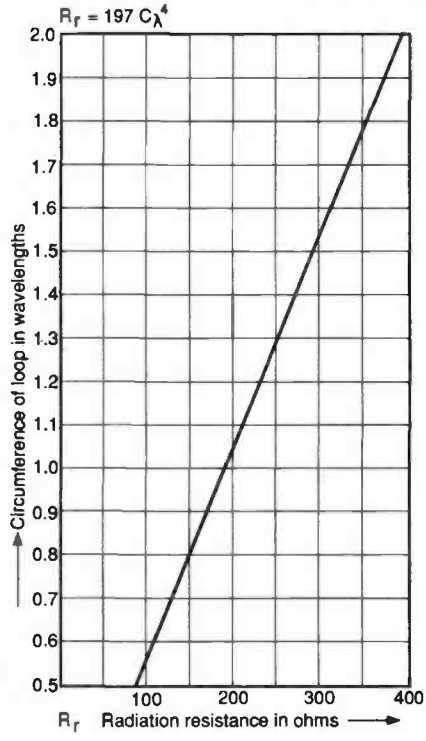

Fig. 1.9: Radiation resistance of small loops.

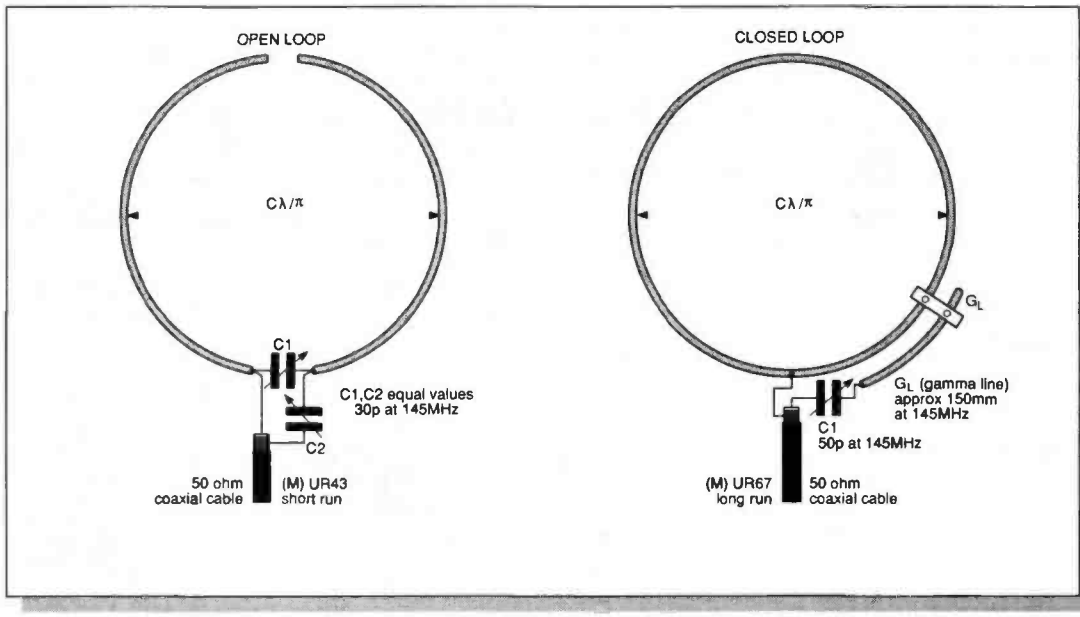

Fig. 1.10:
(a) A simple method of attaching a small open resonant loop with a 50Ω coaxial cable.
(b) A 'gamma' matching line, used on a small closed loop antenna fed as above.

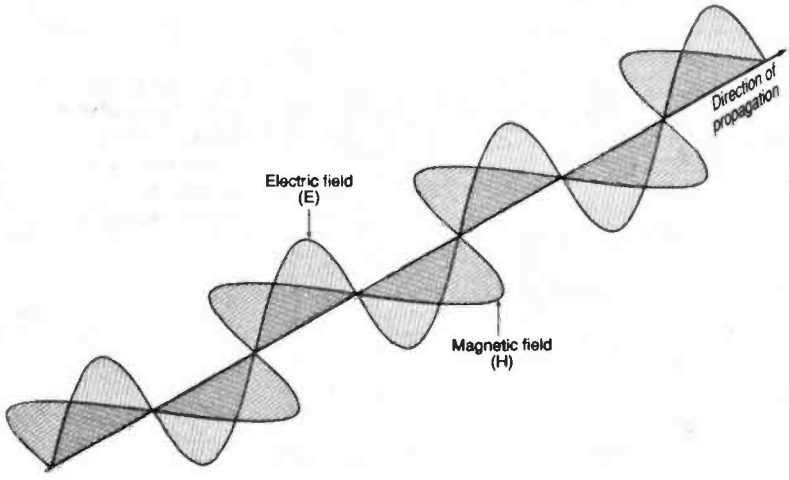

Fig. 1.11: The electric and magnetic components of an electromagnetic wave in free space.

some directivity gain, plus a number of side lobes with approximately the same magnitude as the main lobes in the computer produced radiation pattern **Fig. 1.8.**

Feeding Resonant Loop Antennas

The radiation resistance for a small circular resonant loop antenna (also approximately the same for small square loops) may be found from the graph **Fig. 1.9.** A loop even as small as $\lambda/2$ in circumference would not match directly to 50Ω coaxial cable. Two matching methods are illustrated in **Fig. 1.10.** Method (a) being suitable for loops $\lambda/2$ circumference (as the v.h.f. d.f. antenna mentioned earlier).

The gamma match **Fig. 1.10(b)** is more suitable for larger loops (circumference $\leq\lambda$). It is also suitable for quarter-wave, or larger, square loops. Small circumference tuned loop antennas for h.f. band operation, known as 'magnetic' loop or compact h.f. loop antennas, will be dealt with in a later issue of the magazine.

Meantime, for a better understanding of the radiating properties of the various types of loop antenna and for that matter all antennas, we delve a little into the discovery and principles of electromagnetic radiation.

Electromagnetic Radiation

When an electric current flows in a conducting element, which may be part of a dipole or loop antenna, or indeed any other kind of antenna, then three fields are produced by that current. One is the *induction field*, first discovered by Michael Faraday (1832) which finds application in low frequency (50Hz and audio frequency) transformers and in radio frequency tuned circuits (r.f and i.f.) when a voltage is induced in one coil by current flowing in another.

However, James Clerk Maxwell interpreted the Faraday discovery in another way. He found that the changing magnetic field created by one coil produced an electric force, or field which, in turn, caused a current to flow in another (adjacent) coil. In other words a changing *magnetic* field creates an *electric* field. Maxwell similarly interpreted Oersted's experiment, q.v. that a changing electric field creates a magnetic field.

From these interpretations, Maxwell also showed mathematically that at any point in space, distant from the source, the electric and magnetic fields are mutually *self-supporting* and co-existent (i.e. inseparable and can only exist in this manner). Hence the term electromagnetic field. At a distance, this field is commonly referred to as the *far field*. Maxwell also showed that any electromagnetic disturbance travels through space and that the velocity of this propagation is:

$$c = \frac{1}{\sqrt{\epsilon_0\ \mu_0}}$$

where ε_0 is the permitivity (electric) of space μ_0 and is the permeability (magnetic) of space. When the appropriate values of ε_0 and μ_0 are substituted in the above equation, c is equal to the *velocity of light.*, aproximately 300 000 000m/sec.

The electric and magnetic components of an electromagnetic field can only exist mutually perpendicular to each other (in free space) and perpendicular to the direction of propagation as shown in **Fig. 1.11.** These components are simply separate but equivalent manifestations of one and the same thing, namely, the electromagnetic field. In some instances it may be easier, or more convenient, to work out a problem in terms of the electric field and at others in terms of the magnetic field. The choice is made for simplicity or convenience, and should not be interpreted as reality since the electric and magnetic fields are always together and inseparable. You can't have one without the other!

The second part of this feature will deal first with the near field of radiation (applicable to all transmitting antennas) and continue with the function and performance of 'magnetic' or compact loop antennas for h.f. bands operation.

§ Many of the publications quoted in this and other articles may be available from the *PW* Book Service. Please consult the *PW* Book Service Pages for the latest information and prices.

TO BE CONTINUED

'RAD COMM' for the Radio Amateur

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PACKET PANORAMA

This month Roger Cooke G3LDI continues with the finer points of packet working

Another month passes by - time goes so quickly these days, I am fighting old age but obviously not alone in that respect (see last paragraph for more info).

I wish something could happen with the h.f. bandplan. From the comments received both on packet and the landline, there are some that favour them being sorted out. To that end, I have written to the secretary of BARTG with a concensus of suggestions as to a fair share of the bands for digital modes. I would emphasise once again that it really is imperative that YOU add your written support, before the next IARU meeting.

Forwarding Schedules

As promised a while back I am starting with the forwarding schedule of GB7GUR, owned and operated by Chris GU4YMV, in Guernsey. This can be found in **Fig. 1**. Chris is obviously very busy on h.f. with two rigs going! Tables such as this can be very useful for routing of h.f. traffic, sometimes with a creditable time-saving, especially with the 3.5MHz link. I hope to be joining him soon on that band, to try to alleviate the problem of south-bound traffic, especially bulletins, from Scotland. John GM4IHJ, originates 'Satgen' bulletins that never seem to arrive down south. He now sends them as private mail addressed to me for re-direction. This should improve when I activate the 3.5MHz link.

Joe Kasser, the author of the very popular terminal program, 'Lan-link', sent news of another of his programs, 'What's Up'. The information is given below regarding obtaining a copy.

Now that DOVE is sending TLM again, I'm updating 'What's Up' from 0.42 to a newer 0.5X version. This version should be released sometime in September.

This version runs on the PC only and will contain decode display data for Fuji-OSCAR 20 (and Fuji-OSCAR 12 if someone provides some data on disk). If you'd like to see What's happening up there you can get a copy of the new 'What's Up' by sending a formatted disk containing at least 100Kbytes of telemetry from any OSCAR satellite together with a mailer and return postage to:

Joe Kasser W3/G3ZCZ
11421 Fairoak Drive,
Silver Spring, MD 20902.

All telemetry received will be examined and then forwarded to AMSAT's archives. If you are on my mailing list, I'll send you a copy of the new version. If you'd like to send me a packet message (G3ZCZ@N4QQ) expressing interest in receiving the new 'What's Up' and telling me which satellites you like to copy telemetry from and what you do with the telemetry, and provide some suggestions for features you'd like to see in 'What's Up'. You never know, you may see them there.

Due to the deliberate QRM on the forwarding channels by RTTY, continuous carriers and, when on 14.098MHz, other packet stations assuming one of the forwarding stations callsigns and forcing a disconnect, Jim 4X1RU has put out this bulletin. It is hoped that it will help to explain exactly what the forwarding BBS stations are trying to achieve and also give a little education at the same time.

Subjects:

1. Use of the W-4X\GB7-Transatlantic Gateway.
2. Request QTH SERVER available in the US
3. 'White Pages' (WP) SERVER available in the US
4. QRM 1. Use of the W-4X\GB7-Transatlantic Gateway.

Use of the Gateway

This is an h.f. circuit operating daily between 4X1RU (in Herzlia, Israel) and N4QQ-1 (located in McLean, Virginia, USA) and N4QQ-1 and GB7LDI (in Norwich, England). The call N4QQ belongs to John, but the station N4QQ-1 is located at the QTH of and run by Art KB4ZJ.

The W-4X link is the only one operating between the Americas and Europe, the Middle East and Africa, except for GB7LDI (Roger G3LDI) who handles all the UK traffic. Stations in Australia working with stations in California handle Asian traffic.

Due to technical limitations on this link, which is 9400km long, we've had to restrict message sizes to no more than 2Kbytes (including headers) when the message arrives at either end of the link. For messages longer than this, please split them up into smaller ones.

The local BBS of the addressee MUST be present. If not, your message may not be deliverable and will just be another source of QRM.

When you sign your messages, ALWAYS sign your callsign and YOUR local BBS. Let the other station know where you want to get your mail. It may not be the same BBS that you sent your message. Make this a matter of habit so that you never forget. For example: 4X1AT @ 4Z4SV, where 4Z4SV is 4X1AT's local BBS. It's to your advantage.

Please do not send repetitive messages. If you wish to send the same message to more than one address, send them as follows:

From Europe:
SP REFILE @ N4QQ
or from the Americas:
SP REFILE @ 4X1RU and state in the message where you want individual messages sent. The local SYSOP will refile for you thus saving transatlantic link time.

14MHz
SM7DLZ MAIL, BULLETINS
SM5BKI MAIL, BULLETINS, HAS BACK UP LINK TO USA
OZ5BBS MAIL, BULLETINS
IK4BLV MAIL, BULLETINS
LA6HX MAIL ONLY
4X1RU MAIL ONLY
ALSO BACK UP FOR USA MAIL
EXPERIMENTAL LINK WITH GB7FRI MAIL, BULLETINS
EA8RT, BULLETINS, SOME MAIL FOR EA8
IT8PKB BAK UP FOR I MAIL, NORMALLY GOES TO IK8BLV
HOPING TO SET UP A LINK TO N4QQ
3.5MHz
GB7ERA MAIL BULLETINS, USED AS BACK UP TO MAIN VHF/UHF. LINKS
GB7BNM DITTO
GB7KAW EXPERIMENTAL LINK
GB7ZZZ EXPERIMENTAL LINK
GB7FRI MAIL, BULLETINS
2 HF. RIGS, 24 HOUR OPERATION (UNTIL GB7GUR ISSUED, 80M ATTENDED)I AM ALSO LOOKING FOR SOMEONE TO CARRY OUT TEST ON 40M. SHOULD BE GOOD FOR DAYTIME INTER-UK LINKS.

Fig. 1

QTH Server

Available in the US, it is possible to ask for individual addresses of amateur stations by using the facilities offered by WA4ONG. The following is an explanation of its use: In order to reduce the network loading, the WA4ONG BBS REQQTH feature has been enhanced to allow requesting more than one call QTH per message!

The format is:

SP REQQTH @ WA4ONG [Note this must be an 'SP' message Enter Subject for Msg # 9999]

WB3ABC,WA4ONG,WB0TAX K4NGC @W3IWI. Note use only commas or spaces. No full stops. Send message. Use CNTL-Z or /EX to end: (^Z) Anything placed in the message field will be discarded.

PACKET PANORAMA

White Pages

The 'White Pages' (WP) SERVER is available in the US. It is possible to obtain the local BBs of stations in the US using the 'White Pages' SERVER available in California, as follows:
Subject: White Pages Documentation
Bulletin ID: K0CM00883
R:870730/1257t @:WB0TAX #242 <K0CM. [Tidewater BBS, Hampton, Va.]

WP stands for 'White Pages' and is a directory system for packet radio mailboxes. It allows remote query and updating of a database that lists the users of RLI-compatible mailboxes and their home BBS. To use the program, a message is sent to 'WP' at W9ZRX. The message can have several lines (a single message can contain several queries/updates), but each line must have one of the following formats: <callsign> QTH? <callsign> QTH <mailbox> DE <callsign> @ <mailbox>.

The first form is a query and will return the home BBS of the person with the given callsign. The second form adds or changes the entry for the given callsign, storing his home mailbox with his callsign. The third form provides a return address for the requested information. If the message does not contain a line of the third form, the WP program will try to get the return address from the forwarding headers. This will work as long as the mailboxes in the forward path use the NK6K format for forwarding headers. Replies will be sent to the originating station at the mailbox specified as described above.

The reply will be generated a few minutes after the message is received at W9ZRX. Currently, the WP program is run every 15 minutes, so that is the maximum wait for a reply. Of course, queries sent from other mailboxes will have to make their way through the forwarding system, as will the reply.

For example, suppose you wanted to find out where KE6AD was located? You would send a message to WP like this:

Msg# TR Size To From @ BBS Date/Time Title 2005 PN 11 WP W9ZRX 0319/1207 A query ke6ad qth?

Notice that case is insignificant within the message. If the station was not on file, WP would send you a reply that looked like this:

Msg# TR Size To From @ BBS Date/Time Title 2006 PN 74 W9ZRX WP 0319/1207 Reply to WP query KE6AD no record, sorry. 73 DE WP @ W9ZRX

If you happened to know that KE6AD was at N7EQN, you could tell WP that. Let's say you also wanted to look up N7EQN. The message would look like this:

Msg# TR Size To From @ BBS Date/Time Title
2007 PN 27 WP W9ZRX 0319/1208 ke6ad qth n7eqn ke6ad qth n7eqn n7eqn qth?

The reply from WP would be:

Msg# TR Size To From @ BBS Date/Time Title
2008 PN 85 W9ZRX WP 0319/1208 Reply to WP query KE6AD QTH N7EQN QSL TNX N7EQN QTH N7EQN Redwood City, CA (SKYWARN) 73 DE WP @ W9ZRX. The database is in a growing state so it may not contain the callsign you're interested in. If you wish to add an entry, please make sure that the information is accurate.

Alan G0KRU at the Eastnet barbeque.

QRM

I only request the following from those of you who are h.f. operators. If you hear the link in operation, please do not use the same frequency. Do not bounce your signal off N4QQ-1, 4X1RU or GB7LDI. Do not call these stations since both are programed to respond to registered BBSs only. If you hear another station doing these things and it is a local station to you, please contact them 'off frequency' and POLITELY ask them for their co-operation and explain what you are trying to accomplish.

Message Ends

Finally this month on a much lighter note, there has been a change in the British National Costume. Spotted at the Eastnet Barbecue is Alan G0KRU. Unfortunately this year he forgot his Australian sun-hat, complete with corks on strings! A great day, weather superb and attended by about 75 people. Hope to see you there next year!

73 and happy packeting from Roger G3LDI, @ GB7LDI, QTHR or Tel: (0508) 70278.

Lower Frequencies in Smaller Gardens Part 2

Feature

To round of his article on tackling lower frequencies, Paul Essery GW3KFE takes a careful look at calibration and testing.

I always take care with calibration. For s.w.r. measurements, my s.w.r. meter is checked in the following manner: First, at d.c. I measure the resistance of the big carbon resistor labelled 100Ω, to see if it is still 50Ω. No, I'm not nuts, I brought it as a 100Ω resistor and it turned out to be 50Ω! Secondly, I measure the s.w.r. as seen by my three different meters.

All will be slightly different, but so long as all three give the same answers as before, using the same load, I know none have changed since I last measured. All the results are recorded in the notebook.

Remember, no radio amateur has all the facilities to measure any antenna parameter accurately for themselves. To do that the amateur must borrow some professional tackle and even that isn't always trustworthy!

Testing Time

So - once the wire was up, I made s.w.r. measurements every 50kHz up the band of frequencies being tested. At the same time I was monitoring the peak-to-peak r.f. volts with an oscilloscope across the 50Ω line between a.t.u. and transceiver.

At each frequency tested, the field-strength meter readings were also noted. I also had a note of the a.t.u. settings. None had any 'meaning', save that if anything changed I would know.

A point to remember here is to be sure to stand in exactly the same place when taking readings and to record this detail in the notes. It's surprising how much variation in field-strength can occur if you aren't careful!

The system was now ready to operate 'as is' for a while to get a feel for behaviour on the bands. In the notebook I had enough data to go back a step if needed. These 'measurements' are meaningless in real terms, but they do provide data should one wish to reproduce the circumstances at a later date.

Practical Results

The results of the period of operating on 3.5MHz in this fashion showed that firstly, the antenna tended to favour the south-east. This was not surprising, since this direction provided the clearest 'take off', with fewer buildings and lower hills. The earth radials also spread out in this direction. However, it was at least trying its best as far as other directions were concerned!

Losing Power

Secondly, in wet weather, because of the system's close proximity to the building, I could see distant changes to the figures already recorded, implying that I was losing some power. However, it didn't seem to be significant in terms of reports. So far, I haven't had the opportunity to try it out in snow, but I would expect to find further changes to the readings, indicating greater losses.

On 7MHz, while it was a little better than the previous arrangement - I'd never been able to get on the band before moving to this QTH and from that point of view it was super!

Further Progress

I was confident that I could improve the system even more. I could add lots more copper wire to the ground side of the system by way of as many radials as possible, all parallel with the existing ones. I even managed to hide a couple of 44m radials above ground and behind some of the local authority ground-cover shrubbery.

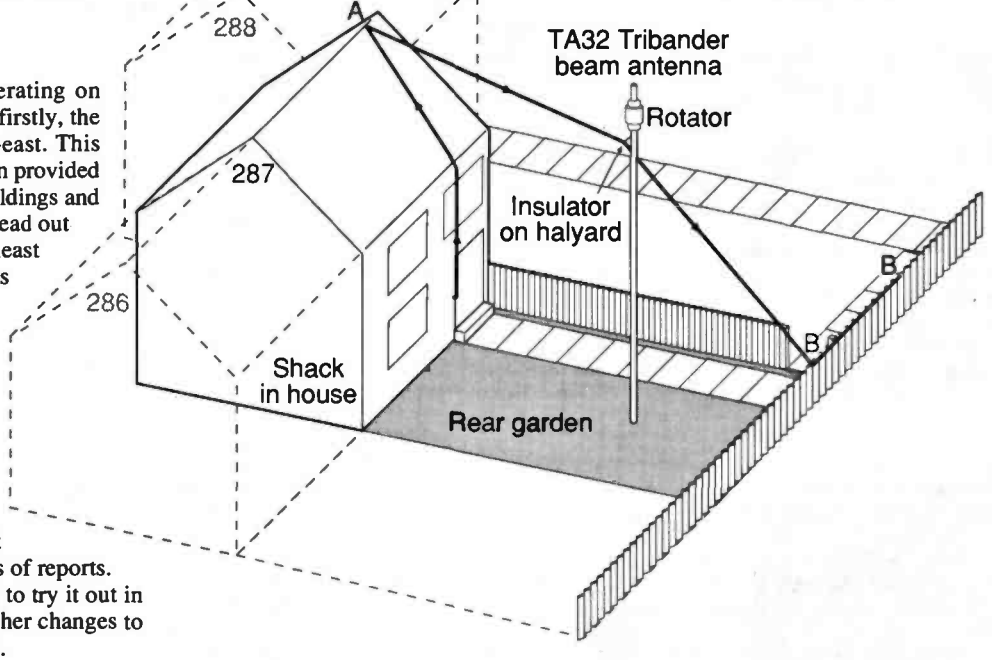
Another idea was to try loading the system for each band. I could also take the end away from a.t.u. to live outside, using a little inductance between antenna and earth, so that the coaxial feed-back to the a.t.u. indoors was reasonably matched over its short length.

Notice that if you use more than one resonant radial in this fashion, it is more important that the two radials are both the same length electrically. This is, if anything, more important than getting an individual radial exactly resonant, if you are to avoid unwanted upwards radiation.

Laying Radials

I have already mentioned how to lay lots of radials just below ground. Despite this, as it's so important I'll briefly mention it again. You should just cut a small trench long enough to take the wire length, drop the wire in the trench, walk along to 'heel' the trench soil flat and it's done.

Don't fret too much about the length, the odd bend, what gauge of wire to use, bending a radial round the apple tree or whatever. But do



Editorial Note: We apologise to 'Andy The Light' GW3UUZ, - referred to by Paul Essery - whose callsign was turned into GW3VVZ, due to misinterpration of dot-matrix 'u' and 'v' computer printed letters. We also apologise for transferring G3VVZ from the south of England to Wales without his permission or knowledge! Editor.

think carefully before you start so you end up with the most useful combination. If you have approximately 150m of wire, then you will find one long radial less effective than using twenty lengths of 10 metres.

One clever method, adopted by G3BDQ, uses wire netting. First, you should mow your lawn closely. Next you should unroll the netting, lay it out flat and staple into the ground so it stays flat!

The grass will then grow through the netting, and the mower will pass over it easily if you have laid the netting carefully. If you have room for several lengths of netting you can solder the separate ends together.

Don't make the mistake of going to all this trouble and then using thin wire to run the earth to the shack! A bit of old coaxial cable with inner and outer strapped together will serve well. Better still, you could use some of the very heavy duty flexible strapping used for earthing in cars. Not much point in a 1Ω earth connected to the rig through 10Ω of lead resistance!

Looking At Loading

In my system, the vertical section of the wire crossed in front of an upstairs window. I brought the wire in, secured it firmly and cut it open so that I could add a loading coil or capacitor.

Remember that a loading coil will make a short wire 'look' longer and by the same token if the antenna 'looks' too long, a bit of capacitance could make it look a bit shorter. As it happened, I had enough to resonate as a quarter-wave vertical on 7.050kHz, so a bit of loading inductance was arranged to resonate on 3.5MHz and a bigger coil prepared for 1.8MHz.

Band Coverage

Even a full-size dipole can't cover the whole of such bands as 1.8 or 3.5MHz with a reasonable s.w.r. Thus, I have a problem. For the 1.8MHz band my loading coil is arranged to give resonance at 1810kHz. The coil windings can also be 'shorted' to resonate the system at higher frequencies up the band.

On 3.5MHz I have two favourite spot-frequencies and only these two are catered for, plus a small band on either side of these frequencies to overcome QRM situations.

On 7MHz, the system covers this narrow band adequately. Looking from the roadway next to my house, the antenna system is quite invisible. This was achieved by replacing the 'gardening string' with clear nylon monofilament as used by fishermen.

Results

The system works well, bearing in mind that I thought I would be QRT when I moved to this QTH. My transmissions don't dominate the band by a long chalk but the system gets out as well as can be expected and has given QSOs outside Europe on all three bands.

On the v.h.f. bands even the indoor beam, although low, is quite successful. In other words I can operate with pleasure on six bands, and I have v.h.f. 'chat-channels' on 144 and 432MHz.

Never Give Up

If I happened to lose my outside two-element beam, I could still operate all eight bands with reasonable results. As for 10, 18, and 24MHz, my few forays on those bands have been achieved by various 'bodges'. Don't give up heart if you have a tiny garden. You might not have a world-beater of a signal, but you should be able to make DXCC or even 5BDXCC, if you 'work on it'! **PW**

Wanna Swap!

Have Eddystone speaker type S688/A. Would exchange for National table model speaker (v.g.c.). I am also looking for a HRO receiver for spares. **Tel:** Bill on 041-649 4345.

Have six-band Eddystone v.h.f. receiver with very large dial. Would exchange for a Hallicrafter or other valved h.f. all-band set. **Tel:** F. Walker on Cambridge (0223) 241088.

Have Matsui MR-4099 all-band receiver and JVC stereo tuner-amplifier both in as new. Would exchange for an FRG-7 receiver, Midi gear or w.h.y. **Tel:** Seon Smyth on (0436) 71181.

Have Yaesu FT-290R MkI all-mode with microphone, NiCads, flexible and telescopic antennas. Valued at about £225. Would exchange for a synthesised 430MHz mobile rig with a minimum of 10W output. **Tel:** Kevin on (0782) 314383.

Have AR950 100 channel scanning receiver, less than one year old. Would exchange for an h.f. portable scanner or w.h.y. **Tel:** Alan on (0223) 412236.

Have Icom R-100 receiver 0.5-1800MHz a.m./f.m./s.s.b. Has 100 memories and built-in pre-amplifier. Would exchange for NRD-515/525, Icom R-71 or Lowe HF225. **Tel:** Ian on Derby (0332) 668272.

Have Bimetallic Thermograph MkII Met. Office ref: No. 1123 with ink bottle and charts. Plus PCR2 general coverage receiver with p.s.u. and spare valves. Would exchange for a general coverage receiver such as EC10, EB35 or similar. **Tel:** Peter Beardsmore on St. Albans (0727) 839908.

Have 2.5m g.r.p. dingy with 4h.p. Mercury outboard motor, has run for only 18 hours. Would exchange for v.h.f. scanning receiver, h.f. a.t.u. or w.h.y. **Tel:** Tony on (0272) 563491.

Have 24GHz waveguide, directional couplers, mixers, bends, attenuator, twists etc. Also have 1920's portable four valve receiver with built-in antenna and speaker, works well. Would exchange all or some for a good camera. **Tel:** Mann on Cambridge (0223) 860150.

Have Trio TS-430S, Yaesu FTV-102 transverter wired to suit the TS-430S. Has 50 and 144MHz fitted. Also Daiwa 30A p.s.u. Yaesu FT-790R, three Microwave Modules linears, 432/100, 144/30LS and 144/100, Yaesu FC902, Fortop TVT-435 transceiver plus antennas and camera. Would exchange all, or some of above for a good speedboat. **Tel:** Bob G4TKP on (0332) 383442.

Have Yaesu FT-690R MkII in boxed mint condition, plus FT-290R MkI. Also NiCads and charger in g.w.o. Would exchange for a Yaesu FT-726R in g.w.o. and with 50 and 144MHz boards fitted. Tel: John GM1ZVJ on Edinburgh 031-331 3360.

Have many World War two radio sets and accessories. Would exchange for WS No. 18 MkII/MkIII or WS No. 68. **Tel:** Brian on (0757) 708805.

Have RN Electronics 144/50MHz transverter and HB9CV antenna for 50MHz. Also have Sony ICF-7600D h.f. general coverage receiver and Datong D70 Morse-tutor. I am looking for an Optoelectronics hand-held frequency counter or w.h.y. **Tel:** Graham G6SUQ on (0494) 424227 during office hours or at 42 David Close, Harlington, Middlesex UB3 5EA.

Back-Scatter

HF Bands

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

It seems a mere few days ago that yours truly was grousing about hot weather; now autumn has descended upon us with a vengeance, causing a wary eye to be cast upon the antenna farm such as it is. So far the only problem has been the wind slewing the beam round a few degrees upon the stub mast - something which happens every year to some extent, and which brings to the mind's eye visions of gear-teeth stripping as they try to hold things steady against the fury of an equinoctial gale....not the pleasantest last thought as I drop off to sleep at night!

Conditions

People say things have been quite reasonable, but whenever the columnar rig is operated, I seem to find dead bands or local QRM in due accord with Sodde's Law; putting things another way, happy chances seem to be in short supply around this QTH. No doubt about it, the sooner I have some e.m.c. legislation with teeth, plus a mite of enforcement, the better!

Forthcomings and Phoneys

Thanks to all for input in this area and in particular *K1AR's Contest Calendar*, *The DX Bulletin* and *DX News Sheet*. Perhaps the first item to be mentioned is that the Bangladesh authorities not only won't permit amateur radio operation, but they will accept donations of amateur radio equipment, provided they are prepared to pay a fee for offering the donation and pay tax on it and a fee and tax on the equipment! About all we can say about that is that the S2 authorities have a minor official with a bloody cheek, and we hope no one is prepared to indulge this unprincipled greed.

The news from USSR continues to be a little puzzling; we hear that various new autonomous republics are being set up with status similar to, for example, Ukraine: notably Tatar and Gagauz areas, which would mean a couple of new DXCC countries.

The sorry state of the Middle East has meant that DJ3TF when he tried for a Tunisian licence, couldn't even get through the security to reach the PTT authorities. Ergo, no 3V8 activity for the moment.

One of the more interesting sidelights on human nature is revealed when one notes that a single station is using various calls in the IOTA net; there seems to be some doubt as to whether this gink is a pirate or not. Whoever it is, we only hope that his name will be made public and broadcast by every DX column around the world.

Hopes of an Albania, ZA, operation seem to have faded away; at the time of writing nothing has been heard from the HA group for some weeks.

On the DXCC front, 3X1SG cards are not acceptable; the same goes for the moment for 7O1AA and 7O8AA QSLs, both the latter being still mulled over by ARRL. On the other hand, all XU8DX cards, including the ones for QSOs with YL operator Sokun can be submitted for credit.

Silent Keys

It is reported that **Gus Browning W4BPD** passed away on August 21 at the age of 81 after a long illness. Older DXers will recall his various DXpeditions back in the late fifties and early sixties. One could almost say that Gus Browning and Danny Weil, the Bournemouth watchmaker, each invented the art of the DXpedition. Gus will be sadly missed.

On August 28, **Richard Hughes G4DZI**, passed away after a short illness to the surprise and shock of his many friends on the DX bands. Our sympathies are expressed to Diana G4EZI, who has said she will keep the G4DZI/G4EZI station up and running for the DX as before.

1.8MHz

Just the one report, from **G2HKU** (Minster) who says he used his s.s.b. to work ON7BW and took c.w. practice upon OL7BTG/P, DJ9KG and OK1HCG. Ted says he hopes that with autumnal conditions coming up, he hopes the S9 noise level with drop a little.

Where's all the DX reportage gone? Surely someone out there uses the band?

3.5MHz

ON7PQ (Kortrijk) mentions that his c.w. managed to raise OH0BT, RL0PY, UZ0WWL, UA9YNG and UL8LYA.

Turning to **G0KRT** (Welling) we find Eric is still using his Lake DTR3 at 1.5W, but now the summer is over he reckons to get on and finish the HW9 rig. Meantime, there were two-way QRP QSOs with G0CHV, G0GJG, G3XBM, G3VFX, G4EHT and GW4KVJ for a first two-way QRP GW contact. In addition Eric hooked DL4BA, GB2WFC, G0IGP, G0IJE, G0KAU, G3INR, G3TLF, G3YLL, G4CAL, G4SQV, G4DNB, G4UZE and ON5AG, all running more power.

Now to **G0HGA** (Stevenage); we have two letters from Angie, since the local postmen sealed the box without clearing it and proceeded to have a one-week unofficial local strike. So, combining the 3.5MHz lists, we find c.w. contacts with Y44NK, IK1FWG, G0HLF, G3JUT, G4AXO, G4ENZ, G4YLQ, G3ZWL and F6BWF.

Now to **GW0HWK** (Wrexham); Mike mentions VK2DZM for a new one on the band, plus a gaggle of Gs and assorted Europeans for makeweight.

7MHz

A close lot the 7MHz addicts, who hug their DX to themselves and don't let on what they are up to! Seriously, there is much of interest to be found, given a decent receiver front-end.

First **ON7PQ** who admits to DF2UU/TF, FM/F2YT, CN2BB, FJ/I4IND, FG5ED, JA2NNF, ZF2PK, KC7EM, AH3C, UM8QDX, K7OQ, VE7SW, SV7/DK9CG, V63AN and ZM7AMO.

G0HGA has about 30W on this band and this when keyed yielded contacts with K1SS twice, K1ZZI, CO2VG, DA1WA, TM1BRE, 4L1QRQ, FJ/I4IND, CU2AK, TK4MI, UL0GWJ, UA9FM, UO5OIV, UC500FS, 4K0ADH, UL8GSAK, UA9MAN and OH9ADV plus the smaller fry.

On to Mike at GW0HWK who notes that LX1NW on the band gave him a new country. Out of the blue came a welcome letter from **Phil G3XAP** (Stowmarket), who wrote a useful series on his trials and tribulations while endeavouring to brew up antennas good enough to obtain a WAC on Top Band a couple of decades ago. Nowadays Phil is to be found on 7MHz c.w. using the transmit half of a KW2000B while receiving with a Racal RA117E. The only real snag with this seems to be the need to keep a fork-lift truck in the shack in case one wants to move it!

Using c.w. on 7MHz netted G2HKU contacts with UL0GWJ, UL8LYA, UW9CP, CM3RA, RV9CFA and LU6EBY.

WARC Bands

First we turn to **9H1IP** (M'Scala); Vince says he managed HA0HW, ZL2BCG, HL1IUA, FS/PA0CRA, V51P, HK5LEX and T5RR. On 24MHz not much was raised due to the conditions on the band, but on August 29 N9AAI, OZ7MY, CT1TM, SM5OMP and DL5BCW were all entered into the log.

G3VWC (Bath) commented that he tried 14MHz for a change and discovered half the USSR calling CQ DX... so he returned to his favourite 18MHz, where he worked VE2PA, VE7QU, VE7SR, NR5Q, KC0AQ, WK0B, KB6NRL, W6VD, W7ELH, W7QK, UI8LA, JA8BB and KL7CYL.

G3ZZG, in the intervals of beating a new electronic typewriter into submission found time to get on 18MHz, where his c.w. exchanged details with 3C1EA (QSL via EA3CJA), 4S8WP, V47NXX, W3TZW, WB2AGT, N5CB, JA2IVY and 7X3DA for a Gotaway. On the s.s.b. front, A92BE was noted.

On 18MHz GW0HWK (Wrexham) mentions HL1TUA, A92BE, C30EMA, HB9IIG, EA3FQV, 6W1QJ and OA4BWE. As for 24MHz, ZS5NK gets the only mention.

At **G3NOF** (Yeovil) 18MHz gave him A92BE, AH3C, AL7I, FH8CB, FP5DX, KA7AIG, KD0EE(S. Dakota), SV1UM/8, VE7EPK, VK6AKG, VK7CK, W5AL (New Mexico), W7VO (Arizona), ZL2APW, 3X1SG, 4K0ADS, 4X1MO, 6W1PZ and 6W1QJ. Don found 24MHz patchy, with deep fading. However, he reached A92BE, D44BC, FR5EL, FT4XG, HK6BER, JA7JH, JR2KDN, NP2FI/MM, LU9FFA, OH9OM, OA1J/4, PY2CDS, SV9AKI, TA0B, TI2KD, UM8MTA, VP2E/KT8Y, W6SAI of antenna fame, WB5KYF, YB0USJ, YO7KAJ, ZP5JCY, 4X6TF and 6W1QJ.

The c.w. activity on the band by ON7PQ found him interesting signals by way of 9L1US, SV0HS, KC6CW, 7Q7XB, 9M2AX, V63AN, ZM7AMO and 3B8CF.

A new reporter at this point; **Dudley Taylor G4ZAU** (Oswestry). Dudley operates as G4ZAU/M, either from near Llansantffraid or near Chirk, using a TS-440S with internal a.t.u. and a Navy Special triband whip. This combination used on c.w. on 18MHz reached out to TA7/KU0J, VE2PA, 3C1EA, 9H3IL, EK3DA/MM, FE1JKK/FY, VK6HD, TK/HB9ASZ, UA1NBW, UA1ZFE, U3CN, UA3DBM, UZ4HYC, UZ4PWB, UA9MGO, UA9XDU, JA1WPX, JR2CQS, JA3AA, JA3AQ, JA3MQY, JG3QCW, JA3TYT, JA5NNS, JA6PA, JA7XGN, JA9CWJ, N0KSV, KA0GGI, KA1DHY, W2LZX, WA2SPL/1, W2TO, K2SWZ, W2QN, WB2V, KI3S, N4KG, N4YDU/A, K6EID, W6OV, W6PT, W7CG, KS7P, NX7U, WW7W, K8NA, KA8WOG, W8ZD, N4AR/8 and WA9SQH. 24MHz was a bit neglected, but GW4OVH at Wrexham was raised for some real DX!

It was the c.w. mode all the way for G2HKU who used 18MHz for TA2AO, TF3CW, W0KZV, JA7FS, K9QVB, CO6CG, K9BG, PY6WT, HI8A, UA9TS, 4S7WP, VE2LI, W3ARK, N4AR, K4II, 9Y4VU, 8R1J, N4KTU, VE2PA, W7CG, PT7SY, W0ZR, VP2E/KT8Y, K2AGJ, LU4FFG, PY2EY and KT2TQC; contrast that with 24MHz where there was simply YO3CD.

28MHz

Alas, like the curate's egg. G2HKU says he managed TR8BY, PZ1AP, K6EID, PT2KT and FH5EJ, all on c.w.

Pat at ON7PQ is very much of a c.w.-only man; his list shows C56/DL7FT, A41JR, Y90ANT, 3B9FR, 5H0QL (Lloyd and Iris Colvin), KC6EE, YN1CC, HS0E, VP2V/W9VME, G0GWA/9L2, WZ6C/ST4, 7Q7KG and SV0HS.

G3NOF noted the short path to JA open between 0700-0900Z, among VKs who stayed in till 1100; South Americans were noted from 1900, and Ws between 1100 and 2000. SSB contacts were made with FR5DX, HK3KPC, JAs, K7OWZ (Utah), KB0NL (S. Dakota), KP4GY, PT9ZZ, TI2JJP, UA0FF (Zone 19), ZW0JR, ZC4BOB, 5B4AAL and 8J90XPO. All were s.s.b. of course.

G0HGA has just 10W to an untuned wire, but her signals exchanged c.w. reports with DL2HD, IK4NOQ, I2DMK/IY1TTM, EA8AB, ZW5B, W4APU, WA1UDH, W8EGB, KA1BB, N4AR, K8XF, K4EJQ, K3BEQ, K8KJQ, W2LZX, K2AGJ, W8CC, VE3KLM, 5B4ES, ZD8Z, UG6GAW, UA9CDV, UW4HM/RL3L and UF6FJ.

We come now to GW0HWK who offers CX9AAW, A22AA, IK4MRI, IK6CAC, YO2CWL, HB9ATA, HG7JBF, I5TZR, I6SRP, F5GI, DL1IAR, G0NOR, KA1OWG, Y24UH, SM4RDG, GW0DYZ and OE5DI/500.

G4ZZG found FH5EJ, plus Europe, Canada, North and South America, but alas couldn't attract the attention of 7Q7KG in spite of umpteen tries.

21MHz

A firm favourite with many people, this

one. GW0HWK notes his QSOs with VK2FMW, VU2TTC, RA3QG, TA2KA, 9M2CW, UJ8JJ, UI8ZAC, DU2USK, TU2UI, ZS5S, OL0GM/A and S92LB.

G0HGA seems to have fun with 10W and an end-fed; W4BQF NA8G, W7ZQ, UA9SGE, UL0GE, UL3DX, UA3UDA, UZ3DZ, UA3TAM, UA3FQM, LZ2YL, OE5DEM, CN2DX, UL8UYA, OA2ZV for a new one, UA0SAU, UA0OGH, UA9AKU, KF4ZH, N4KER and UB5FDO, not to mention an assortment of other W call areas.

As for G3NOF, Don racked up QSOs with A61AD, HL2GS, HL9HH, JAs, JY3ZH, P29SC, PJ6/KV4AD, R1SO, R6L, RL7PDB, SV8/I5DCE, T5RR, UZ0QXU (Zone 19), UM8MGO, various VKs including VK8TM, VP8CED and VP8CEG (Falklands), VQ9TB, VU2TTC, ZL4TS, ZM2NBK, 4K2BDU, 4K0ADS, 5H0QL, 7K1UBJ/3(=JA!), 7Q7KG, 9H3NH and 9X5SW.

ON7PQ mentions JU750SH, 9X5HG, T32BU, KC6EE, 4K4POL (IOTA AS-65), HL1CG, YU3PR/4U in YK-land, 5H0QL, ZM7AMO, SV0HM, 7Q7KG, V73BL, F2JD/CE7 (IOTA SA-18), HI8A and PZ1DY all c.w.

Still all-c.w., G2HKU mentions YC3FFB, UM9MZZ, UH8BO, K1SEC, YC2ESQ, PP5HQ, PY1RCR, LU1HNL, PY1HQ, PY7PZ, K9QVB and HI8A. On s.s.b. the tally was less: W4GXT and N4HH.

Finally 14MHz

GW0HWK looked at the band a time or two, and to prove it offers ZB2JB, VK6NS, VK6HM, 4S7EF, OE1HAB, DU7ZM/MM, VE1TJP, K1CSB, SM4SET and G8VPC.

Angie G0HGA's two letters show that 20W into the end-fed was enough to work JH1OQT, U5ND, UQ0A, 4K0WH, OE5EIN, OM60ARDF (QSL via OK3CNF), 7X2CR (QSL via IS0LYN), LZ1JZ, HA3HU, DL7AFM (a YL), HB9CNE, UB5UFA, UA6AIR, UB5AEY, UV3AJ, UA3/VE3GRG, VK3APK, W2s and W4s, these last in the contest.

For G3NOF, the VKs on the morning long path openings have been intermingled with West Coast Ws, while the 1500-1700hrs have been on occasion good to Africa and Asia. s.s.b. contacts resulted, with A92C, CQ7YH, BV2FA, TA5C, TF5BW, VKs, YK1AA, Z22JE, 5H0QL, 5U7NU, 7Q7KG, 9M2CW and 9X5SW.

ON7PQ successfully went after 3B9FR, VK9NX, T32HK, FO5JR, EK0ACC (IOTA AS 69), 4K2BDU, VP2V/N5XX, 5H0QL, KC6EE, J8/FG5ED, 9J2AL, VU2GSM, UA0QX/A (IOTA AS-70) and ZM7AMO.

G2HKU rounds off; Ted used s.s.b. for the ZL3FV sked, while c.w. gave him EA8AVK, VP2V/N5XX, LU6FBR, HK3RQ, PY1APS, G0GWA/9L3, UA9CW, UV0BB, 5H3TW, JT1T and UZ0QWA.

Come on you regulars - how about some photographs of you in the shack? Send them diract to the PW office or via Paul.

Back-Scatter

VHF Up

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

Solar Data for September 1990

The last week of August saw an increase in geomagnetic activity with a number of flares being reported. With the active side of the sun in view there was an expected rise in solar activity during the first few weeks of September. Geomagnetic activity was also disturbed during this period with a sudden storm commencement (SSC) being recorded on September 10. The A index level was up to 25 units on the 11th dropping to 19 units by September 14. On the 12th there was an M1.5/2N type flare lasting for nearly an hour. The sunspot count also increased, reaching 221 by September 16. On the 17th an M5.3/1B type flare occurred lasting about 10 minutes. Despite this there was very little solar activity. Sunspot numbers declined from 228 down to 172 by September 23. The solar flux was reasonably steady, averaging around 198 units, but considering that this was the period when the active side of the sun was in view, it is a large drop from the 283 flux units recorded during the last solar rotation. During the last week of September the quiet side of the sun was looking our way and there was very little solar input. By September 28 the solar flux had dropped to 150 units and the geomagnetic A index was reported to be quiet to slightly unsettled on most days, averaging just under 10 units for the period.

The 50MHz Band

September was a very lean month for DX. Openings to South America, CX, LU, PY and Africa, V51, ZS6, ZS9, 3DA0, 7Q7 did occur but these were very brief. I am fairly confident that by the time you read this the band will have taken a turn for the better and there will be DX for all. However, please don't get the impression that 50MHz can only be used for working DX. This column generally reports on long distance contacts or the more unusual modes of propagation. Although tropo QSOs are quite often ignored they are still very valid. It is a pity that so few people make the effort to call CQ on 50.200MHz. Perhaps you should try it - you may be surprised.

Conditions during August were very much better as the report from **Steve Damon G8PYP** (DOR) testifies. He was fortunate to work 1A0KM (JN61) on August 1 for a new DXCC country. Other contacts during the month included SV1DH (KM27) on August 2 and HB0/HB9QQ (JN47) on August 11. Later the same day, at 1805UTC, LU8YYO was heard calling CQ but Steve was unable to work him. A contact was made with HB9SNR (JN36) at 2238UTC on August 16 via meteor scatter. Although the Sporadic E season is generally regarded as diminishing during August it was still prevalent on a number of occasions during September. The 2nd was a good day for this mode, contacts being made between 1500-1600UTC with OZ1CDE (JO65), OZ1LO (JO55), OZ5DX (JO54), SM7CMV (JO75), SM7FJE (JO65), SM7SCJ (JO65) and SM7THS (JO76).

"A rather quiet month" is how **Jim Smith G1DWQ** (DOR) sums up the month. On September 1, between 1905-1915UTC, he heard LU8YYO but signals were very weak. Signals from southern Africa were heard on September 21 between 1250-2015UTC. At 1257UTC, ZS6AXT was worked on s.s.b. peaking S5. The Namibian beacon V51E was copied for a considerable time, fading out at 2015UTC. Signals were heard from South America on September 22 with CX8BE being worked at 1820UTC. On the following day, between 1640-1720UTC, the band was open again to southern Africa but nothing new was heard. An interesting c.w. burst "CQ de VK6..." on 50.110MHz was heard at 1110UTC on September 29, but nothing came of it. The band was open to eastern USSR at the time via F2 propagation. In the afternoon Jim heard a brief opening to ZS6.

At my QTH, conditions were no different from elsewhere. The only DX of any note came on September 29 between 1750-1800UTC. Whilst beaming towards central South America, I heard the 9L1US and V51E beacons. Signals were not audible on the correct beam-heading. On the same heading I was also able to copy CT0WW, GB3SIX and GD3AHV. The c.w. contest on September 30 was poorly supported which was a pity as the band opened up to southern Africa during the last hour of the contest. Contacts were made at 1640UTC, with ZS9A (JG77) for a new country, Walvis Bay and at 1738UTC, with V51SW (JG87). The V51E beacon on 50.100MHz was heard between 1715 to 1750UTC.

Paul Baker GW6VZW (GWT) is using an FT-690R into a 35W BNOS amplifier and 3-element MET Yagi. The antenna is fixed at 9° elevation giving a great improvement in signal strength at his particular location. With this arrangement over 600 QSOs have been made outside of the UK since April. Paul caught the good conditions on September 21, working ZS4S (KG41), ZS6AXT (KG33) and ZS6RAD (KG43), all between 1246-1257UTC. On September 22, he worked DJ1ZU (JN68), OE5NEL (JN78) and OE5OLL (JN68) via Sp-E. Excellent results, just showing what can be done with low power and perseverance.

Ted Collins G4UPS (DVN) certainly perseveres when it comes to 50MHz. He caught the opening on September 21 hearing the ZS6DN and ZS6PW beacons at 599, ZS4S, ZS6AXT, ZS6LN, ZS6RAD, ZS9A and V51E. In the opening to South America, between 1830-1930UTC on September 22, Ted heard CX8BE, LU7DZ and PY5CC, although none were strong enough to work. African signals, V51SW, ZS6LN and ZS6WB were heard from 1643UTC on September 23. The first Japanese station of the season, JA2BZY, was heard calling CQ at 0836UTC on September 27 but despite peaking 579, Ted couldn't make contact. In the early evening of September 29, Kosie V51E was heard on c.w. but nothing else was heard apart from the 9L1US beacon on a beamheading of 240°.

144MHz QRB Table
Distances in kilometres

Station	Tropo	Aurora	Meteors	Es
G0CUZ	2943	1758	1996	2943
G0DAZ	2923	1780	2026	2923
G0DKM	2811	1488	——	2203
G0EVT	3080	1640	1808	3080
G0FYD	1315	1624	——	2019
G0ISW	1059	566	——	2057
G0LBK	3060	1755	1876	2350
G1DWQ	1454	1812	——	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	——	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	——	2372
G3FPK	1835	1686	——	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MJT	1163	684	1533	2068
G4N8S	1321	1714		1901
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	——	2130
G6DER	1834	997	1957	2068
G6DZH	2924	711	——	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	——	2265
G6LEU	2620	910	——	2430
G8HHI	1742	——	——	2058
G8JDX	2667	1368	——	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1240	1451	1479	2318
GD4XTT	3053	——	——	1700
GI1JUS	3067	1614	1507	2216
GI8YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW4VVX	2823	1391	1313	1910
GW6VZW	2830	1473	——	2236
ON1CAK	1420	1166	1948	2725
ON1CDQ	1420	1166	1948	2124

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Back-Scatter

The 70MHz Band

Gerry Schoof G1SWH (MCH) made the most of the Trophy contest by making 66 contacts in 40 counties and 6 countries. On September 26, GM4SEU/P (IO76) was worked for a new square.

Bob Nixon G1KDF (LNH) came on the band for the first time during the contest on September 16 after being requested by G1SWH to provide a new county multiplier. Pressing a 50MHz 5-element F9FT Yagi into service Bob made 14 contacts in 30 minutes. A total of 8 squares and 5 countries were worked.

Another new station on the band is **Simon Harris G4WQG** (WLT). He is running a modified p.m.r. box giving 20W of f.m. on 70.450, 70.425 and 70.475MHz. He would like 70MHz operators in the Swindon area to contact him.

The only period of intense activity heard at my QTH was during the Trophy contest on September 16. Tropo conditions were quite good allowing contacts to be made with many stations including EI9FK/P (Louth), GI4SJB/P (DWN), GI4TVV/P (DWN), GJ4TAW/P(JER), GJ7AOG/P(JER), GM3CKR/P (BDS), GM4AFF (GRN), GM4SIV/P (DGL), GM4UJS/P (DGL), GM4ZUK/P (BDS) and GM8TFI/P (SCD). It was noted that many of the leading entrants now have f.m. facilities enabling them to contact stations that in the past have been missed. This strategy is quite useful. The duration of the contest and the reduced band occupancy on 70MHz, means that a number of leading entrants will have worked a similar number of stations by the end of the contest. Any means to increase the QSO total must be utilised, hence the increased usage of f.m. to provide those vital extra points.

The 144MHz Band

There were a number of tropo openings into central Europe during September but all were very fairly brief events. The IARU contest on September 1/2 created much activity but there was little in the way of DX. Similarly the c.w. cumulatives proved that this mode is used by a considerable number of operators but again the conditions had the upper hand.

David Sewell G4FVK (CBE) sent in a long list of stations worked during the Region 1 contest at the beginning of September. Contacts on s.s.b. included EI3GE (IO63), GI1VHT/P (IO74), GJ3XBY/P (JER), GU4APA/P (ALD), F6GYT/P (IN99), F6HPP/P (JN19), F6IFR (JN09), FA1LIU/P (JO10), FC1CBC (JN09), FF1OLW/P (JO00), ON6HT/P (JO30) and ON7TR/A (JO11).

Gary Nicholas GW7EVG (CWD) made his best DX so far by contacting, on September 1, G8LNC/P operating from the Isle of Wight. A contact with G7FDC/P (DVN) gave him a new county. On September 8, contacts were made with GM0GTI/P on the Isle of Arran and with EI6ARB/P (IO54) located in Co. Donegal. A QSO, on September 10, was made with GM8OEG (TYS), being another of Gary's furthest contacts this year. Also reported was a QSO with GW6TEO (DFD) in the rare WAB square SR99.

Annual v.h.f./u.h.f. table January to December 1990

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1SWH	46	33	54	7	85	20	45	8	15	5	317
G6HKM	53	35			65	23	34	13	27	10	260
G0IMG	47	29	44	4	51	13	32	4	—	—	224
G4ASR	27	36	59	8	55	31					216
G0NFH	40	20	21	3	48	9	11	2	2	2	158
G0FYD	20	24	1	1	75	20	11	4			156
G8PYP	27	30	2	1	49	18	21	6	—	—	154
GD4XTT	31	18			73	17	10	4			153
G6MXL	5	17	17	3	34	9	17	5	13	4	124
G0EVT	21	23	—	—	36	14	5	1	—	—	100
GW4H8K	2	12	39	7			29	4			93
G4ZTR	—	—	—	—	59	19	—	—	—	—	78
GW1MVL	2	2	—	—	43	10	11	2	—	—	70
G7CLY	—	—	—	—	60	9	—	—	—	—	69
G4SEU	—	—	62	6	—	—	—	—	—	—	68
GW7EVG	—	—	—	—	37	6	—	—	—	—	43
G7CFK	18	12	—	—	—	—	—	—	—	—	30
GM1ZVJ	1	9	—	—	2	1	—	—	—	—	13

Ela Martyr G6HKM (ESX) found the period September 15/16 to be quite good with a number of DX contacts being made. On the 15th, GJ3YHU was worked for the first GJ of the year followed by QSOs with GM1YOA/P and GM0CDA/P, both in Borders Region. Between 1617-1820UTC, Ela worked OK1DXT/P (JO60), OK1IBL/P (JO60), OK1KPA/P (JN79), OK1KPU/P (JO60), OK1UZG/P(JO70), OK1VEI/P(JO70) and OK1VVP/P (JN79). Conditions were still good on the 16th, Ela contacting HB9STY/P (JN36).

Ralph Sachs G2CZS (ESX) also managed to find the DX. During August, contacts were made with EI2VPX/P, GD4IOM, G4ATA/P(IN79), G0NES/P(DHM) for a new county, LX/ON4MU/P (JN29) and OZ1BEF (JO64). The best DX during the contest on September 1 was LX/ON7RB/P (JN29). A few days later, QSOs were made with G0KTD/P and G1DUK/P, both in Cornwall. Ralph reports that he had been trying for well over a year to work this county. The good tropo on September 15 found OK1IBL and OK1VEI/P in the log.

"Have you noticed the number of whistlers appearing on 144.300MHz?" asks G8PYP. He mentions that some stations appear to be unable to call CQ without whistling into the microphone first, often several times. Not only is it unnecessary but it is also annoying for anyone listening and guaranteed not to get a reply to a CQ call. Steve reports that the Perseids meteor shower was very good this year with many strong and long reflections. Although many stations were heard on 144.200MHz (an unscheduled frequency) only 3 stations, OE8HWQ, OK3LQ and SM5FRH, were worked because of the large amount of QRM caused by other operators. Stations heard included HB9STI, HG1YA, I1CCB, IK1LGV, IK1MTZ, IK5EAR, IV3CER, IW5AVM, IW5EBM, IW0BZM, LA1K, OE5ABM, OH1AF, OZ1FDH, SK3LH and SP2NJI. Not much was reported in the period after the Perseids, only GM8ODG (IO86) via aurora on August 23 and PA3FOC (JO21) via tropo on August 26.

Trying out the Perseids meteor shower in August for the first time, G1SWH was pleased to contact G4DHF/TF (IP03), LA1K (JP53), SK3LH (JP93) and SM5FRH (JO88).

Annual c.w. ladder

Station	Band (MHz)				Points
	50	70	144	430	
G4ASR	59	8	137	—	204
GD0ELY	12		144	—	156
G4OUT		39	99	—	138
G0FYO	31	—	62	1	94
G0DJA	17		10	—	27
GW4VVX	3		9	—	12

Number of different stations worked since January 1 1990

Mick Toms BRS31976 (ESX) was able to spend much time listening to the proceedings during the Perseids shower. He reckons that conditions peaked at around midday on August 12, with very good signals being received from Scandinavia. Mick uses a Yaesu FR101 receiver with inboard converters for all v.h.f. bands from 50-432MHz. On 144MHz he uses a 19-element Yagi at 12m above ground. This year was the first time that a computer Morse reader was used to decode high speed c.w. and although some more work is needed to reduce the r.f.i. produced by the p.c., results were very good. During the weekend of August 11-12 the following c.w. stations were heard, HG3DX, HG7BT, I1TXD, LA0HY, OH5LK, SM6EJY, SM0KAK and YU7AU. Mick also listened on 144.200MHz and comments that a large number of operators were heard operating without using the correct procedures. Examples of stations giving reports and only their own callsign were numerous. Stations heard on s.s.b. during August included DL4MDQ, DK5IE, DG9NCX, EA1YV, ES2RJ, ES2WX, G4PIQ/TF, HB9TFI, HG2NP, HG3DX, IK1DSP, IK1MTZ, I3LGP, I5JUX, LA1JU, LA1K, LA9BM, OE8HWQ, OH1AF, OH5LK, OH7EU, OK2ZZ, OZ1FDH, SM2CEW, SM2CKR, SK3LH, SM4DHN, SM5FRH, SM7BOU, SM7FWZ, SP8NCJ, SP9EWU, YT2C, YU2PT and YU7FF. I hope this report from Mick may encourage others to try this mode of communication. I still have available my 8 page guide to practical m.s. working which can be obtained on receipt of a stamped A4 envelope.

Dave Law G0LBK (YSS) runs a small e.m.e. system consisting of four 9-element F9FT Yagis. Recent QSOs via the moon have included DL3SAS, HB9CRQ and I2FAK bringing Dave's total up to 7. He attempted a schedule with OZ1HNE who uses only 2 Yagis and although signals were heard both ways the QSO was not completed.

Geoff Brown GJ4ICD (JER) has been conducting t.e.p. tests with stations in V51 and ZS6, so far without results. However, Kosie V51E did manage to work into Monaco and Italy in early September. During the 1989 t.e.p. season, Geoff heard the ZS 144MHz beacon and is hoping to make a two way QSO this year.

The 430MHz and Microwave Bands

Want the Isle of Skye on 430MHz? **Collin Robertson GM0HBK** (WIL) is now active on the band with four 24-element Parabeam Yagis.

G1SWH is now fully QRV on 1296MHz with an Icom 271E giving 10W into a 55-element F9FT Yagi. A mast-head low noise amplifier and power amplifier will soon be added to the system.

G1KDF is now running high power on 1296MHz with a single water cooled 2C39BA. This arrangement gives about 90W output compared to about 40W from an air cooled version. Another advantage is that the p.a. is more thermally stable and you can't hear the blower noise. On August 10, an s.s.b. contact was made with EI2VPX/P (IO61). Bob was pleased to work into GD on 2320MHz during the contest on August 12. The QSO provided both a new country and square.

Activity on 10GHz narrowband is increasing according to reports in the RSGB Microwave Newsletter. This may in part be due to kits designed by Charlie Suckling G3WDG becoming easily available. Sam Jewell G4ODK has also, for a number of years, been designing modules for use on the s.h.f. bands. During this summer, tests have been conducted between G3WDG/G4KGC (XYL), G4DDK and G4FRE. The results have been very encouraging with signals from G3WDG being copied during each test. If you want more information regarding the availability of narrowband transverter kits contact the RSGB component service.

Packet Radio DX Cluster News

Following on from last month's explanation about the use of packet radio clusters for v.h.f. DX working, details have been obtained from **Ron Stone GW3YDX** about an expansion of the UK system. A new DX cluster will soon be on the air from the premises of South Midlands Communications Ltd. Although the Notice of Variation for the cluster GB7SMC, specifies only 70.325MHz as the input frequency, a multi-frequency node will be co-located with the cluster PC with access ports on 50.650, 70.325, 144.625, 144.650, 144.675, 432.675 and 1200MHz. In addition to user access, it is intended to have a 9600 baud link to GB7WDX, near Exeter, and to the proposed GB7DXS cluster near Handcross, West Sussex. The GB7DXS cluster will be linked to the first of the UK DX clusters GB7DXI at Wokingham and together with GB7SMC will form the long awaited link between the cluster in the south east and others in the UK. Another cluster GB7DXH will soon be operational from Hertfordshire. This brings the total of

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UK systems up to 7. For further information contact GW3YDX, Secretary of the UK DX Packet Cluster Working Group.

Dxpedition Update

During August, G1KDF operated portable from a number of locations in France. He managed to find some good sites in IN77 and IN87 which enabled many contacts to be made into the UK on 144MHz. The only major problem encountered being the generator which failed to work, restricting Bob to only 50W output on 144MHz. He also took a TS-680S and HB9CV antenna for use on 50MHz, this system giving very good results. On August 23, operating from IN77, a total of 130 contacts were made in 51 locator squares. The band was open from OY through to 9H, allowing 13 countries to be worked in just over 4 hours. Conditions were not so good from IN87 but even so 10 squares in 3 countries were worked on August 28.

There can't be any keen v.h.f. DXers that didn't know about the Five Bells Group expedition to Iceland during August. The group consisted of David G4DHF, Keith G4ODA, Andy G4PIQ, Dave G4YTL and Chris G8IJC. I guess most of you have heard of the first 4 operators but may be wondering who G8IJC is. Chris doesn't claim to be a DX operator but without his help in the support role, looking after the needs of the group, the few operators who were available would have had less time to actually operate the radio.

The logistics of the trip were quite enormous. Apart from actually arranging a suitable location for their base they also had to organise the transportation of all the v.h.f./u.h.f. equipment. No mean task as they had e.m.e. capability on both 144 and 430MHz and a system on 50MHz. Three of the group and a V8 Land Rover set out for Iceland one week before the others. In order to reach their destination they had an overland journey of some 450km over roads which at times ended abruptly because of rock falls or floods caused by glacial meltwater.

Having set up all the gear, the group got to work on the various bands with impressive results. Keith G4ODA was the sole holder of the 50MHz permit and was therefore heavily committed to operate on this band. Operation commenced via m.s. on August 4, well outside the peak of the shower. It soon became clear that with the low e.r.p. levels allowed in Europe that reflections were going to be poor. The only completed m.s. QSOs were with stations located in Scotland at around 1000km.

It was via Sp-E that most 50MHz contacts were made. On August 5 there was a brief opening, at 1440UTC, to GI which lasted for approximately 10 minutes. Later in the day, at 1838UTC the first major Sp-E opening started. In 3 hours, over 160 stations were worked in DL, F, ON, OZ, PA, SM and the UK. The best DX during this event was FC1BUU (IN94) at 2400km. The next event of any significance was on August 12, commencing at 0842UTC. Around 180 contacts were made with DL, F, G, GI, GM, GW, HB0, LA, LX, ON and PA in an opening lasting over 4 hours. The best DX of the day being HB0/HB9QQ at 2500km.

The final event occurred on August 14, the last day of operation. In a 2 hour opening, contacts were made into DL, F, G, GJ, LA and OZ. On the 144MHz band results were equally impressive. The group had to rely on either m.s. or e.m.e. for the majority of the contacts. In 10 days of meteor scatter operation, 134 QSOs were completed with stations in 11 countries. With an e.m.e. system consisting of four 16-element F9FT Yagis, the group had not considered themselves a force to be reckoned with and they only expected to work a handful of stations. David G4DHF however described their results as being spectacular and extremely enjoyable.

Despite losing their remote-elevation facilities during a gale on the first night and having to improvise with poles and a length of rope, 37 QSOs were made with stations in DL, F, G, HB, I, OE, OK, OZ, PA, SM, VE and W. At moonrise, they were able to copy their own echoes every day, frequently at 539. Signals from such stations as KB8RQ, W5UN and VE7BQH were described as tremendous! Conditions were so good that they were able to complete with several 4 Yagi-equipped stations and even a 2 Yagi-equipped station. Conditions on 430MHz however were completely different. Faraday rotation caused many problems and it soon became noticeable that those stations equipped with dishes and rotatable feeds were providing much better signal strengths. Even so, every other contact was a first which heightened the satisfaction and success of the operation. In total, 10 e.m.e. QSOs were completed on 430MHz with stations in DL, F, OE, PA, SM and W. A truly tremendous effort. Well done lads!

Beacon and Repeater News

A number of 50MHz beacons have recently become operational. In Newfoundland, VO1MUN can be found on 50.0375MHz. It is running 10W into a vertical antenna. Reception reports should go to PO Box 51, St Johns, Newfoundland, A1C 5H3, Canada. It has already been heard in the UK.

A Brazilian beacon, PT7ACC is operating on 50.078MHz from locator HI06. It runs 5W into a ground plane antenna.

FC1FNH is running a beacon on 50.418MHz from locator IN96. I suspect this may be an unofficial personal beacon.

The 10GHz beacon GB3MHX, located at the British Telecom Research Laboratories at Martlesham Heath, Suffolk returned to service recently. Operating on 10368.830MHz it was running 20mW into a 1.2M dish, beaming due east, although by the time you read this it will have changed to an omni-directional antenna.

The 144MHz repeater GB3BI located near Inverness has been closed down for an overhaul of the repeater system and its antennas. It is expected to return to service in mid-December.

Meteor Showers

The following data, concerning meteor showers occurring in the next few weeks, will help you determine in which direction to beam at specific times and when the shower is below the horizon.

The Leonids meteor shower will be encountered between November 13-19, peaking on Saturday 17th. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or south-west, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west. The usefulness of the shower for radio communication purposes is not very good from 1100UTC onwards and between 1700 to 2300UTC the radiant is below the horizon.

The Geminids shower lasts from December 6-14, with maximum activity occurring on Thursday 13th. Between 2000 to 2200UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0500UTC beam south-east or north-west. The shower radiant is low between 0900 to 1900UTC.

SP8NCJ is planning to operate from locator KO12 during the Geminids. You can contact him on the 14.345MHz v.h.f. net.

QRZ Contest!

The UK 6 Metre Group are holding a 50MHz contest to coincide with the SMIRK QSO Party on November 17-18. Non members of the 6 Metre Group can participate.

The final session of the 144MHz c.w. cumulatives will be run on November 11 between 2030-2300UTC.

The 144MHz Fixed station and AFS contest is scheduled to take place between 0900-1700UTC on December 2. This contest provides an excellent chance to pick up those wanted UK counties and locator squares.

Details have been received from DL5MAE of a meteor scatter contest being organised by the Bayerische Contest Club. The contest will be held between 11-14 December, 0000-2400UTC each day, to coincide with the Geminids meteor shower. Single or multi-operator entrants should use c.w. at a speed of 1000 letters per minute and 2.5 minute periods, in the frequency band 144.095 to 144.105MHz.

Logs should be sent, no later than December 31, to the Bavarian Contest Club, MS Contest, Kelheimwinzerstrasse 40, 8420 Kelheim, Germany. Use the whole 10kHz spectrum, not only 144.100MHz. Full callsigns and reports must be exchanged, each complete random contact counting as one QSO point. The final score is the total QSO points multiplied by the number of different prefixes worked. Prefixes are as defined by WPX rules, e.g. G3, G4, GW4, Y23, Y32. Your entry must give the operator's name, callsign and address, multi-op stations list of callsigns, contact details giving date, time (UTC), station worked and both reports. Technical details about equipment and antennas should also be given. The first, second and

QTH Locator Squares Table

Station	50	70	144	430	1296	Total
G3IMV	319	—	447	125	51	942
GJ4ICD	407	—	263	119	59	848
G4ASR	279	43	350	41	3	716
G6HKM	265	—	224	112	48	649
G3JXN	204	22	187	134	88	635
G1KDF	309	8	184	104	38	643
G3JXN	204	22	187	134	88	635
EI5FK	314	—	187	58	—	559
G0DAZ	146	—	221	137	39	543
G6HCV	309	—	233	—	—	542
G3UVR	—	50	257	140	83	530
G4KUX	—	—	372	120	—	492
G1SWH	196	31	165	60	8	460
G4RGK	—	—	284	124	50	458
G3XDY	—	—	206	148	91	445
G1DWQ	264		152			416
G0EVT	142		213	57		412
G0LBK	—	—	267	89	46	402
G4DEZ	55	—	249	49	49	402
G8ATK	103		145	94	52	394
G1LSB	73	—	176	144	—	393
G6DER	—	22	183	110	78	393
ON1CAK	48	—	280	53	11	392
G8LHT	79	19	185	93	14	390
G1EZF	—	—	263	93	—	388
G4XEN	—	—	274	111	—	385
G4MUT	82	22	153	93	31	381
ON1CDQ	43	—	255	56	7	361
G8PYP	199	2	120	34		355
G4NBS		35	138	108	67	348
G4RRA	—	—	255	80	—	335
G3CDJ	—	—	186	103	44	333
G8PNN	7	25	129	99	64	324
G4SSO	—	—	229	93	—	322
G4FRE	—	—	102	146	72	320
GM0H8K	132	8	158	19		315
G4TIF	—	—	200	110	—	310
G4DHF			307			307
G4ZTR	78	28	120	50	30	306
G1EGC			198	80	23	301
G8HHI			148	110	38	296
G6MGL	—	—	141	89	59	289
DL8FBD	—	—	280	—	—	280
G0FYD	110	1	160	6		277
GW6VZW	118	—	143	6	—	267
G4PCS	—	—	258	3	—	261
G6MXL	66	22	98	49	23	258
G3BDQ	256					256
G1GEY			168	77	11	256
G3NAQ			175	80		255
G6DZH			158	87		245
G6STI			152	69	24	245
G0NFH	113	25	78	18	9	243
G3FPK			241			241
G4IGO	—	—	238	—	—	238
G0EHV	—	—	160	75	—	235
GW4FRX	—	—	231	—	—	231
GM4CXP	—	—	198	31	—	229
G1SMD	165	—	110	—	—	275
G4OOL	—	—	216	—	—	216
G4MEJ	—	—	213	—	—	213
G8LFB	—	—	209	—	—	209
G8MKD	—	—	150	49	—	199
GJ6TMM	—	—	151	48	—	199
G4YCD	—	—	197	—	—	197
G1TCH	94	—	95	6	—	195
GI1JUS	—	—	192	—	—	192
G8XIR	—	—	123	—	62	185
G7ENF	59		89	24		172
G4FVK	—	—	82	50	23	155
G7ANV			153			153
G4AGQ	—	—	104	42	1	147
G8XTJ	29	—	116	—	—	145
G6MEN	41	2	63	26	4	136
GW4VVX	10	—	117	—	—	127
G1WPF	—	—	97	29	—	126
G0FEH	—	—	101	24	—	125
G0ISW	45	—	59	17	—	121
GW1MVL	—	—	109	7	—	116
G1IMM	—	—	98	17	—	115
GM0GOL	—	—	88	23		111
G7CFK	109	—	—	—	—	109
G1CEI	11	—	77	18	—	106
GI4OWA	—	—	103	—	—	103
G7CLY	—	—	100	2	—	102
G1SWH	—	—	148	53	—	101
GM0JOL			88			88
GM1ZVJ	35		48			83
G4WHZ	—	—	76	—	7	83
G0GTF	76	—	—	—	—	76
G1NVB			73			73
G0HDZ			64			64
G0HEE	—	—	73	—	—	73
GU4HUY	—	—	73	—	—	73
G2DHV	—	—	33	7	2	42
G7AHQ	—	—	34	—	—	34
GW7EVG	—	—	22	—	—	22

No satellite or repeater QSOs
Starting date 1 January 1975

third place winners will receive prizes, country winners will receive certificates.

The penultimate leg of the 430MHz cumulative contest will be held between 2030-2300UTC on December 4.

The three remaining legs of the 1.3/2.3GHz cumulatives will be run on November 10, November 26 and December 12 between 2030-2300UTC.

The Scandinavian activity contests will be run on the following dates. Microwave activity on December 3, 144MHz on December 4 and 430MHz activity on December 6.

Deadlines

Please send your letters to reach me by the end of November. I always write up the column in the first few days of the following month. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM.

Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as QSL cards, awards, certificates, etc, are also required. As they say, a picture is worth a thousand words!

Back-Scatter

Amateur Satellites

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

Satellite Roundup

First this month, I update the amateur satellite scene and give you the latest information available.

RS-10

RS-10 is still active with both transponder and ROBOT at all times. RS-11 is still being kept 'in reserve'.

David Rowan G4CUO, spent part of his holiday break by using his call prefixed by W2 and VE2 whilst in North America. He found that the use of the RS-10 satellite was very low there compared with Europe, and had to stay up very late in order to get QSOs when the satellite was in range of Europe. David remarks, "I was only able to work Ron G3CAG and Don G3BGM on c.w., with many others called who apparently were unable to hear my low power signals!"

RS14/RUDAK-2

The launch date of the forthcoming satellite is still being given as mid-October, one month prior to the intent, so it must still be expected to be on and active when you receive and read this news. Whilst in the UK, **Leo Labutin UA3CR**, asked if it was permissible for the satellite to be called 'Radio-Oscar-21' after launch. AMSAT-NA said that they would be honoured with this terminology.

OSCAR-10

A-O-10 has been barely supporting transponder operations over the past month due to an insufficiency of solar illumination, and AMSAT have been requesting non-use of the spacecraft due to the discovered presence of f.m.'ing of the plain carrier 145.810MHz beacon.

James Miller G3RUH calculates that on September 29 the A-O-10 attitude was ALON 14 and ALAT-5, with an eclipse lasting 28 minutes from mean anomaly 250 through perigee to MA 4. The next period when we expect to have no eclipses, hence potentially a power sufficiency to be able to operationally use the transponder, if the attitude of the solar panels to the Sun are then optimised, is from November 17 1990 to February 9 1991.

At this time the OSCAR-10 apogee and perigee are once again close to the equator, similar to that following launch. The satellite is 'upside down' terrestrially speaking, i.e. the end of the arm beams are earth pointing at perigee and space pointing at apogee. Other than some angulated antenna shading by the spacecraft structure itself, this inversion will not effect communications, as since the IHU command loss only the monopole omni-directional antenna is in use at all times.

OSCAR-13

A new Transponder Schedule for A-O-13 was planned to come into effect as from October 17, when the satellite attitude would be at ALON 180 and ALAT 0.

Mode 'B' from Mean Anomaly 0 to Mean Anomaly 95

Mode 'JL' from Mean Anomaly 95 to Mean Anomaly 125

Mode 'LS' from Mean Anomaly 125 to Mean Anomaly 130

Mode 'S' from Mean Anomaly 130 to Mean Anomaly 135

Mode 'BS' from Mean Anomaly 135 to Mean Anomaly 140

Mode 'B' from Mean Anomaly 140 to Mean Anomaly 256

The omni-antenna will be used from MA 220, through perigee to MA 040. This new schedule will remain in force until December 26, when a new plan will be provided.

John Nevin G3ZHG writes from Newark that he has been busy with OSCAR-13 working lots of JA stations on Mode 'B', so many says John that they have become "back garden DX."

He lists from the numerous QSOs made recently JE1NPN, JL6DUJ, JA2EVF, JA1PJS and JA5LG, none of whom were running more than 25W of power, and all of whom were 5 and 9. North America provided QSOs with WA2RDE (NY), WB6OVH (Cal), KC0TO (Colo), KJ7H (Ore) and VE6LQ in far Canada. John himself runs just 15 to 20W of uplink power to an 11-turn helical antenna and listens with an 8XY RHCP Yagi. G4ZHG has earned both WAC and WAS by satellite, both with his older Class B licence and with his newer Class A callsign.

Hardy DC8TS reports activity on OSCAR-13 from Z22SAT at Victoria Falls since September 12 and Keith 5N0ETP, in Lagos, Nigeria whose QSL manager is Keith Appleton N6QLQ, POB 5046, San Ramon, CA 94583, USA. Also active were OY9JD from the Faroe Islands and on 145.945MHz, CU6AC, Salgueiro, from Pico Island in the Azores. Hardy says that CU6AC has little command of the English language, but is often in QSO with his manager AA6FT, so it is best to listen when AA6FT is asking for calls for CU6AC.

A-O-13 Descent

Further studies that have recently been carried out to check AO-13s orbital irregularities more fully, show a mainly linear decay rate of some 785 metres per orbit at perigee until the spacecraft gets below 200km in mid-1992, when it starts to rise up towards a peak of about 800km in early 1994. It then turns about again and the mathematical model predicts the perigee to be 200km once again by mid-1996. By late 1996 it will have descended to 100km and imminent re-entry. AMSAT say that they trust the figures as far as 1994, but then it is best to wait and see what happens after this.

The change of other Keplerian parameters is also of interest, as whilst the perigee is cycling, the inclination changes from 56.8° to 58°, and the eccentricity rises from 0.696 to a maximum of 0.73 in mid-1992. Variations like these are most unusual, especially the 0.5° per year change in the inclination. Throughout the lifetime of AO-13 the Semi Major Axis, therefore the period and the mean motion, show almost no change, so no actual energy is being lost. This change is all brought about by the juxtaposition of terrestrial, solar and lunar gravitational forces. If the perigee were not so low as to bring the satellite into frictional atmosphere, and hence terminal decay with a real energy loss in late 1996, the next century would see it recover its original perigee height once again.

FO-20

JARL confirm that since emerging from an eclipsing period in late August, FO-20 command stations have been having difficulty controlling the temperature aboard FO-20. The temperature of the battery had risen to over 40°C when mode 'JA' and 'JD' were in simultaneous operation. Even after turning off both transponders the temperature was still at 35°C, and by late October, with then only partial transponder use, was seen to be up to 42°C. If the batteries remain at these elevated temperatures for any prolonged period of time, it not only reduces the voltage, as NiCad cells have a negative temperature coefficient, but significantly reduces the battery life.

As a point of reference, the Microsat battery temperatures typically hover around the recommended 0 to 5°C level. Whilst the command station is collecting data on this problem and working towards a solution, it may be expected that FO-20 will not be firmly fixed to any sort of reliable and regular operating schedule, although the intended activity will be given out by JARL for some two to three weeks in advance.

FO-20 'JD' TAPR Improvements

JA6FTL suggests some modem modifications for the TAPR PSK modem when being used for FO-20 'JD' mode. He has found that the original TAPR PSK modem does not work well when TX audio is fed to the 'mic' input or to the rear data port. He writes: "I checked the waveform at the TX varactor cathode and the discriminator of another monitor receiver at the same time, and compared waveforms. I found that what I was looking at was not the wanted waveform itself, but the phase deviation of the transition point to time axis".

JA6FIL found (with the original unmodified TAPR/JAMSAT modem) that the phase error of the transition point at the output terminal, i.e. the 'hot' side of JP8, was too great, especially the 600Hz wave form, and that this was due to the incorrect time constant of the output filter R7/C8 combination. This he changed by replacing R7, the 22kΩ resistor with one of value 2.2kΩ, and also R5, the 22kΩ with a resistor of 4.7kΩ. He confirms that with this simple modification alone the phase error improved greatly.

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Modification for the 726-R

W9ODI reports a G3RUH modification to improve the auto-Doppler control on the popular 726R that has 20Hz steps. The recommendation is to install a 555 multivibrator circuit across the. tuning switch which shorts the line twice a second. It then pulls the circuit into tune from 300Hz either side.

The MICROSATS

DOVE is back on 145.825MHz 1200 baud packet at full power following sorting out some of the problems. There are still some values in the telemetry that appear to be faulty. Battery cell 6 would have exploded if it were really at the voltage indicated and for some similar strange reason, battery cell 2 is reading a low temperature. At the end of September, the long awaited speech f.m. DIGITALKER had still not been heard, but it should not be long in coming now.

WEBERSAT

Each shot taken by WO-18 still does not result in a successful picture for a number of reasons, but about 1 in 4 does and that percentage will improve. Right now, emphasis is on brightening and obtaining land features.

UoSAT-OSCAR-14

Since the Colloquium week's activity the way has now been cleared for release of the PACSAT protocol. Complete definitions of PACSAT File Headers, PACSAT Broadcast format, and the File Transfer protocol Level 0 will be available. All have been in draft form for some time, and final versions will be published in the ARRL Network Conference proceedings and via the PACKET network as REQFILs once they are to hand.

Development of ground station software for BBS access is now in progress. FTL0 is designed for automated access - not hunt-and-peck keyboard control. Availability of ground station programs, from AMSAT-UK, AMSAT-NA, and perhaps in a limited share-ware version, will be announced in the very near future.

Porting of the file system and the FTL0 BBS to AO-16 is underway. Although most of the code will run without modification, some differences need to be accounted for. This necessarily takes longer than a similar BBS-only effort on the ground. Reflect that UO-14 is simultaneously running 6 programs: sampling telemetry, collecting CPE data, providing a multiple-connection virtual TNC, broadcasting using a new protocol and waiting for file transfers at 9600 bits/sec.

Prospective users of the BBSs should note that you cannot use them with a dumb terminal and a TNC. A home computer is needed for the ground station software. Software will run on an IBM PC initially, but C source code will be published for compiling on any other computer for those who have a compiler.

PACSAT BBS Information

AMSAT-NA Area Co-ordinator **Jim White WD0E**, asked some questions that are undoubtedly of interest to OSCAR satellite users about the PACSATs. They have been answered here by AMSAT Software Engineer **Harold Price NK6K**.

WD0E: "Which PACSAT will commence BBS operations first?"

NK6K: "UO-14 is now about 80% functional with the BBS software. AO-16 will be brought to that level, then LO-19".

WD0E: "Will the TLM or Whole Orbit Data (WOD) format, frequency, or any other parameters change?"

NK6K: "This is more of a spacecraft control than an application question. There is nothing in the new code that will require a change. WOD will probably end up as files, and be downloaded or broadcastable. This means that it won't come down in frames sent to WOD, but the internal record format will be the same. I'd like to see some compression on the WOD, but we may be running out of code space. If it is compressed, the ground station software will know how to decompress it. We'll do a update to the Operating System run-time libraries next year that will give us back some program memory. There would be no frequency changes."

WD0E: "Will people still be able to just digipeat through the PACSATs?"

NK6K: "This has not yet been decided. Digipeating is a good way to check out your station. I don't think there is much other demand for it in the long run. The MICROSATs are available now for digipeating, but you don't see much of this type of activity. I would not want to see digipeating supplant the intended use of store-and-forward data, but if there is a big demand I suspect it would be addressed."

WD0E: "How will the 'user' ground software be distributed and tested?"

NK6K: "Jeff Ward G0/K8KA and I have discussed two approaches. However, nothing has been finalised. The first approach is to make a minimum implementation of the user ground-based software available, including C language source code, as share-ware. We want to get something out soon, and, since Jeff and I are IBM PC-based, availability of code will hopefully encourage others to write for MAC, Amiga, C-64, Unix, and others. The only thing against it is we don't want to leave the impression that all AMSAT offerings are shareware. The minimum implementation will not be automated, and will not be pretty colours, windows, pulldown menus, etc. but will be more portable. The second approach is for AMSAT-NA and AMSAT-UK to make available an 'all-singing-all-dancing' PACSAT ground station program. This will be automated, easily interfaced to terrestrial BBSs, and will have a fancy menu driven format."

Simple Pacsat Hardware

John Branegan GM4IHJ, has been further developing his station and writes of his latest efforts and findings.

"Activity this last week has concentrated on the development of two pieces of hardware. The first is for UoSAT-3 9600bps reception, and consists of a Microwave Modules 434/28 converter, re-crystalled to 101.85MHz to give a 27.67MHz output from the 435.07MHz UoSAT-3 input. Four values of switched capacitance in series with this new crystal allow its frequency to be shifted through four 2.8kHz steps at 407.4MHz, providing inter-channel tuning between the 10kHz channel steps of the CB RX used as the i.f. The CB has a broad 12kHz ceramic filter replacing the normal 6kHz filter in its 455kHz i.f.

Additional modifications now under consideration are a centre tuning meter, and/or a.f.c. At present the oscilloscope eye diagrams are adequate for tuning, but not everyone will be able to afford a 'scope".

"The second piece of hardware is a new DIY aerial for DOVE 'S' Band reception on 2401.22MHz, plus or minus 50kHz Doppler. Initial tests on a two metre diameter dish were a flop, with received signals at S9 one moment, S0 the next. Equally hopeless was the heavy and awkward large quad helix, just too cumbersome for good tracking of fast moving 'DOVE'".

"The new antenna looks like a medium size pair of binoculars, and, to add to this illusion, it fits nicely on a very manoeuvrable camera tripod complete with pan tilt head. The helixes are formed of welding wire, wound on plastics tube supports. The reflector is aluminum foil on a plywood backing board, and the helixes are parallel connected through matching coax to an 'N' type plug which carries the signal to the 2400/144MHz converter".

John continues "With this antenna, smooth tracking is at last possible for at least half of any orbit in range of Scotland. The antenna points out of a large open window in the roof and has a relatively clear view on all bearings from west through north to east. Dove is a very strong signal at times and once Doppler track charts had been checked, was easy to follow. Unfortunately, however, there is a fault on the modulator of Dove's 2401MHz beacon such that the phase modulation is nothing like the desired 180°. The next step here is to try to rig a.f.c., so that the modulation problem can be further explored. Meanwhile AMSAT NA Controllers are already trying Digital Signal Processing on this difficult signal to investigate whether they can achieve demodulation effective enough to allow investigation and correction of Dove's computer problem, which was earlier preventing use of its 2m transmitter.

"As a further test of the simple antenna described above, it was pointed at OSCAR-13 as it passed through Apogee, sending Mode S beacon and transponder traffic. The beacon was good, S2 copy , and so were the transponded c.w. signals from I7LIT, but although voice signals could be heard they could not be read. This latter is hardly surprising however, noting that OSCAR-13 is forty times further from the earth than Dove, hence there is approximately 33dB of path loss. So, do not expect too much from OSCAR-13 if you decide to build a simple antenna with no pre-amplifier to listen to DOVE, but be aware you can test on AO-13 whilst you wait for DOVE to come around, noting that AO-13 has very little Doppler shift on its signal and once you have found it, no antenna tracking is required".

SALYUT-7

As well as OSCAR-13, the Soviet predecessor to 'MIR', SALYUT-7 is on the way down. Earlier hopes to gather up the spacecraft and transport it back to earth by means of the large 'BURAN' shuttle seem to no longer be viable, as the Soviets have yet to finalise the escape safety system necessary to permit the manned recovery flight.

The most recent sets of Keplerian elements show a steepening decline, with the large spacecraft likely to be re-entering earth's atmosphere some time between late December 1990 and early March 1991. Using the formula we earlier applied to the decaying COSMOS-1900, it should again be possible to get an increasingly accurate the time and possible point of burn up. As undoubtedly some solid material will come to earth, providing some very spectacular fireworks, meteor scatter and ionised trail propagation to boot, this event should prove well worth while pre-calculating and watching.

Keplerian Elements

Our Finnish satellite listener colleague **Birger Lindholm** has again provided us with his edited set originating as NASA 2-line elements. Birger has shown a zero level P drag (nodal period decay rate per orbit) and I drag (increment decay rate per orbit) figure where the NASA decay is given as a negative number. The nodal period and increment are calculated for the epoch day given.

He points out that that METEOR 2/17 and METEOR 3/03 are now on, that OKEAN-2 is sometimes switched on during its afternoon passes, and that the mean motion of Fen Yung-2, yet to be listed, is probably closer to 14.0005. Birger also calculates that the true orbit number for OSCAR-13 is now the NASA number -3, and finally that FO-20 is now reliable, as NASA has finally stopped confusing it with nearby in-line similar DEBUT in their listings.

TLM

Joe Kasser G3ZCZ/W3 is collecting amateur satellite telemetry for the archives, to form a reference bank. Any would be welcome, in particular any that can be taken from JO-20 when found on in the warming non-eclipse period, which JARL advise will last until May 1991.

CCW and EME

Satellite users, and OSCAR-0 users (moonbouncers) in particular, may have considered that coherent c.w. (c.c.w.) is an ideal application for getting those ultra-

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weak signals out of the noise to give a solid readable output. Indeed, the circuitry and practical use of this technique to give better than a 20dB improvement of signal over noise, e.g. using one tenth of the power to end up with a 10dB signal gain has been well demonstrated with cross terrestrial signal paths by radio amateurs. See articles by **Charles Woodsen W6NEY**, *QST* May 1981, pages 11-14 and June 1981, pages 18-23.

Dr Tom Clarke W3IWI, AMSAT-NA Chairman, referring to the ongoing discussion between Ray Soifer W2RS and myself of c.c.w. application to e.m.e., came up with the following considerations: "The simple naive c.c.w. won't help much. The moon is a rough enough scattering surface to broaden the intrinsic bandwidth to 50-100Hz (at 70cm) with coherence times in the 10-20 millisecond range. However, there are Digital Signal Processing tricks which will buy 10-15dB improvement. N4HY, W3IWI and I2KBD have all copied our own echoes from the moon with a typical AO-13 class station (e.g. 100W to a 10-15 dBi gain antenna), and N4HY and W3IWI have copied each other using long pulse non-coherent integration techniques.

Sadly for e.m.e. enthusiasts, though fortunately for the amateur satellite community, Tom is working for AMSAT 25 hours per day, building Microsats, DSP boxes, running the AMSAT BBSs, and working hard for a living for the rest of the time, with never a non-committed moment to spare. He just needs time to perform the mechanics and resultant write-up in order to make it all work operationally so that some of us can give it a go. They know HOW to do it and will undoubtedly tell we readers as soon as time permits.

Try Weather Sats?

Jeff Wallach N5ITU, who is Chairman of the Dallas Remote Imaging Group wants to remind OSCAR satellite users they can easily process weather satellite Automatic Picture Transmissions (APT) using a large part of their current station. "If you have a 2m beam or a turnstile with a pre-amp, if you have satellite tracking software and a general coverage receiver which can tune to 137MHz, you are not far from being able to process WX pictures" says Jeff. "Ideally the 137MHz receiver you use should be capable of wideband f.m. modulation with a 50kHz wide i.f." (Jeff has experimented with f.m. scanners which have 150kHz wide i.f.s with good success!) He points out that there are several interface cards which can easily be installed into IBM PC computers and clones which will turn the APT signals into very detailed pictures with 4km resolution. Once you have the weather image signal and its audio is routed to the interface card in the back of your PC, with the proper software, the pictures are easily produced on a EGA or VGA screen. For a start, you can try looking for some of the signals from the satellites for which the Keplerian elements are given this month.

Satellite	NOAA 9	NOAA 10	NOAA 11	METEOR 2/16	AO-18	AO-19
Int. Design	84-123A	86-073A	88-089A	87-068A	90-005F	90-005G
Object No.	15427	16969	19531	18312	20441	20442
Element Set	617	461	343	467	106	107
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	235.19924558	238.41621235	241.31348508	210.05150029	237.75437792	237.11386243
Inclination	99.1717	98.5981	98.9865	82.5504	98.7007	98.7031
RAAN	236.5983	264.7812	189.7191	257.1065	313.8343	313.2197
Eccentricity	0.0015171	0.0014855	0.0013268	0.0012318	0.0011760	0.0011939
Arg of Perigee	177.4451	67.3341	79.1484	129.4886	316.7425	319.2050
Mean Anomaly	182.6802	292.9394	281.1175	230.7562	43.2838	40.8253
Mean Motion	14.12641537	14.23701036	14.11689484	13.83865228	14.28932011	14.29000413
Decay Rate	0.00000442	0.00000576	0.00000825	0.00000219	0.00000464	0.00000421
Orbit Number	29344	20460	9928	14877	3080	3071
Nodal Period	101.993029	101.202311	102.082089	104.130125	100.831939	100.827112
P-Drag	2.260E-06	2.878E-06	4.227E-06	1.192E-06	2.293E-06	2.080E-06
Increment	25.495408	25.300999	25.514239	26.161300	25.206979	25.205746
I-Dreg	5.688E-07	7.240E-07	1.064E-06	2.979E-07	5.769E-07	5.233E-07
Beacon-QRG	137.620=APT 1707.0=HRPT	137.500=APT 1698.0=HRPT	137.620=APT 1707.0=HRPT	137.850=APT	437.0751/ 437.102MHz	437.15355/ 437.1258/ 437.125MHz
Ref. EQX	01 Sep 1990	30 Aug 1990	01 Sep 1990	03 Aug 1990	30 Aug 1990	30 Aug 1990
Orbit	29469	20511	9966	14946	3141	3141
HHMM.MM	0116.02UTC	0000.65UTC	0009.74UTC	0059.13UTC	0037.03UTC	0021.84UTC
Degrees W	113.29	69.80	149.92	72.99	29.11	25.29

Satellite	METEOR 2/17	METEOR3/02	METEOR 2/18	METEOR 3/03	FO-20	UO-15
Int. Design	88-005A	68-064A	89-018A	89-086A	90-013C	90-005C
Object No.	18820	19336	19851	20305	20480	20438
Element Set	351	566	300	206	102	115
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	241.12367145	240.97555581	241.04223640	241.13668582	237.47999198	239.08893472
Inclination	82.5442	82.5240	82.5229	82.5552	99.0343	98.6992
RAAN	292.4839	225.9110	170.4087	186.5538	270.8937	314.9507
Eccentricity	0.0017918	0.0017635	0.0015914	0.0015788	0.0540177	0.0009756
Arg of Perigee	116.7539	130.2790	153.4871	142.0168	251.6210	311.1805
Mean Anomaly	243.5458	229.9790	206.7167	218.2082	102.5464	48.8550
Mean Motion	13.84366856	13.18904199	13.83993788	13.15864098	12.83159065	14.26414905
Decay Rate	0.00000211	0.00000392	-0.00000122	0.00000042	0.00000011	0.00000337
Orbit Number	13027	10053	7564	4054	2563	3098
Nodal Period	104.077395	109.405071	104.105385	109.491532	112.2805	100.868418
P-Drag	1.147E-06	2.474E-06	0	2.657E-07		1.667E-06
Increment	26.148168	27.480186	26.155327	27.501559	28.08375	25.218170
I-Drag	2.866E-07	6.186E-07	0	6.644E-08		4.194E-07
Beacon-QRG	137.300=APT	137.300=APT	137.300=APT	137.850MHz	435.796/ 435.910MHz	435.120MHz
Ref EQX	01 Sep 1990	01 Sep 1990	01 Sep 1990	01 Sep 1990	30 Aug 1990	30 Aug 1990
Orbit	13067	10093	7605	4092	2621	3140
HHMM.MM	0021.18UTC	0021.00UTC	0009.14UTC	0037.51UTC	0003.44UTC	0044.53UTC
Degrees W	55.02	121.40	174.14	184.78	64.23	31.20

Satellite	OSCAR 10	OSCAR 11	RS10/11	OSCAR 13	AO-18	AO-17
Int. Design	83-058B	84-021B	87-054A	88-051B	90-005D	90-005E
Object No.	14129	14781	18129	19216	20439	20440
Element Set	546	771	303	144	103	111
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	238.61336052	237.59292487	240.87042174	233.10507940	237.63803804	237.06960698
Inclination	26.0406	97.9466	82.9234	56.9230	98.7008	98.7014
RAAN	187.8160	287.8695	274.8282	139.8507	313.6744	313.1244
Eccentricity	0.5953791	0.0013246	0.0010300	0.7012370	0.0011129	0.0011348
Arg of Perigee	170.7905	33.1708	279.0842	234.0055	318.7523	318.8345
Mean Anomaly	208.8811	327.0388	80.9192	39.5251	43.2786	41.2012
Mean Motion	2.05880615	14.65587461	13.72105398	2.09695679	14.28790688	14.28838028
Decay Rate	-0.00000014	0.00001618	0.00000193	-0.00000146	0.00000506	0.00000448
Orbit Number	5418	34813	15941	1873	3078	3070
Nodal Period	698.862	98.313211	105.007273	686.818	100.841904	100.838585
P-Drag	-	7.410E-06	1.077E-06	-	2.501E-06	2.214E-06
Increment	175.221	24.579401	26.377715	172.199	25.209486/	25.208641
I-Drag	-	1.864E-06	2.693E-07	-	8.293E-07	5.571E-07
Beacon-QRG	145.810/ 145.987MHz	145.826/ 435.025/ 2401.5MHz	29.357/.408, 145.657/.903 29.407/.453, 145.907/.953	145.812/ 435.651/ 2400.664MHz	437.02625/ 437.05130/ 2401.143MHz	145.82516/ 145.82438/ 2401.2205 MHz
Ref EQX	01 Sep 1990	01 Sep 1990	01 Sep 1990	31 Aug 1990	30 Aug 1990	30 Aug 1990
Orbit	5430	34707	15984	1694	3141	3141
HHMM.MM	1027.20UTC	0015.18UTC	0008.71UTC	0250.34UTC	0108.91UTC	0059.75UTC
Degrees W	310.26	49.62	69.57	243.29	37.12	34.82

Satellite	SALYUT 7	MIR	OKEAN 2	METEOR 2/19	FENG YUN 2	UO-14
Int. Design	82-033A	86-017A	90-018A	90-057A	90-	90-005B
Object No.	13138	18609	20510	20670		20437
Element Set	470	895	237	47		200
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	241.02365089	240.78682715	211.66444949	241.10600192	247.65515168	235.48023174
Inclination	51.6011	51.6132	82.5238	82.5421	98.9373	98.6908
RAAN	293.9038	323.8284	57.6821	230.7768	282.3263	311.3834
Eccentricity	0.0001196	0.0025873	0.0020909	0.0017773	0.0010580	0.0011282
Arg of Perigee	51.3600	302.4545	130.0406	82.8304	282.5138	322.8890
Mean Anomaly	308.7384	57.3803	230.2614	277.8876	77.4587	37.1513
Mean Motion	15.70044339	15.61256444	14.73289847	13.83845377	14.011872778	14.28684771
Decay Rate	0.00069158	0.00047935	0.00001092	0.000000086	-0.000000017	0.00000564
Orbit Number	47627	25945	2247	860	??	3047
Nodal Period	91.855123	92.171558	97.800355	104.116568	102.826586	100.849392
P-Drag	2.570E-04	1.811E-04	4.923E-06	4.878E-07	-	2.788E-06
Increment	23.302093	23.429044	24.579768	26.157975	25.706975	25.211450
I-Dreg	6.320E-05	4.458E-05	1.230E-06	1.169E-07	-	7.015E-07
Beacon-QRG	19.953/142.417/ 925.240MHz	143.625=voice 166.130=data+ ranging 247.5=KVANT	137.400=VIS+ 2xradar		137.800MHz	435.070MHz
Ref EQX	03 Sep 1990	31 Aug 1990	03 Aug 1990	01 Sep 1990		30 Aug 1990
Orbit	47706	25980	2297	901		3141
HHMM.MM	0113.21UTC	0038.83UTC	0128.82UTC	0141.42UTC		0131.34UTC
Degrees W	92.02	38.12	278.52	136.90		42.88

Keplerian Elements
Source: NASA 2-line elements, edited by Birger Lindholm (not to be used for precise scientific analysis).

Back-Scatter

Propagation

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

Propagation

Once again I hope that you, our readers, will see the importance of combining as many reports as possible to provide posterity with a widespread picture of the various events as they happened. No matter how small your observation may have been, if you think it was unusual then send me the details so that I can slot it in the right section.

Solar

During August, **Ron Livesey** (Edinburgh), using his refracting telescope and projection equipment, identified 5 active areas on the sun's disc on days 6 and 26; 7 on the 5th, 11th, 22nd and 31st; 8 on days 2, 10 and 28; 9 on the 1st, 17th and 25th; 11 on the 16th and 12 on the 20th. **Neil Clarke G0CAS** (Ferrybridge) added more about this solar activity when he wrote, "August saw the highest mean sunspot number so far this cycle at 199.9, the previous highest monthly mean was June 1989 at 196." As usual Neil sent along his computer print-out, **Fig. 1**, showing the daily variations in solar flux for the month, but points out, that although the spot count was the highest this cycle, the "solar flux did not respond so well" reaching only 4th place in the records to date. By making drawings of the sunspot positions, with his special apparatus, as often as possible, **Petrick Moore** (Selsey) has again shown how the active state of the sun can vary in as little as a couple of weeks. Who could have predicted that the number of sunspots that he observed at 0805 on August 16, **Fig. 2**, would rapidly grow and groups would form by 1100 on the 22nd, **Fig. 3** and then reduce again to a relatively small amount by 0640 on the 30th, **Fig. 4**. Many of these spots must have been independently active because it is not surprising to learn that **Ern Warwick** (Plymouth) heard variations in the background noise of his 28MHz receiver around 1600 on the 26th, 0900 and 1500 on the 27th, 1700 on the 31st and 1240 and 1550 on September 23.

Despite some cloud on September 1, 4 and 8, **Cmdr Henry Hatfield** (Sevenoaks), using his spectroheliioscope, managed to locate a sunspot group, 12 filaments and 8 quiescent prominences at 1120 on the 1st; 1 triple and 2 double spots at 1130 on the 4th; 1grp, 19fs, 6 small and 1 large qps at 1145 on the 6th; 1grp, a small hot spot almost flaring and a small eruptive prominence to the west of it, 11fs and 14qps at 1108 on the 8th; 8 spots, 16fs, 18qps and a few spicules at 1030 on the 9th; 2gps, 15fs and 16qps at 1140 on the 13th; 2gps, 13fs and 11 qps at 1340 on the 27th and 2gps, 16fs and 8qps at 1129 on the 28th. He also recorded individual bursts of solar radio noise at 136MHz on August 31 and September 18, 23 and 24 and a small burst on 1297MHz on the 18th. I had the pleasure of showing my old friend Henry, **Fig. 5** (left) and his wife Sue around the vintage wireless collection, during their visit for the tribute to **Gerald Marcuse**, pioneer of Empire Broadcasting, held at the Amberley Chalk Pits Museum, Sussex, on September 2. Another VIP on that day was **Myles Eckersley** seen talking to Joan Ham in **Fig. 6**. Myles is currently writing a book about the work of his late father, Capt. Peter Eckersley, the first chief engineer of the BBC.

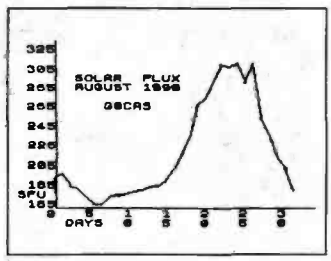

Fig. 1

Auroral

Ron Livesey, the auroral co-ordinator for the British Astronomical Association, received reports of 'glows' from observers in Ireland and Scotland for the overnight periods of August 1, 3, 21 and 24; 'rays' from Scotland and Finland on the 16th and 25th respectively and 'homogeneous arc' from Canada and Scotland on the 21st and 22nd.

There is little doubt in my mind that the massive sunspot group, observed by Patrick Moore at 1100 on August 22, **Fig. 3**, was responsible for the aurora that manifested later in the afternoon. From his home in New Radnor, **Simon Hamer** received distorted auroral reflected pictures from distant television stations on Chs. E2 (48.25MHz), R1 (49.75MHz), Ireland's RTE on Ch.IB (53.75MHz) and on one of their channels in Band III. **Doug Smillie GM4DJS** (Wishaw) made auroral contacts on 144MHz with six amateur stations in Scotland, one in Norway and one in North Wales. During further events on days 23, 28 and 30 Doug made tone-A contacts with stations in Belgium, Denmark, Faroe Is, Germany, Holland, Poland, Scotland, Switzerland and Wales and copied signals from the propagation beacons in Buxton (GB3BUX-70.050MHz), Faroe (OY6VHF) Germany (DL0PR), Inverness (GB3RMK-50.060MHz) and Lerwick (GB3LER-144.965MHz). Shortly before the aurora faded out on the 22nd, Doug worked GW4VEQ in North-Wales and had the unusual experience of hearing the GWs' Morse code signal direct as well as being reflected from the aurora. In other words T9 and Tone-A, hi! Ern Warwick tells me that the German beacon DK0WCY (10.144MHz) was giving a weak auroral warning between 1800 and 1900 on August 26 and that he heard an 'echo' on the signal from the South African beacon ZS6PW at 1700 on the 31st.

Magnetic

Neil Clarke's print-out of the 'Ap' index for August, **Fig. 7**, clearly shows the peak storm conditions around the 26th. Neil rightly points out that by comparing **Figs. 1** and **7** you will see that the increased magnetic activity coincided with the higher output from the sun. Apart from his own observations with a 'Jam-Jar' magnetometer, Ron Livesey also received reports from **Gerry Hawkins** (Bristol), **Tony Hopwood** (Worcester), **Karl Lewis** (Saltash) and Doug Smillie who between them observed magnetic activity on days 1, 3, 4, 11, 12, 14, 15, 16, 21, 22, 23, 26, 29, 30 and 31.

Sporadic-E

Lt. Col. Rana Roy (Meerut, India) reports receiving television pictures in Band I from the USSR and sometimes Dubai during Sporadic-E openings on 18 days in June; 8 in July and 7 in August. As the 1990 Sporadic-E season waned early in September **Bob Brooks** (Great Sutton) received pictures, in Band I, from Italy and Spain on August 23, Italy on the 31st and September 1 and Norway and Sweden on the 3rd. Simon Hamer logged Italy and Poland on the 31st, Iceland Norway and Yugoslavia on September 1 and Hungary and the USSR on the 2nd. Ern Warwick heard 27MHz CB activity from Holland at 1030 on August 27, parts of Europe at 1400 on the 28th and 1110 on September 23.

Propagation Beacons

First of all my thanks are due to **Ted Waring** (Bristol), **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Henry Hatfield, **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), and Ern Warwick for their detailed 28MHz beacon logs from which I compiled the chart in **Fig. 8**. Greg Lovelock reports hearing PT2AA on 28.220MHz and copied YO2X on 28.239MHz sending "KN05OS QRV 10/2m QRP2W DIPOLES BEACON TIMDSOARA QSL VIA YO2IS". Ern Warwick added KA1NSV (28.260) and PT2IBM (28.222MHz) to the list this time and heard W8UR on 28.218MHz sending "W8UR/B 500mW BOX 343 MACKINAW CITY, MI 49701" at 1250 on September 20. In addition to his 28MHz observations Ern kept watch on other beacon bands during the period and received frequent signals from PY2AMI on 24.931 and 18.100MHz, LU4AA, ZS6DN/B, 4U1UN/B and 4X6TU/B on 14.100MHz and DK0WCY on 10.144MHz. He also copied signals, less frequently, from IK6BAK on 24.915MHz and OH2B and W6WX on 14.100MHz

Tropospheric

Rana Roy received early morning television pictures in Band III from India and Pakistan on a few days in June and in his letter of September 17 he remarked "Tropo has been very poor with nothing in July, August or September."

The slightly rounded atmospheric pressure readings in **Fig. 9**, for the period August 26 to September 25, were taken at noon and midnight from the Short & Mason barograph installed at my home in Sussex and at times indicated the onset of a tropospheric opening. For instance, Simon Hamer received television pictures in Bands III, IV and V from stations in the Benelux countries, France and Ireland on September 2 and **John Woodcock** (Basingstoke) watched CANAL+ from France during the afternoons of the 4th and 7th.

George Garden (Edinburgh) conducted an interesting experiment while on holiday in Buckinghamshire early in September. On arrival at the hotel he set up his JVC CX610 receiver and amplified loop antenna and apart from strong 'local' television, he received a weak, black and white picture from the Midhurst transmitter of TVS on Ch. 58. On the 2nd he noted from the TV weather map that there was a ridge of high pressure to the south of the British Isles, so DXing for George began again at 0700 on the 3rd. "The sky was cloudless, blue and the weather very hot," said George

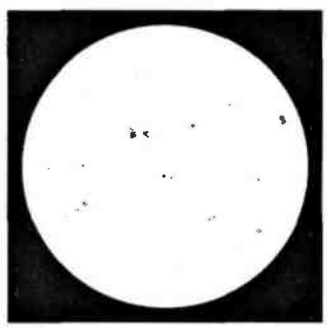
Fig. 2

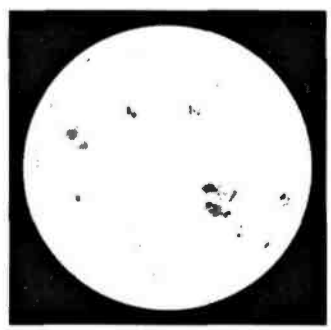
Fig. 3

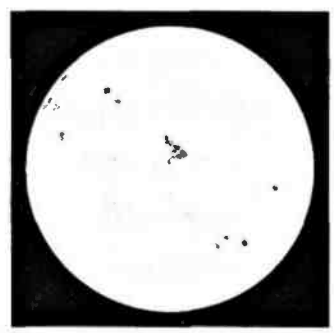
Fig. 4

who was delighted to receive strong colour pictures, with sound, from the Rowridge (Isle Of Wight) transmitter of BBC1 (South) on Ch.31 and from TVS at Midhurst on Ch.58. By 0930 the sky had clouded over and at 1000 both signals were "non-existent".

934MHz

Although u.h.f. conditions were not brilliant, **Les Jenkins** (Godalming), managed to work CK-26, UK-04, UK-1067, UK1271 and UK-1381 all in East Kent while on holiday in Deal, Kent between September 9 and 14. Les uses a Cybernet Delta-One transceiver with a 10-element home-brew beam.

The cooler nights on August 12 and 13 enabled **Terry Wyatt** (Walton-on-Thames) to exchange reports with stations in the Channel Islands, Guernsey (UK-176) and Jersey (UK-797), Swanage, Dorset (UK-569/P) and in Sussex on Butser Hill (UK-1391/P), Hailsham (UK-1428) and Selsey (UK-1149). From Jersey, UK-797 told Terry that he made contact with a Spanish station EA2-WD/MM on 934MHz. John Levesley UK-627 logged signals from GY-186 in Guernsey on August 25, 27 and 29 and September 8 and Ern Warwick learnt from a 27MHz CB operator that conditions were good on 934MHz on the 26th. **Rob Petrie UK-1509** (Yeovil) took advantage of the lift on September 28 and with his Delta One and PA7E Collinear antenna made contact along the Sussex coast with BT-203 and CY-01 in Angmering, TB-01 in Bognor Regis and heard UK-942 in Essex. All good stuff, but readers, what about a few more reports?

Ron's page relies on feedback from you! Write to him direct or via the office. Alternatively, we'll be pleased to pass on comments received by telephone.

Fig. 5

Fig. 6

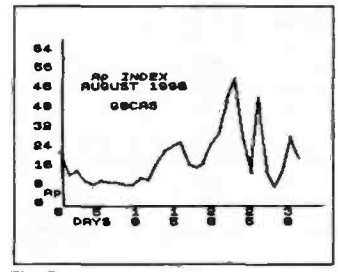

Fig. 7

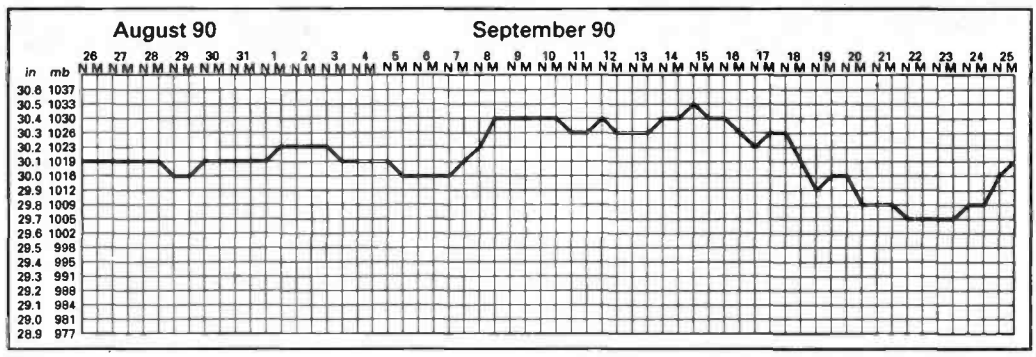

Fig.8

Beacon	August 26	27	28	29	30	31	September 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
DF0AAB		X	X	X		X	X	X		X	X			X													X		X		
DF0THD			X			X	X																				X				
DL0IGI	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
EA3JA	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
HG5GEW				X		X	X				X																X	X			
IY4M	X		X			X	X		X		X																X	X	X		
KA1NSV																															X
KC4DPC				X		X	X	X	X	X		X		X		X								X	X	X					
KD4EC				X		X	X	X			X							X							X			X		X
KE2DI								X	X	X				X											X	X			X		
KF4MS							X	X	X			X				X								X	X				X	X	X
KJ4X				X				X	X	X		X		X		X							X	X	X	X			X		X
KW7Y									X																	X					
LA5TEN	X	X		X		X	X	X			X			X													X	X	X		
LU1UG														X																	
NX20			X	X			X	X	X	X				X		X									X	X			X		X
OK0EG			X	X	X	X	X	X			X													X		X	X	X	X		
OH2TEN	X	X																									X	X	X		X
PI7BQC			X																												
PI7ETE			X																												
PT2AA		X	X			X			X	X	X																				
PT2IBM																													X		
PT7AAC						X																			X	X	X	X	X	X	X
PT8AA									X	X	X	X				X		X			X										
PY2AMI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X
SK5TEN		X		X		X	X	X			X			X												X	X	X		
VE2HOT																										X					
VE3TEN			X	X		X		X	X														X	X	X	X			X		
VK2RSY	X	X		X			X		X	X	X		X	X			X	X	X				X	X	X	X	X	X	X		X
VK5WI	X	X		X	X		X		X	X	X		X	X			X		X	X	X		X	X	X	X	X	X	X		X
VK6RWA				X	X		X		X	X	X		X	X	X		X	X				X	X	X			X	X	X		X
WA4DJS	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X					X	X	X	X		X	X	X	X
WC8E							X	X	X	X				X											X	X					X
W3SV																									X	X					
W3VD	X	X	X	X		X	X	X	X	X		X	X	X		X	X			X				X	X	X		X			X
W8UR								X	X																	X					X
W9UXO								X	X	X				X											X	X					X
YO2X														X																	X
ZD8HF	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
ZL2MHF											X												X	X							
ZS1LA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZS5VHF		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ZS6PW	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4N3ZHK		X		X	X	X	X	X			X				X								X	X			X	X			X
5B4CY	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5Z4ERR	X	X	X	X		X														X				X	X			X	X		X

Fig. 9

Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the *PW* Editorial Office

Unification

The main event on the international broadcasting scene during October was undoubtedly the changes to broadcasting in and from Germany following unification at midnight BST on October 2. The final broadcast in English from Radio Berlin International went out at 2045GMT with Robin Mitchell, Head of RBIs English Service, presenting a closing monologue which seemed to grumble (legitimately, perhaps) about the fact that rather than sharing the task of German international broadcasting, Deutsche Welle was simply absorbing its eastern counterpart.

The Director of RBI, Klaus Fischer, also presented his views on RBIs demise, saying that "in the past, it has not always been possible to respond...as openly and honestly as during the past few months", referring presumably to the Communist propaganda which the station broadcast for the last forty years. Radio Berlin International will be heard no more: on October 3, RBI short wave frequencies carried a transmission from the church service at Marienkirche in Berlin commemorating the day of unity (broadcast simultaneously by domestic programmes and Deutsche Welle), followed by programmes from Deutsche Welle in Cologne.

The medium wave transmitter on 1.359MHz used by Radio Berlin International for its European services now carries the programmes of Deutschlandfunk. All the signals from transmitters in the former East German territory are a split second behind DW and DLF transmitters, indicating that they are fed not by landline, but by satellite. Presumably this is because telecommunications across the now invisible inner-German frontier are still somewhat backward - even telephoning across the Berlin Wall proved highly problematic during the division of the country, and will doubtless take some time to catch up with the highly developed infrastructure of the West.

Interestingly amongst all this, Radio Moscow's medium wave sender on 1.323MHz in Leipzig still continues to be heard including the English transmissions during the evening. It will be worth keeping an eye on this to see just how warm relations between Germany and the Soviet Union are.

Reports from Deutsche Welle in Cologne suggest that following talks between the Soviet Foreign Ministry and its German counterparts, Moscow is prepared to offer time on ex-jammer transmitters to DW for programmes beamed to Asia. It is unlikely that DW's Sri Lankan relay station at Trincomalee will be back in service for the next eighteen months at least, and the station is investigating all possibilities to improve reception in Asia. Despite the acquisition of RBI's eight h.f. transmitters, DW's transmitting capacity is still well below that of its major Western competitors, BBC World Service and the Voice of America.

Gulf Crisis

In the news but further south, the Gulf Crisis continues, with jamming by Iraq of some Arabic language broadcasts actually diminishing at the beginning of October. It seems that Iraq's capacity to broadcast deliberate harmful interference does not match that of the UK and other broadcasters to add frequencies to Arabic language programme slots. Jamming of the VoA has certainly reduced.

The Voice of America has broken with convention and introduced a Gulf greetings programme for troops and civilians in the region. The programme can be heard at 0455, 0555 and 0555UTC, and people may telephone, FAX or write in with messages. VoA's charter does not include broadcasting to US citizens overseas - its main role is as a broadcaster to the rest of the world. It is therefore likely that the introduction of this broadcast is an indication of the seriousness that the US government attaches to the situation, and the likelihood of military intervention are too long. Should this be so, it will once again prove that watching the international radio scene is an invaluable way of keeping on top of the nuances of the world wide political scene. With the introduction of the new winter schedule at the beginning of October, BBC World Service increased its own *Gulf Link* programme from 15 minutes to half-an-hour, aired three times each day.

Civil War In Liberia

The civil war in Liberia has been mentioned in recent months and the absence of ELWA in Monrovia noted. The station was closed down on July 5 when conditions became impossible for operation to continue. Some 22000 refugees from the fighting came into the transmitter compound and stripped hundreds of coconut trees on the site bare. The station, which is run by an Evangelical movement, is not expected to be back on the air for some time.

Further rationalisation at Radio Moscow has reduced the Chinese output from the station by more than one third from around 182 to 112 hours a week. Similarly, Swahili output was reduced by one third from 21 to 14 hours each week when the winter schedule was introduced.

Radio Vilnius reports that the Voice of America may be prepared to help the station bypass a new law which is being considered to prohibit republican radio stations broadcasting to other parts of the Union. It is reported that a site outside the Soviet Union, provided by VoA, may be used to beam Radio Vilnius programmes back to the USSR.

European Stations
All times UTC (=GMT)

Radio Tirana has been tinkering with its frequencies for the winter period which leaves its European English service schedule:

0630-0700 on 9.50 & 7.205MHz
1830-1900 on 9.48, 7.12 &1.395MHz
2230-2300 on 9.48, 7.215 &1.395MHz

Iceland's Rikisutvarpid short wave relays of the Iceland domestic service continue to be heard on s.s.b. at:

1215-1245 on 17.493, 15.77, 13.83 & 11.418MHz
1410-1440 on 17.44, 15.77 & 13.855MHz
1855-1930 on 15.77, 13.855, 11.418 & 3.295MHz
1935-2010 on 17.44, 15.77 & 13.855MHz
2300-2335 on 17.44, 15.77 & 13.855MHz
All transmissions use upper sideband.

Radio Free Europe's transmitters at the Portuguese relay station at Gloria are currently carrying the European services of the Voice of America which have been displaced by the need to use Kavalla, Werchtachtal and Munich for the 24-hour-a-day Middle East Arabic and English network mentioned in last month's column. This may improve reception of VoA's services in the United Kingdom.

Radio Sweden has reorganised its schedule for the winter period, with the full frequency schedule for English now:

0100 on 9.77 & 1.179MHz [Europe; Asia]
0200 on 11.705 & 9.695MHz [N America]
0300 on 11.705 & 9.695MHz [N America]
1230 on 21.57, 17.74 & 11.715MHz [Australasia]
1400 on 17.74 & 9.765MHz [Asia]
1530 on 21.50 & 17.88MHz [N America]
1800 on 11.90, 9.655, 6.065 & 1.179MHz [Europe; Mid East; Africa]
1930 on 7.265 & 6.065MHz [Europe; Africa]
2200 on 6.065 & 1.179MHz [Europe; Africa]
2300 on 11.705 & 9.695MHz [S America]

Some language services are also affected: Portuguese disappears and Spanish and French will be reduced to 15 minutes each day (a reduction of 50%). Estonian and Latvian transmissions, however, expand to 15 minutes each on a daily basis.

Middle East and African Stations

English from Radio Baghdad, describing itself in its broadcasts to the Middle East as the *Voice of Peace*, uses 11.86MHz at 1000-1300, 1600-1800 and 2000-2200, whilst English to Europe remains at 2000-2200 on either 13.66MHz or 13.60MHz.

Meanwhile, the allied Arab states are moving to the parts of the bands where, until the annexation of Kuwait by Iraq, Radio Kuwait was heard. Saudia Arabia's Broadcasting System (BSKSA) in Arabic is using 15.495MHz in parallel with the usual channel of 21.505MHz. United Arab Emirates Radio in Dubai has been noted on 21.675 between 1000 and 1400 in parallel with 15.435 and 21.605MHz. Radio Baghdad has been heard on both 15.495 and 21.675MHz since shortly after the invasion with the *Voice of the Masses* programme.

Asian and Pacific Stations

All India Radio has introduced Hindi programmes beamed to expatriate workers in the Middle East, heard at 1745-1830 on 11.62, 9.55 and 7.412MHz.

Radio Thailand beams in Thai to expatriates in the Gulf region at 1500 for one hour on 11.905, 9.655, and 4.83MHz.

Radio Japan has altered its General Service in English very slightly for the new schedule period, which results in broadcasts at:

0700-0800 on 21.69*, 21.50, 17.89, 17.81 & 17.765MHz
1400-1500 on 21.70*, 11.865 & 11.815MHz
1500-1600 on 21.70* & 11.865MHZ
2300-2400 on 21.61, 17.81, 15.195, 11.835* & 11.815MHz

Frequencies marked with an asterix are transmitted from the Moyabi relay station. A temporary Arabic service transmission is beamed from Moyabi at 0930 for thirty minutes on 21.53MHz.

Following my suggestion to look out for Radio Ulan Bator in English in a recent column, **Hubert Ruysschaert** of Oostende in Belgium has written - but says that he has been unsuccessful so far! Hubert lists his attempts using both an RA17L and Grundig Satellit 400 with a 9m long wire:

0900 on 12.01 R Moscow in English SINPO 5543
12.03 R Moscow also SINPO 55433
1200 on 12.025 and 11.85 both nothing heard
12.03 has Radio Moscow and Swiss Radio International
1445 on 13.78MHz Deutsche Welle
1435 on 9.795MHz Radio Moscow
1945 on 11.85 and 12.05 three unidentified stations on both channels at the same time.

Has anyone had better luck than Hubert? Drop me a line at the *PW* Office.

The Americas

HCJB in Quito continues its s.s.b. tests using the 30kW transmitter supplied by the Swiss PTT and used during the 1960s for military communications from the Schwarzenburg site. 25.95MHz puts in a good signal during the daylight hours here in the UK. The station is keen to receive reception reports.

Back-Scatter

ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN28PH

ATV Aloft Again

Dave Woodhall ZS6BNT/G3ZGZ writes from Edleen in the Republic of South Africa to describe some fascinating experiments with ATV aloft in a balloon carrying amateur radio (BACAR).

He writes: "As far as the balloon flight was concerned, we (Southern Africa AMSAT) approached both the Post Office and the South African Broadcasting Corporation (SABC) for permission to transmit in the u.h.f. television band. The Post Office gave us the go-ahead provided there was no objection from the SABC who would have to allocate the channel to be used. The SABC gave us the go-ahead provided the Post Office had no objections! We knew at this time that we were on to a winner!

Experimental Flight

"We were given the channel 35 to use on an experimental basis for the duration of our tests and the balloon flight. As a matter of interest the Post Office gave us permission to use 1602kHz for a c.w. beacon for one of the flights in order that school children could use medium wave receivers to pick up signals from our package. The Post Office were in fact very co-operative.

"The concept of the overall package is that several met balloons are filled with gas and connected via a release mechanism to the top of a parachute. The parachute has an equipment module connected to the bottom carrying our experimental payload and power sources. There is a completely self-contained 144MHz beacon with its own power source and antenna. This is used for tracking via Doppler equipped vehicles to ensure recovery. The release mechanism is totally self-contained and consists of a command receiver and decoder connected to a device used to sever the cord between the balloons and parachute. There is also a timer mechanism that will perform the release after a certain time period, just in case the command link fails.

"We had asked that the lowest frequency channel be allocated as it was intended to use a 70cm video transmitter design suitably tweaked up. As it happens for channel 35 we had to start from scratch and design the transmitter. This was my task and I soon had a modulator and low power driver strip running. The intention was to obtain about 100mW from the driver then add a linear amplifier. I do not have sophisticated test gear and the driver strip was tuned up using wavemeters and a home-made spectrum analyser. The picture from a vidicon camera, v.t.r. and test card generator on the domestic TV looked good.

"In the mean time the rest of the team were doing their scrounging acts and had come up with a couple of fairly small (but heavy) 12V vidicon cameras but no c.c.d. one. We did power budget calculations and decided that we could manage to fly this camera if nothing else came available. The only constraint was that we would have to use more batteries than normal with a subsequent increase in weight, lower altitude obtainable and perhaps a shorter flight. To help counter this we commissioned one of our members to build a switch mode power supply to replace the simple linear one that was normally used.

"The rest of the flight package consists of telemetry sensors, a RTTY encoder, a 144MHz downlink transmitter, a command receiver and decoder plus a balloon release and timer mechanism. The telemetry encoder uses an a-d converter to measure 0 to 5V on eight channels and converts this to a telemetry block rather like that used on the Oscar satellites which is transmitted to the ground as a 50 baud RTTY signal using a.f.s.k. on 144MHz.

Chief Scrounger

"The 144MHz telemetry transmitter, command receiver, decoder and automatic timer had been used several times previously so were carefully checked out and declared ready for flight. The 'equipment sourcing manager' (chief scrounger) had magically turned up a Philips c.c.d. camera without lens but with a slight fault. Fortunately the vidicon cameras we had got previously were fitted with suitable lenses and this solved the lens problem. I managed to repair the camera after tremendous effort in between the work on the transmitter and other parts of the package. All that was wrong was a dry joint on the back of the power connector socket! (I wonder if the previous owner of the camera was charged for a new unit ?)

Mysterious Energy?

"Back to the video transmitter and the power amplifier stage. Well, I had looked in the scrap box, gone to our normal scrounging sources, and even considered BUYING a p.a. transistor. In the end we were donated a few transistors that should have been OK. Most of these devices were specified for use on the u.h.f. mobile radio frequencies around 500MHz and we figured that they would probably work at channel 35. Whenever I build gear such as this I am very fortunate in being able to borrow a 1GHz spectrum analyser and generator from one of the mobile radio manufacturers (one of the directors is licenced and is also on our committee - this seems to help strangely enough!) When the test gear was connected to the transmitter I was very disappointed to find that the 250mW that I thought the driver strip gave out turned out to be about 80mW on the correct frequency. Plenty of changes later resulted in an output on the right channel of about 150mW that should have been fine to drive the p.a. transistor to give about 1.5W out.

"The p.a. was driven to about 5W d.c. input and on the test set wattmeter gave about 3.5W output. This was great and I went to bed that night feeling very happy with myself. The next day I decided to check the stability of the transmitter and removed the crystal. There was still just under 3.5W output and I panicked thinking that the strip was self-oscillating. In an attempt to sort this problem out the p.a. was disconnected from the rest of the circuit and the wattmeter still showed power. During the checks I even disconnected the p.a. collector lead from the circuit and there was still power going into the wattmeter! This was great, I'd invented perpetual r.f. without any transistors, all that was necessary was a tuned circuit, decoupling capacitor and a direct connection from the power rail to the r.f. output socket on the transmitter!

"It did say that the wattmeter would work from d.c. to 1GHz, but how silly I felt when the d.c. blocking capacitor was fitted and the 'r.f.' suddenly stopped! After the p.a. was reconnected there was some real r.f. of about 300mW. No matter what I did the output would not rise over 800mW. We had calculated that we needed at least 1.5W to get the 400km coverage that we needed from the balloon package. After many changes to the output matching no better levels could be obtained. A frantic call via the SA AMSAT bulletins resulted in two more transistors being given to me a week before the launch date. We were prepared to call off the flight if the required amount of r.f. could not be obtained.

Early Hours Decision

"Help was sought from those amateurs that worked in the r.f. field and most of them made comments like "that's a stupid frequency to tune up on as most devices are designed either for 500 or 900MHz". Well I can confirm this statement but by using an 'old fashioned' (in the words of the r.f. design engineers) 2N5044 I got about 1.25W out. *This was just* acceptable and by the Wednesday evening, no actually Thursday morning, at 2.30am I decided we could fly on the Saturday. On Thursday I got a phone call to say "there's a couple of driver transistors here that may work - do you want them?" The drivers were collected and put into the transmitter and what do you know, there was just over 2W of r.f. even with the d.c. blocking capacitor fitted! We were in with a good chance."

Read the next gripping instalment to see if they really got off the ground!

As from the January issue of *PW*, 'Backscatter' is changing. The 'feedback' received by readers via the survey forms, letters and comments clearly show that a different approach is required.

In future issues 'Backscatter' will carry 'HF Bands', 'VHF Up' and 'Broadcast Round-Up'. Pat Gowen's 'Amateur Satellites' will be produced as a separate monthly feature as will Ron Ham's regular article based on propagation.

The 'Propagation' feature now in 'Backscatter' will be absorbed into Ron Ham's popular 'What Is Propagation?' article and will appear as a separate feature under the title 'Reflections'. Ron intends to cover propagation, technology and personalities and their activities and interests with less of an emphasis on reports.

Pat Gowen plans to cover more news and items of interest from the satellite world. Personalities, techniques and news and reports of your own 'extra terrestrial' activity will be very welcome.

Andy Emmerson's 'ATV' feature from 'Backscatter' will appear bi-monthly as a separate feature in the magazine and we hope to include more personalities, news and topics in Andy's column.

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