PRACTICAL WIRELESS

PW

THE RADIO MAGAZINE

Reviewed This Month

Yaesu FT-650 Transceiver
For HF & 50MHz

INSIDE THIS ISSUE

New Digital Product
A Frequency Sensitive AND Gate

CB High & Low

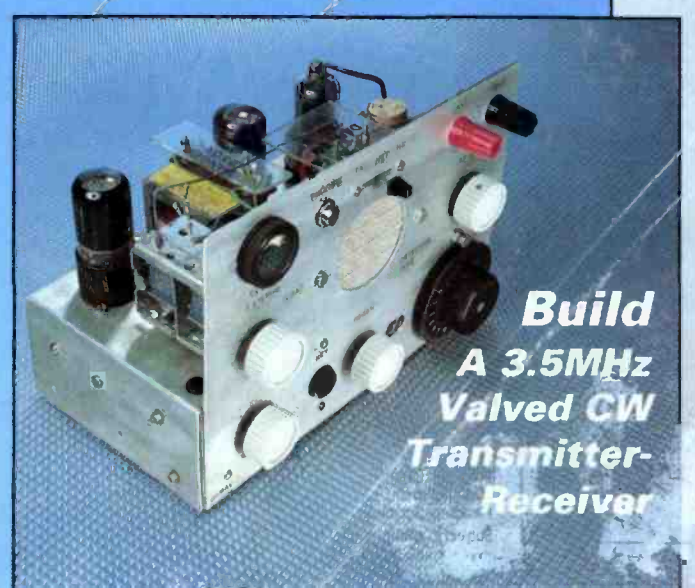
Packet Panorama

Newsdesk '91

Competition Corner

Radio Diary

And Lots More!



Build A 3.5MHz Valved CW Transmitter-Receiver

APRIL 1991
£1.60

ISSN 0141-0857
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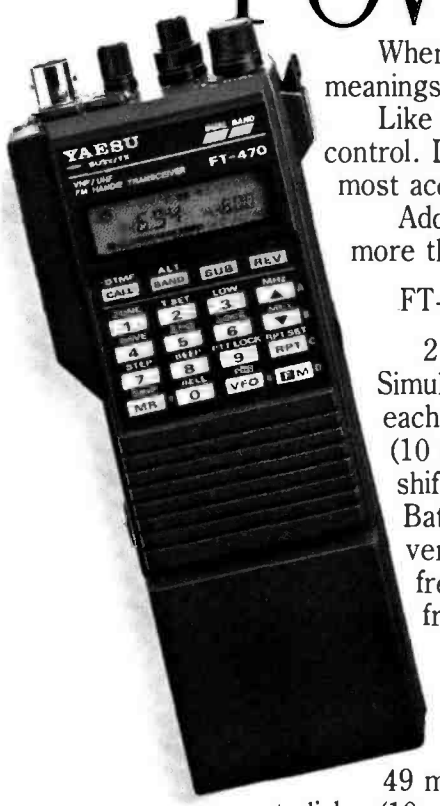
OUR COMPLETE LINE OF PORTABLE POWER TOOLS.



When you're talking Yaesu handhelds, power takes on many meanings.

Like maximum RF output. Sophisticated microprocessor control. Deceptively simple operation. Even cost savings—as most accessories are interchangeable throughout the line.

Added up, it's no wonder amateurs choose Yaesu HTs more than any others.

FT-470. DUAL-BAND OPERATION PERFECTED.

2 metre and 430-440 MHz 42 memories. Simultaneous receive of both bands. Dual VFOs each band. Paging feature. DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Audible command verification. Keypad and rotary-dial frequency entry. Battery packs available from 2.3 to 5 watts. More.

FT-411 SERIES. MAXIMUM SINGLEBAND PERFORMANCE.

2 metre FT-411 and 430 MHz FT-811. 49 memories. Dual VFOs DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Audible command verification. Key-pad and rotary-dial frequency entry. Many battery packs available, from 2.3 to 5 watts. More.

FT-23R SERIES. SMALL, SMART, RUGGED.

2 metre FT-23R, and 430 MHz FT-73R. 10 memories (7 store odd splits). Memory scan at 2 frequencies per second. High/low power switch. LCD power output and "S"-meter display. Auto-battery saver. Alluminium-alloy case. Water-resistant seals. Many battery packs available, from 2 to 5 watts. More.

Want more information? Call **(0703) 255111**
Or call into your local authorised Yaesu dealer and ask about the FT-470, FT-411 and FT-23R Series handhelds. The power in handheld performance.

South Midlands Communications Ltd, S M House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire, SO5 3BY. Telephone (0703) 255111, Fax (0703) 263507, Telex 477351 SMCOMMG.

YAESU

Prices and specifications subject to change without notice.

PRACTICAL WIRELESS PW

APRIL 1991
(ON SALE MARCH 14)
VOL. 67
NO. 4
ISSUE 1009

NEXT ISSUE (MAY)
ON SALE APRIL 11

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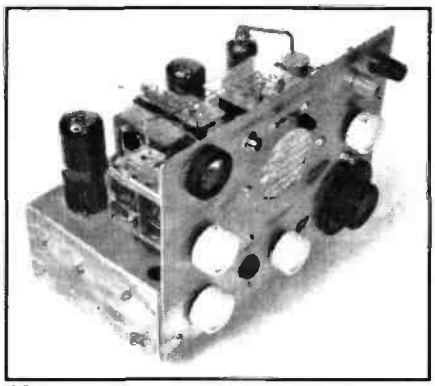
Contents April 1991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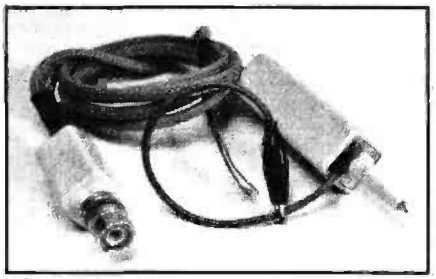
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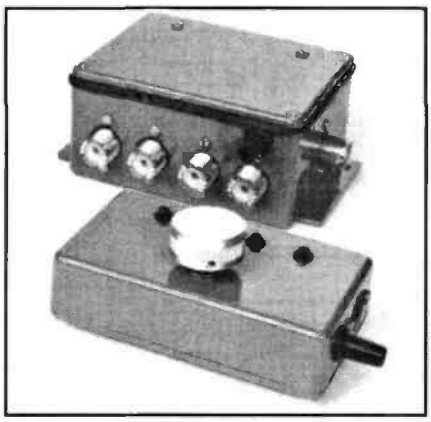
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Regular Features

SATELLITE SCENE HAS BEEN HELD-OVER THIS MONTH

PUBLISHED on the second Thursday of each month by PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Blackmore Press, Shaftesbury, Dorset. Tel: 0747 53034. Distributed by Seymour, Winsor House, 1270 London Road, Norbury, London SW16 4DH, Tel: 081-679 1899, Fax: 081-679 8907, Telex: 8812945. Sole Agents for Australia and New Zealand - Gordon and Gotch (Asia) Ltd.; South Africa - Central News Agency Ltd. Subscriptions INLAND £19.00, EUROPE £21, OVERSEAS (by ASP) £22, payable to PRACTICAL WIRELESS, Subscription Department, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the publishers first having been given, be lent, re-sold, hired out or otherwise disposed of by way of trade at more than the recommended selling price shown on the cover, and that it shall not be lent, re-sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

ICOM

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

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

4SE, 7cm VERSION NOW AVAILABLE

Actual Size

Slim and unbelievably compact.

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

Simple design for operating convenience.

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

Other advanced features:

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

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

Options

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

• Battery packs and case.

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

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

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

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

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

•HS-5I, Headset. Headset with VOX function that allows you hands-free operation.

• Carrying Cases.

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

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

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

Datapost: Despatch on same day whenever possible.
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Count on us!

THE COMPACT HANDHELD WITH A SPLIT PERSONALITY

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

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

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

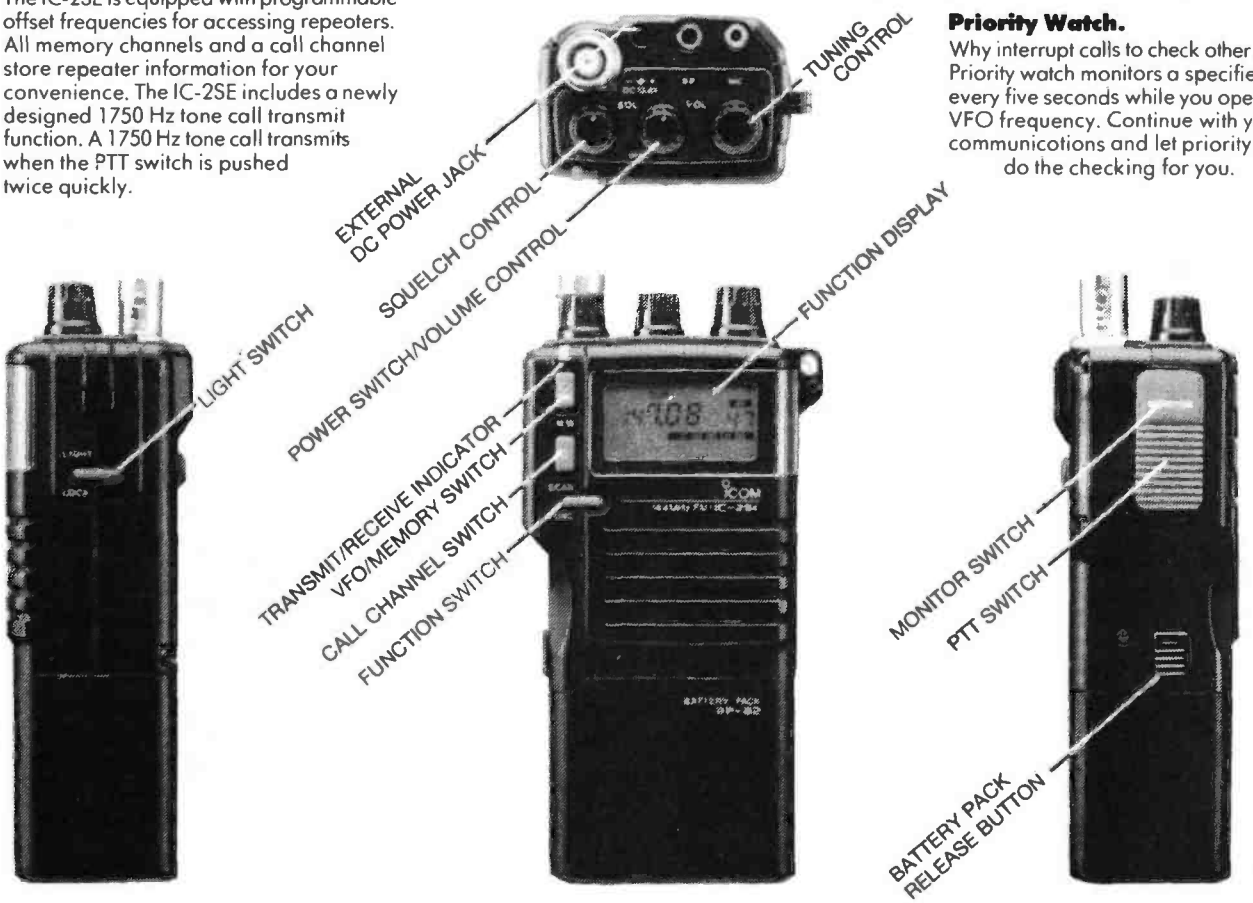
Power Saver for longer operating time.
The power saver ensures lower current flow during standby conditions. Operating times are much longer than with older, more conventional transceivers.

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

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

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

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



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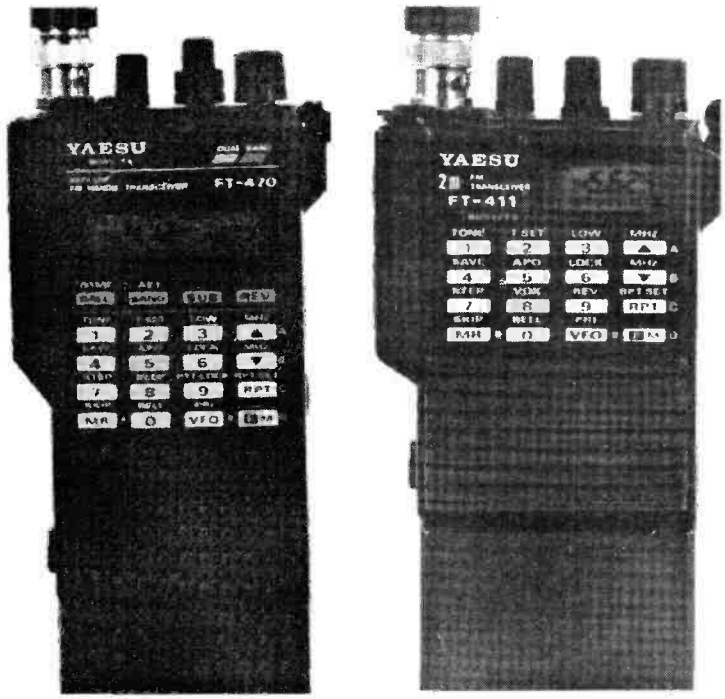
WHY NOT SHAKE OFF THE WINTER BLUES WITH A SPRING SPECIAL FROM SMC



We are pleased to offer ***FREE*** with every FT-23R, FT-73R, FT-411, FT-811, FT-911 &FT-470 an FNB9 NiCad Pack and NC27C Charger.

This makes these some of the best value hand-helds around.

FT-23R	**£209**	FT-73R	**£229**
FT-411	**£225**	FT-811	**£239**
FT-911	**£329**	FT-470	**£369**

OR THE INCREDIBLE FT-736R

With a ***FREE*** 6m module, a saving of **£239** on the normal retail price.
You pay only £1359 for arguably the world's best multiband VHF/UHF Station

★ ALL THESE OFFERS AVAILABLE FROM 14th MARCH TO ★
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Birmingham *021-327 1497*
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Birmingham B8 3HX.
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9am.-4pm Sat.

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1 Western Parade.
West Street,
Axminster,
Devon EX13 5NY.
9.00am.-5.20pm. Tues-Sat

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1kW PEP RF INPUT
70-120W DRIVE **£875.00**

HL2K
160-10M 2 X 3-500Z
2kW PEP RF INPUT
60-120W DRIVE **£1425.00**

VHF LINEARS

HL66V	6m 10W in 50-60W out RX Pre-amp	**£129.00**
HL166V	6m 3/10W in 80-160W out RX Pre-amp	**£249.00**
HL37V	2m 3W in 32W out RX Pre-amp	**£89.00**
HL62V	2m 10W in 60W out RX Pre-amp	**£135.00**
HL110V	2m 2/10W in 100W out RX Pre-amp	**£215.00**
HL180V	2m 3-25W in 120W out RX Pre-amp	**£295.00**
HL36U	70cm 3/10W in 40-50W RX Pre-amp	**£135.00**
HL60U	70cm 10/25W in 50W out RX Pre-amp	**£215.00**
HL130U	70cm 3-25W in 120W out RX Pre-amp	**£389.00**

SMC...For all your accessories

BASE STATION ANTENNAS

HF

OSTD-HP	10-80m Trapped Dipole	£54.49	C
OSG5RV	10-40m Half size G5RV	£19.50	B
OSG5RVF	10-80m Full size G5RV	£25.49	B
HF3VNB	12-17-30m Vertical	£79.00	C
28HS-2HB	10m HB9CV 2 Element	£65.00	C

VHF/UHF

DSC 770	Discone 70-700MHz	£24.95	C
TW435D	Discone 400-1200MHz	£46.00	B
D130	Discone 25-1300MHz	£75.00	C
2H86	6m HB9CV 2 element	£35.00	C
HS-GP62	6m 2step collinear	£64.95	D
ABC23	2m 3 x 5/8 collinear	£63.97	C
GP23	2m 3 x 5/8 collinear	£45.00	C
GPV5S	2m 2 x 5/8 collinear	£45.49	C
SQ144	2m Swiss Quad (Vert. Pol)	£67.95	C
GP714	70cm 14 step collinear	£88.20	C
WX1	2m/70cm 4.5/7.2dB collinear	£54.99	C
WX2	2m/70cm 6.0/8.0dB collinear	£75.00	C
WX4	2m/70cm 7.8/10.8dB collinear	£99.00	C
CA2X4WX	2m/70cm 6.5/9.0dB collinear	£79.00	C
CA2X4MAX	2m/70cm 8.5/11.9dB collinear	£99.95	C
LT606	Log Peridoic 50-500MHz	£184.00	C

MOBILE ANTENNAS

HF

SMC12SE	12m Foldover	£16.85	B
SMC15SE	15m Foldover	£16.85	B
SMC17SE	17m Foldover	£18.75	B
RSL28b	10m Foldover	£13.95	B
PL20M	20m Fixed	£22.43	B
PL40M	40m Fixed	£22.43	B
PL80M	80m Fixed	£23.58	B
PL160M	160m Fixed	£23.58	B
HELI5	10/11/12/15/20m two section	£48.88	C
FLEXI10	160-10m	£80.39	C

VHF/UHF

2QW	2m 1/4 wave	£4.95	B
2NE	2m 5/8 wave foldover	£13.25	B
VM-144HP	2m 7/8 wave foldover	£31.95	B
78B	2m 7/8 wave ball	£15.00	B
88F	2m 8/8 wave	£18.00	B
268E	70cm 2 sect collinear	£32.80	B
358	70cm 3x 5/8 wave	£33.73	B
VM-727RS	2m/70cm 1/2 + 2 x 5/8 wave HI Pwr	£27.75	B
VM-727SKR	2m/70cm 1/2 + 2 x 5/8 wave	£24.96	B
HS-727VMS	2m/70 1/2 + 2 x 5/8 wave shortened	£25.96	B
CA2X4MB	2m/70cm 4.5/7.4dB	£37.75	C
CA2X4KG	2m/70cm 2 x 5/8 + 4 x 5/8 wave	£39.95	C

MOUNTS

SMCGCCA	Gutter Clip c/w 4m cable	£14.25	B
SMCSOCA	Cable Ass. 4m SO239/PL259	£6.90	B
SMCSOCAL	Cable Ass. 6m SO239/PL259	£7.20	B
HS-TMK	Trunk Mount H.Duty c/w cable	£18.50	B
SOMM	Mag Mount c/w 4m cable	£12.75	B
SMCGCD	Gutter Clip only	£6.45	B
BSD	Bumper Strap	£11.50	B
RSM4M	Mag Mount c/w Cable Ass.	£25.88	B
TBR	Hatchback Mount	£11.25	B

MINI VHF/UHF

CHL21J	2m/70cm 0/2.15dB	£14.49	B
CHL23J	2m/70cm 2.15/3.8dB	£16.95	B
HS-727SS	2m/70cm 0/2.8dB	£16.95	B

MOUNTS MINI

RS17	Mini Trunk mount only	£12.50	A
RS16	Mini Gutter Clip only	£12.50	A
CK-3LX	Mini Cable Ass. RS16/RS17	£15.95	B
SSB1	Mini Hatch Mount c/w 5m cable	£26.50	B
SS-BM	Mini Multipurpose Mount only	£10.00	B

JAYBEAM

HF

MM3	Minibeam 10-15-20m	£408.25	D
VR3MK3	Vertical 10-15-20m	£92.00	C
TB1MK3	Dipole 10-15-20m	£133.40	C
TB2MK3	2 Ele yagi 10-15-20m	£264.50	D
TB3MK3	3 Ele yagi 10-15-20m	£394.45	D

VHF/UHF

DB4	4m/6m 4 ele yagi	£153.99	D
4Y6M	6m 4 ele7dBd	£64.63	C
4Y/4M	4m 4 ele yagi	£53.25	C
HD/2M	2m Halo Head Only	£12.88	A
HM/2M	2m Halo c/w 24" mast	£15.07	B
C5/2M	2m collinear 4.8dBd	£116.27	C
LR1/2m	2m collinear 4.3dBd	£49.91	C
LW5/2m	2m 5 ele yagi 7.8dBd	£24.38	C
LW8/2M	2m 8 ele yagi 9.5dBd	£31.28	C
LW10/2M	2m 10 ele yagi 10.5dBd	£37.95	C
LW16/2M	2m 16 ele yagi 13.4dBd	£55.43	D
PBM10/2M	2m 10 ele parabeam 11.7dBd	£75.33	C
PBM14/2M	2m 14 ele parabeam 13.7dBd	£91.54	D
Q4/2M	2m 4 ele quad 9.4dBd	£48.53	C
Q6/2M	2m 6 ele quad 10.9dBd	£63.14	C
Q8/2M	2m 8 ele quad 11.9dBd	£78.66	D
D5/2M	2m 5 over 5 slot yagi 10.0dBd	£44.39	C
D8/2M	2m 8 over 8 slot yagi 11.1dBd	£60.84	C
5XY/2M	2m 5 ele cross yagi 7.8dBd	£47.15	C
8XY/2M	2m 8 ele cross yagi 9.5dBd	£60.15	C
10XY/2M	2m 10 ele cross yagi 10.8dBd	£75.33	C
C8/70	70cm collinear 6.1dBd	£123.17	C
D8/70	70cm 8 over 8 slot Yagi 12.3dBd	£44.51	C
PBM18/70	70cm 18 ele parabeam 13.1dBd	£53.94	D
PBM24/70	70cm 24 ele parabeam 15.1dBd	£70.50	D
MBM28/70	70cm 28 ele multibeam 11.5 dBd	£35.88	C
MBM48/70	70cm 48 ele multibeam 14.0dBd	£57.39	C
MBM88/70	70cm 88 ele multibeam 16.3dBd	£80.04	D
8XY/70	70cm 8 ele crossed Yagi 10.0dBd	£69.00	C
12XY/70	70cm 12 ele cross Yagi 12.0dBd	£85.56	C
D15/23	23cm 15 over 15 slot 15.0dBd	£75.21	C
D15/24	23cm 15 over 15 slot 15.0dBd	£75.21	C

CREATE

714X-3	3/4 ele Yagi 15-20-40m	£799.00	E
AFA40	2 ele Yagi 40m	£375.00	D
CO218	3 ele Yagi 10-15m	£199.00	D
CD318JR	4 ele Yagi 10-15-20m	£299.00	D
CD318	4 ele Yagi 10-15-20m	£349.00	D
CD318B	5 ele Yagi 10-15-20m	£449.00	D
CD318C	6 ele Yagi 10-15-20m	£725.00	D
CL10	5 ele Yagi 10m	£215.00	D
CL15	5 ele Yagi 15m	£319.00	D
CL40B-4	3 ele Yagi 40m	£999.00	E
CV730V-1	V-dipole 10-15-20-40m	£149.00	D
CY103	3 ele Yagi 10m	£120.75	D
CY104	4 ele Yagi 10m	£171.35	D
CV48	Vertical 40m	£209.99	D
AD385	Switch Box 40/80m use with CV48	£49.00	B

BALUNS

BL40X	1:1	3-40MHz	SO239	1kWPEP	£19.49 A
RAG-1.1A	1:1	1.8-30MHz	SO239	2kWPEP	£25.99 B
CB2F/2k	1:1	2-30MHz	SO239	2kWPEP	£29.95 B
CB2F/4k	1:1	2-30MHz	SO239	4kWPEP	£55.00 B
CB2F/6k	1:1	2-30MHz	'HN'type	6kWPEP	£175.00 D
CB2F/10k	1:1	2-30MHz	'HN' type	10kWPEP	£450.00 D
CB2F/5k	4:1	50MHz	'N' type	3kWPEP	£103.50 D
CBL-30	1:1	1.7-30MHz	SO239	1kWPEP	£18.50 A
CBL-2000	1:1	0.5-60MHz	SO239	2KWPEP	£25.00 A

DUPLEXERS

CF416MN	144/430 Duplexer UHF/N conn.	£25.50	B
HS790DN	144/430 Duplexer UHF/N skts	£25.50	B
CFX4310	144/430/1200 Triplexer	£36.00	B

PRICES FOR POSTAGE ON ALL THE ABOVE ITEMS ARE CODED AS FOLLOWS;
A = £1.75
B = £4.00
C = £6.00
D = £10.00
E = £15.00

RSGB Access VISA Creditcharge

- *Free Finance on selected items, subject to status. Details available on request.*
- *Up to £100 instant credit, a quotation in writing is available on request, subject to status.*
- *Yaesu Distributor Warranty, 12 months parts and labour.*
- *Carriage charged on all items as indicated or by quotation.*
- *Prices and availability subject to change without prior notice.*
- *Same day despatch wherever possible.*

ARE COMMUNICATIONS

THE SHOP WITH THE SMILE

WE SELL ALL WELL-KNOWN BRANDS LET US QUOTE FOR YOUR CHOICE

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ICOM
IC-R100 WITH SSB!

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.

ONLY FROM US - WITH SSB!

Phone for Best Price

STAR ITEM

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Keylines

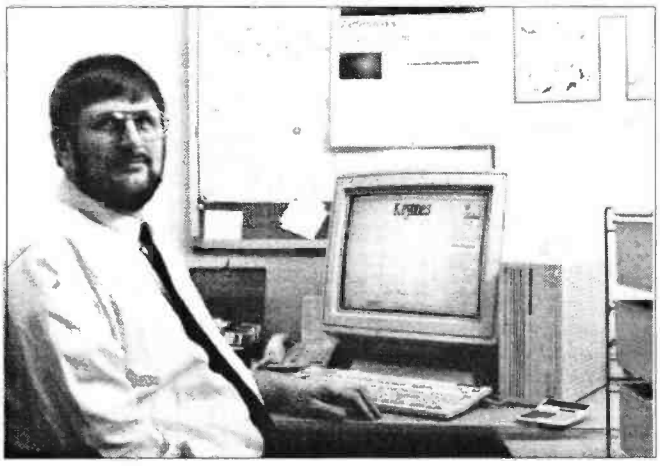
It's about this time of year that most of us begin to think about holidays. The main rally 'season' is rapidly approaching and I've no doubt that some of you are trying to balance the family holiday with you attending a favourite event.

Friedrichshafen Hamfest

For many of us, rallies are the main source of 'bits and pieces'. For others, it's the chance to meet old friends and make new ones.

Some rallies offer you the chance to 'break new ground' by exploring a part of the UK you've never seen before. Occasionally there's a chance to attend an event on the European 'mainland'.

Such an opportunity comes at the end of June, when it's time once again for the marvellous Friedrichshafen Hamfest in Germany. Members of the *PW* team have been before of course, but for the first time readers may be able to join us on a special luxury trip straight to the show, while letting someone else do the driving!



Rob Mannion G3XFD

Largest European Rally

The show - the largest in Europe - takes place over the last weekend in June, on 28, 29 and 30th. The venue is at the German equivalent of the Birmingham N.E.C., the Friedrichshafen Messe, which is set alongside the beautiful Lake Constance, or Bodensee as it's known to the German people.

The *PW* party's luxury double-decker coach, fully equipped with reclining seats, video, tea and coffee and other 'vital' necessities, will depart from the south coast on the Friday and return late on Sunday evening. On the way to the Ramsgate ferry the coach will 'pick up' in London - so readers from the north won't have to come too far south to join us.

It's a long trip, but we'll have all day at the show (the 'Flea Market' alone is the size of the Leicester show!) before an overnight trip home. There's no need to worry about language problems - because we'll have German speakers on board and most people at the show seem to be delighted to practice their English!

The cost of the trip will be based around the £100 mark. If you're interested, write to the *PW* office in Poole, marking the envelope 'Friedrichshafen '91 Trip', enclosing an s.a.e., for further details. You're also welcome to 'phone me at the office to talk about the trip - but please try to avoid lunchtimes! Don't forget to let us know if you're interested, as each luxury double-deck coach only seats 71 passengers, and we don't want to disappoint anyone!

73s DE Rob Mannion G3XFD

Receiving You...

★★★★★
STAR LETTER
★★★★★

Dear Sir

I was both happy and sad to read in 'Keylines' (*PW* February) that an overseas company has once again taken the initiative in running an RAE course. I wish them every success. But is it not a sad reflection on what we have seen happening over the past thirty years when, apart from a few dedicated, enterprising British-owned companies, the majority of UK amateurs and enthusiasts have had to rely almost entirely on overseas manufacturers in supplying their needs?

R. Williams
Deddington
Oxon

Dear Sir

I feel I must take issue with J M Dunnett's comments on the reunification of the two German states ('Backscatter', *PW* February 91).

A magazine such as *Practical Wireless* is not really the place to voice political opinions; however, having allowed Mr Dunnett's opinions to go to print I hope that you will now allow me to state the facts!

Mr Dunnett is not completely wrong - legally, the new united Germany is the same political entity as the old West Germany. However, there is no question of a West German take-over. It was the decision of the freely-elected government of the German Democratic Republic that the GDR should be dissolved and its territory become part of the Federal Republic of Germany. It was one of the main points of the Christian Democrats' election manifesto that, if elected, they would make an early application for the GDR to join the Federal Republic, and it is believed that their landslide victory was won largely on that particular issue.

It is probably true that quite a few East Germans were in two minds about joining the Federal Republic, and now that reunification has taken place many more are having second thoughts about it all. Even many West Germans now feel that everything happened rather too soon, and that the two populations should have been given more time to grow into one people.

The problem was, of course, that the GDR economy was on the point of collapse, and joining West Germany was seen by most people as the only way to stop the country from going bankrupt. Many financially-troubled businesses saved themselves from bankruptcy by voluntarily selling out to larger companies; the East German government was following the same lines when it decided to hand over the country and its troubled economy to the rich neighbours in the West.

Angelika Voss G0CCI
Manningtree
Essex

Receiving You...

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

Dear Sir

I have recently joined The 'Worked All Britain Group' (WAB) which I find very interesting. It certainly improves your geography! But I have noticed that quite a few amateurs don't know their square.

Would it be possible for the WAB square to be included in the RSGB *Amateur Radio Callbook*, possibly bracketed to avoid confusion with the postal code?

It would be a simple and easy task to find the callsign in the *Amateur Radio Callbook* with the WAB reference immediately alongside. I could have sent this letter to the RSGB, but thought it would be more effective if first published in *PW*s 'Receiving You'. Besides, they wouldn't give me a voucher for £10 or £5 on publication!

Despite the increasing number of 'Details withheld' in the *Callbook* - the WAB reference would give little other information away. I can also say that no one has yet declined to give me their county or rateable district when I've asked.

John Harris GW0MOW
Mid Glamorgan
South Wales

Editor's reply. John Harris has a good point here. Personally I can't see any objection to having a WAB reference following a callsign in the *Callbook*. In fact, it would serve two purposes in the (ever increasing) 'Details withheld' category. Anyone working a 'Details withheld' station would have a good idea where the other station was, without compromising their requested privacy and WAB enthusiasts would also benefit at the same time.

Dear Sir

Well, well! It appears that h.f. packet types have finally decided all is not well with mail forwarding, etc., on the h.f. bands ('Packet Panorama', February 1991). Is it too much to hope for that the v.h.f./u.h.f. packet devotees will, one day, decide a similar situation exists on the v.h.f. and u.h.f. bands?

I've got a comparison which may amuse readers. I compare the expenditure in time and money on mailbox facilities and software to a Porsche car.

Unfortunately, the present communications network (the actual data links of various sorts) is equivalent to a ploughed field. I have to smile (more like a sickly grin) at the packet equivalent of two oxen pulling a Porsche across a ploughed field.

The sad part of the comparison is that the car's passengers think it's wonderful. None of them appears to have the slightest notion to put petrol in the thing and build a decent road. But then, roads are built by national bodies and we haven't got a national packet body have we?

Phil Cadman G4JCP, Dudley, West Midlands

Dear Sir

The postman dropped February's 'Camm's Comic' on the mat this morning. As usual I read with interest the 'Keylines' editorial by Rob Mannion G3XFD. I've been monitoring the new format and contents from the time of the 'new look'. Firstly I should say that I have been a reader since the days of the great 'F.J'. when I was about eight years old in 1932.

Since the 'new look' *PW* started, whilst I don't agree with everything published in the magazine, *PW* has to cater for the varied tastes of its many thousands of readers. The fresh approach by the Editor now 'in the chair' may not please everyone, but I feel that we must all support his actions and in particular his support for the hobby of amateur radio and the RSGB.

Again, the RSGB cannot please all shades and opinions - try as they might. Despite this, the Society must have the support of all radio amateurs and all short wave listeners even if you don't agree with all that they do. You cannot change things from the 'outside'. Think again about your subscription. Look at the cost of your radio gear - you'll see that in percentage terms, the RSGB 'sub' is a very small fraction of the cost of your station and participation in amateur radio.

To those people who are working publicly to support amateur radio I urge them to keep up the good work. To those on the 'side lines', I ask that they put their hands in their pockets to support the hobby. You can't take it with you, but at least you'll have the satisfaction of helping amateur radio survive and supporting amateurs of the future.

Dennis K. Egan GW4XKE
Dinas Powis
South Glamorgan

Dear Sir

One of the great pleasures that I and most amateurs have in common once outside of the shack, is visiting Rallies, either locally or at some distant locality.

For me this activity is no longer the pleasure it used to be. Mainly because that in the past year I've been the victim of many accidents at these rallies. I've suffered bruises to both my knees, ankles, thighs and insteps.

Most bruises have unfortunately come from prams and pushchairs. These were being used by XYLs as a means to force a passage through the crush. Another big problem is that of children running about unsupervised.

Some of the blame can, and should be, laid at the feet of the rally organiser. They try to 'cram' the maximum number of stalls into the smallest area. Some blame can also be laid at the door of people who block gangways unnecessarily.

Although I realise such occasions are a good family 'day out', why do people take a baby or very small children into the crowded rallies?

Another big problem is that caused by people smoking - despite 'No Smoking' notices and the fact that ventilation is often poor. Top this off with the chance of being stabbed in the eye with a whip antenna from a hand-held rig and you've got an obstacle course which can deter anyone but the keenest and fittest!

J. D. Bolton G4XPP
Crook
County Durham

Editor's comments: Mr Bolton's letter (shortened for publication) has some important comments. To take his last point first I have never understood why the 'No Smoking' rules are not enforced. To be in a very crowded, hot rally hall and to have burning cigarette ends pushed into your face or clothing (as the person struggles by) is unpleasant to say the least.

However, I can sympathise with family groups and their problems at rallies. I've noticed recently that more people carry 'the junior operator' in special 'back-packs'. Perhaps the answer should be better 'family facilities' at rallies? Many rally organisers really do try their best to help in this way, but we rarely hear about their problems. Now the time's arrived - come on rally organisers - let's hear your point of view in 'Receiving You'!

Dear Sir

I have been a reader of *PW* since 1954, in the days of the great F. J. Camm; and I still enjoy reading many of the articles in those 1950s *PW*s.

I also enjoyed reading the series 'Crops and Coils' during the late 1980s, but found that series sadly lacking in circuit diagrams. The series 'Valve Communications Receivers' was also interesting, and kept me buying *PW*.

There is a small but growing group of amateurs - myself included - who build vintage circuits. My

Competition Corner

Circle the 12 differences, fill in the form below and send your entry to **PW Publishing Ltd., April 1991 Spot The Difference Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. Photocopied entries must be accompanied by the corner flash at the foot of this page.**

Closing Date 26 April 1991.
The Editor's decision on the winner is final, no correspondence will be entered into.
First prize winner can choose either a one year *PW* subscription or £20 in vouchers for the book service.
The two runners-up can choose from either a six month *PW* subscription or £10 in book vouchers.

Name .....

Address .....

.....

.....

Postcode .....

☐ Subscription

☐ Vouchers (please specify)

50MHz transmitter is a modified 1950 circuit, with a pair of 807s in the final, driven by a VT501 Doubler from a 6AG7 crystal oscillator.

My 50MHz converter has four r.f. stages (three CV66 in grounded-grid mode and one EF50 Pentode stage), with a Triode mixer. When I get my full ticket, my h.f. transmitter will have valves from my 800 series collection, probably an 802 and an 803. The 700V, 350 mA power supply will use a pair of 866A rectifiers, also in keeping with its period.

In the USA, 1929 CQ parties are a great hit, with contests for building and operating vintage equipment. The Historical Radio Society of Australia is setting up a vintage amateur h.f. net.

So, please give us more reprints of constructional articles from the 1930s, 1940s and 1950s. The reprint of the May 1955 'Cigar Box Receiver' in your 1000th issue was particularly welcome. But please give us more!

It's very encouraging to read letters like the one from a 17-year old enthusiast calling for more published articles on simple valve a.m. transmitters, etc. If amateur radio is to survive, it has to encourage younger people to join its ranks. What better way is there, than by publication of simple constructional projects that provide hands-on experience, - *Practical Wireless*, if you like!

It's a learning experience that they'll never get from a Japanese 'Black Box'. After all, that's how it all began

I wish *Practical Wireless* every success in the 1990s, but do please give us, your readers, more historical constructional articles and articles around simple valve circuits.

T. F. Pool VK7YAI
Tasmania
Australia

Editor's reply: We're receiving you Mr. Pool! The *PW* team hope you like this month's valved project for 3.5MHz. While not forgetting modern techniques, we're aiming to cater for the many 'thermionic' types amongst our readers. I'm sure you'll also find our next valve project (for 50 and 70Mz) of interest!

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.

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

Wireless Line
This is 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.

Newsdesk '91

International Marconi Day 1991

Cornwall ARC - GX4CRC - presents International Marconi Day 1991. This year the event will be held on Saturday 27 April and will run from 00.01z through 23.59z - a 24-hour event. The stations taking part in this year's programme are listed below. As in previous years, all stations have a particular Marconi connection, or are being worked from sites used by Marconi and his associates when those early transmissions were made many years ago. The stations are as follows:

K1VV/IMD	Cape Cod.
VE1IMD	Nova Scotia.
VO1IMD	St. Johns, Newfoundland.
EI2IMD	Eire.
IY4FGM	This is the official Marconi club station in Italy.
GB0IMD	From the Packpool Park Wireless Museum on the Isle of Wight.
GB4IMD	At Perranwell, a little way South-west of the city of Truro.
GB2IMD	Near Rathlin Island in Ireland.
IY0TCI	In Civitavecchia.
IY1TTM	From the Tigullio Tower. The location of the tower is at Sestri Levante on the Italian Riviera, near Genoa.
ZS6IMD	This station is representing the South African influence of Marconi.
DA0IMD	On Borkum Island off the North German coast.
GB2MDI	From the Salisbury area.
GB4MDI	From Flatholm island in the Bristol channel.

In the event last year, 51 stations qualified for the special award by working the required number of Marconi stations which were then operating, and in addition, 16 short wave listeners also successfully applied for the award.

This year there are 14 special event stations, and to qualify for the Marconi award it will be necessary to work any 10 of these 14 stations. As before, QSL cards can be exchanged via the Bureaux, or if preferred, directly (if possible with stamps or a small donation towards postage costs) to:

CRAC (or IMD), PO Box 100, Truro, Cornwall TR1 1RX.

All the official award claims must be made via their PO Box and accompanied by either $5(US) or £2.00(UK) or 10IRCs. The official award is for two full days working only, but again this year they are offering an award for short wave listeners. Applications for this award will also be via the PO Box. Claimants will have to record at least 10 of the Marconi Day stations, together with the times heard and the other stations being worked. The s.w.l. award will cost $3 or £1.50(UK) or 6IRCs.

Where to find them? They are pleased to announce that they will be working any or all modes, on all bands from 3.5MHz to 50MHz (and locally on 144MHz).

For any further information, please write to:
CRAC, PO Box 100, Truro, Cornwall TR1 1RX.

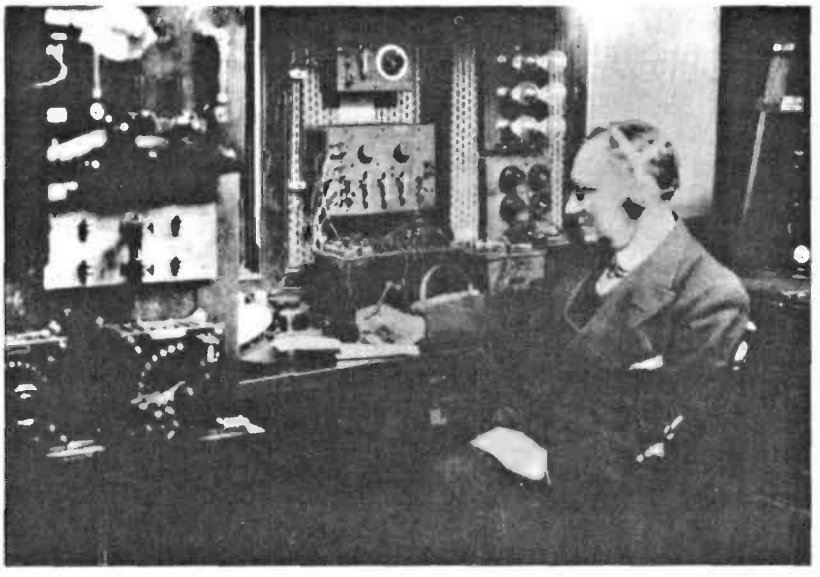


PHOTO. MARCONI COMPANY LTD.

Guglielmo Marconi 1874-1937

WAB Activity

The OSCAR VICTOR Activity Group (WAB) invites you to the 5th Annual Family Fun Weekend at Bent Riggs Farm, Ravenscar, North Yorkshire in August.

Due to the increasing success of their Bank Holiday Fun Weekend, WAB extend the hand of friendship to other amateur radio-related Groups and Societies by inviting them to their next venue which will be held from the 23rd to the 26th of August 1991.

As usual they will be holding their venue at Bent Riggs Farm, Ravenscar, which can be found midway between Scarborough and Whitby on the beautiful North Yorkshire coastline. The Cleveland Walk passes close by to their site.

As they have a field exclusively for their own use, the Oscar Victor Group also welcome Campers and Caravanners. There's also a 'Bunk Barn' for those of you wishing to have a roof over your head.

During the weekend you have the chance of working either h.f. or v.h.f. pile-ups from the infamous Oscar Victor Square, or perhaps working DX from the control station on site. It's a truly family occasion, and if you wish to enjoy the scenery, the area affords many colourful and interesting walks.

Your evenings on site are spent in the company of other hobbyists where the Barbeque compliments the conversation and the liquid refreshments which are readily available.

Further attractions include a Car Boot Sale with the chance to turn your unwanted equipment into cash, sporting activities arranged for the children and child-minding facilities are available during the weekend.

It really is a fun weekend, in an informal atmosphere with or without the radio and a very enjoyable time can be had by all.

Cost for use of site irrespective of caravan or tent size, (including Barbeque)

Adults and over 14s £2.50 per day.

OAPs and under 14s free.

Further details can be obtained from either:

Peter Austin G7BXA.
QTHR
Tel: (0532) 563462.

Steve G1SGB
QTHR
Tel: (0709) 543747.

Newsdesk '91

Sherwood Forest Award

Mansfield ARS are launching the Sherwood Forest Award with a brand new, and stylish certificate.

The Sherwood Forest Award is available to all licensed radio amateurs (on a QSO basis) and short wave listeners (on a heard basis) who have worked/heard licensed radio amateurs in the County of Nottinghamshire.

The award is worked on a points system and to claim the certificate a minimum of 30 points must be collected. They are awarded as follows:

5 points for working/hearing the Mansfield ARS club callsigns of G3GQC or G1GQC.

2 points for working/hearing any member of the Mansfield ARS.

1 point for working/hearing any other licensed radio amateur in the County of Nottinghamshire.

All permitted bands and modes may be worked.

Each station may be entered into the log only once per claim, irrespective of band or mode.

There is no time limit for starting and finishing the award.

A list of the current members of the Mansfield ARS and their callsigns may be obtained by sending an s.a.e. to the Awards Manager.

A copy of your log entries recording QSOs with stations in the County of Nottinghamshire, should be certified by two other licensed amateurs and sent to the Awards Manager of Mansfield ARS along with a fee of £2, $4 or 7IRCs.

All claims and queries should be sent to:

G. W. Lowe G0NRA
Mansfield ARS Awards Manager
25 Manor House Court
Kirkby-in-Ashfield
Nottinghamshire
NG17 8LH.

Centre of England Rallies

Because of its huge success in such a short space of time, attracting visitors from all over the county, and from far away as Ireland, the Centre of England Rallies have become major events. The venue, the British Motorcycle Museum, Bickenhill, close to the NEC, has proved extremely popular because of its easy access by road, and ample parking facilities. Visitors can spend a few hours at the rally, then browse around the museum which houses over 500 motorcycles.

The Rallies, have been held twice yearly. There's been one on Easter Sunday, which this year falls on March 31, and an Autumn rally held in September.

However, because of its popularity, traders and visitors alike asked if the committee would organise a Christmas Rally as well, and this is planned for late December.

To add colour to the Easter Rally, the traders have decided to have a competition amongst themselves to see who can come up with the most outrageous and funniest Easter hat. So be warned visitors - you could see some very odd creations walking about! There's plenty of fun for everyone with talk-in available on S22.

Four More Languages

BBC World Service broadcasts in four languages, including Turkish, have recently been increased as a further response to the Gulf War.

The increases came on top of extra daily Arabic and Persian language transmissions. Now BBC broadcasts in Turkish increase by 15 minutes a day. Hindi, Urdu and Bengali all get an extra ten minutes to make up a daily half-hour programme. This special trilingual Gulf War broadcast will be audible at lunchtime in the Gulf, late afternoon in the Indian Subcontinent.

Changes in weekly hours are as follows:

Turkish	Up from 12 hours to 13 hours 45 mins.
Hindi	Up from 14 hours to 15 hours 10 mins.
Bengali	Up from 9 hours 15 mins to 10 hours 25 mins.
Urdu	Up from 10 hours to 11 hours 10 mins.

The recent increases took BBC output in Arabic to 98 hours a week (up from 63 hours before Iraq's invasion of Kuwait) and Persian to 14 hours (up from 12 hours 15 mins). All the increases, agreed by the Foreign & Commonwealth Office, will continue until further notice.

The BBC World Service in English, which has been keeping its transmitters serving the Gulf, on the air around the clock since last August, continues to provide a special schedule in response to the Gulf War. Longer news bulletins are being carried on the hour every hour with additional news summaries wherever possible at 30 and 45 minutes past the hour. Detailed news and analysis is broadcast in special Gulf programmes three times a day.

The BBC engineers report that World Service is still free of Iraqi jamming in all the languages it broadcasts, including Arabic.

Club News

Midland ARS meet at 7.30pm, Unit 22, 60 Regent Place, off Caroline Street, Birmingham. On March 19, they have Kites & Aerials by Norman Parker G4VMP. For any queries, please contact **John Crane G0LAI at 194 Brays Road, Sheldon, Birmingham B26 2PP. Tel: 021-742 8712.**

Derby & District ARS meet Wednesdays, 7.30pm at 119 Green Lane, Derby. March 20 is their AGM, the 27th is Using Oscilloscopes, an illustrated talk by Rex Beastall G1LRI, April 3 is a Junk Sale and the 10th is a Night on the Air. Further information about the Society is available from **Richard Buckby G3VGW, 20 Eden Bank, Ambergate, Derby DE5 2GG. Tel: (0773) 852475.**

Poole RAS meet last Fridays of the month, 7pm at Russell-Cotes House, Lower Constitution Hill Site, Bournemouth & Poole College of FE. April 26 is their AGM. Further details from **Vernon Cotton G3BCI, 45 Branksome Hill Road, Bournemouth BH4 9LF. Tel: (0202) 760231.**

Spalding & District ARS meet 1st Fridays of the month, 7.30pm at The Ship Albion, Albion Street, Spalding. Details from **Tom Simpson G3NSF, 184 Boston Road, Holbeach, Spalding, Lincs. Tel: (0406) 24523.**

Preston ARS meet Thursdays, at The Lonsdale Sports & Social Club, Fulwood Hall Lane, Fulwood, Preston. March 21 is Preston Kaleidoscope, an illustrated talk by Mrs Crossley and April 4 is The Ribble Valley, an illustrated talk by Mr Green. Details from **Eric Eastwood G1WCQ, 56 The Mede, Freckleton, Preston, Lancs PR4 1JB. Tel: (0772) 686708.**

Horsham ARC meet at the Guide Hall, Denne Road, Horsham, West Sussex. They have a talk on Navigation Beams (WW2) on April 4. For further details, contact **Peter Stephens G8SUI, at 11 Nutwood Avenue, Brockham, Betchworth, Surrey RH3 7LT. Tel: 073784 2150.**

Bury St. Edmunds ARS have a change of venue for 1991, they now meet at the West Suffolk College, (Room EO-40), Out Risbygate, Bury St. Edmunds, on the 3rd Tuesday of each month, at 7.30pm. Further details about the club from **Ian Capon G0KRL, on (0359) 70527.**

Three Counties RC meet every other Wednesday, 7.30pm at the Railway Hotel, Liphook, Hampshire. March 27 is Army Radio Equipment and Operation and April 10 is IsoLoop HF Antenna. For further details contact **Dave G4VKC, 39 The Maltings, Liphook, Hants GU30 7DG.**

Newsdesk '91

Latest Component Catalogue

New from the Vintage Wireless Company - their latest Vintage Audio & Radio Component Catalogue, priced at £1.50 post paid (UK and Eire), £1.95 post paid Surface (overseas) and £4.50 Airmail post paid (overseas).

Their 67 A4-page catalogue is packed full of every conceivable vintage component, including grid leaks, transformers, accumulators, coils, jones plugs for R1155, h.t. batteries (UK's only source!), h.t. capacitors, headphones, pick-ups, capacitors, resistors, tuning capacitors, loudspeaker silks, volume controls, cloth covered cables, control knobs & dials, sleeving, cabinet transfers, output transformers, terminals, crystal set parts, mains transformers, intervalve transformers, rheostats, dials, etc.

Also available, free of charge, is their Valve Catalogue, 1991 Audio Catalogue and 1991 Books & Data Catalogue (includes WD data listing!).

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

Lee Electronics

We apologise to Lee Electronics of 400 Edgware Road London W2, Tel: 071-723-5521, for the mistake in their advertisement on page 24 of the March issue of *PW*.

Unfortunately, we inadvertently printed a photograph showing an older transceiver rather than their new C5608 dual-band 144/430MHz mobile transceiver.

Moving Premises

Elliott Electronics are moving to a new shop mid-March. Any reader who intends to visit them, should first contact them by phone.

Elliott Electronics
Tel: (0533) 553293.

FJP Kits

Mr Powell of FJP Kits recently sent us a copy of their current catalogue. To keep costs down this has been photocopied, but at a cost of 50p it contains many useful items needed to build *PW* projects. Mr Powell is also willing, for a small charge, to build any *PW* project if you don't feel up to it yourself.

FJP Kits
63 Princess Street
Chadsmoor
Cannock
Staffs
WS11 2JT.
Tel: (0543) 506487.

PW German Weekend

Would you like to join the *PW* weekend to Friedrichshafen in July? You can join us as we travel by luxury double-decker coach to the biggest radio rally in Europe. See the 'Keylines' page for further details.

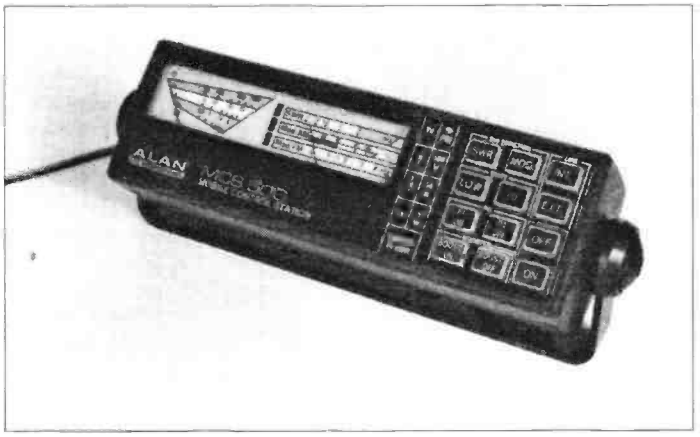
MCS500 Mobile Control Station

This unit is designed to mount in the car to provide a control and test console for the CB radio. The unit has the following functions:

*Automatic s.w.r. measurement *Power meter (up to 500W) *FM deviation meter (built-in) *Antenna pre-amplifier *Remote control switching for ancillary equipment.

It will retail at £99 and should prove popular with the CB radio enthusiast who thought he had everything!

Nevada, 189 London Road, North End,
Portsmouth, Hants PO2 9AE.



SG-2000 Introduced

SGC Inc., a well-known communications design and manufacturing company has introduced the Model SG-2000 high frequency single-sideband radiotelephone. This full coverage s.s.b. radio provides h.f. communications on voice and data transmission. The SG-2000 features several sophisticated scanning modes, a large l.c.d. frequency display and is remote and ARQ/FEC ready. The SG-2000 features a splash-proof front panel and includes an internal clock with turn on/off programming and 616 ITU voice and data channels, plus 100 user programmable memory channels.

The Model SG-2000 is a professional h.f. s.s.b. transceiver and incorporates unique features which appeal to the commercial, industrial and pleasure markets. The SG-2000 produces 150 watts, and operates on the 1.8 to 30MHz frequency bands. The unit has all functions built-in for h.f. s.s.b. operation, including remote capability (up to six remote stations) or remote controlled through telephone lines. The SG-2000 can be controlled, by an IBM or compatible computer, without its removable front panel.

Designed as a product for the 90s, the SG-2000 will operate on any marine, commercial and ham frequencies and will have receive capabilities for broadcast and weatherfax frequencies.

The SG-2000 will retail for $1995.00. Additional remote heads are $595.00 each.

SGC is a leading manufacturer and supplier of high frequency single-sideband communications products and related accessories. Over the last 20 years the company has gained an excellent reputation for the performance and reliability of their h.f. s.s.b. equipment. SGC produces a full range of marine and aviation equipment as well as antenna couplers and antennas. SGC also publishes a comprehensive *HF-SSB Latest Factbook*, which is available at $11.95.

For additional information about the SG-2000 or any SGC products, contact:

SGC Inc.
Sales and Marketing Department
SGC Building
13737 S.E. 26th St. Bellevue
WA. 98005, USA.
Tel: (206) 746-6310.

Newsdesk '91

Auction - Change of Date

Thousands of items must go at the 'Fools for a Day' auction held by Alton Communication Engineers Ltd., and Communication Development Specialists Ltd.

Due to moving premises all stock must be cleared at ridiculous prices.

Join the spirit of things and visit their auction on 2 April 1991, the day after 'April Fools Day' (the only joke is the prices!)

Viewing: Monday 1 April 12-4pm
Tuesday 2 April 9-10am

To be held at Herriard Village Hall, Herriard, Nr Basingstoke (off the A339). Auction begins 10am. Bar and refreshments available.

Stock to include: two-way radio equipment, (new and used), masts, towers, power supplies, tone signalling equipment, test equipment, tools, furniture and office equipment.

For a list of products please telephone (0256) 83528/83277 or send a stamped addressed envelope to:

Unit 4, Summerlea Court
Southrope
Herriard
Basingstoke
Hampshire RG25 2PX.

60th Birthday Prize

In honour of 60 years of ministry, radio station HCJB is inviting listeners to visit them in Quito, Ecuador.

Two lucky listeners will be able to do this free!

When you write to HCJB, Box 691, Quito, Ecuador, just include the words, "Happy 60th Birthday".

Those words will make you eligible for a draw to be broadcast on Christmas day 1991, the 60th anniversary of HCJB.

Two letters or cards, with those words on them, will be drawn. Each person will receive a free round trip to Quito, from the country where they mailed the card, and will be their guest at HCJB for one week. If one of the winners is from their host country of Ecuador, then that person will be allowed to bring a guest with them, at their expense, for a week at HCJB.

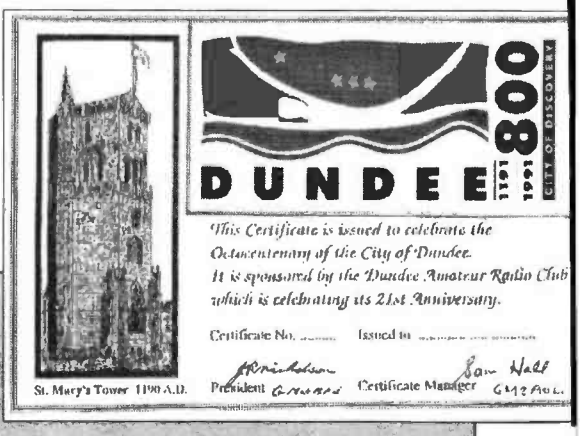
Members and employees of HCJB World Radio, or their immediate family members are not eligible.

Just send your birthday greetings to HCJB, Box 691, Quito, Ecuado.

All entries become the property of HCJB. The winners will be announced on Christmas day 1991 and will also be contacted by post.

All are invited to be a part of this 60th anniversary of HCJB. Remember to include the words, "Happy 60th Birthday" when you write to them in Quito. All entries must be mailed to Ecuador. They will not be received at any of their other offices.

They hope to see you in Quito!



The Dundee 800 Certificate

This award has been designed as one of the many activities celebrating the 800th anniversary of the granting of the Royal Charter to the City of Dundee, The award is sponsored by the Dundee Amateur Radio Club which is celebrating its 21st anniversary during the year, and it will be available for contacts made at any time during the year 1991.

RULES FOR THE CERTIFICATE

1. The certificate will be available to all licensed radio amateurs and, with an s.w.l endorsement, to all interested short wave listeners.
2. A contact with a club member on one amateur band (no WARC bands) will count as one contact point. A club member may be worked on more than one band for extra points.
3. The qualifying requirements are:
   a. Stations outside Europe must obtain two contact points.
   b. Stations in Europe, but outside the UK, must obtain four points.
   c. Stations in the UK must obtain eight contact points and must include at least three club members.
4. The cost of the certificate is $2.00 US or £1 sterling.
5. The applicant must list for each contact the following information:
   a. Date of QSO
   b. Callsign of the station contacted.
   c. Frequency band used.
   d. Signal reports sent and received.
6. Enquiries and applications should be sent to the certificate Manager:

W. S. Hall GM2AOL, 21 Seabourne Gardens, Monifieth Road, Broughty Ferry, Dundee, Scotland DD5 2RT.

Broadcasts to New Zealand

The BBC World Service is now being rebroadcast around the clock in New Zealand's largest city. The rebroadcasts on f.m. have been brought forward in response to the Gulf Crisis.

Until recently, BBC World Service could only be heard by New Zealanders with short wave radio receivers. Now for the first time in Australasia the network has been brought within reach of anyone using a standard radio, 24 hours a day.

The service is initially on air in Auckland on 91.8MHz, a temporary frequency allocated to make the service available at this critical stage in the Gulf Crisis. The service has also begun in the capital Wellington. Later this year it will be extended nationally on a.m. or f.m. frequencies.

New Zealand company, Satellite & Terrestrial Ltd., will be carrying out the rebroadcasts. Managing Director, Ken Wikeley, says that his firm had planned to introduce the service during 1991 but that the Gulf situation led them to make the temporary broadcasting arrangements. These were accomplished in less than a week, using equipment flown out from London in the last 48 hours.

New Zealand's arrangement to rebroadcast BBC World Service live and in full is one of only a small number in the world. A similar scheme in Singapore attracts an audience of 9.6% of all adults, or 200 000 people. BBC World Service has a regular audience of 120 million worldwide, more than any other international broadcaster, the great majority listening on short wave.

A Valved Transceiver For 3.5MHz

Construction

John Keeley G6RAV found that valves still produce good results on 3.5MHz. His experiments resulted in an interesting little transceiver that can produce excellent on air results.

The *PW* editor Rob Mannion, is not the only person to like valves. I also find that they are still equal, sometimes better than transistors for the home-constructor. Spurred on by this interest, I decided to 'have a go' and build a suitable transceiver for an 'A' licenced friend to use.

The transceiver described here, is the result of 'raiding' various stalls at rallies and updating a design by T. W. Dresser, which was originally published in a 1953 issue of *PW*.

Minus Points

There are unfortunately, draw-backs with valves. They require a separate heater voltage, usually 6.3V for 'mains' powered valves or 1.4V d.c. for battery-supplied types. These voltages have to be provided from a separate supply source.

The second, and potentially hazardous, problem is that **VERY HIGH VOLTAGES** are present in the unit. Under certain conditions r.f. voltages of up to **1000V** peak-to-peak may be present. This level of voltage and frequency can 'jump' several centimetres to 'earthed' fingers and knuckles. This is a particular hazard if you're wearing a ring. I'm speaking from experience, and I know that this type of r.f. burn can take many months to heal.

The Design

The transmitter design is shown in its modified state in **Fig. 1**. It consists of a single-valve, cathode-keyed, oscillator (V1) which can produce 3-4W of r.f. at the crystal frequency (3.550MHz). The valve, a 6V6GT, is really an audio 'beam' power amplifier, but works well at these lower frequencies as a power oscillator.

Filter Network

The necessary matching and filtering circuitry consists of C7, L4 and C8. This is the well-known 'pi' (π) network that allows almost any piece of wire or antenna to be used efficiently at this frequency. As valves use a much higher supply voltage than transistor output stages, the power drop-off with differing antenna systems is much less of a problem.

All capacitor used throughout must be high voltage working (300V minimum). But **C6 must be of even better quality and have a high working voltage**. I discovered a suitable capacitor at a rally. It had a capacitance value of 10nF with a 2.5kV working voltage. Meter M1 with R4 and D1 form the power sensing circuit to complete the transmitter.

The Receiver Described

The receiver is a simple three-valved regenerative design. It's not at all difficult to follow how the circuit works as each valve is in effect one 'stage'.

The valve V2, is a 6K7GT acting as an r.f. amplifier and 'buffer'. The gain of the stage is adjustable by R8. As the wiper of resistor R8 is brought closer to the junction with R7, the stage gain is reduced smoothly.

Inductors L5/6 form a broadly-tuned filter at the working frequency. The capacitor C10 may be adjusted to give greatest signal over the working band of interest.

The next valve, V3, is a 6SJ7 acting as an

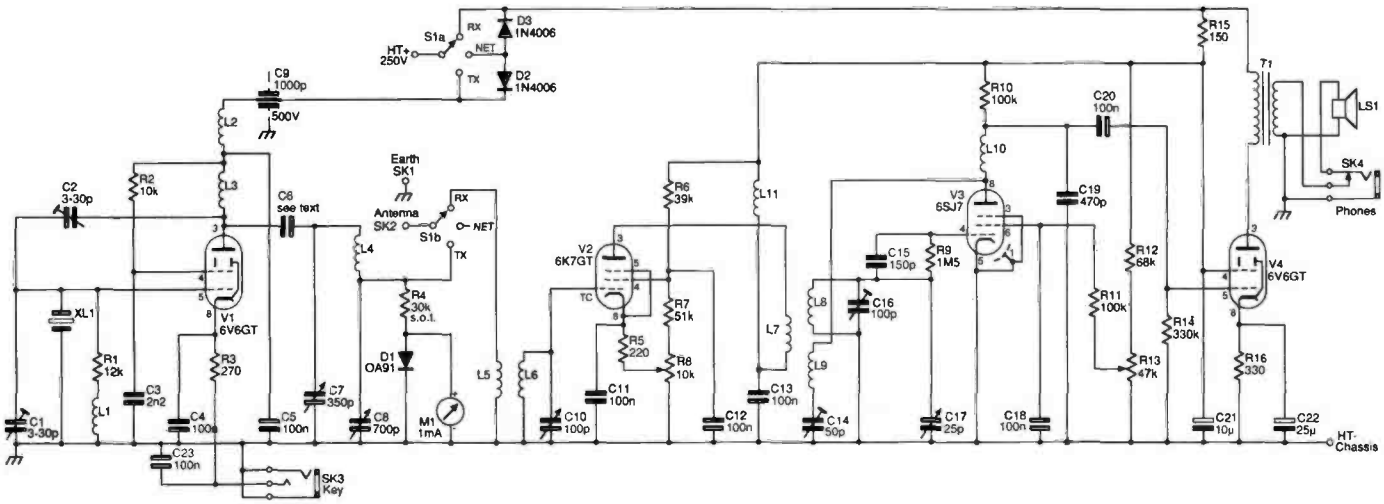


Fig. 1: The circuit diagram of the transceiver.

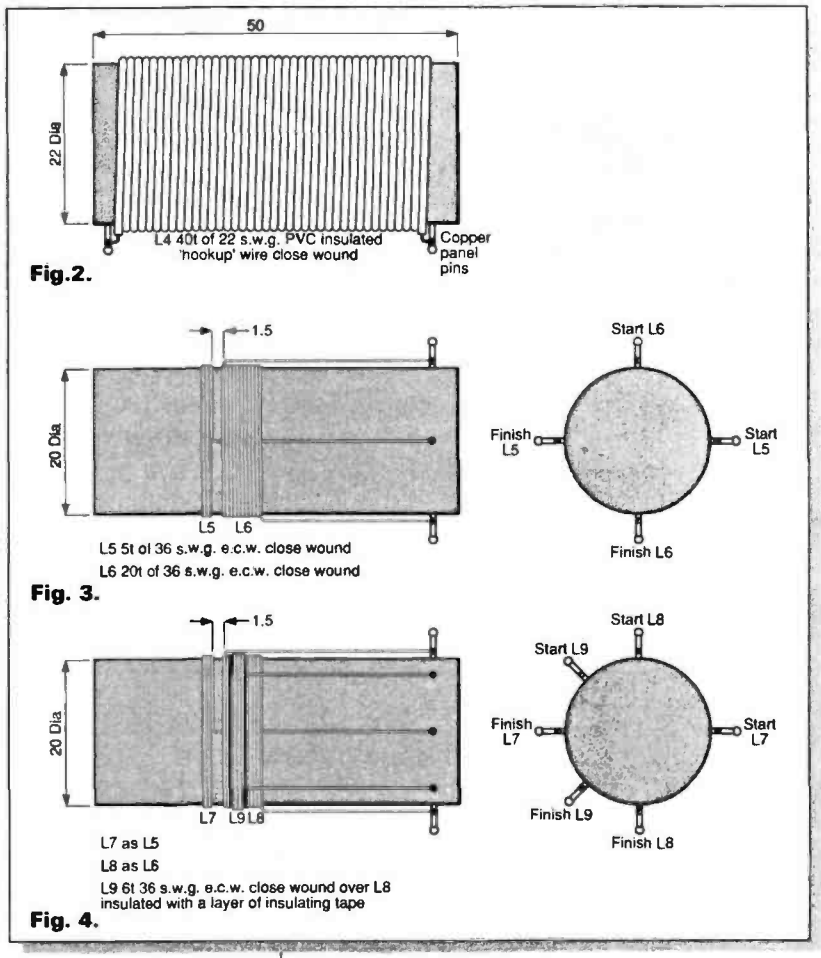


Fig. 2: This coil (L4) wound on a piece of wooden dowelling) is for the π-matching unit.

Fig. 3: Make two sets of coils to this design. One set, for the detector, then has an extra winding applied.(See text)

Fig. 4: Using one of the coil sets from Fig. 3, add an extra winding as shown for the detector.

oscillating detector. Positive 'feedback' (often called 'regeneration' or 'reaction') is applied via winding L9. The amount of 'feedback' may be adjusted by using trimmer capacitor C14, in combination with the 'reaction' control R13.

The standing current of this valve is kept very low, due mainly to the very high anode load of L10 and R10. Signals at radio frequency are developed across L10 and fed back to the input tuned circuit L8/C16 and 17.

The varying r.f. signals cause an a.f. signal to be developed across R10. This is then amplified in V4, the audio stage.

Final Stage

Audio amplification is carried out by V4, a second 6V6GT, operating this time in its more 'normal' a.f. mode. This stage has C22, the only low voltage capacitor in the circuit. The component acts as an audio-frequency 'bypass' capacitor for the cathode resistor of V4.

The receiver audio output is normally to headphones, but a small loudspeaker may be used for strong local signals if you prefer it as an alternative.

Construction

This rig was put together with the help of a junk box and few of the components had to be purchased. Almost all of the coils used as radio frequency chokes were rescued from old valve receivers or old television sets.

I'll only describe those items which are critical to the operation of the rig. These critical components are some of the coils and capacitors, and I'll start with the transmitter as shown in **Fig. 1**.

The coil L1 acts a radio-frequency choke and has an inductance of about 1-2mH. It consists of two pile-wound windings of about 150 turns each of 38-42s.w.g. enamelled copper wire on a 9mm Paxolin former.

The choke's impedance reduces the loading of the crystal by R1. Its inductance value may vary over a wide range without a great change in its effect. You must mount L1 at right angles to the anode choke, L3, to minimise interaction.

Inductor L3 is of similar value to L1 but it should be of marginally heavier gauge wire. Coil L2 was home-made and consisted of as many turns of 24-28s.w.g. wire as would fit on the body of a 1W carbon composition resistor (10-100kΩ).

In the π matching network, L4 is wound on a short length of 22mm wooden dowelling as shown in **Fig. 2**. Capacitors C7, a single 350pF, unit and C8, both sections of a dual 350+350pF unit, complete the matching circuitry.

Receiver Coils

The receiver coils are not difficult to make. The coils L5/L6 and L7/L8 are basically the same. Make them on 50mm lengths of wooden dowelling (new, dry 'broomstick' is ideal!). Wind the two sets of coils as shown in **Fig. 3**, and then choose one set to become L7/L8. The chosen set then has a third winding added, as shown in **Fig. 4**. After you've completed the coils, they can be finished and sealed with a coat of varnish.

Simple And Effective

The simple but very effective cathode keying method is used in this transceiver. Resistor R3 limits the maximum current flowing in the valve. Capacitors C4 and C23 give a small amount of keyed waveform shaping to reduce the possibility of 'key-clicks' and 'splatter' .

Sensing of the relative r.f. output level is carried out by R4, D1 and M1. This simple 'sampling' of the r.f., to provide an indication of what's appearing at the antenna socket, works well in practice. You should select R4 to give about 80-90% reading when the transmitter is correctly matched to your antenna.

Boxed Up

My prototype was made on a 230 x 135mm aluminium chassis, with a depth of 65mm. The front panel was made from another aluminium plate measuring 230 x 165mm.

The illustration, **Fig. 5**, shows the prototype photographed from above, displaying the above-chassis layout. Although you may not follow my layout entirely, it's a good idea to see the original project built-up before starting your own!

Visible in the photograph of the underside, **Fig. 6**, is the metal shield which divides the transmitter from the receiver section. The photographs showing the layouts in **Fig. 5** and **6**, are included as an indications only, as each transceiver will be different - depending whose junk box is used!

Setting Up

Setting up is very easy, when it's compared to synthesised transistor systems. When preparing to transmit, you should adjust C2 for maximum output from the combined crystal-oscillator power

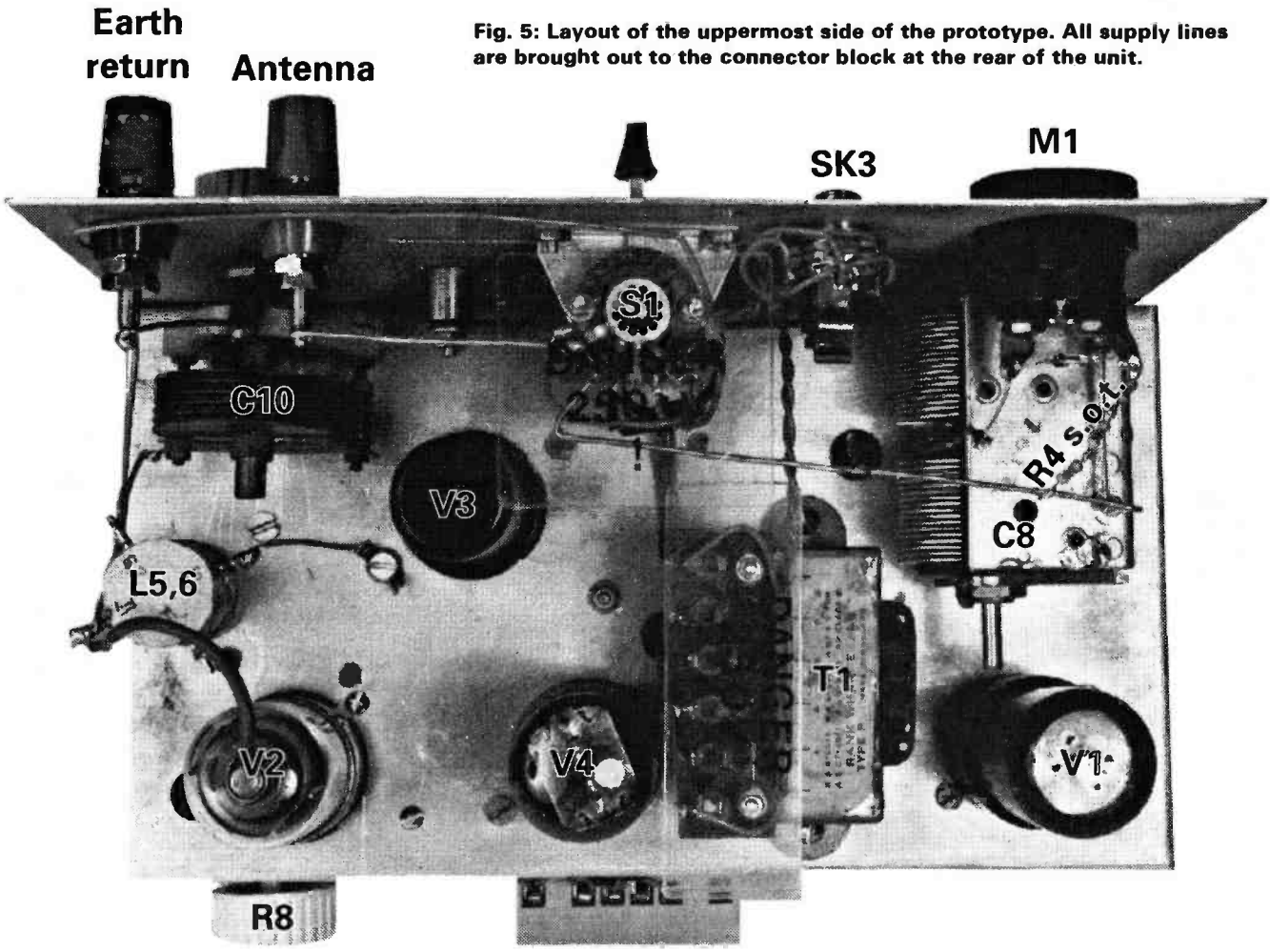


Fig. 5: Layout of the uppermost side of the prototype. All supply lines are brought out to the connector block at the rear of the unit.

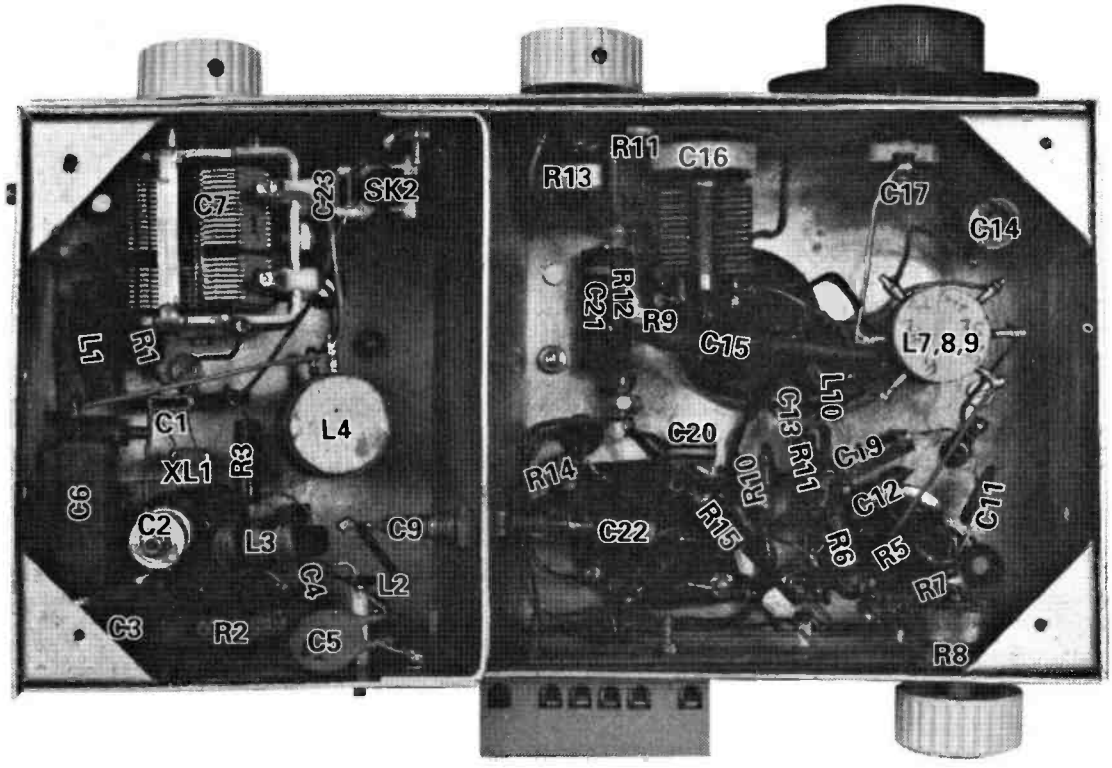
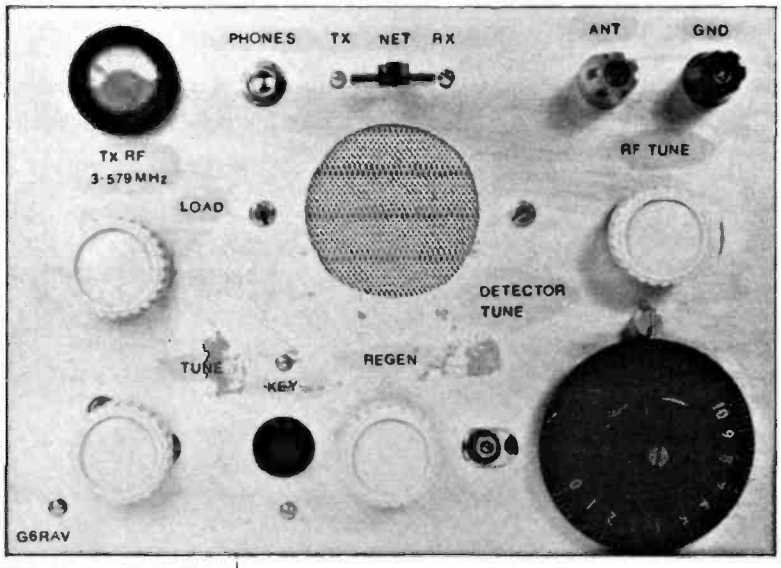


Fig. 6: Layout of the underside, showing the plate dividing the transmitter from the receiver.



Photograph of the completed front panel.

amplifier. **REMEMBER THAT THE HT VOLTAGE IS PRESENT DURING THIS ADJUSTMENT. You must use an insulated adjusting tool.** The capacitor C1 may be used to change the operating frequency of the crystal slightly. If you adjust C1, you'll have to readjust C2 again for maximum output.

To adjust the π matching network for the first time, set C8 to maximum capacitance to start with. Connect the transmitter to an antenna which is known to work on 3.5MHz. Key the transmitter and set C8 to 'peak' the reading on M1. Vary C7 ('tune') to peak this further. 'Juggle' the settings of C7 and 8 to provide a maximum output into the antenna.

Receiver Adjustments

Start the receiver adjustments by setting C10, 14 and 17 to about mid-travel. Then set R8 to minimum (nearest to 0V) and R13 to minimum.

Finally, switch the transceiver to the 'net' position, and tune C16 to hear your own transmission. You should then move switch S1 to 'RX' and this time using C17, tune around for an incoming signal. 'Peak' this signal with small adjustments of C10, C14, R8 and R13 before giving the other station a call!

Regenerative Tips

The skill in using a regenerative receiver is easy-to-learn, although you might find it a little baffling at first. A 'Golden Rule' is that you should always use minimum 'reaction' setting at first.

The secret to success is to get the detector on the very 'threshold' of oscillation. It's at this point the receiver is at its most sensitive and it's why the 'regenerative' type is so effective with c.w. communication.

In use, you should advance R13, the 'reaction' control, until a general increase in noise level is heard. Then adjust C10, R8 and R13 to achieve the best level and quality of sound in your headphones or the loudspeaker. The receiver's main tuning is achieved by variable capacitor C17 which is used as the normal tuning control. **PW**

How Difficult? **Intermediate +**
How Much? **£10+ (depends on the 'junk-box')**

Shopping List

Resistors

Carbon film 5% 0.4W

30kΩ	1	R4

Carbon Composition 10% 1W

150Ω	1	R15
220Ω	1	R5
270Ω	1	R3
330Ω	1	R16
12kΩ	1	R1
39kΩ	1	R6
51kΩ	1	R7
68kΩ	1	R12
100kΩ	2	R10, 11
330kΩ	1	R14
1.5MΩ	1	R9

Wire-wound 2.5W

10kΩ	1	R2

Variable 1W 6.3mm shaft

10kΩ	1	R8
47kΩ	1	R13

Capacitors

High voltage (300V or greater)
Polyester

2.2n	1	C3
100n	7	C4, 5, 11, 12, 13, 18, 20, 23

Silver Mica

150p	1	C15
470p	1	C19

Feed-through De-coupling (screw fixing)

1000p	1	C9

Electrolytic (350V working)

10µ	1	C21

Electrolytic (40V working)

25µ	1	C22

Air-spaced Trimmer (variable)

30p	2	C1, 2 ('beehive' variable type)
50p	1	C14
100p	1	C16

Air-spaced variable 6.3mm shaft

25p	1	C17
100p	2	C10, 16
350p	1	C7
350+350	1	C8
1-10n	1	C6 (minimum 500V working) See text.

Inductors See Text

Semiconductors

OA91	1	D1 (or 1N4148)
1N4006	2	D2,3

Valves

6V6GT	2	V1, 4
6K7GT	1	V2
6SJ7	1	V3

Miscellaneous
One or more crystals in the 3.5-3.8MHz band, Octal valve bases, small valve audio transformer (240: 6V@1A a possible replacement), a small loudspeaker, plugs sockets and insulated terminal posts. One Two-pole Three-way switch with high insulation properties and a terminal block. Sheet aluminium or p.c.b. material to make up the chassis. A suitable power supply for this transceiver, designed by Niel Starkie, was published in the January 1991 issue of *PW* (page 29).

Suppliers
For many components for this and other similar projects the following suppliers may be able to help. You can telephone to check availability and prices.
J. Birkett of Lincoln Tel: (0522) 520767
FJP Kits of Chadsmoor. Tel: (0543) 506487
Marco Trading of Wem, Shropshire. Tel: (0939) 32763

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ANOTHER RAYCOM PACKAGE

The *TOKYO HX-240* HF Transverter when coupled to an all-mode 2m rig will give you 50W on 80 to 10m. RAYCOM have put together this unique unit with the new YAESU FT290RII.

IT WORKS GREAT !

FT-290R II	£429.00
TOKYO HX-240	£249.00
1/2 Size G5RV	£ 14.95
12 Amp PSU	£ 59.95
Nicads & Wall Charger	£ 31.30
Total regular price	£784.20

RAYCOM PACKAGE .. £699.00

YOU SAVE £85.20 !

Includes ALL D.C. and Co-ax leads

EXCELLENT HF AND VHF STARTER PACK
COME IN AND TRY IT FOR YOURSELF - YOU WILL NOT BE DISAPPOINTED
FULL RANGE OF YAESU AND ICOM ALSO STOCKED

HP100E/AR1000

Exclusive to RAYCOM
Short wave converter Module
Made in the UK by AKD
Coverage 200kHz to 30MHz

HP100E with converter	£299.00
HP100E no converter	£249.00
Converter only	£ 59.00

NOTE
HP100/AR1000 not purchased from RAYCOM requires modification to work with the converter Cost £15.00

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WE HAVE SECURED LIMITED QUANTITIES OF THE NEW ICOM SCANNERS DIRECT FROM JAPAN - HURRY TO RESERVE YOUR ONE NOW !

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IC-R1	500kHz to 1300MHz.	£399.00
IC-R100	500kHz to 1800MHz.	£499.00

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BEARCAT UBC 50/55XL 66-88/136-174/406-512MHz 10 memories, channel review, *including FREE charger worth £4.95*		£99.95
BEARCAT BC 70XLT 66-88/136-174/406-512MHz 20 memories, full frequency display, *with FREE car charger kit worth £4.50*		£149.99
BEARCAT UBC 100XLT 66-88/118-174/406-512MHz 100 memories, airband, search, *including FREE car charger kit worth £4.50*		£199.99
BEARCAT UBC 200XLT 66-88/118-174/406-512/806-956MHz 200 memories, top of the range, *including FREE car charger kit worth £4.50*		£229.99
BEARCAT UBC760XLT 66-88/108-174/350-512/806-956MHz MOBILE 100 memories, 5 search bands, *including FREE mains adapter worth £4.95*		£229.99
NEW **JUPITER MVT 6000** mobile 25 to 550 MHz and 800 to 1300MHz, 100 Memories	ONLY	£329.00
JUPITER MVT 5000 Hand-held 25 to 550MHz and 800 to 1300MHz, 100 Memories	ONLY	£249.00
AOR 3000 base 0.1 to 2036 MHz, 400 mems, LSB/USB/CW/WFM/NFM/AM	Limited Supplies available	£699.00

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URGENTLY WANTED - USED SCANNERS AND HAM GEAR, WORKING OR NOT.

ICOM IC-R7000

Listen to weather, fire, coastguard, TV, airband and many, many more. Wide frequency coverage provides you with all the channels you need to become a VHF and UHF listener. Frequency coverage is guaranteed from 25 to 1300MHz, but may extend on individual units to 2GHz! Features include:

- O USB, LSB, FM, FM-N, AM
- O 99 memory channels, keypad entry
- O optional infra-red remote control
- O variable speed scan and delay
- O optional voice synthesizer
- O six tuning steps
- O sensitivity < 0.3µV for 10dB SINAD

Save £108! Raycom price £925

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Why not take advantage of the ***RAYCOM Credit Card*** and spread the payment for that scanner you've always wanted. Example: Yaesu FRG9600 MKV package £70 deposit and £28 per month (APR 36%). Call for a quote and written details! Licensed credit broker.

YAESU FRG9600

9600 standard 60-905MHz		£469.00
9600 MkII 60-950MHz		£499.00
9600 MkII pack 60-950MHz		£545.00
9600 MkV 0.2-950MHz		£625.00
9600 MkV pack 0.2-950MHz		£699.00
Standard to MkII	Upgrade	£ 40.00
Standard to MkV	Upgrade	£149.00
MkII to MkV	Upgrade	£129.00

Packs include PSU and ROYAL 1300!

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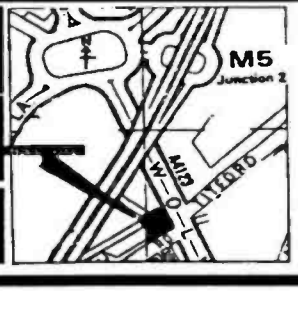

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Yaesu FT-650

24, 28 & 50MHz All Mode Transceiver

REVIEW

Recently Rob Mannion G3XFD and Tex Swann G1TEX had the chance to try the Yaesu FT-650 Transceiver. They liked what they found!

I often wonder why the various manufacturers go to the bother to produce sophisticated modern transceivers for a very limited number of bands. Mind you, after trying the Yaesu FT-650 for a week or so, I soon found that the benefit is biased towards the operator!

Tex Swann, our technical sub-editor, has a QTH better equipped with 50MHz antennas, so he had the first go. Now I've got to admit that Tex, when it comes to 'singing the praises' of modern commercial transceivers - is not known to 'overdo it'. Well, that was certainly the case until he tried this rig out on 50MHz!

Sensitive Receiver

The main comment coming from Tex after he'd had the transceiver for a few days, centred on the receiver. "It's incredibly sensitive" he said - and after I'd tried it out I could only agree.

Working on 50MHz, Tex found that the receiver's very sensitivity caused problems - due to the very high level of 'computer hash' which surrounds almost every 'built up' area.

The appalling 'hash' problem wasn't quite so bad at my QTH, and I was able to sit and listen - quite fascinated - by the American 'Public Service Band' signals appearing between 35 and 50MHz.

Good Guides

The various signals from the USA and elsewhere on 'low-band' v.h.f., although not of interest to the radio amateur for their own sake - provide good indications of the band conditions on 28 and 50MHz. (Yes, I did find them both 'up' at the same time, to a limited extent).

Tex had listened a lot on 28MHz, and I'd had the opportunity to work some of the real DX that had appeared on 28MHz. The superior sensitivity of the FT-650 made my existing equipment sound very poor. Compared to the FT-650, my other equipment acted as if it was completely 'deaf'!

On The Air

I didn't work anyone on 24MHz, but I heard a great deal of activity. My antenna, which is particularly useful for 28MHz work, brought me excellent reports from as far afield as South America, the American Mid-West and my very first Japanese station on s.s.b.

The FT-650's triple-conversion receiver (dual-conversion on f.m.) coped with some terrible 'pile ups' on 28MHz and even sorted out some of the problems on the UK and international CB radio frequencies. The selectivity and dynamic range of this handsome little transceiver is certainly amongst the best I've heard in a while.

General Coverage Receiver

The ability of the receiver to tune continuously from 24.5 to 56MHz was a definite bonus. I was able to listen to many transmissions from the United States and farther afield - to provide me with a guide to propagation.

Tuning control, knobs and all controls are very well laid out. In particular (and I'm very 'fussy' in this respect) the main tuning control is a delight to use and it's completely free of the very common, but annoying, 'click-stop' effects.

As I'm a keen c.w. operator, I was keen to see how well it coped and again I can freely admit I was impressed. Yaesu offer a 600Hz crystal filter kit - but I managed without it on 28MHz!

Transmitting

The transceiver has a duty cycle of 100% at 100W at 25°C. It seemed to cope very well with everything even when it had been left on in the shack all day.

There is not a great deal of activity on 50MHz here in the south and I only worked a few stations. The reports on speech quality were very satisfactory indeed.

REVIEW

I'm pleased to say that there is growing interest in a.m. transmission. 'Ancient Modulation' is making a 'come back' - it's already got a foothold on 70MHz - and a good quality a.m. signal is a pleasure to listen to on v.h.f.

I heard several a.m. transmissions and the FT-650 provided good quality reception. Although I'm pleased that the transceiver has a.m. facilities, unfortunately, the a.m. stations were somewhere in the south midlands and they couldn't hear me!

Summing Up

To sum up our impressions of this rig, I must say that I found it delightful. I even found the multi-function controls easy to use. It was a delight to have in the shack, mainly because it covers some very interesting frequencies which provide some excellent DX 'forecasting'.

There's no doubt in the mind of G3XFD that Yaesu have an excellent transceiver here, and that the receiver is especially good in an area where receivers - even modern designs - can 'fall down' . If I get the chance - this is another of very few modern transceivers that I'd like in my shack. But this time, we'll let Tex Swann G1TEX (as a true v.h.f. man) have the final words on this machine,

Swan Song

As Rob has already told you, I have a series of antennas at my QTH, one of them being a delta loop for 50MHz. I've used this antenna with my FT-690R and consider it to be adequate, given the south facing side-of-the-hill position of my house. I had already noticed a few 'burbles', 'squeaks' and other associated 'twitters' with my '690, but I was unprepared for the continual barrage of signals which were marching down the coaxial cable into the FT-650.

Literally every few kHz I could hear some activity from the microprocessor-based cash-tills in the row of shops 200m to the north. The sensitivity of the rig could be reduced with a simple switch, but even this left the rig more sensitive than my own.

A few tentative 'CQs' showed that the output of the rig was 'clean'. When I transmitted at approximately the 20W output level, little disturbance was noted on a nearby domestic v.h.f. f.m. radio.

My unanswered 'CQ' calls and the interference from 'background' radiation, has left me unable to comment on the transmit side. Unable to use the other two bands of the set, I listened to others making use of them. I noted that the delta loop was more than adequate to hear 'state-side' on 28MHz at signal levels as if the USA was next-door!

Controlled Ease

As I had little time to play with the rig 'on air', I'll expand on some of the controls that Rob found quite easy to use. The synthesisers in the rig have several stepping rates, changeable by either a small button or by pressing the function key in.

This action, and rotating the main tuning dial is a way of tuning the transceiver quickly, in large steps, through the range covered by the equipment.

With the smaller step-rate, the tuning, though in steps, was both precise and stable. It sounded 'smooth' when tuning into s.s.b. speech transmissions. The FT-650 also has a secondary receiver incremental tune (r.i.t.) which allows over 20kHz of independent 'off-tuning' capability.

Second Method

A second method of tuning in larger discrete 2.5kHz steps, was available from a smaller knob low on the right hand side of the rig. When using f.m. or a.m. this feature proves very useful.

The extra control knob, when in 'memory' mode, cycles through each memory in turn. To store a frequency into a memory, the operator has to tune the v.f.o. to the frequency required and then press the 'mem' button once.

Specifications

General	
Receiving frequency range:	24.5 to 56MHz
Transmitting frequency range:	24.5 to 25MHz 28 to 29.7MHz 50 to 54MHz
Frequency Stability	(0 to +50°C) less ±2ppm on s.s.b./c.w., less than 10ppm on a.m./f.m.
Emission Modes:	J3E (s.s.b.), A1A (c.w.), A3E (a.m.), F3E (f.m.).
Frequency Steps:	10 and 500kHz for all modes. 10Hz for s.s.b., c.w. and a.m. 2.5, 5, 10, 15, 20, 25kHz selectable (all modes).
Antenna Impedance:	50Ω
Supply Voltage:	13.8V d.c. 110-125 or 220-234V a.c. (selectable) 50-60Hz with optional FP-22 a.c. p.s.u.
Power Consumption:	2A d.c. receive and 18A d.c. transmit (100W) approximately.

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Trade Stand enquiries welcome to ERC Chairman, Norman Miller, G3MVV, 178 Warley Hill, Brentwood, Essex, CM14 5HF (tel: 0277 225563).

Specifications (continued)

Transmitter Details

Power Output:	10–100W adjustable (Max. 50W a.m. carrier)
Duty Cycle:	100% @ 100W, 25°C
Modulation Types:	Balanced, filtered carrier on s.s.b. Low-level (early stage) on a.m. Variable reactance on f.m. Maximum f.m. deviation ± 5kHz at normal i.f. bandwidth, ± 2.5kHz at narrow i.f. bandwidth.
Spurious radiation:	(harmonic/non-harmonic) at least 50/40dB below peak output below 30MHz. 70/60dB below peak output above 50MHz.
Carrier Suppression (s.s.b. operation):	at least 40dB below peak output.
Unwanted sideband suppression:	at least 40dB below peak output.

Receiver Details

Circuit Specifications:	triple-conversion superhet in c.w. and a.m. modes. (dual-conversion on f.m.)
Intermediate frequencies:	13.69, 455kHz and 8.215MHz (excluding f.m. mode).
Sensitivity (r.f. amplifier on):	0.125µV for 10dB S/N c.w./s.s.b. 0.5µV for 10dB S/N on a.m. 0.16µV for 12dB SINAD on f.m.

Selectivity

Narrow:	2.4/4.5kHz (-6/-60dB) s.s.b., c.w., a.m.
Narrow (with c.w. optional filter):	600/1200Hz (-6/-60dB)
Narrow (f.m.):	8/30kHz (-6/-40dB)
Normal (a.m.):	6/18kHz (-6/-50dB)
Normal (f.m.):	15/30kHz (-6/-40dB)
Intermediate Frequency Rejection:	70dB or better (within amateur bands)
Image Rejection:	60dB or better (within amateur bands)
Intermediate frequency notch depth:	4dB or better.

The memory number then flashes in the display. The next step is to rotate the smaller knob to select the memory which is to hold the information, before pressing the 'mem' button in until a fairly long 'beep' is heard. Both frequency and mode have been stored.

On this transceiver, only memories containing data were displayed. Overall I found this method simple and quite easy to understand.

There's another control button which can be used to transfer the information in the 'other direction' (memory to v.f.o.) if required. This allows 'frequencies of interest' to be held in memory, to be recalled and used as a tuning start point.

Portable Operation

This rig isn't just a base station for the shack, where an optional switch-mode p.s.u. can be used. The transceiver's also supplied with a long, very heavy 12V lead to allow the set to be used in the 'field'.

I'd like the opportunity to take it to a local hilltop overlooking the sea to work the DX. Please SMC can I borrow it again when the weather is warmer and vertical antennas are allowed on 50MHz?

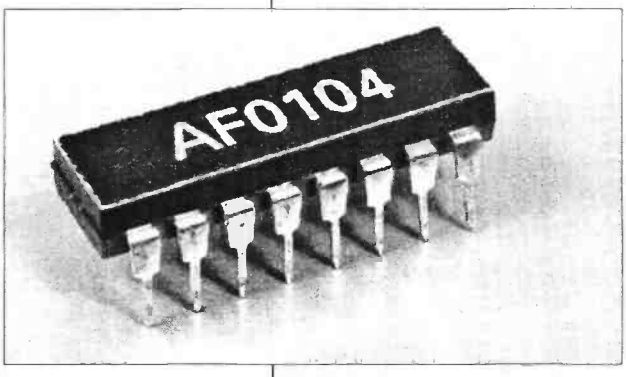
PW

The Yaesu FT-650 is available from South Midlands Communications at Chandler's Ford, Eastleigh, Southampton S05 3BY, at £995 inclusive of VAT (optional power supply £149 inclusive of VAT) and we thank them for the loan of the review model.

Theory

Pulsed System Receivers

Using The Frequency Sensitive And Gate (FSAG)



Gerald Stancy G3MCK, brings you news of a development, which could revolutionise receiver design.

I recently visited the Deutsches Institut für Ausserordentliches Denken in Österhase southern Germany. I was shown a receiver based on a prototype frequency sensitive AND gate (f.s.a.g.) chip.

Before describing the receiver it's necessary to understand how the f.s.a.g. works and this means delving into a little basic digital theory. It's only by understanding digital techniques fully that you'll realise how special the f.s.a.g. is.

AND Pulses

A basic building blocks of digital circuitry is the AND gate. The simplest version of this has two inputs producing one output as shown in **Fig. 1.** The diagram of **Fig. 2** expresses this in logic terms where 'the presence of a signal at a port is denoted by '1' and the absence by '0'. For a logical '1' output to occur both inputs must also be logical '1', or to use the jargon, set-on. Under all other conditions of the inputs a '0' output is present. The value '1' means a signal more than 67% of the supply voltage. Logical '0' represent a voltage less than 33% of the supply voltage.

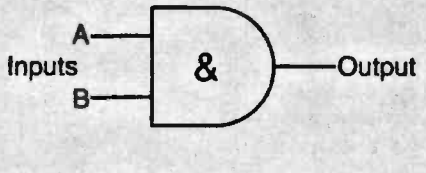


Fig. 1.

A \ B	0	1
0	0	0
1	0	1

Fig. 2.

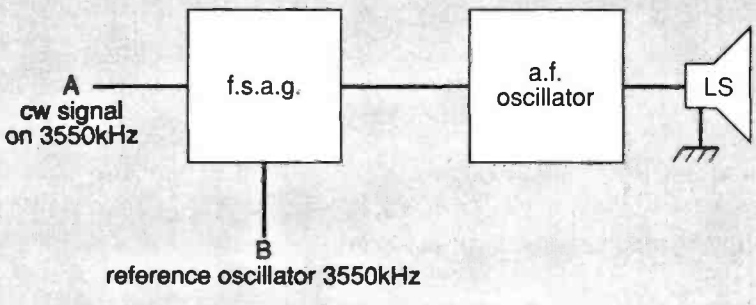


Fig. 3.

'Recht In Linie'

The table shows the states of the output for the various input stages. Therefore, it shows that if B is held at '1' and A pulses i.e., 0101.. etc, then the output will pulse in phase with A. As the german demonstrator said "Recht in linie," or in-phase sequence.

The f.s.a.g. has similar characteristics but with one critical difference. That is both A and B must be sine waves. Besides the AND logic that's been described, output will only occur when A and B have the same frequency.

Therefore if a c.w. signal on 3550kHz is applied to input A and a steady reference signal of 3550kHz to input B, a pulsed d.c. voltage will appear at the output. This voltage will follow the c.w. that is applied to input A. It can, after filtering to remove the r.f. ripple, key an audio oscillator. The basic c.w. receiver is shown in **Fig. 3.**

FSAG Operation

To use the f.s.a.g. receiver is an uncanny experience. All the signals have exactly the same tone, strength, and s/n because, you are listening to a keyed audio oscillator. They just drop in without the hetrodynes experienced when using a conventional receiver. If the receiver is to be used for other than spot frequency work this knife-edge tuning is a problem.

Oscillator Loop

The solution is rapidly sweeping the reference oscillator about its mean frequency. The deviation, controlled by the operator, is small but gives a bandwidth of twice the deviation frequency. Too little and the tuning is sharp, too wide, and neighbouring signals cause interference by keeping the output port 'on'. This causes a continual audio tone to be heard in the loudspeaker. However by careful manipulation of both the sweep and the reference oscillators, it is possible to eliminate them all except the zero beat interference. Of course, no drift can be tolerated in either the receiver or the transmitter. The architecture of a practical f.s.a.g. receiver is shown in **Fig. 4.**

Enhanced Decode

A further enhancement, still under development, will almost completely solve the problem of zero-beat QRM. This is done by utilising the idea of phase-ANDing. Here, besides the basic properties, both inputs must be in-phase to produce an output.

The institute prototype was managing to acheive 90° phase discrimination. It should be possible for up to four c.w. stations to use the same frequency without causing mutual interference. More development is taking place, with the objective of increasing the phase resolution. It's the phase difference be-

tween the interfering signals and not the number of zero-beat signals that's important with this new technique.

Yellow Over-Unit

While this has been a description of the use of the f.s.a.g. in a c.w. receiver, the system can be duplexed for RTTY and similar f.s.k. pulse systems. Light with a wavelength of 576nm (521THz) must be present to allow the f.s.a.g to work properly. A single yellow coloured polarised filter has to be fitted in the final unit. Unfortunately the f.s.a.g. is not yet available in the current trade catalogues, but is due shortly (projected date 29th February 1994).

The f.s.a.g. will eventually enable all amateurs to build high performance c.w. receivers with ease.

Roll on that day!

PW

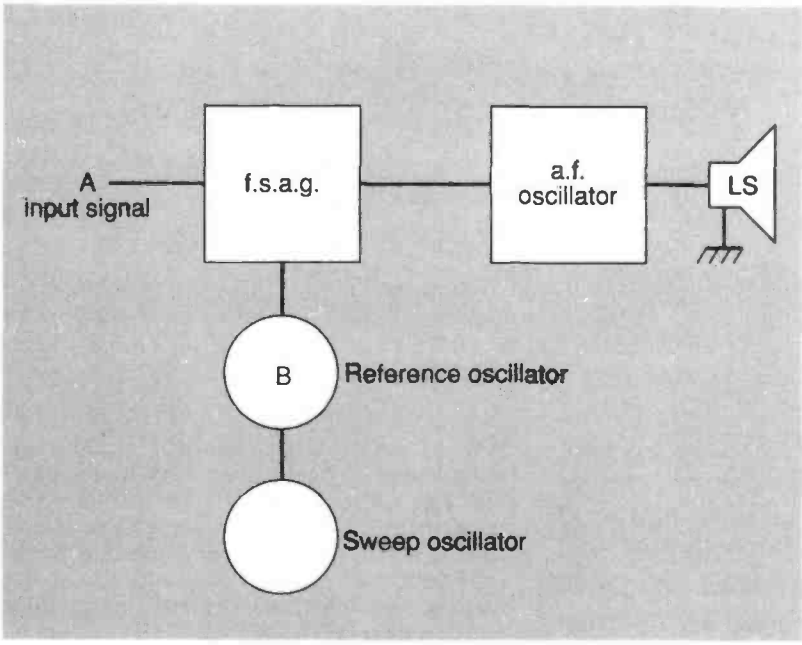
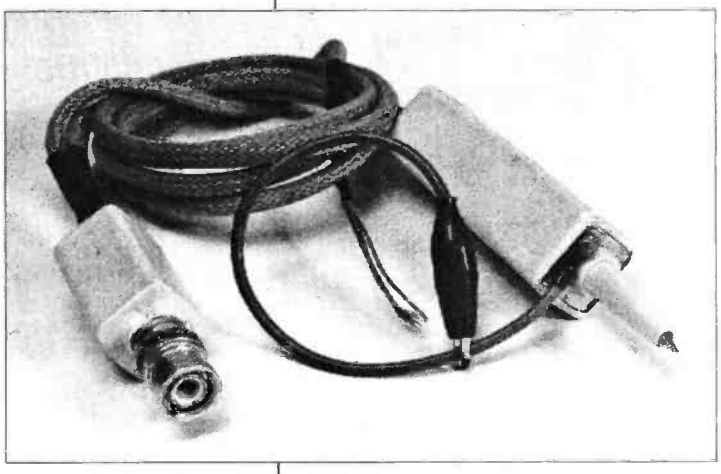


Fig. 4.

Construction

High Impedance Oscilloscope Probe



You can get the best out of your 'scope and 'sniff out' the high frequencies with this active probe from Steve Farrow G8IWY.

If electronic measuring equipment is to be effective, it must have minimum effect on the circuit under test. This applies especially to the oscilloscope at higher frequencies. Special techniques have to be used to reduce to a minimum the loading by the resistive and capacitive elements of the oscilloscopes input circuitry. This useful little project helps to do just that.

Low Impedance

Oscilloscopes have high impedance inputs. A typical 'scope input circuit can be 1MΩ in parallel with perhaps some 5-10pF. At d.c then, the input impedance is 1MΩ (at d.c. a capacitor is effectively open circuit). At 1MHz the impedance of the input capacitor has fallen to 15-30kΩ. Then you have the lead itself to consider. One metre of coaxial lead can have a capacitance of 80-100pF. This gives an impedance of about 1.7KΩ. At 20MHz this decreases to about 80Ω impedance.

One Answer

The illustration in **Fig. 1** shows the circuit of a typical 'x10' passive probe. The impedances of the 11pF and the 100pF capacitors are arranged to have the same ratio as the 9 and 1MΩ resistances. That is 9:1, giving an overall 'gain' figure of 0.1 (-20dBs) at all frequencies. **BUT** the input capacitance is now less than 11pF, much lower than with the coaxial cable alone.

The major disadvantage of the above answer is that the probe has an overall loss. This means that the 'scope must have more gain to counteract this loss. Wide bandwidth, high gain amplifiers are more costly to produce. This is the main reason that budget 'scopes are not brilliant at high frequencies.

How can we keep the high impedance, but keep as wide a bandwidth as possible?

Another Approach

The answer to that is quite simple, make the probe an active probe. Put an amplifier in it. That is the option I have taken.

The full circuit diagram is shown in **Fig. 2.** The circuit is in essence a source/emitter follower, with the output balanced round about 0V. The d.c. input impedance is 10MΩ from R1. Resistor R2, with both diodes D1 and 2, protect the gate of TR1 against overdrive. The voltage on the gate of TR1 is limited to no more than ±6V by their action. Capacitor C1, gives a compensating boost to the higher frequencies.

Transistor TR2, further buffers the signal to drive the coaxial line capacity. Resistors R5-7 form matching pads, to make sure the coaxial line plays no other part in changing the signal. In r.f. terms they would be there to keep the v.s.w.r. down to 1:1.

Construction

I would recommend that you use both p.c.b.s in the designed cases if you are building the probe. This will maximise the bandwidth and viability of the completed probe. Until the system has been calibrated, don't solder the top cover for each part.

Follow the layout shown in **Fig. 3,** when you build the probe. Leave the soldering of R3 to the last, when assembling the amplifier board. Care should be taken to keep component leads to the minimum length. The value of R3 is adjusted, such that the quiescent voltage at R5, is as near 0V as possible. Start with a value of about 1.5kΩ. Increase the value to make the voltage more positive, and reduce it to make it more negative. An aid when doing this is to use a 2kΩ variable resistor to set the voltage level. When you are satisfied, remove and measure the resistance needed to achieve the result. Use the nearest preferred, E24 or E48 series, resistance value for R3.

Covered Up

The cases for both parts are shown in **Fig. 4.** Make two each of the two channel pieces. In one of the shorter channels, drill a suitable hole to allow R7 to be adjusted. Make four end-plates as shown in the diagram. For the 'scope board, one end-plate is soldered directly to the plug to fit on the 'scope. The other has a hole suitable to take the coaxial cable.

For the probe end, one end-plate has a central hole for the coaxial cable, and one smaller hole for both power supply leads to pass through. For the forward end of the probe, I used a 4mm socket to allow the actual probe tip to be changed to suit the needs of the job. This meant a single hole about 6mm across to fit the socket through. You could

Fig. 1: A typical passive 'x10' oscilloscope probe circuit.

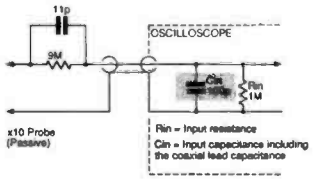


Fig. 2: High impedance active probe circuit diagram.

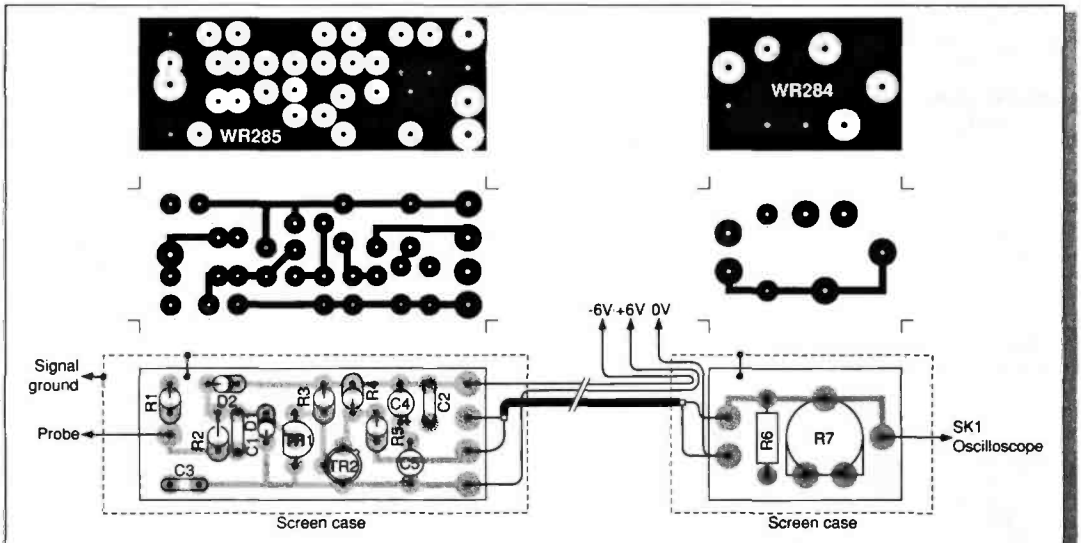


Fig. 3: Overlay and interconnections diagram of the probe.

also, if needed, fit another coaxial socket for the tip. The drawing of **Fig. 5** shows a suitable probe-tip in this case. You might like to replace the wire, with a sewing needle suitably soldered in position.

The top foil groundplane of both boards should be soldered, in several places, to each case. Check that the probe is working as designed, and solder the top half of each case into place, taking care to see that you can adjust R7 on the smaller board.

After calibration, finish the project, by adding a final covering of heat-shrink sleeving to hide the soldering as much as possible.

Calibration

To calibrate the probe you should find a suitable source of 2V peak-to-peak sine wave signals at a frequency of about 10kHz. The next step, is to use the probe to monitor this signal, and adjust R7 to give a 1V peak-to-peak signal on the 'scope display.

Capabilities

The probe has a 'gain' of 0.5, with an input impedance of 10MΩ in parallel with about 6pF, made up from the diodes and f.e.t. capacitances. I measured the response of the probe up to 48MHz and **Fig. 6** shows the results. I think you can see from this, that the probe is more than adequate for the vast majority of oscilloscopes. **PW**

Further Reading

'The Oscilloscope In Your Workshop', a series of articles by Fred Judd G2BCX, starting in this issue of *PW*

How To Use Oscilloscopes And Other Test Equipment R.A. Penfold, £3.50

Oscilloscopes How To Use Them, How They Work. Ian Hickman, £12.95

Both of the above books are available from our *PW* Book Services.

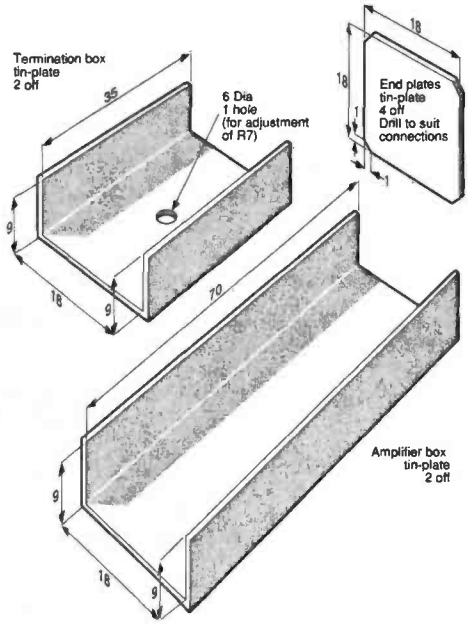


Fig. 4: Basic measurements of the three shapes required to make the probe screening boxes.

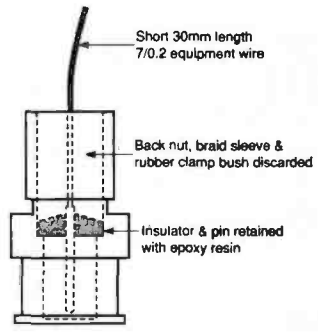


Fig. 5: One idea for a possible interchangeable probe tip.

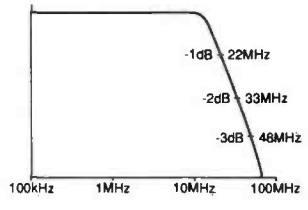


Fig. 6: This shows the measured characteristics of the prototype unit

How Much?
£10
How Difficult?
Beginner+

Shopping List

Resistors

Metal film 1%, 0.25W

43Ω	1	R5
220Ω	1	R6
100kΩ	1	R2

R3 is selected on test as described in the text.

Metal film 1%, 0.6W

220Ω	1	R4
10MΩ	1	R1

Variable Miniature Horizontal Mounting

100Ω	1	R7

Capacitors

Miniature Disc Ceramic

10nF	3	C1-3

Tantalum Bead 16V

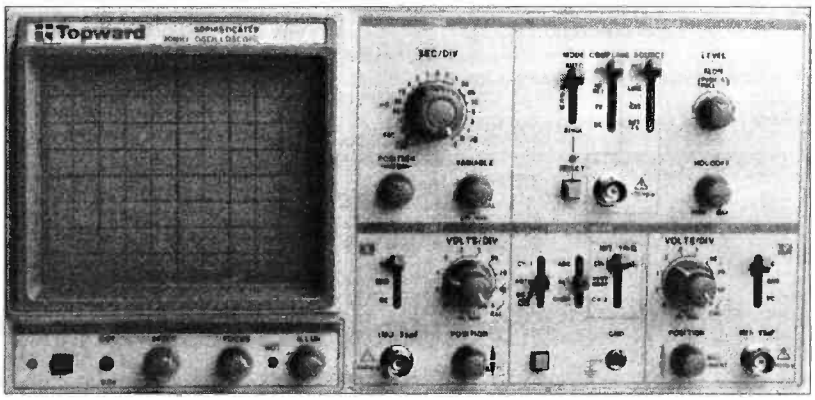
1μF	2	C4,5

Semiconductors

1N914	2 (or 1N4148)	D1,2
2N2222	1	TR2
2N3819	1	TR1

Miscellaneous

Double-sided p.c.b.s (*PW* p.c.b. service), tin-plate to make the boxes, plugs sockets to suit the 'scope, a length of miniature 50Ω coaxial cable up to a maximum of about 1m, a 4mm 'banana' socket and matching plug, nylon weave sleeving.



New Series

This month Fred Judd G2BCX, begins his new series on the oscilloscope, one of the most versatile servicing and testing 'tools' available to the radio enthusiast and professional engineer.

The Oscilloscope In Your Workshop

The oscilloscope is undoubtedly one of the most versatile of all measuring instruments used in radio and electronics. The 'scope has literally hundreds of applications, yet it is rarely ever used to its fullest extent, except perhaps in laboratories.

The object of my new series is to deal with as many of these applications as possible. The series will include many photographic examples (oscillograms) that may prove useful to both existing and potential owners.

The origin of the 'scope and how it operates, is a story that can be found in many textbooks, including references 1 and 2 at the end of this part. However, a few words about the use of the 'scope and about buying a suitable instrument will be a helpful introduction to oscillography.

Choosing Your 'Scope

When purchasing a 'scope, it is important to consider what you're going to use it for! You'll also have to consider the other instruments necessary for common applications, e.g., performance measurements and/or fault-finding in audio, radio, video and electronic equipment generally (ref. 3).

Prices of new, modern 'scopes range from around £300 to £3000 or more. Note that those at the top of the price range may have a frequency coverage from d.c. into the GHz region and have a wide range of facilities. These 'scopes are normally regarded as 'laboratory' instruments.

A three-trace 'scope similar to that shown in **Fig. 1.**, will cater for most measurements, tests, and waveform displays, required for even the keenest amateur experimenter. This particular model has a frequency response from d.c. to 20MHz and two Y amplifiers which will accept a.c. or d.c. signals at the inputs.

Other facilities provided on this 'scope include the synchronising of the timebase (from all three traces) from input signals, and from an external triggering signal. Timebase speeds range from 0.5s/division on the screen graticule (1 division = 10mm) to 0.2µs/div. It also has a 10 times magnification on each of the 20 calibrated speeds.

Signal magnitudes from 5mV to 5V per/div (10mm) are available over 10 calibrated ranges. The cathode ray tube (c.r.t.) traces appear in bright green and are of short persistence, which means that the 'green glow' lasts only a short time.

Solid State

Many oscilloscopes have other useful features, but these and the facilities described above are typical of most 'scopes in the price range £300 to £400. These days, such instruments are solid state except for the c.r.t.

There's a wide range of 'scopes to choose from, so it's important to make a study of the performance specifications and facilities of different models and makes before parting with your cash!

Secondhand (solid state) double-trace 'scopes and older (valved) models, such as a Cossor 1039 MkIII, which is equipped with double-trace and with a.c. or d.c. input Y amplifiers, can be obtained at reasonable prices. However, **you should be very wary of** any model, however recent, that has been modified for some reason and/or will not function to its specified calibration.

If the calibration is suspect, the measurement of a.c., along with the voltage and current magnitudes of a.c. could be unreliable. There's also the possibil-

Fig. 1. (Heading Pic). A modern but relatively low cost triple-trace 'scope. The unit has a frequency limit of 20MHz. (see text for other performance details). Photo courtesy of Maplin Electronics.

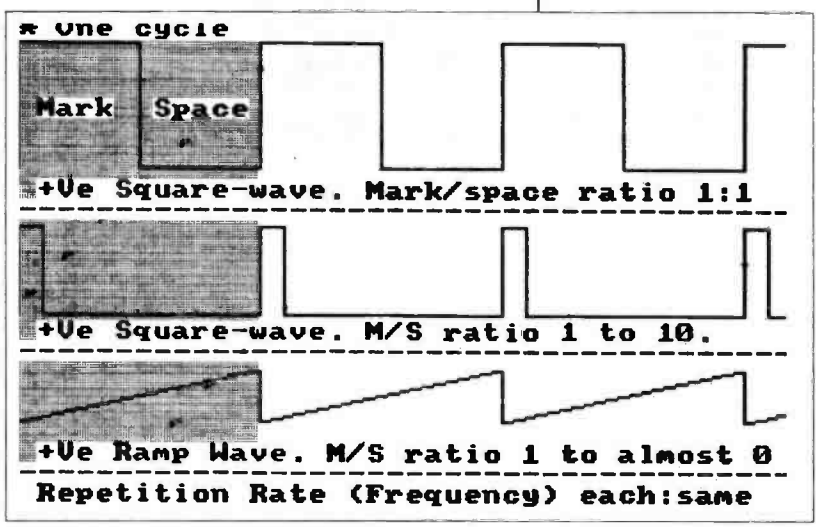


Fig. 2. Waveform 'mark/space' and frequency relationship (see text).

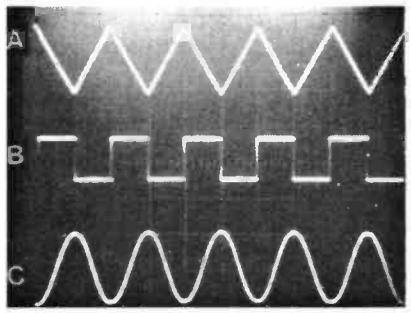


Fig. 3. Oscillogram. (A) Sawtooth, (B) Square and (C) Sinewaves. (See text. Time v Frequency and amplitude factors).

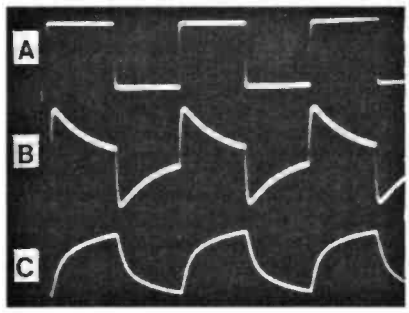


Fig. 4. Oscillogram. High quality audio amplifier frequency response test with 1000Hz input. (A) Signal at amplifier output as (B) indicates poor low frequency response and as (C) poor high frequency response. (see text).

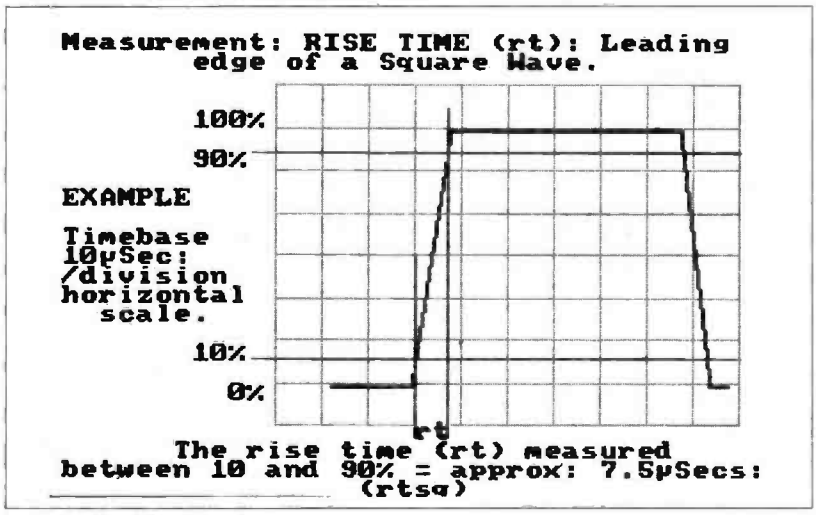


Fig. 5. The 'rise-time' of a squarewave is measured over 80% of the leading edge i.e, between 10 and 90%.

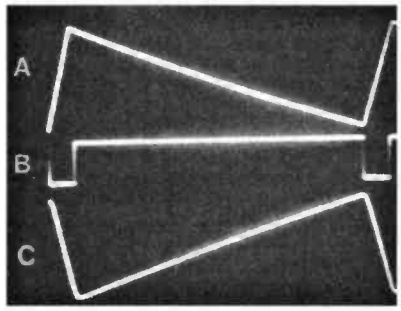


Fig. 6. Oscillogram. Ramp waves are often used as timebase voltages in oscilloscopes. They can be very linear and generated to be (A) negative-going or (C) positive-going. (B) This is the initiating pulse.

Table. 1.

Value	Sinewave	Squarewave	Triangular-Wave (Isoceles)
Peak : r.m.s.	$\sqrt{2} = 1.4142$	1.000	$\sqrt{3} = 1.732$
r.m.s. : Peak	$1/\sqrt{2} = 0.7071$	1.0000	$1/\sqrt{3} = 0.577$
Peak : Average	$\pi/2 = 1.57$	1.000	2..000
Average : Peak	$2/\pi = 00.64$	1.000	0.5000

ity that the visual display of simple and complex waveforms associated with radio, audio and electronic equipment generally, will not be accurate.

A 'scope can also be used in a visual display mode - similar to a v.d.u. - for showing specific events in conjunction with special items of equipment. I'll explain this technique later in the series, but again accurate calibration plays an important part.

Timebase Calibration

As the timebase calibration of virtually all modern 'scopes is in terms of 'real-time', a close approximation of the frequency, or repetition rate of virtually any waveform, is quite easy to determine. However, the highest frequency that can be measured is bound by the limit of the timebase repetition rate, (horizontal or 'X' deflection) and the frequency response of the 'Y' amplifiers (vertical or Y deflection).

On most 'scopes, the graticule over the c.r.t. screen will have 10 graduations 10mm apart. Each division represents a duration of seconds (s), milliseconds (ms) or microseconds, (μs) depending on the timebase ranges.

On the screen there are usually eight divisions, also 10mm apart, for amplitude measurement in terms of N volts or millivolts-volts per division according to the Y amplifier attenuator ranges (see **Fig. 1.**). The X and Y channels on many 'scopes can be combined for Lissajou Figure frequency comparison and have what is known as a 'Z' input for signals to provide the necessary display on the c.r.t. screen.

Simultaneous Displays

When one or more different, but frequency related waveforms are displayed simultaneously for comparison, it's important to be able to define the mark/space ratio of each and the duration of one cycle. The three different waveforms in the computer-derived illustration, **Fig. 2**, have the same frequency. So, one cycle of each has the same duration but the mark/space ratio of each is different.

The oscillogram, **Fig. 3** (photo of actual display on c.r.t. screen) shows three different waveforms. The timebase speed is 1ms per division, and the three traces each show five complete cycles. One cycle of either has the same duration i.e., 2ms.

The frequency of the waveforms (A) sawtooth, (B) , (C) sinewave, is 1000/2 or 500Hz. Assume 1 volt/div for the Y, or horizontal graticule lines, then the amplitude of (A) is 1.75V, (B) just over 1V. Note however, that the amplitude of (C), the sinewave, is 2V. Between the positive and negative peaks, i.e., 2V peak-to-peak.

Note: In a.c. practice, any references to voltages or currents, (unless otherwise specified), is usually taken as being the r.m.s. (root mean square) value. Ordinary measuring instruments - such as your bench multimeter - are normally calibrated in r.m.s. values. Sinewaves however, are displayed on a 'scope in terms of their peak-to-peak amplitudes. **Table 1** summarises the principle characteristics of several waveforms (ref. 4).

Waveform Applications

There are many applications for different waveforms. For example, a 1000Hz squarewave was at one time commonly used for checking the performance of high fidelity audio amplifiers. With a lead-

ing edge 'rise-time' of about 1μs (one microsecond) squarewave, as (A) in **Fig. 4** a squarewave at this frequency also has a harmonic content extending to about the 30th harmonic.

The signal is fed to the input of the amplifier to be tested, but if it appears at the output like (B) suffering differentiation, it indicates a poor low frequency response. Integration (C) is indicative of poor high frequency response. If the squarewave appears at the output with close approximation to its original form, then the amplifier has a fairly 'flat' overall response from at least 20 to 20 000Hz.

The rise-time of the leading edge of a squarewave is also an important factor in certain electronics applications. As in the computer-derived illustration, **Fig. 5**, where it's measured over about 80% of its leading edge. Modern 'scopes will display a waveform rise-time of 1μs, or less. **Note:** a.c. (capacitive) coupling in audio or electronic circuitry, can cause very low-frequency squarewaves to become slightly differentiated (sloping top and bottom) if the coupling capacitance value is too low. When measuring this type of signal with your 'scope, it's wise use the 'Y' amplifier d.c. inputs.

Ramp Waveforms

Examples shown by the oscillogram in **Fig. 6**, are (A) negative-going and (C) positive-going ramps. The initiating pulse may be a positive or negative-going depending on the circuit.

The negative-going squarewave (B) has an approximate 1ms 'mark' duration. The fairly long rise-time of the ramp waveforms is equal to the duration of the initiating squarewave.

Ramp wave-forms are commonly used as timebases for modern solid state 'scopes. The necessary oscilloscope timebase 'flyback' suppression, is often derived from the initiating squarewave. This technique is required to 'blank out' the electron-beam, which provides the glowing 'trace', as it quickly returns to the left of the screen at the end of each 'sweep'.

Valve Timebases

The most commonly used timebase generator in 'scopes using valves, is the Miller-transitron circuit. This circuit which produces a timebase wave and blanking pulse is shown in **Fig. 7**.

Some earlier valve-equipped 'scopes featured the Puckle timebase and other special circuitry by O.S. Puckle, who was one of the pioneers in this field. Timebase (or X) calibration on most older valved 'scopes, is usually only approximate. Some models may not be calibrated at all.

Quite accurate calibration, or a check on existing calibration, can be obtained with the aid of narrow pulses at known frequencies. Those displayed in **Fig. 8**, are locked to the timebase and have intervals of 10μs (a frequency of 1 000 000/10 or 100kHz).

The 'scope screen, or graticule, is marked off as shown. This test will also show how linear the timebase is. The oscillogram, **Fig. 9**, which uses the same calibration as in **Fig. 8**, and is taken from the Cossor 1039 MkIII valved-equipped 'scope (**Fig. 10**) shows that the rise-time of the squarewave (S) is very close to Iμs.

Gated Time-Markers

With the aid of suitable circuitry, a given number of time-marker pulses, like those in **Fig. 9** (they're often called 'pips') can also be 'gated' so as to start coincidentally with an audio or r.f. pulse and still be synchronised with a timebase.

This technique can be achieved with a multivibrator at a suitable frequency, and a flip-flop (one shot multivibrator) or with a 556 timer 'chip'. I used gated time-markers, as in the oscillogram **Fig. 11**, to obtain very accurate measurements of the velocity of sound in air.

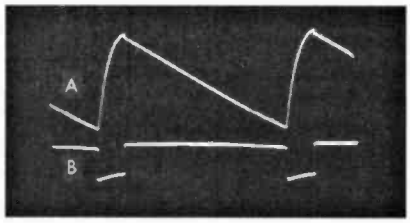


Fig. 7. Oscillogram. (A) Miller-transition timebase with (B) initiating . Commonly used with older 'valved' scopes.

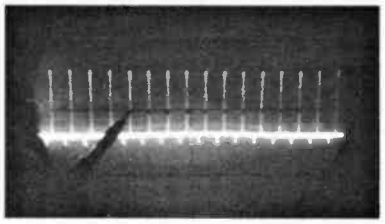


Fig. 8. Oscillogram. Method of calibrating a timebase with narrow marker pulses of known frequency. Example pulse intervals = 10μs. (see also Fig. 9 and text).

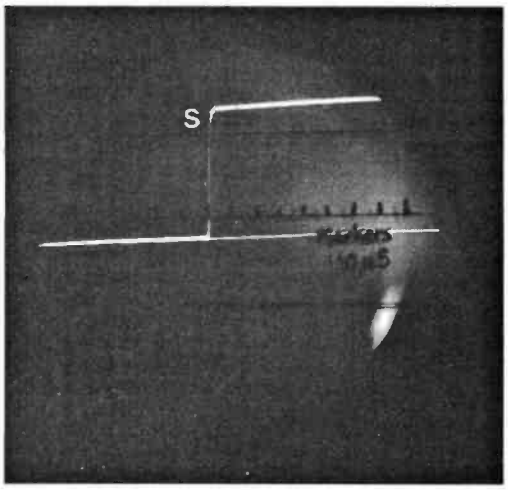


Fig.9. Oscillogram. 10μs markers inked onto uncalibrated graticule. Rise-time of square wave (S) also displayed, is virtually 1μs.

Fig. 10. The Cossor 1039 MKIII double-beam scope used for the examples Fig. 8 and 9. This model employed valves and the Y amplifier inputs catered for d.c. as well as a.c. voltages. (The cine camera was used to make a demonstration film of oscilloscope applications).

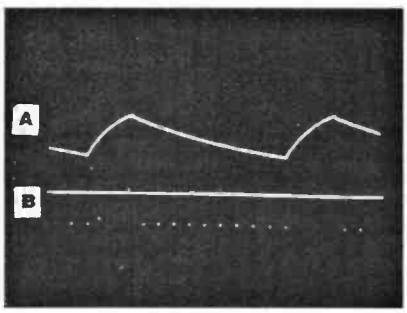


Fig. 11. Oscillogram. (A) Timebase wave. (B) Very short duration (0.5μs) marker pips. (See text regarding a specific application).

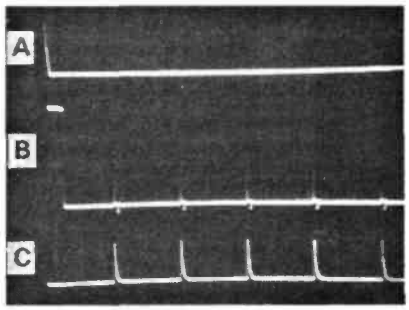


Fig. 12 Oscillogram. (A) Synchronising pulse for timebase (B) transmitter (r.f.) gating pulse and (C) distance markers. (See text and Fig. 13 regarding application.

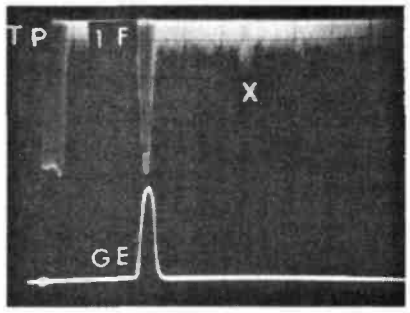


Fig. 13. Oscillogram. (TP) Transmitted r.f. pulse (50μs). (1F) Echo from the ionospheric F region. (GE) Same echo but gated to eliminate noise etc. (X) A secondary echo (2F) just above the receiver noise. See text for further explanation.

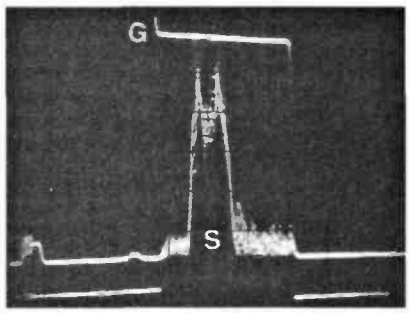


Fig. 14. Oscillogram. (S) Echo from ionosphere (F region). with splitting due to the earth's magnetic field. (magneto-ionic splitting). (G) Superimposed gating-pulse, opened-out so that the whole of echo and some receiver noise is displayed.

The markers and short pulses at audio frequency, were synchronised with the timebases of a v.d.u. and a 'scope. This set-up was then operated in conjunction with a 'sound' transmitter and a special transducer, similar to a microphone, placed at a predetermined distance from the sound transmitter.

The 10 markers in the example, are at intervals of time (t) the total time along the timebase being 10 x (t). If the leading edge of the short pulse from the sound transmitter appeared at the 8th marker for instance, it would have travelled a distance (d) equal to 8 x (t). (Ref. 4)

Marker pips of this nature are also used in radar systems. In this application the time intervals are not only related to the speed of radio waves (300 x 10^6 metres/sec) but must also take into account the double journey made by the transmitter pulses to the 'target' and back to the receiver.

The oscillogram, **Fig. 12**, shows the time relationship between (A) and the master synchronising pulse (B) and the transmitter (r f) pulse and (C) the 1ms interval distance markers of a very long range system. This is briefly described below and is yet another use for a 'gate' circuit.

Ionospheric Sounding

In the oscillogram shown in **Fig. 13**, I've provided a photograph of an actual display of a radar type r.f. pulse transmission and reception technique used for measuring the virtual height of the ionospheric regions (E, F1 and F2) as well as 'sporadic E' observation.

The transmitted r.f. pulse (TP) of about 50μs and the received echo (1F) on the top trace, indicate an F region virtual height above earth of 375km at the time the photo' was taken. The (1F) echo is gated to appear entirely on its own, as (GE) on the bottom trace with receiver noise and other possible interfering signals completely eliminated.

As the gate pulse can also be moved to any point along the timebase, the second echo, just visible above the noise in the top trace at (x), could also be gated. I should also point out that the signals on the top trace are inverted for convenience. Many 'scopes have this facility.

The width of a gating pulse can also be varied to let through a greater portion of signal as in the oscillogram, **Fig. 14**. In this example the gate pulse (G) is actually shown, sufficiently 'opened' to accommodate a 'split' echo from the ionospheric F region plus a little receiver noise. The echo is 'split' by the earth's magnetic field (magneto-ionic splitting).

That's the lot for this month, but next time I'll take a look at frequency comparison by Lissajou figures, audio and r.f. amplifier frequency responses using the sweep frequency technique, audio amplifier harmonic distortion and h.f. transmitter monitoring methods using a line sampler.

PW

References

1. *The Oscilloscope At Work* by A. Hass and R. W. Hallows.
Iliffe. London 1959.
Good basic material but applicable to older valved 'scopes. Deals with many applications and how the 'scope operates.

2. *The Radio Laboratory Handbook*. by M. G. Scroggie, B.Sc C.Eng, FIEE. Iliffe 1971
A book for the experimentally-minded enthusiast. It covers laboratory measuring techniques and equipment, including oscilloscope techniques.

3. *Servicing With The Oscilloscope* by Gordon J. King. Newnes-Butterworths. 1976.
An excellent guide to fault-finding as well as testing the performance of audio and TV equipment using the oscilloscope.

4. *Measuring The Velocity Of Sound*. by F. C. Judd MIOA, M. Inst. E., Assoc: IPRE. *International Broadcast Engineer Magazine*. Oct 64.

NOTE: The reference books (1, 2 & 3) have been chosen because they contain much basic information often missing in modern books. Although now out of print they are almost certainly available from libraries. There are of course many modern books covering solid state circuitry for special applications in conjunction with oscilloscopes, e.g. low distortion sinewave generators, audio and r.f. sweep frequency generators, 'electronic' gating systems, multi-waveform generators, etc. (see *PW* Book Service)

Reflections

The Mid-Sussex ARS. Twenty Five Years and Going Strong

This month, I give pride of place to the Mid-Sussex Amateur Radio Society who held their 25th AGM in January. For at least 15 of those years I have had the privilege of being one of their honorary life members. Although I have a poor attendance record at their meetings I'm kept informed about the club's activities through their journal *Mid-Sussex Matters*. Believe me, they are a super bunch of people and a great credit to the amateur radio movement which they support as a group and individually in so many ways. Congratulations Mid-Sussex ARS, you've all done a grand job!

Program Description

The word 'Reflections' was among the first I called up on a thesaurus program, after it arrived from the *Computer Shopper* magazine. It offers as alternatives the words 'thought', 'image', 'observation' and 'study' which, in my view, describes the prime objects of this column. Let's start with a 'thought' for the early cycle and wireless mechanics and dealers who laid the foundations of the radio industry that we know today.

Earning With Enthusiasm

The man at the wireless shop in the 1920s was looked upon as the local genius. This was because he could put a number of parts together that would bring voices and music into the home, 'without wires' from far away places. In addition, this often 'one man band' enterprise earned his living by erecting antennas, making cabinets, charging accumulators, selling 'dry' batteries and wireless parts. He also often maintained stationary engines, domestic wiring and showed cartoons and 'one reelers' at childrens' partys with a trusty old 'GB' 16mm cine-projector.

It was one such man, an uncle, who gave me the bits in 1940, when I was 10 years old and encouraged me to build a single valve receiver. That set was my pride and joy for a long time. The receiver had one coil and tuned somewhere in the short wave bands. It needed a 2V accumulator and a 120V high tension battery to provide power. How could I be expected to sing in the choir on Sundays or concentrate on anything else for that matter, when my mind was on the numerous stations to be found amid the oscillations on this 'magic' box?

I can honestly say, that of all the super equipment that I have owned and serviced since, nothing has given me the same thrill and wonderment. I remember hearing 'Lili Marlene', no doubt being sung to the German forces, entering my headphones. All this was via a handful of components secured to a base-board with wood-screws and carefully shaped interconnecting wires around the terminals.

The Image

I was about 18 months old when the famous F. J. Camm launched *Practical Wireless* and I first bought a copy some years later, when I could spare the 4.5p which it cost then, from my total earnings of 12.5p for all-day Saturday delivering greengroceries on a 'trades' bike. At the age of 13, I began working on Saturday mornings for a cycle and wireless shop and my income increased, to 15p, for less work. When I left school at 14 they gave me a full-time job starting at 75p per week. Throughout the late 1940s, *Practical Wireless, Short Wave Magazine* and *Wireless World* carried adverts for brand new war-surplus radio and RADAR receivers and transmitters, test-gear and a host of accessories all at a fraction of their original cost. For many years these magazines kept up their image of assistance to readers, by carrying articles, publishing circuits and suggesting modifications to surplus gear. These included such famous receivers as the AR88, BC342, MCR1, R107, R1116 and R1155 and transmitter/receivers like the B2, TR9, WS-18, 19, 38, 46 and the Canadian 58 infantry set. The 58 was one of the first pieces of WWII equipment to use the 1.4V minature glass valves, which are shown standing between the set and a large ex-RAF transmitting valve in **Fig. 1**. Wartime sets like this are much sought after today as collectors items and are fetching amazing prices.

Shortening Wavelengths

The 1950s saw the opening of the v.h.f. bands for both amateur radio and domestic broadcasting. Our various magazines once more devoted several pages each month to updating and helping readers in this new area of activity. They reviewed such a.m/f.m. communications receivers as the Eddystone 770R, and later, the ex-military R216 (both covering 19 to 150MHz in several bands). They also looked at a variety of domestic radio and television sets with additional ranges in Bands II (88-100MHz) and III (175-220MHz) respectively. The editors gave space to the rapidly growing selection of beam antennas for the new bands along with the associated feeder cables, masts and fittings, ranging from clamps to coaxial connectors. Many of us did our spade-work and learnt a great deal during the 1950s and early 60s about v.h.f. techniques and propagation as the technology matured.

Study

The field of v.h.f. communication was a fresh and exciting area for radio enthusiasts to study. Many amateurs built crystal controlled transmitters for the 144MHz band and made converters so that their station work-horse, the communications receiver, could be accurately tuned between 144 and 146MHz.

This was the era of converters and a variety were manufactured so that existing broadcast sets could receive the new BBC stations in Band II. Viewers with early televisors could then receive the stations in Band III. In most cases the antenna socket of the existing equipment became the intermediate frequency input for the added v.h.f. tuner, while the set worked on its original

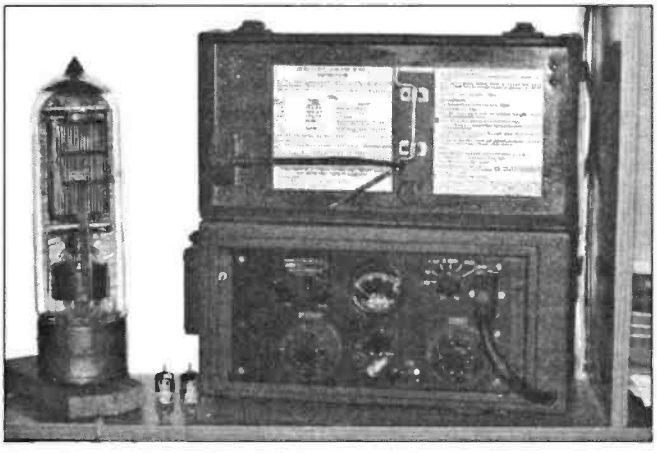


Fig. 1: The Canadian 58 Set.

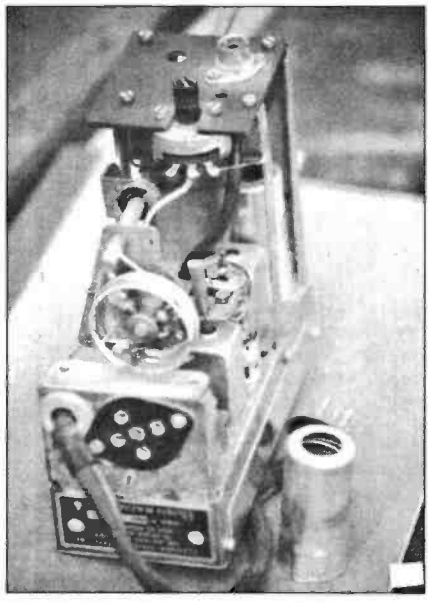


Fig. 2: VHF Converter made by Bush.

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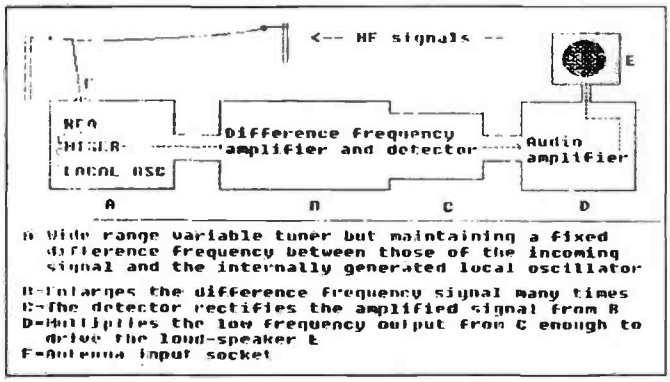


Fig. 3: Fundamental Superhetrodyne Receiver.

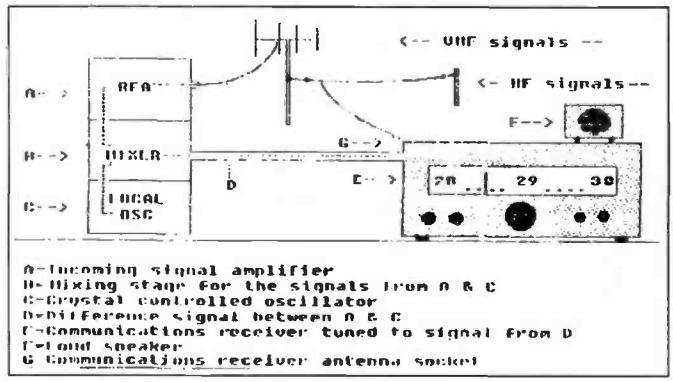


Fig. 4: Conversion Basics.

frequency setting.

The British Company, Bush Radio Ltd., made a two-valve Band III converter, type 184 - shown in **Fig. 2**, specifically for their own early receivers. The valve under the screening can at the rear is the r.f. amplifier and the one in the foreground, with the can removed, is the combined mixer and local oscillator.

The fundamental layout of a superhetrodyne and the basic principles of conversion, exaggerated in **Figs. 3** and **4** respectively, are also intended to help newcomers with their studies of receiver techniques. Let us assume that the variable 'front-end' in **Fig. 3** tunes from 10 to 30MHz and the makers decided to use a difference (known as intermediate) frequency of 500kHz (usually 465kHz). At the low frequency end, the local oscillator would be running at 9.5MHz and at the high end it would be 29.5MHz. Therefore, whatever frequency is selected within this range, the mixer will always offer a 500kHz signal to the difference frequency amplifier.

The intermediate frequency amplifier must always be well screened. This is to stop signals which are normally transmitted at the difference frequency, being picked up spoiling the reception of the wanted station. This is known as i.f. breakthrough. If we now tune this superhet to 28.5MHz, **Fig. 4**, and disconnect the antenna and replace it with a screened lead carrying the output from a v.h.f. converter, our imaginary receiver becomes a sophisticated intermediate frequency amplifier.

Let's imagine that the converter shown in **Fig. 4**, is designed to receive and amplify signals between 144 and 146MHz, using a crystal controlled local oscillator to send a fixed 116MHz signal to the mixer. The difference will be 28MHz (144-116 = 28), which means that 28MHz on the dial of our receiver will be 'changed' to 144MHz. Now this is where the sophistication comes in - we can now (if we wish) vary, not the oscillator, but the intermediate frequency and dial readings of 29MHz (145-116 = 29) and 30MHz (146-116 = 30) which are converted to 145 and 146MHz respectively. The pointer in **Fig. 4** is now representing 144.5MHz. Once again it is important that the line coupling the output of the converter to the input of the receiver is very well screened. This is to avoid any unwanted signals being picked up between 28 and 30MHz, especially when the 28MHz band is 'lively'.

Other frequency combinations can be used, for instance, my radio-telescope monitored 136MHz. I then used a 110MHz local oscillator in the converter and tuned a communications receiver to 26MHz. You will get a better idea of what's available by taking a look at the various converters supplied by the various advertisers in *PW*.

Observations

The major aurora, which lasted from about 1730 on November 27 to 0054 on the 28th 1990, was seen in various forms from Herstmonceux in Sussex, County Clare in Ireland and several parts of Scotland. **Doug Smillie** (Wishaw) logged tone-A signals on 50 and 144MHz from stations in France and the UK from 1540 to 1900 on the 27th. Around 1900 on the 28th, he noted weak auroral effects on the signals from the beacons v.h.f. GB3LER and GB3RMK. Auroral reflected signals were also logged by **Tony Hopwood** (Upton on Severn) on the 27th, 28th and 30th. The magnetometry reports received from **Neil Clarke G0CAS** (Ferrybridge), **Tony Hopwood**, **Karl Lewis** (Saltash), **Ron Livesey**, (Edinburgh), **David Pettitt** (Carlisle) and Doug Smillie all gave storm conditions on the 27th.

During December, **Ron Livesey**, the auroral coordinator for the British Astronomical Association, received reports of visual aurorae from observers in Scotland for the overnight periods on the 8, 12th, 13th, 18th, 21st, 24th and 26th. In his observatory, **Cmdr Henry Hatfield** (Sevenoaks) uses converters for the 'front-ends' on both of his radio-telescopes. During January he recorded individual bursts of solar noise, on 136MHz, on days 7 and 11 and February 1 and on 1297MHz on days 12 and 17 and February 1. There is little doubt in my mind that some of the January activity was associated with the large sunspot group, **Fig. 5**, observed and drawn by **Patrick Moore**, with the special apparatus, at his observatory in Sussex at 1135 on the 14th. While this group was visible, Henry Hatfield recorded a violent radio burst at 136MHz at 1525 on the 11th and, with his spectrohelioscope, saw a large quiescent prominence on the eastern limb of the sun at 1445 on the 13th.

Ern Warwick (Plymouth) found the 28MHz band 'dead' at 1630 on the 16th, noted very fast fading on the signals from the beacon VK2RSY on the 1st and echos on the beacons DF0AAB on days 1, 2, 5, 10 and 20; PY2AMI on the 10th and WA4DJS on the 2nd, 5th, 9th and 10th. You can never be sure whether 'echos' are due to auroral or abnormal ionospheric propagation, or both, anyway, whichever, they are always worth a mention.

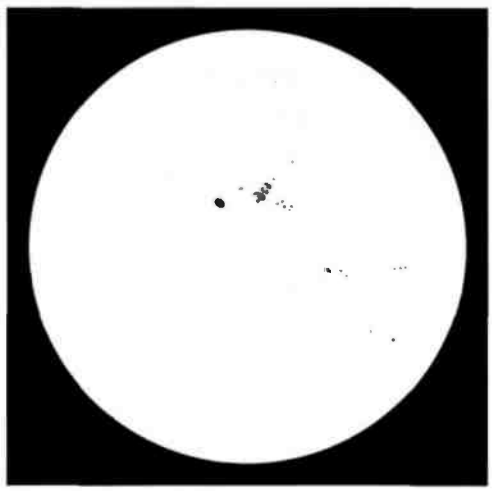


Fig. 5: Sunspot Group.

Tropospheric Observations

The recording chart on the Short & Mason Barograph, installed at my home, showed the atmospheric pressure fluctuating between 29.5in (998mb) and 29.9in (1012mb) from January 1 to 1800 on the 11th. At midnight on the 11th, it took off to reach 30.5in (1032mb) by 1000 on the 12th and fell again slowly to 30.3in (1026mb) by 0600 on the 14th. The pen then hovered around 30.2in (1022mb) until 0600 on the 18th when it rose sharply to 30.55in (1034mb) and remained there from 2200 on the 19th to midday on the 28th. The pressure was then a fairly steady average of 30.3in through to the 31st. While the high pressure was falling on the 28th/29th, **Geroge Garden** (Edinburgh) took his broadcast DX gear to a high point on Cairn O' Mounth. He heard BBC Radios York and possibly Leicester. ILR 'Borders' on Band II and a weak monochrome picture from the Caldbeck transmitter (near Carlisle), on Ch. 34 and coloured pictures from ITV Borders (Selkirk) on Ch. 59 and TYNE TEES (Chatton) on Ch.49, in the u.h.f. band.

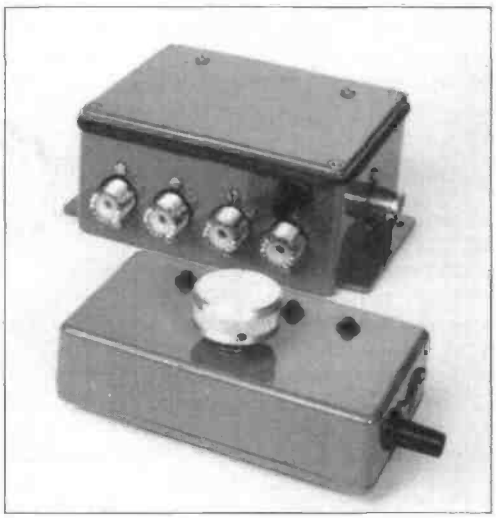
Don't forget to write to Ron if you are interested in Propagation, Meteorology and the more specialised radio observations.

Reflections

CAP.Co AS-305R

Remote Antenna Switching Unit

With their various products, CAP.Co have earned themselves a reputation for innovative design. Mike Richards G4WNC, looks at their new AS-305R remote antenna switching unit.



The AS-305R has been designed to fill a gap in the market for a good quality antenna switch that can be mounted remote from the shack. The need for this has been generated by antenna systems like CAP.Co's own magnetic loop antennas. When using this form of antenna however, more than one antenna is required to cover all the h.f. amateur bands.

Although you could provide antenna switching back at the shack, it would obviously be much neater if you could mount the switch remotely. You would then only need one coaxial feed from the shack to the antennas - saving many expensive feeder.'runs'.

This is where the AS-305R comes into its own, as it provides the much needed remote switching. The AS-305R consists of two smart die-cast boxes, one of which is mounted close to the antennas, while the other controls the switching from the shack.

There's a bonus, as the unit is designed to work with other antennas as well as CAP.Co's own products. Anyone who uses or experiments with antennas mounted close together will find it useful.

Connecting Up

The instructions for the AS-305R were supplied on two A4 sheets. The first sheet gave some background information on the development of the unit.

Also included was a specification and a simple operational guide. The second sheet contained a series of four drawings illustrating the control connections to both the base and remote units.

In use, the base unit containing the switch and indicators is mounted in the shack while the remote unit is mounted next to the antennas. Linking the two units requires a single coaxial feeder and a six-way multi-core cable.

Fortunately, a 15m length of multi-core cable was supplied, so the interconnection was simplified. Wiring-up of the multi-core cable was very straightforward, thanks to the provisiøn of screw terminal strips inside both units.

In my opinion this was far better an idea than fancy plugs and sockets, as the terminals provided a sound mechanical and electrical connection. This is particularly relevant to the remote unit, as that may have to stand both extremely high and low temperatures.

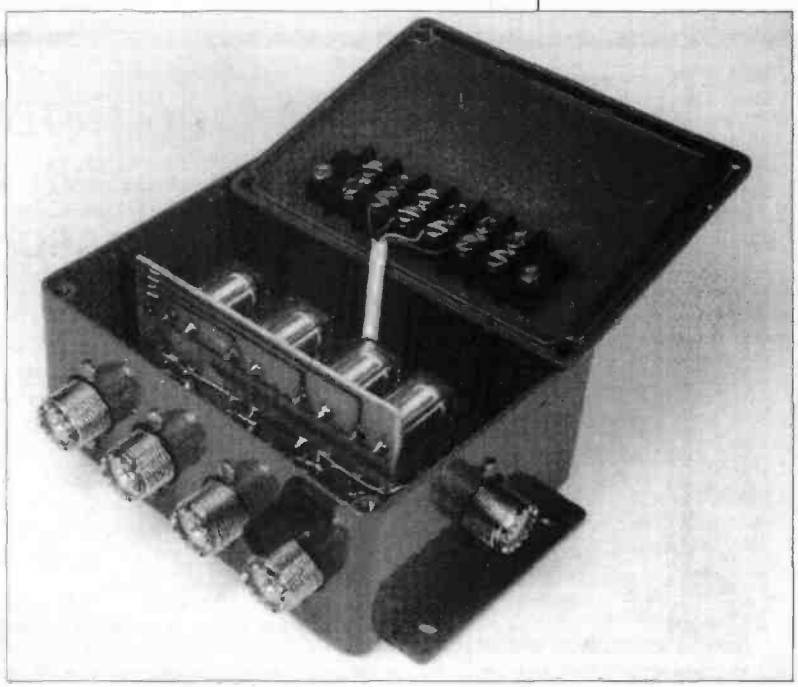
Extra Protection

Weather-proofing of the multi-core cable was provided by a plastics grommet for the cable entry on both the base and remote units. The only problem I found, was that the grommet diameter was too large for the supplied cable. This meant that some additional weather-proofing would be required at the remote unit.

Another problem I encountered was with the rubber seal on the lid to the remote unit. On the review model, this seal proved to be very difficult to replace after terminating the multi-core cable.

Although the remote unit was clearly designed to be mounted out in the open, I think it would be wise to provide some protection from the elements. One good reason for this is the use of SO-239 sockets for the antenna connection. Although rubber seals were used where the sockets interfaced with the case, PL-259 plugs are not weather-proof and so would need additional protection.

Probably the simplest way to bring the weather-proofing up to the required standard would be to invest in some self-amalgamating tape. This could be used to protect the coaxial connections and the multi-core cable entry. It also could be used to provide additional protection for the lid seal.



REVIEW

REVIEW

Power Supply

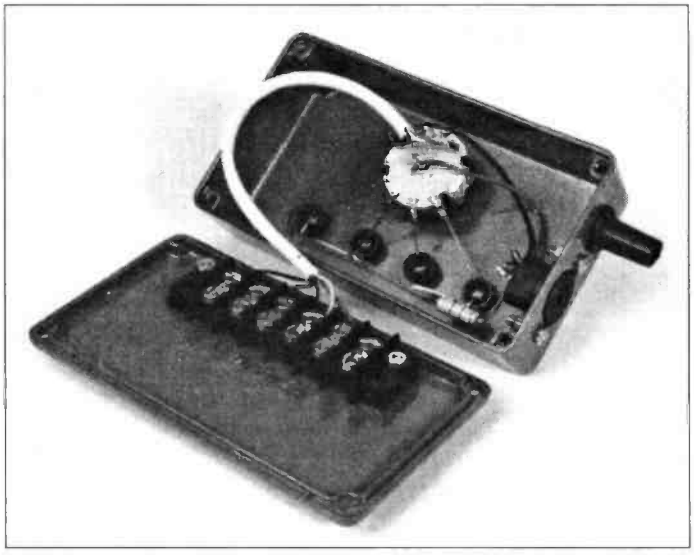
The final connection required was a power feed to energise the relays. The connection was made using a DIN speaker plug on the side of the base unit. The power requirement was a modest 12V at a maximum of 100mA. Although this supply needed to be limited to 13.8V maximum, it didn't need to be regulated.

Simple To Operate

Operation of the AS-305R was really simplicity itself. All that was required was to rotate the selector switch to the desired antenna. Indication of the switch position was given by four high brightness l.e.d.s on the base unit. Besides the four positions for antenna selection, there was a fifth position that grounded all the antennas.

Another interesting feature was the inclusion of static and lightning protection. This was achieved simply by grounding all antennas when the d.c. power was removed from the switching unit. This principle was, in fact, extended so that all except the selected antennas were grounded.

If you use compact antennas that are located close together, this feature could be particularly useful. By grounding adjacent antennas, the inevitable interactions are kept to an absolute minimum.



Specifications

Power handling:	3kW p.e.p.
Frequency range:	1MHz to 160MHz
Through loss:	Less than 0.04dB
Power requirement:	12V d.c. Max. 100mA
Input & output Sockets:	SO-239
Dimensions:	
Base unit:	113mm x 62mm x 55mm
Remote unit:	140mm x 103mm x 57mm

Summary

The AS-305R is certainly a neat and very useful accessory. When assessing it's value, you should also consider the amount of feeder saved as well as the operational convenience you'll be gaining.

The quality of construction was generally very good, but prospective buyers would be well advised to provide some additional weather-proofing on the external unit.

The AS-305R costs £85.50 inclusive of postage and packing and can be obtained from CAP.Co Electronics Ltd., Unit 28, Penley Industrial Estate, Penley, Wrexham, Clwyd LL13 0LQ. Tel: (0948) 74717. I would like to thank CAP.Co for the loan of the review model. **PW**

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Construction

A Six Element Experimental HB9CV

You can sharpen up the response of your 430MHz HB9CV Antenna. Tony Martin G4XBY, tells us how it's done.

The HB9CV antenna, which may be bought so cheaply at rallies, is a splendid antenna for starting on any of the bands. I have seen variants for bands between 28 and 1296MHz. The latter type was a home-made version, but seemed to function well.

The major grouse about the antenna, is the very wide beamwidth. If you refer to the drawing in **Fig. 1**, which is a representation of these characteristics for the antenna you'll see what I mean. This wide beamwidth characteristic tends to leave it with two distinct 'minus' points, which are, low forward gain and difficulty in 'nulling-out' interference. I decided to set about modifying the antenna to improve both of these areas.

Back To Basics

To find out how the HB9CV antenna might be improved I had to refer back to several books on antenna theory (‡ see below). Looking into the theory of the Yagi antenna, it appeared that a six-element design would give the best improvement for cost. The design shown in **Fig. 2**, is the result of this work. You should strip the antenna down, or if new, leave it untouched for the moment.

Construction

All the new elements are made from 8mm diameter seamless aluminium tubing. A single length of about 1.2m is sufficient to make all four directors D1 to D4. You should cut and trim the individual directors to the lengths shown in **Fig. 2**. The next step is to mark and drill each element at the exact mid-point, with a hole just large enough to allow the 3mm screws to pass through.

Caution Needed

If you are stripping the original antenna, take care to leave the original feed lines as they were. Otherwise just follow those instructions to make up the antenna, but build it on the new, longer, boom.

Starting about 20mm back from the forward end of the boom, mark and drill the four 3mm holes that will hold and retain the director elements. Mark and drill the hole for the forward element of the HB9CV antenna. Use the original antenna to measure the spacing for the rear of the two driven elements.

To finish off, either use end-caps on all the elements and boom, or wind a little self-amalgamating tape around each element to seal them from the effects of the weather.

Setting Up

Arrange to set up the antenna well away from surrounding objects, and with as clear a forward path as possible. The setting of the trimmer capacitor is now a little more critical and you should take time to set it up carefully.

Use a suitable frequency in the 430MHz band and preferably f.m. Also use the minimum power to provide a reliable reading on the v.s.w.r. meter. You should then carefully adjust the variable capacitor to give the lowest v.s.w.r. reading. Elevate the antenna as high as possible and check that the v.s.w.r. remains low. All that remains to be done is to place the antenna into the working location. **PW**

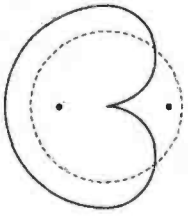
‡ Further Reading
VHF-UHF Manual, RSGB Publications (ISBN 0 900612 31 2)
Beam Antenna Handbook, Orr and Cowan, Radio Publications (USA) (ISBN 0 933616 04 X)
All About VHF Amatuer Radio, William Orr, Radio Publications (USA) (ISBN 0 933616 10 4)
See our Book Service pages for more information.

How Difficult? **Beginner**
How Much? **£5 (+ cost of HB9CV)**

Shopping List
A budget priced HB9CV antenna (check at the next rally you attend)
8mm aluminium tubing 273mm + 282mm + 290mm + 298mm
15mm square tube 900mm length (Your local TV antenna erector may be the cheapest source)

M3 screws at least 27mm long, nuts for the screws, end-caps or self-amalgamating tape, mast clamp.

Fig. 1: This polar plot diagram gives you an idea how wide the beam angle, of the original HB9CV antenna is.



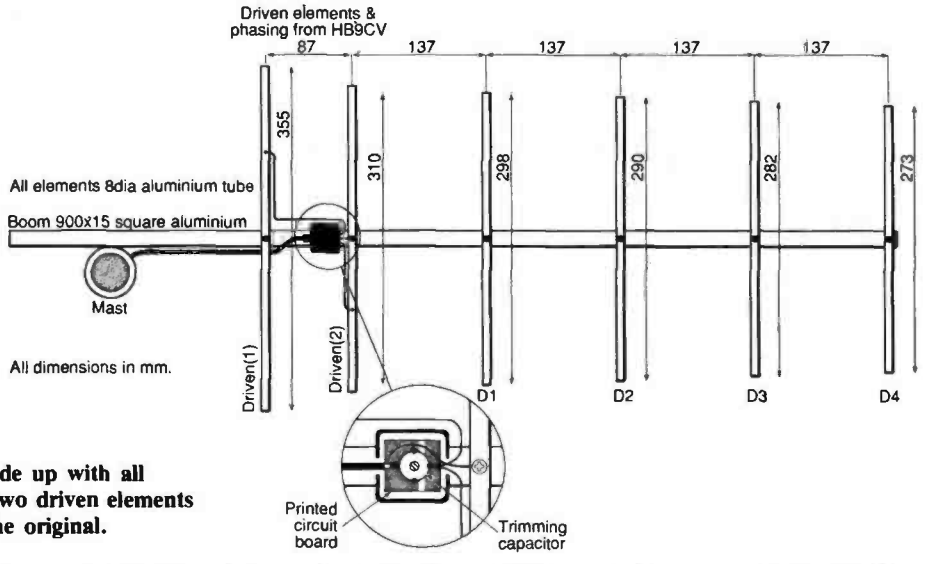


Fig. 2: This is how the antenna is made up with all dimensions of the new elements. The two driven elements from the HB9CV antenna are as in the original.

Mathematics for the Radio Amateurs' Examination

Many people get 'worked up' about the techniques, but there's no need to! Subtraction of fractions follows similar rules to addition, the only difference is that numerators are subtracted from each other. For example:

$$\frac{1}{2}-\frac{1}{6}=\frac{3}{6}-\frac{1}{6}=\frac{3-1}{6}=\frac{2}{6}=\frac{1}{3}$$

You see it wasn't so difficult was it? There are a few self-test questions, at the end of this article, to try when you have read all of this part of the series.

Multiply And Simplify

The next hurdle is multiplying fractions. It is actually easier than addition or subtraction! All we do, is to multiply the two numerators together, then multiply the two denominators together.

Suppose we want to multiply $^2/_3$ by $^3/_4$:

$$\frac{2}{3}x\frac{3}{4}=\frac{2x3}{3x4}=\frac{6}{12}=\frac{1}{2}$$

Again:

$$\frac{2}{3}x\frac{5}{8}x\frac{11}{12}=\frac{2x5x11}{3x8x12}=\frac{110}{288}=\frac{55}{144}$$

In each case above, I have simplified the answers, by dividing **BOTH** top and bottom by the same number (in each case by 2).

Diminish Division

Dividing one fraction by another is nearly as simple, just **invert** (turn upside down) the second fraction (the divisor) and multiply them together using the rules given above:

$$\frac{1}{2}\div\frac{3}{4}=\frac{1}{2}x\frac{4}{3}=\frac{1x4}{2x3}=\frac{4}{6}=\frac{2}{3}$$

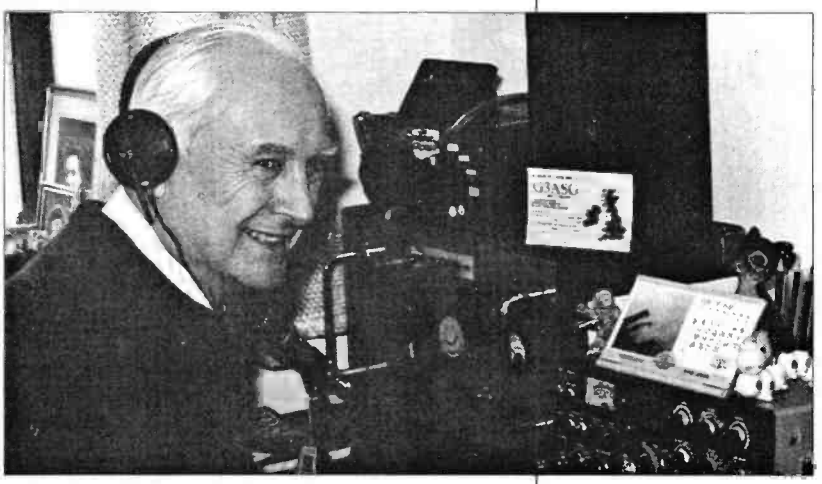
Decimate Decimals

Perhaps a word about decimals might be of help to those who missed them at school or who have since forgotten!

Decimals are just special fractions, the denominators are the same, or very nearly the same in all cases. In the first examples on this page there are various denominators, such as: 2, 3, 4, 6, 12, etc. All of these need to be brought to common denominator before the maths can be worked out. But first, let's recap on how we use numbers, such as the number 376 (three hundred and seventy-six). If you can remember the method used when you first started arithmetic at school? It really means:

	h	*t*	*u*
	3	0	0
		7	0
+			6
=	3	7	6

That is 3x100 or 'three hundreds' added to 7x10 or 'seven tens', added to 6x1 or 'six units' as I (and older readers maybe) would have written it out.



After Ray Fautley G3ASG's first article on addition of fractions, he continues his easy style with other tricks with fractions. Go on - have a go,- it's not really difficult!

The above example uses whole numbers only, but fractions are easily represented as decimals.

These fractions are shown in the decimal system by being written **AFTER** a decimal point. The decimal point is used simply to separate the whole number from any fractionional part. So 376 could also be written as 376.0 in decimal notation. The '0' indicates that there is no fractional part.

As another example, the number 53.6 means a whole number '53' and some fraction which is represented by the '.6'. The number 53.6 is read as 'fifty-three point six'.

Base First

As the 'base' of our counting is 10, there are only 10 possible numbers, and these are 0-9. So, fractions in decimals have denominators with base 10. The fraction 1/10 can be represented in decimal notation by 0.1, the fraction 2/10 is written 0.2, 3/10 is 0.3, etc.

Remember that the decimal point itself divides a decimal number into two parts. For example,

34.3 is divided into two parts:

(i) The first part, **BEFORE** the decimal point, '34' represents a whole number, the decimal point means that fractions follow. So after the point the number '3' represents a **FRACTION**, (less than 1) or 3/10.

So the decimal number 34.3 is the same as 'thirty-four and three tenths'. Similarly, the decimal number 129.7 is the same as 'one hundred and twenty-nine and seven tenths'.

Now we'll look at some rather more complicated decimal numbers.

What does the decimal number 13.675 mean? Well, don't forget that 0.6 is the same as 'six-tenths'. Of course, we have 'thirteen and six tenths' for 13.6 in this example, but what about the other two figures in the number, the '7' and the '5', where do they come in?

They are used to give more accuracy, as something divided into 'tenths' gives only ten portions. To achieve more accuracy then we can divide each 'tenth' into ten again, or into 'hundredths'. 0.1/10 is represented as 0.01. This is the same as 1/100. Similarly, we can divide each 0.01 by a further 10 to make 'thousandths', 1/1000 is 0.001, 2/1000 is 0.002, etc.

Just as '.6' represents 'six tenths', 0.07 is the same as 'seven hundredths', and 0.005 is 'five thousandths'.

Still not quite clear about it? Not to worry, we'll just add the various bits of the decimal number together.

13.675 is equivalent to:

	13	('thirteen')
+	0.6	('six tenths')
+	0.07	('seven hundredths')
+	0.005	('five thousandths')

So we can write 'thirteen and six tenths and seven hundredths and five thousandths' just by putting down '13.675'. It's a much simpler way to express awkward numbers than by using fractions all the time.

Thinking Caps On

Now it's time for you to exercise your new knowledge and skill!

(i) What is the decimal equivalent of $2^1/_2$ ('two and a half')?

Separate the whole number from the fraction. In this case the whole number is '2'.

The fraction is 1/2 (or 5/10 'five tenths') which is 0.5.

Joining the bits together we get:

	2.0
+	0.5
=	2.5

So the decimal equivalent is 2.5.

(ii) What is the decimal equivalent of $4^3/_4$ (four and three-quarters)

Separate the whole number from the fraction 4. The fraction is 3/4, or 'three divided by four'.

Dividing 4 into 3 is obviously less than 1, so there is not a whole number in the answer.

The numerator '3' **ON ITS OWN** is a whole number, so it can be called '30 tenths' or '300 hundredths' or '3000 thousandths', which are all the same as '3'. Supposing we try dividing our 3 (written as 30 tenths) by 4. This time there **IS** a whole number in the answer, **BUT** there's also a 'remainder': 30/4 = 7 with a remainder of 2. (Remember that the answer is in 'tenths').

Try again using our 3 as '300 hundredths':

300 divided by 4 = 75 ('hundredths'). Success. The answer is a whole number with no remainder!

Now '75 hundredths' is 75 x 0.01, so the decimal number required is 4.75.

(a) $\frac{3}{5}+\frac{5}{7}$ (b) $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$ (c) $\frac{5}{6}+\frac{1}{7}+\frac{18}{21}$

(d) $\frac{7}{8}-\frac{3}{16}$ (e) $\frac{5}{6}-\frac{1}{7}-\frac{18}{21}$ (f) $1\frac{3}{4}-\frac{3}{5}-\frac{3}{10}$

(g) $\frac{2}{3}x\frac{3}{4}$ (h) $\frac{1}{2}x\frac{3}{4}x\frac{1}{2}$ (i) $1\frac{1}{2}x\frac{2}{3}x\frac{1}{2}$

Represent the following fractions as decimals.
Take care with the last two examples.

(j) 1/2 (k) 1/8 (l) 5/8
(m) 15/20 (n) 15/8 (o) 1/3

Rules OK

Here are some rules for use in converting a fraction into a decimal.

(i) Separate any whole number from the fraction and write it **BEFORE** the decimal point.

(ii) Add a '0' to the numerator of the fraction, in other words - multiply it by 10.

(iii) Divide the new numerator by the denominator. If the answer is a whole number **WITH NO REMAINDER** the problem is finished. Just write the whole number **AFTER** the decimal point.

(iv) If the answer is **NOT** a whole number with no remainder, add a second '0' to the numerator. Multiply it by 10 again (the original numerator has now been multiplied by 100).

(v) Divide the new numerator by the denominator. If the answer is a whole number **WITH NO REMAINDER** the problem is finished. Just write the whole number **AFTER** the decimal point.

(vi) If the answer is **NOT** a whole number with no remainder, add a third '0' to the numerator, multiplying it by 10 again (the original numerator has now been multiplied by 1000).

(vii) Divide the new numerator by the denominator. If the answer is a whole number **WITH NO REMAINDER** the problem is finished. Just write the whole number AFTER the decimal point.

(viii) If the answer is **NOT** a whole number with no remainder, keep on adding '0s' to the numerator and dividing by the numerator, and dividing by the denominator as in steps (vi) and (viii) until the answer **IS** a whole number with no remainder. When this is achieved, simply write the whole number **AFTER** the decimal point.

(ix) If the whole number has only one digit, for example '6', the decimal part of the number will be '0.6'.

(x) If the whole number has two digits, say '31', the decimal part of the number will be '0.31'.

Now it's time for a worked example using the above rules.

Convert the fraction $16^3/_8$ into its decimal equivalent.

(i) The whole number is 16, so we write it **BEFORE** the decimal point. 16.

(ii) Add '0' to the numerator. 30

(iii) Divide 30 by the denominator 8, 30/8 = 3 with remainder 6.

(iv) Add another '0' to the numerator 300

(v) Divide 300 by the denominator 8, 300/8 = 37 remainder 4.

(vi) Add another '0' to the numerator 3000

(vii) Divide 3000 by the denominator 8, 3000/8 = 375 **NO REMAINDER!**

So, writing the '375' **AFTER** the decimal point gives the decimal equivalent as 16.375.

That wasn't as difficult as you thought, was it? I've provided a few questions based on this, and last month's part. Work them out, they're not so bad! I'll give you the answers in the next part along with some help in using your calculators to the best advantage.

To be continued

This month 'Quaynotes' answers some of the many letters you've sent him - and looks at an interesting new antenna product that's about to come on the CB market.

CB HIGH & LOW

By 'Quaynotes'

Well, you've certainly let me know that you welcome the continuing of the 'CB' page in *PW*! My mail-bag is certainly starting to fill up, and even if you don't get your letter printed in full here - I'll use whatever I can to share it with the other 'CB High and Low' readers.

As I hope to do every month from now on, I'll start right 'up at the top' with a letter from dedicated 934MHz 'High' man, Ken Callow in Scotland. Ken's the 'Hon Sec' of the FDX Group based up there in Shotts, midway between Edinburgh and Glasgow.

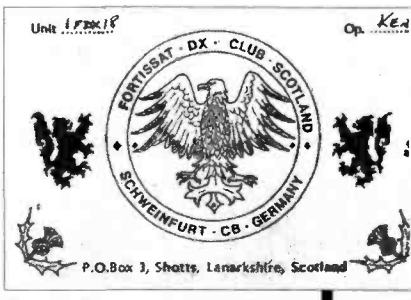
I've driven through Shotts quite a few times in the past Ken - which one of the TWO huge masts is yours? Only kidding, I know that one is a BBC mast and that the other is for ITV, although nowadays all TV comes from the ITV 'Black Hill' transmitter, just up the road from your village.

Ken sent an interesting QSL card showing that their group is 'twinned' with a group in Schweinfurt, Germany. The letter (passed on to me from Rick Maybury) goes on to explain the activities of the very busy FDX Group which was formed in 1983. I was interested to see that the FDX initials stand for 'Fortissat DX'. Even after a visit to a library and a look in a German dictionary and a Latin quotations guide didn't explain the meaning of Fortissat.. I've no doubt that Ken and other members will let us now what it means!

The group, as Ken wrote in his letter, does not regard themselves as being anything 'special' - but they do aim to promote international friendship and understanding. In particular, Ken stressed their insistence on a high standard of operating. Any member using obscene language immediately forfeits his membership and Ken reckons that ALL clubs should enforce this rule.

The FDX group has over 150 members throughout Europe, and they also have 'exchange' visits from friends abroad. How about some photographs for 'CB High & Low' Ken? I feel sure that we'd all be interested to see as many 'personalities' (and that means **YOU!**), clubs, rigs and 'special events, QSL cards and other items we can share in our 'small corner' of *PW*!

The new Hi-Gain DX Exterminator CB Loop Antenna from CAP.Co. Ltd.



Ken Callow's distinctive QSL card.

Dedicated User

Another letter came winging its way to my corner of Dorset from London, as soon as Mr J. F. Gale of Kensal Rise in the northern part of the capital read the first 'CB High & Low' column. I've got to be formal, as he forgot to give his first name!

Mr Gale says that he's a 'truly dedicated' 934MHz operator and has been a member of the much respected '934MHz Club UK' since he 'discovered' the joys of working on 934MHz in 1984. His next comment is one that appears in all your letters, and that's about the high operating standards on 934MHz. Interestingly, Mr Gale mentions that the unfortunate abuse on the amateur radio 144MHz repeater in south London is referred to as 'overflow' from 27MHz in his neighbourhood!

Finally, Mr Gale mentions the interference he's suffered from the dreaded 'Poser Phones' on 934MHz. However, he's been able to cure 99% of the problem by adjusting the polarisation of his 'beam' antennas and fitting a filter to use in conjunction with his antennas. This was done despite the fact that the 'Poser Phone' transmitters are close by! How about a photograph of how you did it Mr Gale?

I've had so many letters and comments about interference from 'other users' near to the 934MHz allocation that next month I'm going to show you the simple technique of using coaxial 'stub' filters. It's very effective, you only need a short length of suitable coaxial cable, side cutters and patience! This idea saved me many hours of fruitless work when I worked as a radio and TV 'aerial rigger', and it costs nothing but time.

So, before I 'wrap up' the 'High' part of 'CB High & Low' I'd like to thank all of you who wrote to welcome me to the page. I'm also going to follow up your suggestions that I get onto 934MHz myself. See you there!

Scene On Twenty-Seven

My comments about the 'rural net' down here in Dorset, prompted an interesting letter from a gentleman in Tenterden, Kent. He's in the early stages of starting up a rural CB service on 27MHz and readily confesses to being a member of the 'Over 60s Brigade'.

The only problem is, that money is limited. Can anyone help? To start the service up, they only need three transceivers, but the group need technical assistance and advice on antennas.

If you can help, please write to me c/o the *PW* office - and I'll pass the letters on. I've got no doubt whatsoever that we'll get him and his friends 'on the air'.

A Sneak Preview

It's not often nowadays that we get new antennas onto the CB market. But things are happening and I'm pleased to say that we've got a new product about to come onto the shelves from a respected UK manufacturer.

The new 'Hi-Gain DX Exterminator' loop antenna from CAP.Co Electronics Ltd., fills a much needed 'gap' in the market. Not only is the antenna very small, it can also be very effective when mounted very low down or hidden in a roof space.

The full technical specification looks very interesting and it seems as though anyone suffering from, or causing interference will benefit. I've managed to get a picture of the new antenna and soon I'll have one to try out and 'review' for 'CB High & Low' readers.

The antenna's going to be priced at around £99.50 but CAP.Co. Electronics, whose address is Unit 28, Penley Industrial Estate, Penley, Wrexham, Clwyd, Wales LL13 0LQ, Tel: (0948) 74717, are planning an introductory offer of £79.50.

We've got some more interesting products to look at very soon, but that's our lot this time. Don't forget to write to me c/o the PW *office in Poole and let's have plenty of photographs and details of what you're doing on 'CB High & Low!' Cheerio for now.*

PACKET PANORAMA

This month Roger Cooke G3LDI, starts of a section for the newcomers to packet. Those mysterious words and phrases will no longer be a mystery.

In order to help the newcomer, and the not-so-newcomer, I'll devote a space each month to a form of help-line. This will be separate from the main body of the column in a panel of its own. Over the coming issues I'll be providing a glossary of terminology which causes you problems. I also intend to publish a list of hints and tips. Should you have any helpful hints or tips, general or specifically related to one piece of gear, please let me have them so I can include them in 'Starting Frame', with a credit to the sender.

This month I'm continuing with the interesting paper from Dr. Tom Clark W3IWI, with particular reference to h.f. packet re-organisation. It would be really useful if we could bring together the worlds' major BBS software writers and lock them in a room together for a month or so. That way, we should end up with some common ground for real improvements! However, with thought-provoking papers such as the one from W3IWI, it looks as though AX.25 has a limited life-span and indeed, may be already due for an overhaul!

Link Level Issues

This paper and its companion discuss some of the issues involved in improving amateur h.f. digital links. The intent is to present some strategies to allow a significant improvement with modest hardware and software investments. There is frustration at the current situation, the number of packet stations around the world has increased enormously over the past five years. The ability of the long-haul h.f. networks to support user's message traffic has been, at best, a 'level' resource with two fundamental problems:

1. At the link level all digital modes are using elementary technology, which grew out of standards that were convenient but far from ideal.

2. The AX.25 protocol, currently used, is incredibly inefficient and needs updating or replacing.

Developments in these two areas should proceed in parallel.

Wireless Wires

It has often been stated that radio links, especially those at h.f., are the worst possible 'wires' for carrying digital signals. Modem designers using real 'wires' are able to make three simplifying assumptions: The signal-to-noise ratio is high. Signals are stable for long periods of time and any noise present in the system has a Gaussian probability distribution.

Non-linearities present in the 'wires', have effects that are constant for long periods of time, and may be handled by simple adaptive equalisation. Against these conditions, even our best v.h.f./u.h.f. paths are inferior. At h.f. none of the above conditions are applicable, and yet we attempt to use the Bell-103 modem standards (200Hz shift, 300baud, one bit/baud) for h.f. packet and similar standards for RTTY and AMTOR.

Old And New

The Bell-103 modem standard was easy to implement using i.c.s such as the Exar XR2211. Inexpensive modems became cheap and easy to manufacture. But ease of manufacture does not mean optimum performance!

Soon we will have Digital Signal Processing (DSP) hardware available. Much experimentation by amateurs has led to several products which will be available soon. The AEA and DRSI hardware will be the commercial side of AMRAD, TAPR and AMSAT as amateur developments.

These new products have an 'open architecture' so further experiments may be made. When a new idea is available, the code will be distributed by various means. This may mean a 'System of the Week Club' being formed!

In order to design an 'optimum' modem system, (if it even exists) we must consider the overall data transfer system, as outlined in **Fig. 1**.

This drawing of **Fig. 1** is intentionally simplistic. Data managing may take place in the host computer or in a separate box. Some data operations, such as forward error correction (FEC), or convolutional encoding, may best be handled by the DSP 'engine'. For the sake of simplicity, think of the modem functions as separate from coding functions.

In optimising the modem side, we must consider the entire signal path. The radios, antennas and ionosphere are considered as a filter. Radios and antennas are simplest to deal with, since their performance is nearly constant with time.

James Miller G3RUH, has demonstrated that the combined inadequacies of f.m. transmitters and receivers can be improved by pre-distorting the transmitted signal waveform. This could also be used at h.f. An optimum demodulator needs to employ the conjugate filter to achieve best performance.

Noisy High Frequencies

The further problem arises because of additive noise. The h.f. band is plagued, with impulsive noise, from thunderstorms, vehicle ignitions, relays, etc. The major defense against noise, is to ensure that data protocols are tolerant of dropouts. Receivers and demodulators having good dynamic range and which recover rapidly from 'glitches' can also help. It has also been argued for frequency diversity to help mitigate against such problems.

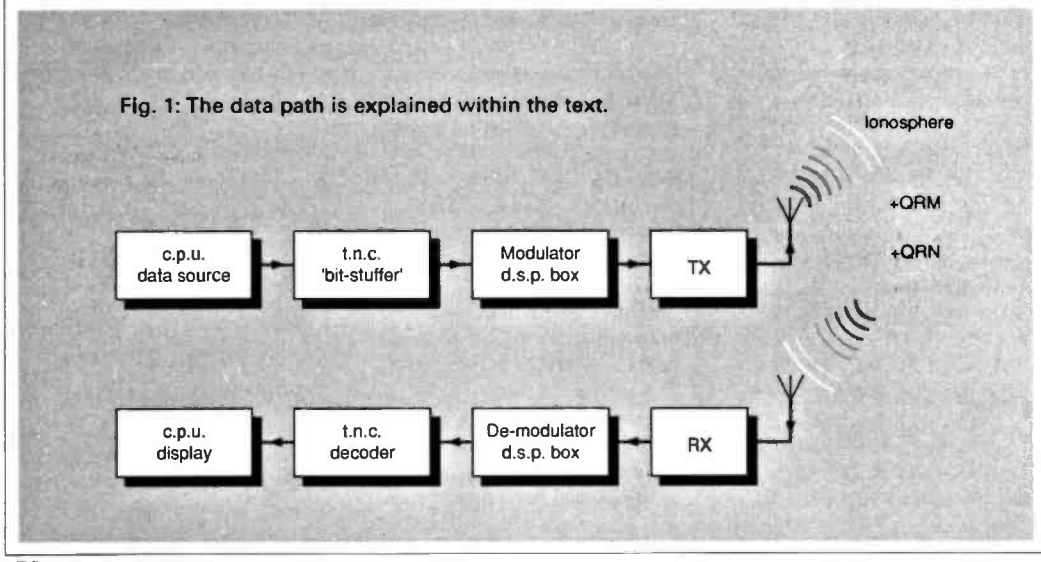
Bit And Baud

The confusion between bit-rate (b.p.s.) and baud must be clearly understood. A bit is a single piece of data, a baud represents an interval of time to accomplish the signaling of that bit.

We now see more than 20 000b.p.s. on a normal telephone line. It is often said that, 'if such signals can go through a phone line, why don't we use them on the radio?' However these high speed V32 modems use a complex trellis code scheme. Here, quadrature and in-phase channels are each amplitude modulated after the bits are encoded.

The resulting complex waveform must be handled very carefully if information is not to be lost. Typical V32 modems use custom DSP chips with 18-bit

Fig. 1: The data path is explained within the text.



converters. A 'training sequence' at the start of each transmission is used as a test.

These aren't the characteristics to be found on our radio links!

Let's consider the tone-dialling telephone system. Each signalling element consists of one low tone, and one high tone. The two signals encode 16 possible states, equivalent to 4 bits. This could be expanded to 255 possible states - almost 8 bits worth of data (the zero state with no tones present is undefined).

No Mathematics

The complex mathematics concerning limitations of m.u.f., Planck's constant and Shannon's limit, have been cut out as the majority of readers will not be interested in this aspect.

All of the modems, that seem to violate the uncertainty principle and Shannon's limit, do so by requiring stable signal and high s/n ratios. One of the goals of h.f. modem development should be to figure out just which schemes can force bits through poor channels. Of more concern though, are the ionospheric effects that exhibit considerable time and frequency variability on the signals.

Ionospheric Filter

We tend to think of the ionosphere as a mirror that 'bounces' signals back. However, this is an overly simplistic view. In reality, the ionosphere continually bends a signal travelling through it.

When we operate at 3.5MHz, our signal undergoes many degrees of phase shift as it is slowed down and 'turned'. All the little density variations in the ionosphere lead to the severe multipath distortion heard on this band. However, when we operate on 21 or 28MHz the signal spends little time in the ionosphere so it has less distortion.

Users of RTTY and AMTOR on 3.5 and 7MHz know that 45 or 50baud signals usually works, but plain text (ASCII) at 110baud is marginal. Very few have been successful with 300baud Bell-103 packet transmission on 3.5MHz. Many military and commercial h.f. tests similarly indicate that 50-75baud, is about the limit for h.f. paths shorter than 1000km.

In the 1000-2000km range covered by the 7, 10 and 14MHz bands, clearly the system can work - witness the success of SKIPNET at moving large volumes of packet mail (albeit with low efficiency). But the AMTOR and RTTY stations running lower baud rates are able to move data when packet stations have difficulty.

The strong evidence is that rates in the 100-200baud range would be much more suitable when conditions are poor. Since there are days when the ionosphere is good, and others when it's horrid, an optimised strategy would be to have adaptive rates which change with conditions. In the ionosphere, how long is my baud?

Data Coding Rates

Up to now I've talked in terms of the baud. This term means the number of signalling elements that occur in one second. I can now briefly mention some schemes which can be easily implemented in DSP hardware. Which of the systems proves most successful remains to be seen! In all of these schemes, each signalling element will convey more than one bit.

The first simple example is known as Quadrature Phase Shift Keying (q.s.p.k.). A carrier signal is phase modulated to one of four possible phases. Since there are four discrete states of the signal, then 2 bits of data can be encoded in each time slice. If the propagation medium is stable enough to permit 8 or 16 phase states (8p.s.k. and 16p.s.k.), then 3 or 4 bits could be sent. In addition to modulating the phase of the signals, amplitude coding will be tested.

Commercial systems using multi-tone on/off keying (o.o.k.) have proved successful. So we might design a scheme where 32 tones spaced 25Hz apart are used, with one tone representing each bit. The 25Hz channel spacing and the uncertainty principle discussed earlier mean that we can key the tones at 25baud (40ms signalling elements) and occupy about 850Hz of spectrum.

Although this is a 25baud system, it conveys 800b.p.s. of data. Instead of using all 32 bits for data, we might add in an error-correcting code. Depending on the degree of protection desired this might reduce the delivered data rate to 600-700b.p.s. This multi-tone o.o.k. approach, if carried to this limit, places severe needs on the dynamic range of transmitters. The peak-to-average power requirements will be quite large. Since amateurs are notorious for 'upping the wick', on-the-air tests will be needed to see how gracefully multi-tone o.o.k. loses performance and how 'unfriendly' it is to users on nearby frequencies.

Early Days

In the early days of packet, error detection and correction was rejected because the c.p.u. chips (8085, 6809 or Z-80) of the time lacked the 'horsepower'. The protocols used placed less stringent requirements on these processors, so FEC was included. Now the price of 'smart' silicon has come down, so the early decision should be reversed, especially for h.f. applications.

More next month. I also plan give some information about packet activity in Canada.

Comments, news, views and insults to:
Roger, G3LDI @GB7LDI, QTHR, or Tel: (0508) 70278 - for 24hr answering clone.
73 and happy packeting.

Starting Frame

Address: The identification of a packet transmitting station or destination of the packet message.

Address field: The section in a packet frame containing the callsigns of the source and destination of the packet. It may also optionally contain the callsigns of one to eight digipeaters (rebroadcast stations)

ANSI: American National Standards Institute. When applied to a computer or terminal screen, it means a series of codes which control the colours and position of the characters on the screen

ASCII: American National Standard Code for Information Interchange. A seven bit digital code to numerically define characters and control codes. The values 0-47 are control codes, 48-58 are the numbers. Capital 'A' is 65, 'B' =66, etc. Lower case 'a' starts at 97, 'b' is 98... The last number is 127 which means delete last character typed.

Application Layer: Level 7 of OSI-RM that provides and interface between the other OSI-RM layers and the user application. (See OSI-RM)

Asynchronous: A digital data transmission timing technique that adds bits of information to indicate the beginning and end of each transmitted character. A start-bit signifies that a character is about to be sent. One, one and a half or two stop-bits signify that the character should be complete.

AFSK: Audio Frequency Shift Keying. A method of transmitting digital information by switching between two fixed audio tones transmitted as if from the microphone input.

Autobaud: The capability of a communications device to automatically adapt to whatever baud-rate is being used by the terminal connected to it. (baud-rate is a measure of 'bit' transmission speed)

Auto Line Feed: A DTE (data terminal equipment) or DCE (data communications equipment) function that causes a line feed control character to be sent whenever a carriage return control character is sent (see ASCII).

AX.25: A definition of the significance of each character in the packet stream. The link-layer packet radion protocol based on the CCIT X.25 packet-switching protocol.

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Getting Started- The Practical Way

George in his workshop with one of his 'junior operators'. Like father, like son!

In the second part of his regular series, the Rev. George Dobbs G3RJV, looks at resistors, switches and tackles a practical project.

'Getting Started' is essentially a practical series. You'll build things and learn by building. Components and techniques will be introduced along the way, as will simple theory.

Sometimes the practical projects will outstrip the theory. Don't worry, it will catch up in time, but in order to build things we may have to ride 'roughshod' over some of the niceties of theory. To get at some practical projects you may simply have to accept what I say with the simplest of explanations. All you have to do is to trust me and warm up your soldering iron!

Passive And Active

Electronic components can be divided into two groups and these are **Passive components** and **Active components**. This is a simple description of their function with a circuit. The active components 'do things' such as amplification, multiplication and division, etc.

The 'active' group includes transistors, diodes and integrated circuits (often knowns as 'chips'). The passive components surround the active components, and, generally speaking, enable them to do their job.

Common Resistor

The commonest passive component is the resistor. It's a deceptively simple component which, as the name implies, resists the flow of electrons in the circuit.

Most of you will know that copper wire is a good conductor. Resistors however, are designed to be bad conductors. They used to be made from a carbon composition, with a ceramic content. Nowadays though, they are made from a thin carbon or metal film deposited on a ceramic former.

Most of the resistors you'll come across will have a wire lead at either end of the component. Their value of **resistance** is quoted in **ohms** and is given the Greek symbol Ω (Omega). We'll explore the simple mathematics involved in relationship between resistance, voltage and current later in this series.

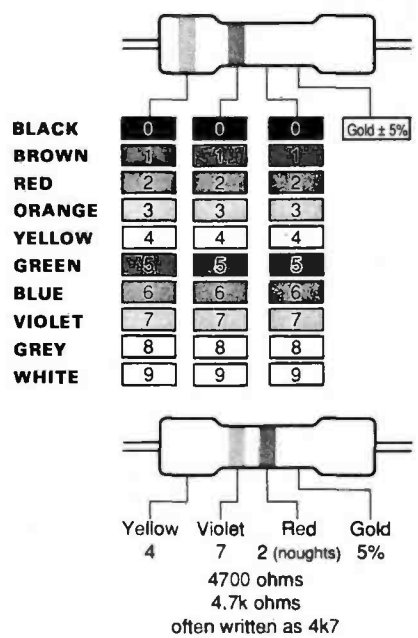
Colour Coded

Look into most pieces of electronic equipment and the circuit boards will abound with resistors. They're easy to spot, and you'll soon see the little cylinders with bright coloured stripes and a wire at each end.

The stripes are a colour code to indicate the value of the resistors in ohms. The way this coding system works is shown in **Table 1**. Each number from 0 to 9, is identified by a colour. The coloured bands are usually read by beginning with the band nearest one end of the resistor body.

It's not a difficult technique and the order of reading is: Number - Number - Multiplier. The multiplier band tells the reader how many noughts to add to the value of the resistance.

Table 1.



4700 ohms
4.7k ohms
often written as 4k7

The figures shown below and their decade multiples or submultiples are the series of prefered values.

E12: 10 12 15 18 22 27 33 39 47 56 68 82
E24: 10 11 12 13 15 16 18 20 22 24 27 30
33 36 39 43 47 51 56 62 68 75 82 91

There is a fourth band which indicates the 'tolerance' of the resistor, that is, how accurate the value can be. A gold band indicates plus or minus 5% and a silver band plus or minus 10% of the stated value.

Practical Example

The following example shows how the system works. We'll assume that we have a resistor with **Yellow - Violet - Red and Gold** markings. The markings indicate **4, 7** and **2** zeros and that it's a 5% tolerance resistor. So the value in ohms of this particular resistor is 4700, or four thousand seven hundred ohms (Ω), or 4.7 thousand ohms.

It's usual to shorten this with the conventional '**kilo**' and '**Mega**' designations. The 'kilo' equals 1000 (or three zeros) and 'mega' equals 1000000 (or six zeros). So 4.7 thousand is expressed as 4.7kΩ.

Because decimal dots can be 'lost', this 4.7kΩ is often written as 4k7, the k replacing the decimal point. Get 'stuck in' to your component box. Try and find some other values such as: **brown - black - red** (1kΩ), **green - blue - yellow** (560kΩ) **red - red - green** (2.2MΩ) and so on.

Circuit Applications

For most circuit applications the value of a resistor in ohms is not very critical. A variation of 20% (plus or minus 10% of the value) would be in order.

With this in mind, there is a standard range of resistor values that begins at 1 and increases in approximate 20% steps. The standard range also goes up in decade values. These are, for example: 1.2, 12, 120, 1200 (1K2), etc. This range is called the E12 range of preferred values because there are twelve steps.

The next range, called the E24 Range, increases in approximately 10% (plus or minus 5% of the value) steps. Most amateur radio projects can be built with resistors from the E12 range, although the odd E24 value might be required from time-to-time.

The standard range of values means that a limited set of resistors can be held that will serve almost any purpose. Several companies sell packs of resistors in the E12, or E24 ranges with 5 or 10 of each value in the range. Packs like this can make a very useful component starter pack for a beginner.

Simple Switching

For most of the simpler switching operations carried out by hand from the front panel of a piece of electronic equipment, toggle switches are a good choice. Some amateur constructors like to use a much cheaper device, called a slide switch, but their unreliability is renowned and I avoid them!

The three commonest types of toggle switch are shown in **Fig. 1**. The single-pole on-off switch is the simplest of all. A pair of contacts (A and B in the drawing) are closed and opened by the action of the switch.

The single-pole change-over switch does what the name implies. The centre contact, A, is switched between two other contacts, B and C, by the switch. In fact, this type of switch is more common than the single on-off types. This is because it can also be used for on-off application by simply using contacts A and B or A and C for the on-off operation.

The double-pole change-over switch is exactly like its single-pole counterpart except that two contacts are switched over: A to B or C and 1 to 2 or 3. The dotted line shows that the two 'switch-over' actions are performed by the same lever action.

Be Warned

Here's a timely warning for you! It might be assumed that the toggle lever of the switch points towards the contact that is being made. For example in **Fig. 1**, with the lever up as for the double-pole change-over switch, A and B and 1 and 2 would be connected. However, be careful as this is not so!

In most examples of miniature toggle switches, contact is made in the opposite direction to the way the lever points. So, it's wise to check before using any switch.

The 'old hand' would check the switch with the ohms (Ω) range on a multimeter. Don't worry though, if you don't have a meter yet - you could check it with a battery-and-bulb 'continuity tester' to see which way the switch action occurs.

A Practical Project

It's nice to build circuits that do something, make sounds, flash lights, move meter needles and so on. This project does none of those, and in fact it does 'minus things' because it reduces signals.

The project might seem boring, but believe me, it's very useful. Every amateur radio shack ought to have a 'stepped attenuator'.

You may have seen a switch, or switches, on the front of a communications receiver marked 'attenuation'. To put it simply, these switches reduce the amount of radio signal going into the input of the receiver.

This might seem odd. You may ask me 'surely, we want as much signal as possible to enter the receiver?' My answer would be a qualified yes.

This answer will be because sensitivity may not be the most important factor that governs a receiver performance. The '**Dynamic range**' can often be more critical. The dynamic range is the range of signal strengths that can be handled at any one time by the receiver. Or put in simpler language, 'When listening to a weak signal, how big can a nearby signal be, without 'clobbering the wanted signal'.

Undesirable Effects

A poor dynamic range can produce a range of undesirable effects in a receiver. Strong signals can 'desensitise' the receiver.

Other problems can occur. Odd signals can unexpectedly appear in the receiver, when a large signal causes unwanted signals to be generated by the 'mixing' circuits inside the receiver.

It's a complicated matter, but poor dynamic

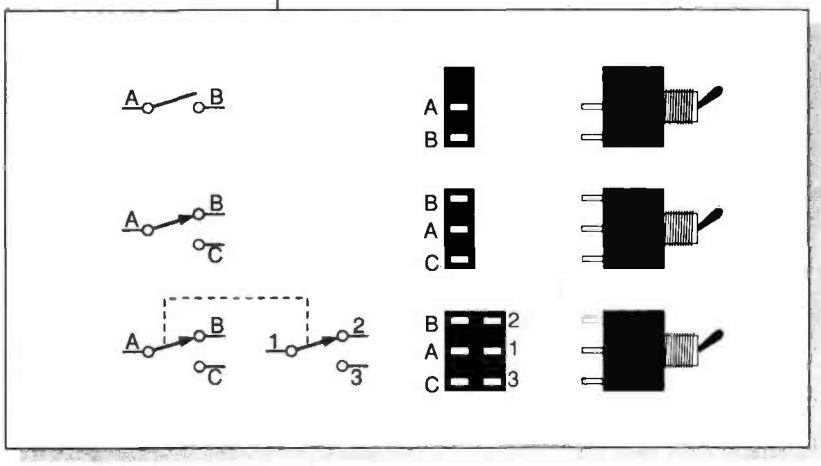


Fig. 1:
Simple switches.

Top.
Single-pole on-off.

Middle.
Single-pole change-over.

Bottom.
Double-pole change-over.

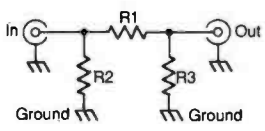
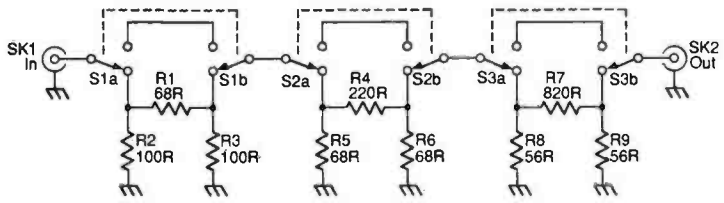


Fig. 2: A simple, one stage attenuator.

Fig. 3: This is the attenuator which you can build as a practical project. Note that this version consists of three attenuators joined in series.



Shopping List

Resistors 5%, 0.25W

56Ω	2	R8, 9.
68Ω	2	R1, 5, 6.
100Ω	2	R2, 3.
220Ω	1	R4.
820Ω	1	R7.

Switches

Miniature Toggle: Double-pole Change-Over
Maplin Type FH04E or Marco SW/SM/DPDT

Miscellaneous

Die-cast aluminium box, Maplin type LH70M or similar. The Marco type, BOX/27134PSL is slightly larger than the Maplin version. Phono Sockets (single hole mounting) 2 off. Wire, blank p.c.b. material or aluminium sheet for screens.

Addresses: **Maplin Electronics**, PO Box 3, Rayleigh, Essex SS6 8LR, Telephone Orders (0702) 554161.

Marco Trading, The Maltings, High Street, Wem, Shrewsbury SY4 5EN. Telephone Orders (0939) 32763.

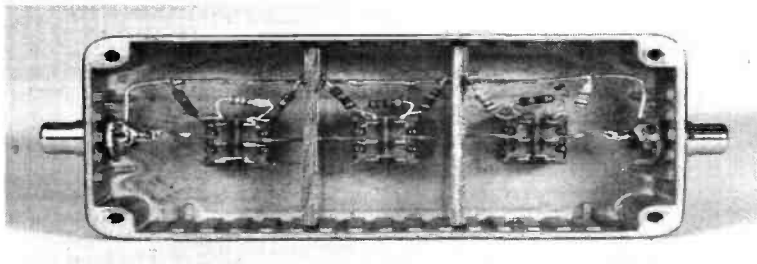


Fig. 4a. A view of the attenuator mounted in its box.

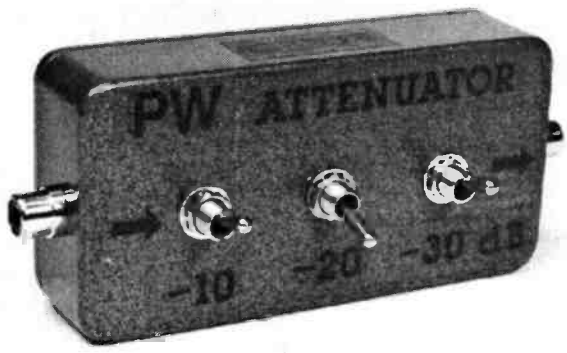


Fig. 4b. Three-quarter view of the finished project.

range can seriously reduce receiver performance. An attenuator placed in the antenna input circuit of a receiver can often help!

The reduction in signal strength an attenuator provides, enables the receiver circuits to reject strong nearby signals although wanted, weaker signals at the tuned frequency can still be heard.

Attenuators are also used in equipment testing to vary the signal reaching the circuits under test. You'll perhaps now realise why an attenuator is an item whose usefulness will increase the more you learn about the hobby.

Circuit Diagram

A circuit diagram of a simple attenuator is shown in **Fig. 2**. If you're not used to circuit diagrams, this project will help, because the diagrams are simple to follow.

You can regard the circuit diagram as a 'map' of how the components are connected to make the circuit function. It's not an exact representation of how the circuit may look when built, but it does show how the parts connect.

The diagram looks rather like a London Underground map doesn't it? The circuit illustration shows where all the 'lines' go without showing how long they are, or exactly how they get from one place to another. In other words, the diagram shows routes without true scale or true direction.

Symbolic Greek

The type of attenuator we're using is called the Pi Attenuator. It's standard practice to indicate what the circuit is, by using the Greek symbol Pi or π which looks rather like our letter 'n'.

The circuit consists of three resistors combined to reduce a signal that passes from 'in' to 'out'. You might notice that the resistors used in the three sections all come from the E12 range I've already mentioned.

The diagram, **Fig. 3**, shows how three of these attenuator circuits can be connected in line to make a variable ('stepped') attenuator. The resistor values chosen depend upon two requirements that may have to be accepted at this stage rather than be fully explained.

The attenuator is designed to fit into a signal path at 50Ω impedance. Expressed simply, impedance is the resistance to current 'flow' that has to be overcome by the alternating current signals passing through the attenuator.

Antenna inputs for most receivers and many other types of signal in radio frequency work have an impedance of 50Ω. The second requirement is the amount of attenuation (or reduction) offered by each stage of the circuit.

Discovering Decibels

The level of signal reduction provided by the attenuator is expressed in decibels (dB). The decibel is a unit of power ratio by which increases or decreases in power steps can be expressed by a simple number.

One decibel (1dB) stands for multiplying the power by a factor of 1.26 times, which is a just noticeable increase in signal strength. So, a 5dB increase means that five just noticeable increases in signal strength have occurred.

An easy figure to remember is 3dB, which is almost the same as increasing the power by two. The decibel can be shown in plus or minus numbers to

show increases or decreases in level, and as our attenuator decreases the signal, it has -dB steps.

Small Steps

For many applications 10dB steps are small enough for practical use. The attenuator we've built offers steps of -10dB, -20dB and -30dB.

This means that signal reduction can be obtained from -10dB to -60dB in 10dB steps. This is made possible by switching the sections in and out of the circuit. Double-pole change-over switches permit the three stages to be either in the line, or they can provide a direct path (0dB) with no attenuation.

Not Difficult

The project is not difficult to build. It only requires you to drill a few holes in a metal box and being able to make good solder joints.

The three sections of the attenuator are separated by two screens. These can be made from aluminium sheet or doubled-sided printed circuit board material.

The box is a die-cast aluminium box type M5002 with external dimensions of 100 x 50 x 25mm, although any similar box would be suitable. The switches are evenly spaced, centrally mounted along the length of the box. The screens are cut to fit into convenient slots on the inside of the box.

When you've made the screens, two small holes (1.5mm) are then drilled in the centre and to one side. The central holes carry the signal wires, which must be of pvc insulated wire.

The offset holes carry a 'grounding' (earthing') wire to which the bottom ends of the resistors are connected. This is a bare wire and 22s.w.g. (standard wire gauge) copper wire is ideal.

This wire is soldered to the screens, and it forms the soldering points for the 'bottom legs' of the attenuator resistors. The wires also connect between the grounding lugs of the input and output sockets. In the example shown the sockets are of the inexpensive 'phono' type, but other types of socket could be used.

General Guide

A general guide to building the attenuator is shown in **Fig. 4a and 4b**. Use it as a guide to suit whatever box you can find, or copy it by using the same type of box.

To test the attenuator, you should place it between the antenna and the input of a receiver. Try combinations of the attenuation on different bands under varying conditions. As your understanding of radio grows, the usefulness of your attenuator will soon be proved.

PW

Join me next time as we explore the fascinating world of hobby radio together.

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WANTED Yaesu FT-102 ANT Unit. Yaesu SP 102P Loudspeaker Unit. Yaesu FV-102 DM v.f.o unit. 1000W dummy load 50 ohms impedance. Plus h.f. wavemeter - Good one. Mr P. J. Brouder G3ZJH, Aldebaran, 169 North Road, Stoke Gifford, Bristol BS12 6PH. Tel: (0272) 691025.

FOR SALE FT-101EX Transceiver with a.t.u., s.w.r. meter, mic, key, phones. Complete working station, ex silent key, £250 (o.n.o.). Mr R. Palmer, 8 St Francis Road, Blackfield, Southampton SO4 1XU. Tel: (0703) 89420.

WANTED 70cm module for FT-726 Yaesu. Bird Elements for 144/432MHz. Mike Mundy G0GNV, Volks Haven, 124 Junction Road, Worlds End, Burgess Hill, West Sussex RH15 0PZ. Tel: (0444) 241407.

FOR SALE OR EXCHANGE Hitachi Midi-system, 4 bands, twin cassette, detachable speakers. Mint condition. **Wanted** Matsui MR4099 or Tatung TMR 7602. Same condition. Mr A. Stapleton, 130 Sherwell Valley Road, Torquay, Devon TQ2 6EX. Tel: (0803) 605045.

FOR SALE FTV-107R 2m transverter £95. FT708R 70cms hand-held £110. Grundig TK144 reel-to-reel recorder £45. Epson MX100/III printer £95. Telescope 3" refractor £150. **Exchange** Atari 1040ST, IBM-PC, general coverage h.f./rx, offers? Mr D. W. Howard G1AJB, Rame Common Farm, Carnkie, Helston Cornwall. Tel: (0209) 860297.

FOR SALE Trio VFO 520 £45. Memory keyer, 8 x 50 characters, pos/neg outputs, mains/battery, sidetone £60. Both post extra. Mr K. Smith G3RB, 78 Thorntree Drive, West Monkseaton, Whitley Bay, Northumberland NE25 9NW. Tel: 091-2530504.

FOR SALE Yaesu FT-726 complete with 50, 144 and 430MHz boards, also 'satellite' board, £850. Fax-1, £175. Spacetech satellite receiver £50, Buyer to collect. Mr R. Fuller, 35 Chichester Walk, Wimborne, Dorset BH21 1SL. Tel: (0202) 882269

FOR SALE OR EXCHANGE IBM AT 'clone' 12MHz with 640K RAM, 2 x 32Mbyte disks, 5.25"+3.5" floppies, VGA mono, 1Par/2Serial ports. Genius mouse included. Ideal for d.t.p. or graphics. £650 or offers. Would consider exchange for a dual-band v.h.f./u.h.f. base station or w.h.y. Contact G1TEX ('Tex') at *PW* editorial offices.

FOR SALE OR EXCHANGE Receivers in very clean condition. Bendix radio compass MN26C working. RAF v.h.f. beam-approach R1147/b ref 10D/13129 boxed. American Nova tech airband valved general coverage plus v.h.f., £15. Mr B. D. Tipper G3WWL, 271 Blackberry Lane, Four Oaks, Sutton Coldfield B74 4JS. Tel: 021-353 8874.

WANTED Technical details on the HRO-M communication receiver, circuit diagrams, layout, w.h.y. Mr A. Couchman, 3 Manor Grove, Sittingbourne, Kent ME10 1LT.

FOR SALE 5V 30 amp p.s.u. £20 plus postage. Colin Redwood G6MXL, 45a Lulwortth Avenue, Hamworthy, Poole, Dorset. Tel: (0202) 665284.

WANTED *Satellite TV - A Laymans Guide. Wireless; The Crucial Decade, 1924-1934*. RS; Dilecon variable tuning capacitors, solid dielectric type, 500pF. **For Sale** *Practical Wireless* mags 1955-1977 (not full years) 15p each. SAE for list, postage extra. Mr M. B. Evans, 120 Loughton Way, Buckhurst Hill, Essex IG9 6AR

Back-Scatter

HF Bands

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

For this month the most important event has to be the outbreak of the Gulf War; just what its impact on our hobby will be in the long-term is anyone's guess. Let's just hope things don't escalate to a point where activity is seriously affected in some countries or, worse, a QRT is enforced upon us.

The Bands

At the time of writing I can look out upon snow-covered hill-tops, but on the bands I've had a longish good spell during the last month.

The 1.8MHz Band

Here I'm pleased to note that the *Top Band Newsletter* for January 1991 has arrived, ably penned by G3RBP and G3XTT, and in the direct line of succession from the W1BB and VE3DO efforts. Now they need **SUPPORT**, which means sending a couple of IRCs plus a self-addressed envelope for each issue. As I understand it, you can have credits in hand this way for several issues. The intent is to more-or-less cover costs but to subsidise copies to 1.8MHz operations in those places where IRCs or foreign currency are difficult to obtain. The address is: Roger Parsons G3RBP, 32 Windmill Lane, Ashbourne, Derbyshire DE6 1EY. More power to their elbow, say I, and *Top Band* will be the better for their efforts. However, the other thing they need is INPUT, from the 1.8MHz DX fraternity both UK and abroad.

An interesting sidelight on the activity level on Top Band is that while 1.8MHz was the UK's prime natter-spot, W1BB took some 28 years to achieve the first DXCC in 1976; but since nattering on 1.8MHz more or less ceased in favour of v.h.f., the number of people achieving this target of 100 countries confirmed has mushroomed to 250-plus around 53 countries to the end of 1989! The reason is the vast increase in the number of countries having access to the band and of expeditions taking 1.8MHz equipment along.

Talking of nattering, the Tuesday evening 1900 Powys ARC net on 1.932MHz give-and-take the QRM, seems to be noted by lots of people around the country - and nothing pleases us more than to chat.

This month **G3BDQ** (Hastings) notes that he hasn't been very active on any band of late but he did manage to work T77C, VE1ZZ, K1JO, ND1T, UW3PN, UC2WEH, I0UZF and VK6HD - the latter peaked to R5S7 both ways from his new QTH.

Turning to **G2HKU**, Ted worked ON7BW on s.s.b., while the c.w. gave W4QM/MM off Tunis and OK1DWJ.

The 3.5MHz Band

The 3.5MHz band is another area where DX is a minority activity. **ON7PQ** (Kortrijk) notes that he is nearly complete on 5BWAZ, having now only seven zones needed, all on this band. His c.w. exchanges took place with K2OPJ, KU0S, UG1700GM, V73AS, VS6BG, 6W6JX, YA0RR, N6ND, CO8LY, 4K2/UV3CC, ZL4IE and 4K2OIL; the YA, VS and V73 being new ones on the band.

Recently **G3NOF** (Yeovil) has been on the band, and made s.s.b. QSOs with EA8/G0GPW, KE1Y, SV9AKI and VE2AFJ.

Now to **G0KRT** (Welling), who has been on the air since July 1989, always with QRP c.w. on this band. This time the QRP Winter Sports gave him G0FOD, G0DRT, G0FYP, G0NRL, G3LQI/M (narrow-boat *Moorlands*, on the Grand Union canal), G3YHO, G3IRW, G3DSJ, G4ECI, G4FGI, G4JJN, G4YYR, G4JZO, G4ZZB, and DN5AG; outside the event there were a half-dozen Gs, PA0ZEZ, and IK1PQT for a new country.

It was s.s.b. on 3.5MHz for G3BDQ; John notes JA6XMM twice, VK2CWG and CN8AR.

Sad to say, **GM3JDR** (Aukengill) had a short list to offer as he has been laid up with chickenpox for three weeks; indeed on the day he wrote he had had his first step outside for a fortnight. However, JA8EAT, JA0CWZ, JL1ARF, JA1HQT, and UA0QAE were worked on the key around 0800-0900.

Turning to Mike **GW0HWK** (Wrexham), it may be recalled he hoped for lots of time in the shack this time, until the TV set protested! The problem seems to have been due to water in the outside TV pre-amp or splitter as it cured itself in the end. The score then, on 3.5MHz included 6W1QC, A92BE, W4QCU, OK3TKW, G3HVH, G4XDK, G3OQT, G4HMC, YO3GK, G4VDA, GW0LAL, G0LJR, G4PEL, YO2BHL, G4RFA, G0JDQ, G3MTQ, GM3HGA and OZ8DX.

For this month's report G2HKU (Sheppey) dug out his QRP rig on 3.5MHz, and used it to key with OK2BTT, DK7QB, OK2PAW and OK5VD.

The 7MHz Band

In general, people who specialise in this band seem to keep quiet about what's what. Despite this, ON7PQ, mentions his c.w. contacts with 9M6/JH1ROJ, 4K2/UV3CC, VS6BG and YA0RR.

Turning to G3BDQ, we find John tackling W3GET, 4X/YU3PR, VU2TEC, VK4XA, VK2BJ, JG3ZDK, UA9LQ, UA9SLK, HL1KXS and UL7GDX, all of course on the key.

Up north of Wick, GM3JDR keyed into 4K2/UV3CC, RA0SHQ, UA0LH, UZ0OWS, UZ0AXX, VS6DO, VK3RP, VK2BJ, 8P6AU, FY7YE, VU2PCD, ZS9Z/1, 6Y5IC, 3W4BK, YC0UNC, 9N1HMB, UJ8JF, HL1CG, JT1CO, UA0AMV, UA0WO, PY1AFL, UG1700GDS, UG1700GAW, CO8LY, 9Y4SB, RA0BA, BV2CE and UA0ZAS.

Westwards now, to GW0HWK, who offers VE3GAS, UO5PE, TK/DL7HZ, GW0LAL, EI4CY, GJ4YCR, CT1ABE, FG5FC, UB4WWW, RC0A/UC2WO, LY2BJA, OK3TKW, DL1NCH and CU2BQ.

From the Isle of Sheppey, G2HKU used c.w. to contact T77GM, W4PLL, K4FU, UA9MJA, UL7VB and U3DR.

WARC Bands

Let's make a start with ON7PQ. Pat found 10MHz c.w. signals from 4K2/UV3CC, YA0RR and KE9A/DU3. While on 18MHz the haul was 6W6JX, C30CAG, 4K2OIL, ZC4CZ, TU4CO/TT8, 4Z4DX, and C9EC, leaving for 24MHz TF3EJ, ZL3GQ, VS6BG, TU4CD/TT8, 6W6JX, 4K2/UV3CC and C9EC.

Now to GW0HWK who offers 24MHz contacts with VK8HN, 6W1QJ, YQ3R, KA2CYN, KE8FG, SV1AKW, EA7ABW, WA4BWB, KF2X, KZ4V, N0DH, N5FA, N4UCK, N8AYC, N4LUF, V51KC, W1DW, EA9UA, K1ZSE, and some smaller fry.

On these bands G2HKU stuck to his keying; 10MHz gave ZP6XDW, W8EGB, KP2A, W1FZY, W2BA; 18MHz W4QM/MM, and on 24MHz ZP6XDW, W1HT, N2JFD, N4CR, W2BA, W6VD, N5VV, W6DU, W4QM/MM.

Up in the north Midlands **G4ZZG** (Mansfield), notes that as well as having the XYL laid up for three weeks, he lost electric power and mains water (pumped from underground) for five days. In addition the 18MHz dipole went for a 'Burton', but the minibeam on its home-brew telescopic mast coped admirably. Despite all the problems, Charles managed to find, on 18MHz, J6LNJ, C31BB, VE7SR, 4K2/UV3CC in Franz Josef Land, EUs, Ws and USSR stations assorted.

In Yeovil, G3NOF had a 'go' at 18MHz, with RF0FWW, and then went to 24MHz to raise AP2JZB, C53GH, C6ANX, CN8MC, CO6CG, CU3LF, EA8/GGPW, GM3NQA, HK5LEX, JR2KDN, NZ7E (Nevada), N7PBX likewise, OA4CBN, PZ1EL, RA9YD, RC2CR, SV5FD, TI2KD, UF7FWR, UJ8JCQ, V51KC, VE7CUL, VK3CTT, VK3EO, VK8HN, VP2VE, VU2RX, W7HLK (Arizona), W7MAD (Montana), W7ZJ, YQ3R, ZS1ACY, 5R8GN, 6Y5IC, 9H4CM and 9Q5TE.

Comments

It's good to welcome **G0GQP** who writes a first letter to 'HF Bands' from Bletchley, and says that he also worked UB4UHP, the YL operator mentioned recently by G3JMO. Dave says he found her very friendly and ready to 'chat' and to QSL direct. Apparently her mother taught English which accounts for her fluency, and she said her rig was a home-brew to the UW3DI design, into a ground-plane up at 45m.

The 28MHz Band

When it's good, great, but when it's dead, nix! ON7PQ looked through the openings to key with 8Q7BX, YA0RR, XU8CW, C9EC and HL0KOI.

G0GQP says he uses the band between about 1100-1300 most days. Of course there are the usual East Europeans and USSR signals to be found, but in addition he heard ZS6RF, talking to his son ZU1B, (a novice licence?), VK6 several times, A92EV, PV8AAL, VP8CEX, VO1TX, CN8NY, VK5EK and so on. On January 7 a CQ call at 1100 started a string including CT1, UV3, UW9, VP9, VK3, WP4, UO5, KA2 and K3 before close-down at 1318z. All these QSOs were on s.s.b. but c.w. was used for OH8LED, KA1JVF, W4LVP and OH6MDM.

Now to G3NOF who stuck as usual to s.s.b. and found DU1COO, DU1DDP, FM5DN, HK0TCN, HL1AHS, KF7NR (Arizona), TR8XX, UA0SKO, UI8UAA, UL8NMV, VE7BWO/W6, VE7DGM/A7, VE7FJE, VP2VE, VS6AK, V8U2DNL, VU2JYY, W5IJU for IOTA NA-58, XE1REB, YA0RR, ZD8CUE and ZF2PX.

For this band G3BDQ offers 9J2VH on c.w., plus s.s.b. to HC5Z and VS6DL. Another short report this month was the one from GM3JDR who only managed ZS9Z/1.

For GW0HWK, the score benefited to the tune of 3DA0AY, ZL3CQ, W2FV/0, K9EIC, N3BAW, WB3EML, WA7HRR, VK6ME, YQ3R, KA1CNG, N7NHV, KA0WTA, K6GCF, W7LTH, K0REF, N4YAM, K1CSB, CT1DL and ZS5ADB.

This time G2HKU seems to have had a benefit on the band, with XE2MX, YV1NX, UV0BB, K7UOT, W6OV, LU1ICX, K1RH, RB5FQ, N3GMA, K4KQ, K1HZ, KM4WL, WA7CWM, KE2WY, WT7F/8, W6DU, W5TCX, W1HMD, K8CIT, YN1CC, N2IF and 3W4DK.

Up in Scotland, s.w.l. Scott in Glasgow runs a Kenwood R2000A into a T antenna of some 20m. He mentions PJ1B (1600Z), 8P9X, VK5EX(S. Australia (1030Z), KC4RHW, Antarctica (1337), C53GH (1155), HK5FWW (1215), TA5C (1302), and YI1BGD at 1306z - this last has not been about much lately!

For G3ZZG and his key, the band provided PY2IBS, RA9LL, VE3NXB, VU2KB, UA9MHN, UZ9WWR, LU1IXC, CO8RL, KP4YD, plus Europeans, European USSR and Ws.

The 21MHz Band

All the Fun of the Fair! ON7PQ got on the roundabout with his key and scored 5V7AK, YA0RR, JF2POF/JD1, and BY5RA.

Down in Somerset, G3NOF was able to collect prize s.s.b. contacts with A41KF, A41KY, AP2ZR, BZ4RBH, C30EOE, FY5AN, HL5FBT, HL5FRG, RV9CFP, TR8AHO, UM8TBE, UV9CBU, UZ0WWL, VK2DTN, VK3MEY, VK7NCO, VS6BT, YA0RR, 6W1NQ, 7K1NWR and 9Q5US.

The c.w. of G3BDQ made it to HL30AP, 5V7AK, YF0AQD, but not alas, YA0RR. However, all was well because a couple of days later YA0RR was heard on sideband and hooked first call....some you win, some you lose!

The 14MHz Band

On 14MHz we start with G3NOF. Don mentions A71AD, A71AL, BV2FB,

CQ9WDX, HE7IQB, OX3KM, TU2PA, VE7BYS, VU2JPT/MM, YB8BYS, YK1AO, SZ6AZQ, 5H3DC. The latter comes from Yeovil and has a sked with home, 14150 Tuesdays, 1930z, and he is pleased to work UK stations after this QSO.

For his effort GW0HWK raised KA2CIK and then changed bands!

Another singleton came in from G3BDQ who worked OT7XT on the key, and wonders whether it might have been Antarctica!

On this band G2HKU used s.s.b. to raise ZL3FV. As for the keyer, it managed UA/Q0QHN and UT0/UB4MM.

Finally, ON7PQ wraps it up this month by reporting his c.w. QSOs with TU4CO/TT8, YA0RR, OE5NOK/ZL5, 4K4AB, C9EC, and UZ0QYY/4K4 for Iota AS-22.

Famous Last Words!

The deadline for the incoming stuff to me - your input - is to reach me each month by the first of the month, addressed as above. If it's late, of course it 'misses the bus' and gets held over to the following month which makes for stale news! And of course we can always use more letters and piccies of you and your station. The idea is to show the personality behind the call. Get those shutters clicking!

WE'VE HEARD THE CALL SIGNS, NOW LET'S SEE THE FACES!

Back-Scatter

VHF Up

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

Solar Data for January 1991

The first few weeks of January saw very little solar input. During the period January 1-11, the solar activity ranged from low to moderate and the geomagnetic field was quiet to unsettled. The early part of the second week proved to be the most energetic, with a number of M-class flares being observed on January 8. The first flare occurred at 0434UTC, lasting for 61 minutes, the second at 0656UTC lasting for 20 minutes, and the third at 1127UTC, lasting for 32 minutes.

The period from January 12-20 also saw very little solar input. The only event of any significance being a major flare at 1502UTC on January 17. During the last two weeks of January there was a major burst of solar activity. Flares occurred on January 21, 23, 25, 27, 29 and 31. The event, at 0625UTC on the 25th, measured 3500 flux units, among the highest recorded during Cycle 22. Later on, at 1730UTC, a brief 'Scottish-type' aurora, effecting the v.h.f. bands from 50-144MHz, enabled stations situated in northern and central England to make many contacts. This surge of activity was not unexpected, especially as we have now entered the period February-April, when increased geomagnetic field activity causes a rise in radio auroras. During January, the solar flux index rose from 173 units on the 3rd to peak at 367 units on the 30th.

The geomagnetic A index remained mostly quiet during the month but peaked at 15 units on the 3rd, and 14 units on January 13, 24 and 31. A stratospheric warming alert, commenced on January 2 and lasted for most of the month. These warnings are issued whenever abnormally high temperatures are observed in that area between the troposphere and ionosphere, called the stratosphere. Large areas of intense warming can cause atmospheric expansion sufficient to increase drag on low orbiting satellites, such as the OSCAR series. There is also some evidence that these events may cause changes in atmospheric circulation and weather patterns. Although stratospheric warming can be caused by intense solar activity, it is more often associated with natural processes occurring in the earth's atmosphere.

Forecast

March may be somewhat of a mixed-bag for v.h.f. openings. There is a possibility that an increase in solar activity may cause sudden ionospheric disturbances (SID), short wave fade-outs (s.w.f.) and auroral openings on all bands from 50-430MHz. This increase in activity could raise the solar indices to levels sufficient to provide good openings on the 50MHz band. The trans-equatorial path (TEP) should be excellent, allowing contacts, up to 10 000km, to be made into southern Africa and maybe even South America. The best times for contacts into ZS will be around 1600-1800UTC, with openings into the LU/PY area occurring about three hours later. Some of these openings will be via t.e.p. or they may include a path enhancement, via Sp-E, at the UK end. In this latter case, there is a possibility that signals will arrive at your QTH on a non great-circle bearing. In some instances incoming signals may peak on beam-headings up to 60° off the true bearing. The far east path to Oceania should also be open on a number of mornings during March. If conditions are right, the band will be open to VK or VU between 0800-1130UTC, as indeed they were on a number of days during February. Once again, be prepared for signals arriving on obscure beam-headings.

The 50MHz Band

Band openings during January were very similar to that of the previous month. The African path was open on numerous occasions, especially for those fortunate to be located in southern England. The last few days of January, from the 26th, saw an enhancement in the east-west path, enabling many contacts to be made into the North American continent. During January, the band also supported propagation to South America via F2 and into Europe via Aurora, F2 backscatter and Sporadic-E. This state of affairs continued through to the first week of February and saw some excellent long distance propagation into Australia and the Philippines, but more about that in next month's column.

First of all the African openings. **Ted Collins G4UPS** (DVN) started the month off by hearing TU4DH, at 0943UTC on January 1. He also heard TU2EW, 6W1QC and 9L1US. Conditions were good later in the day with TU2EW, TU4DH and 9L1US all being heard again from 1520UTC. On the following day, at 1150UTC, **Chris Gare G3WOS** (HPH) found TR8CA working c.w. on 50.090MHz. A quick exchange of reports was made before Chris went to look for more DX. A few minutes later at 1208UTC, he worked TU2EW on s.s.b. Openings into Africa continued unabated during January, although once you had worked TR8CA, TU2EW, TU4DH, 6W1QC and 9L1US, the band became less interesting. In Jersey, GJ4ICD observes that he had an almost 100% daily path reliability from 9L1US during the month. Unfortunately, he missed a few days because of work! Propagation extended a little further to the south on January 16, with the ZD8VHF beacon (50.0325MHz) being heard by a number of stations.

You had to be really keen to work into South America but nevertheless the openings were there, albeit very briefly. On January 1, **Geoff Brown GJ4ICD** heard the FY7THF beacon (50.039MHz) peaking 599+ from 1130-1242UTC. At 1212UTC he worked PZ1AP on c.w. 559 bothways. G4UPS heard PT7NK in beacon mode at 1044UTC and the FY7THF beacon at 1150UTC. Conditions were again reasonable on January 15 with G4UPS hearing FY7THF at 1140UTC, GJ4ICD hearing PT7NK and the YV5ZZ beacon (50.045MHz) at 1210UTC and **Neil Carr G0JHC** (LNH) working PZ1AP at 1245UTC. Not much else was heard from South America until January 26, when **Richard Lax G4AHN** (SRY) heard HC1BI in Ecuador, at 1315UTC. A very good opening into FY, PY, PZ and YV occurred on January 30, with a number of stations throughout the UK managing to work the DX.

Openings into the North American continent were observed during the last week of January, although GJ4ICD had a brief opening on January 9, working K1IKN, K1JRW, K1TOL, VE1BVL and VE1HD. On the previous day, VE1BVL copied the GB3IOJ beacon (50.0655MHz) but very little else seems to have been worked. During the period January 25-31, the band was open daily, around 1230-1400UTC, to W1, W2, W3 and VE1. On January 30, conditions were particularly good, the opening stretching to W4, W8 and W9. At 1241UTC, G4UPS heard KP2A on c.w. peaking 559. To round off the month, GJ4ICD also heard KP2A, on January 31 at 1208UTC, but no contact was made. Geoff, incidentally, is now well on his way to DXCC, 100 countries confirmed on 50MHz. He notched up country 101 during the first week of February and is now waiting for the QSLs to arrive.

Apart from the real DX via F2 propagation, other modes such as meteor scatter, Sporadic-E and aurora were also observed during January. The Quadrantids

144MHz QRB Table

Distances in kilometres

Station	Tropo	Aurora	Meteors	Es
G0CUZ	2943	1758	1996	2943
G0OAZ	2923	1780	2026	2923
G0OKM	2811	1488	——	2203
G0EVT	3080	1640	1808	3080
G0FYO	1315	1624	——	2019
G0ISW	1059	566	——	2057
G0LBK	3060	1755	1876	2350
G1OWQ	1454	1812	——	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	——	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	1650	2372
G3FPK	1835	1686	——	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2068
G4NBS	1321	1714		1901
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1450	1774	2025	2172
G4ZTR	935	1535	——	2130
G6OER	1834	997	1957	2068
G6OZH	2924	711	——	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	——	2265
G6LEU	2620	910	——	2430
G8HHI	1742	——	——	2058
G8JOX	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

Back-Scatter

shower on January 3-4 provided much activity for G4UPS. He managed to work OZ1ABE, OZ3ZW, SM7AED and SM7FJE. **Ian Galpin G1SMD** (DOR) however was disappointed with the m.s. activity as he only heard a few GMs on 50.350MHz and failed to work anyone. He wonders what has happened to all the 1987-88 activity? Ian also reports that during the Perseids, Geminids and Quadrantids showers, a number of European stations were operating within the DX window, 50.100-50.130MHz. IJntil recently he could not understand why many were operating in contravention of the IARU bandplan, but all was revealed recently when a well known G station was heard on 28.885MHz, claiming that the frequency to use for European m.s. working was within this DX window. Clearly, this is totally wrong. The correct frequency to use for m.s. working is 50.300MHz for c.w. and 50.350MHz for s.s.b. As Ian comments, 50MHz is a large band and most European countries, with the exception of Italy, have allocations to at least 50.400MHz. Why do operators insist in cramming all the narrow band activity within 20kHz of 50.110MHz?

Right, I'm off the soap box and we'll get back to the DX.

During the evening of January 2, from 1815UTC, there was a 30 minute opening into Iceland via Sp-E, with the TF3SIX beacon being heard in southern England. There is very little activity from Iceland with only three stations, TF3EJ, TF3SA and TF4LB, having 50MHz capability, (TF6MM is now not active having sold his equipment to TF4LB).

The band was also open, via Sp-E, to YO2IS and 9H1 on January 9, OZ and SM on January 13, to CT, DL, I and OE on January 15-16 and OZ on January 22.

The series of flare activity during the fourth week of January gave rise to a number of weak auroras. On January 25, **Tim Hugill G4FJK** (AVN) heard GB3RMK (50.060MHz) go auroral at 1850UTC. The only station noted was GM0GEI, peaking 55A, on a beam heading of 20°.

Altogether, January was a very interesting month, especially if you had many hours of spare time on your hands! Those of you with a nine-to-five job will have seen little of the DX, and therefore might have thought that the band wasn't worth bothering with. In reality, as I have already recorded, 50MHz was open to four continents and in excess of 30 countries.

The 70MHz Band

On 70MHz, the series of cumulative contests, commencing on January 27, brought an increase to band activity, albeit for two hours on a Sunday morning. An aurora, on January 25, unfortunately went unnoticed by the majority of UK operators. This was a pity, as it is normally during such openings that fixed stations in England can work into Ireland or Scotland.

At my QTH in Herefordshire, I made 37 QSOs during the cumulative contest on January 27. Contacts on s.s.b. included GI4SJB/P (IO74), GW6TEO (IO71), G8ESB (YSN), G0EHV (TWR) and G3YJX (CNL).

Derek Poulter G3WHK (LDN) is back on the band after a period of inactivity. Equipment in use consists of an Icom IC-575A h.f. transceiver driving, at 28MHz, an RN Electronics transverter. This produces 10W p.e.p. output which is fed into a BNOS Electronics 100W amplifier. The antenna system set-up comprises of a 4-element Yagi mounted on top of a 2-section Versatower at 15m above ground.

Bob Reeves G8VOI (HPH) is now active on the band. He is using a Microwave Modules transverter driving a 50W MM linear. Although he is using a loft mounted dipole, the QTH at 50m a.s.l. has a reasonable take-off, allowing contacts to be made well up country.

A station with a more ambitious antenna is **Tony Ashcombe G4APA** (CHS). He is using two stacked 8-element Yagis to great effect.

Neil Underwood G4LDR (WLT) is building the *PW* Meon transverter and hopes to be active on the band soon.

The 144MHz Band

Up on 144MHz, Tropo conditions were enhanced at times during January, allowing many UK operators to work into central Europe.

Dave Brown GO4XTT (IOM) noticed that conditions were quite good between January 23-27. Time was very limited during this period, QSOs being made with PA3EPA (JO21) on January 23, DL3ELB (JO31) heard on the 25th and F6FNL (JN03), 57 bothways on January 27. During 1990, Dave managed to work 75 counties and 20 countries on 144MHz and 31 counties and 9 countries on the 430MHz band.

At my QTH, propagation was good into Germany during the evening of January 28, allowing me to make s.s.b. contacts with DB8KJ and DC6KI, both in JO30.

Graham Peyman G0KDN (DOR) reports that following an early morning m.s. schedule with SP9EWU on December 23, he tuned around the f.m. section of the band and was delighted to hear U2MIR working simplex on 145.550MHz. The signals exhibited much QSB, possibly because of the orientation of the MIR space station. He tried calling with a Russian phrase which means "Hello and thank you for the call" but no reply was heard. However, a few hours later G0LAJ telephoned Graham with the news that he had been listening on the frequency and had heard the cosmonauts calling G0KON back in Russian! Unfortunately Graham didn't hear any of this and hasn't heard them since. Perhaps you should all practice a few Russian phrases as it might get you that elusive QSO! If you don't want to attempt a telephony QSO you could try via packet radio. It is possible to connect to the U2MIR personal mailbox. **Patrick O'Brien GW1SXN** (GDD) reports that he heard U2MIR, on February 4 at 1140UTC and 1457UTC, as the space station passed overhead. A number of stations, including DC6SN, EA2ARU, EI3FI, F6EXK, G4JY, I0LYL and OZ8DF, were all trying to connect to the on-board p.m.s.

Meteor Scatter

Graham G0KON is a newcomer to m.s. operation and has provided details of his first experiences using the mode. He was initially persuaded by a local station G8PYP, to try m.s. and so, armed with 80W and a 16-element Yagi, he went looking for the DX. He made two s.s.b. schedules on the 14.345MHz v.h.f. net and was very excited to work, on December 13, SM6KJX (JO67) and YU3ES (JN65). That was it. The bug had bitten! Reading that c.w. was much easier and more productive, Graham modified a tape recorder, bought a keyer and built an audio up-converter, all within the space of one week.

The up-converter, incidentally, works by mixing the received Morse audio beat with a fixed audio frequency of typically 9kHz to produce a new audio frequency somewhere around 12kHz. This is then fed to the tape recorder. When the tape is subsequently slowed down, for decoding purposes, the received pitch is easier to copy. Without an up-converter, the tape pitch, when slowed down, may only be 50-200Hz, which is not so easy to copy. Having set up the station for c.w. operation, Graham took more schedules on the v.h.f. net. Successful contacts during the latter part of December included DL7ARM (JO62), EA3KU (JN00), OE3JPC (JN88), OE3UP (JN87), SP6GZZ (JO81) and SP9EWU (JO90). The Quadrantids shower was eagerly awaited, especially as a new 180W amplifier had been obtained. Contacts were made, on January 3, with HG8CE (KN06), SP6BTI (JO81) and Y27BL (JO61) and on the 4th with IK1LGV (JN44).

With the exception of the Quadrantids shower, the conditions for meteor scatter during the first quarter of the year are normally poor. No other usable showers exist and the sporadic meteor rate is very poor, being at a yearly low in February. However, Graham was pleased to report c.w. contacts with IK0BZY (JN61) on January 11, GM4IPK (IO99) on January 23 and SM0KAK in early February. The only penalty awarded for becoming a "ping-jockey" is the ridiculous hours you have to get up in the morning. The advantage is that you can work daily DX on 144MHz, at distances of typically 1200-1800km, even at times outside of the recognised shower periods.

Clive O'Hennessy GW4VVX (GWT) is also a new convert to meteor scatter operation. He will soon be active on c.w. having obtained a Supa-Keya and made the necessary modifications to a cassette recorder for variable speed playback. Before he got the Morse system installed, Clive tried his hand, at some s.s.b. tests during the Quadrantids shower. His first schedule with HB9SUL (JN46) produced only a few short pings and similar results were obtained during the next test with GM0JOL (IO78), only one ping being heard in 30 minutes. Not a very encouraging start. He tried two more schedules, between 1300-1500UTC, and was pleased to work DJ3VI (JO51) and SP3MFI (JO91). Clive mentions that these tests showed that the east-west path was much better

QTH Locator Squares Table

Station	50	70	144	430	1296	Total
G3IMV	319	—	447	125	51	942
GJ4ICD	428	—	264	119	59	870
G4ASR	279	43	350	41	3	716
G6HKM	270	—	224	112	48	654
G1KDF	309	8	184	104	38	643
G3JXN	204	22	187	134	88	635
EI5FK	314	—	187	58	—	559
ON1CAK	207		280	53	11	551
G0DAZ	146	—	221	137	39	543
G6HCV	309	—	233	—	—	542
G3UVR	—	50	257	140	83	530
G4KUX	—	—	372	120	—	492
ON1CDQ	168		256	55	10	489
G1SWH	201	30	166	62	9	468
G4RGK	—	—	284	124	50	458
G3XDY	—	—	211	150	92	453
G4MUT	143	25	155	94	34	451
G0OFE	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
G8LHT	79	19	185	93	14	390
G1EZF	—	—	263	93	—	388
G4XEN	—	—	274	111	—	385
G8PYP	206	2	120	34		356
G4NBS		35	138	108	67	348
G4RRA	—	—	255	80	—	335
G3COJ	—	—	186	103	44	333
G8PNN	7	25	129	99	64	324
G4SSD	—	—	229	93	—	322
G4FRE	—	—	102	146	72	320
GM0HBK	132	8	156	19		315
G4TIF	—	—	200	110	—	310
G4DHF			307			307
G4ZTR	78	28	120	50	30	306
G1EGC			198	80	23	302
G8HHI			148	110	38	296
G6MGL	—	—	141	89	59	289
GM4CXP	50		201	32		283
DL8FBO	—	—	280	—	—	280
G1SMD	167		110			277
G0FYD	110	1	160	6		277
G6MXL	75	23	99	51	23	271
G4YTL			269			269
GW6VZW	118		143	6		267
G4PCS			258	3		261
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
G4IGD	—	—	238	—	—	238
G0EHV	—	—	160	75	—	235
GW4FRX	—	—	231	—	—	231
GM4CXP	—	—	198	31	—	229
G1SMD	165	—	110	—	—	275
G4DOL	—	—	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	83	26	4	136
GW4VVX	10	—	120	—	—	130
G1WPF	—	—	97	29	—	126
G0FEH	—	—	101	24	—	125
G0ISW	45	—	59	17	—	121
GW6ARL	116					116
GW1MVL	—	—	109	7	—	116
G1IMM	—	—	98	17	—	115
GM0GDL	—	—	88	23		111
G0KON			104			104
G7CFK	109	—	—	—	—	109
G1CEI	11	—	77	18	—	106
GI4DWA	—	—	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

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Back-Scatter

than the north-south path.

As constructive criticism, I would say that some of these schedules were with stations located too close for effective working. With an average antenna system, let's say, a single long Yagi at 12m above ground, the best results will be somewhere in the range 1400-1800km. Surprisingly therefore, it is better to make schedules with stations towards the extremities of Europe, such as LA, SM, SP, OK, HG, YU and I, rather than the likes of DL, HB and OZ who are all located much nearer to the UK. I'm not saying you can't work stations via m.s. in these countries. I'm only saying it's just more effective to choose schedules with stations within your optimum range. Another very important point to note, is that unlike sporadic meteors, shower meteors follow a specific path through the sky. Therefore, optimum propagation in a certain direction can only be made at specific times. For example, the best times to make schedules during the Quadrantids shower, with someone located to the south of the UK, would be around 0400UTC and 1300UTC. In the April Lyrids, the same DX station would be scheduled around 0000UTC or 0800UTC. Again, I'm not saying you can't make QSOs at the 'wrong' time, but why make things difficult for yourself?

VHF News

The RSGB's National VHF Convention, is being held, as usual, at Sandown Park Racecourse, Surrey on Sunday 24 March, the doors opening at 1030. In addition to the trade exhibition, specialist groups and equipment test facility, a full lecture programme has been arranged. Subjects include, e.m.e. by G3LTF, v.h.f. DX by G3SEK, 10GHz equipment by G3WDG, 1.3GHz antennas by G3GRO and repeater linking by G4NJU. Further details can be obtained from Geoff Stone G3FZL on 081-699 6940.

Commencing on Sunday April 7, the RSGB News Broadcast GB2RS, will be transmitted on 50MHz, simultaneously with the 144MHz broadcasts. It is expected that 30 news-readers located in G, GI, GJ, GM, GU will be given permission to operate on 51.530MHz f.m. using horizontal polarisation. I would be interested to hear what results you obtain when listening to these transmissions. **I suspect that most Yagis in use in the UK run out of gain at these elevated frequencies!**

It is hoped that an expedition will take place in early June to the Minquies Reef, located 15km south of Jersey (IN88). Operation will take place on a number of bands, including 50 and 70MHz. The reef counts for the Islands On The Air award (IOTA) and has never been activated before. Further details can be obtained from GJ4ICD.

Clive GW4VVX, reports that all QSL cards for his GB2XS expedition in 1990 have now been sent to the bureau. If you have not received your card yet, he would be only too happy to provide a duplicate. If you missed Clive last year, you can catch him again, operating as GB2XS from IO78, between August 10-24.

QRZ Contest!

The RSGB 50MHz Trophy contest will be held on Sunday April 7 between 1000-1800UTC. The contest has sections for fixed station single operator, fixed station multi-operator and portable stations. County and country multipliers will be used.

The last of a series of five 70MHz cumulative contests will be held on March 24, between 0900-1100UTC. The contest exchange must include locator, QTH, report and serial number.

Another 70MHz contest, a fixed station event, will be held on Sunday March 31 between 0900-1500UTC.

The German 430MHz c.w. contest, AGCW-DL, will be held between 1900-2300UTC on Saturday March 16. Further details were given in the March issue of *PW*.

The first 1.3GHz fixed station contest of 1991 will be held between 1600-2200UTC on Sunday April 14. Both single or multi-operator stations may enter.

An RSGB microwave cumulative contest, for all bands from 3.4GHz upwards, will be held on March 31, between 0900-2100UTC.

Scandinavian activity contests will be held on the following dates. 50MHz activity on March 26 and April 23, 144MHz on April 2, 430MHz on April 9 and Microwaves on March 19 and April 16. All band sections run between 1700-2100UTC. You can obtain a full set of rules by sending me a stamped addressed envelope.

Deadlines

Please send your letters to reach me by the end of the month. I normally 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.

QSL Information

K1JRW: R.Robinson. 136 Pelham Hill Road, Shutesbury, MA 01072, USA.
KP2A: J.Ackley. Box 10245, Charlotte Amalie, Virgin Island, 00820.
PZ1AP: Arnold Polsbroek. POB 566, Paramaribo, Suriname, S. America.
TR8CA: Via F6CBC. J.Charron, 183 Ave Carnot, F-33150 Cenon, France.
TU2EW: Daniel Biau. Box 1890, Abidjan 11, Ivory Coast, West Africa.
3X1SG: Via ON6BV. V. Ravyts, Freest 4, B-1590, Bever, BT, Belgium.
6W1QC: Toshihiko Kiya. 2-21-13 Hokuei, Chitose, Hokkaido 066, Japan.
9L1US: Via K.Scheper. 5875 Cedaridge Dr, Cincinnati, OH 45247, USA.

Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the *PW* Editorial Office

As I write this, the Gulf war is in its twenty-fifth day, and it seems that the Coalition forces have control of the air waves as well as air superiority. Iraqi radio seems to be reduced to very little output, with its external services untraced for a couple of weeks. Their broadcasts were jammed by the Allies for a while, with a 'wobble' jammer evident on some channels. With little on the air from Baghdad, the jammers have stopped. A new station calling itself 'Mother of Battles' radio was noted in Arabic during late January and early February, but this fell silent on February 4.

Currently, it seems that only the Iraqi domestic services are heard, traced on 3.98MHz in parallel with 8.35MHz. Both of these are audible from time-to-time in the UK, but the 3MHz frequency is occupied by the Voice of America from 1700GMT.

A number of other broadcasters are continuing to react to the developments, adding transmissions to serve forces, expatriates and the local population in the Gulf. Indeed, changes to the output of BBC World Service mean that Britain now has the highest number of hours transmitted overseas since 1947. The figure is currently 823 and a half hours a week.

The Foreign and Commonwealth Office, which funds World Service, has agreed to release in excess of £4 million to meet the additional costs of covering the Gulf War. Pictures flashed around the world on the day war broke out showed listeners in the Gulf region holding short wave receivers to their ears, listening to London in English and Arabic, proving the BBC's worth in times of crisis.

In the Baltic states, there has been much action on the broadcasting front. Soviet Interior Ministry troops stormed the radio building in Vilnius on January 12, forcing it off the air. Dramatic appeals for assistance were heard in English and Lithuanian. Relays of the station, usually carried on transmitters in other parts of the Soviet Union for listeners overseas, were stopped for a week or so, but negotiation with the Soviet State Radio system proved fruitful, and Vilnius was once again heard here and around the world with very good reception.

Radio Moscow's output is somewhat strange. I came across an unusual programme on Sunday 10 February at around 1240 on the English World Service. It was called *Vasily's Weekend* and seemed to consist of pop music introduced by Vasily Strelnikov from somewhere he called the 'Radio Moscow Hotel', and by a contributor with what seemed to be a genuine American accent in Chicago!

The programme interviewed 'guests' at the hotel, including Vasily's sister, and waxed lyrical about the wonderful world of international radio, and sang the praises of Jonathan Marks' *Media Network* on Radio Netherlands. I suspect that this programme could be a regular one, and it might be worth tuning in to Radio Moscow on Sunday lunchtimes at 1230GMT.

However, Radio Moscow news bulletins did not mention the independence vote in Lithuania on Sunday 10 February, although *The Independent* newspaper reported that domestic services did report the vote without comment. It never ceases to amaze me how the Soviet media functions. Looking at another example, the fledgling radio service of the Russian Federation, Radio Russia, is in dispute with the authorities about its transmissions. The service was broadcast on the popular *Mayak* service when it first started, but has now been relegated to the All Union Radio *Second Programme*, reaching only about 50% of the Russian Federation's population. The service is broadcast on short wave (frequencies in the European section) and I wonder how long it will be before the service inaugurates English programming.

Radio Sweden is reacting to the Baltic states crisis by expanding its output in the Baltic languages. Lithuanian is now being added to the successful Estonian and Latvian broadcasts which have now doubled. The services can be heard on 1.179MHz.

Adventist World Radio has applied to the Italian government to build a new high-powered short wave transmitting station some fifty kilometres east of Bologna. The station proposes to install two 100kW and two 250kW senders. The site will have eight antennas, serving northern and eastern Europe, the Soviet Union, southern Asia, the Middle East and North Africa.

Back-Scatter

With so much going on in the world at present, it doesn't pay to be away from the short wave dial for any length of time. Even in the car it's possible to stay in touch. I'm using a Grundig car radio at the present, which includes m.w., l.w., v.h.f.-f.m. (including RDS) and the 6, 7 and 9MHz short wave bands. These include out-of-band channels, so the receiver is quite flexible. Whilst I miss the higher frequency bands, and some of the more distant broadcasters such as Radio Australia, the set is useful for listening to BBC World Service, the Voice of America, Switzerland, Holland and so forth. And it's nice to know that I'm never completely cut off from the world of international radio. Look out for a comprehensive test of the Grundig car radio, together with another German receiver, a Blaupunkt, in *Short Wave Magazine* later this year.

European Stations
All times UTC(=GMT)

If you have been wondering as to the whereabouts of Radio Austria's *Austrian Short Wave Panorama* presented by David Hermges, it has been dropped for extended Gulf coverage. Whether it returns might be down to listeners' reaction. If you miss it, drop the station a line.

The British Forces Broadcasting Service (BFBS) has a feeder from Cyprus to the Gulf on 6.84MHz upper side band (u.s.b.) noted during the evening period.

The Red Cross Broadcasting Service, via Swiss Radio International transmitters, has added an extra programme on the second Sunday of the month at 1100 on 7.21MHz, with a repeat on the following Monday at 1700, also on 7.21MHz. The last Sunday of the month broadcast continues as normal.

Radio Russia from the Russian Federation can be heard 1000 until 1400 and 1900 to 2100 on 15.75, 15.63, 11.99, 11.83 and 9.585MHz amongst others. These are channels used by All Union Radio's *Second Programme*.

A reminder of the Radio Vilnius frequencies at 2300 via Soviet h.f. facilities: 9.75, 15.18, 17.69 and 17.72MHz. The Lithuanian transmitter on 9.71MHz proves to be inaudible at present. The station's *DX* programme has reported that the first home service from Vilnius is on the air 24 hours a day on 9.71MHz, from 0400 until 1700 on 6.01 and 1700 to 2300 on 9.675. The FAX number for reception reports to Radio Vilnius is area code 0122, 22 15 71.

Some feeder news. A feed from Munich to Portugal has been noted on 10.86MHz carrying the Voice of America on one sideband, and Radios Free Europe and Liberty on the other. AFRTS is fed from the UK, presumably to the Gulf, on 9.023 u.s.b.

African and Middle Eastern Stations

The Voice of the UAE in Abu Dhabi seems to have replaced the evening English programme with Arabic. It is scheduled for 2200 until 2400 on 15.10, 9.60 and 6.17MHz with a frequency change at 2300 when 15.10 is replaced by 13.605MHz.

Israel Radio has offered some dramatic listening since the Gulf War started. English language broadcasts, which generally relay the English domestic service, have been interrupted by air raid warnings and instructions to the population on what action to take. Broadcasts at 2230, 0100, 0200 and 0500 are carried on 11.605, 9.435 and 7.465MHz. At 1100 try 21.79, 17.575 and 11.585MHz whilst at 1815 there are two channels, 11.585 and 11.655MHz.

Israel's Arabic transmissions have been jammed recently. At 1700, a 'wobble' jammer has appeared on the 15.10MHz frequency.

English from Saudi Arabia at 1600 until 2100, which is scheduled to use 9.705 and 9.72MHz has been untraced on both frequencies for some time.

The frequency usage of Syria's Radio Damascus has settled down and the station's English programmes in the European evening are now at:

2005 on 15.095 and 12.085MHz
2110 on 12.085 and 9.95MHz

Asia and the Pacific

Radio Australia has inaugurated a special programme for forces serving in the Gulf with messages telephoned in by relatives and friends. It's called *Gulf Links* and is transmitted at 1430 for one hour daily on 21.775 and 25.75MHz, of which the higher channel offers best reception in northern Europe. The programme is modelled on the highly successful BBC World Service *Gulf Link* programme which brought news from home to hostages in Kuwait and Iraq in the months before Christmas 1990.

The new Radio Japan relay station in Sri Lanka has been inaugurated, and the schedule is:

0100-0200 on 11.84MHz to South Asia
1400-1500 on 9.535MHz to South Asia
1600-1700 on 15.21MHz to Middle East and North Africa

Japanese to the Middle East and North Africa is transmitted at 0400 on 17.82MHz and at 1700 on 15.21MHz. All transmissions from the site in Ekala are from 300kW senders.

North, Central and South America

Radio Canada International has added extra frequencies for its services to the Middle East, with English at 0400 now using additional 9.555MHz from Deutsche Welle transmitters in Europe.

Meanwhile some frequencies for European, Latin American and African services have been discontinued. The Eastern Europe service at 1515 has lost 13.65 and 15.315MHz, and at 1715, the same frequency of 13.65MHz has been lost.

At 1800 the African service loses 13.67 and the 0200 Latin American service during the week, and weekends at 0100 has lost 13.72MHz.

Ways are still being looked at to guarantee the continuation of Radio Canada International. The Department of External Affairs seems to be the most likely candidate to provide the Can$20 million required to run the service. A decision is likely during March.

HCJB reports from Quito, Ecuador that its s.s.b. transmissions have been highly successful. John Beck, the station's frequency director, says that results have far exceeded expectations from the Siemens 30kW s.s.b. sender with variable carrier insertion. The 11m band operation uses a vertical antenna, whilst the 13m band unit uses an unterminated bi-directional rhombic directed towards Europe and the South Pacific. A reminder of the frequencies, 21.455 or 25.95MHz. Some programme highlights from the station include a special edition of the Monday *Dateline 90* on April 1, which will include a simulated live report of the Easter events of the first century with interviews with Peter, Mary and a host of others involved at the time.

The *DX Partyline* programme, aired on Saturdays, will look at broadcasting in Ghana on March 9, and on March 30 the programme will take a trip to Malta on the day before the island's Independence Day.

Wednesdays on HCJB brings *Ham Radio Today*, which is running a series about 'Propagation', together with other features about amateur radio operating.

Look out for the review on this car radio in our sister publication *Short Wave Magazine*.

* Practical Wireless & Short Wave Magazine in attendance

Radio Diary

***March 17**: The Norbreck Radio, Electronics & Computing Exhibition will be held at the Norbreck Castle Hotel Exhibition Centre, Queens Promenade, North Shore, Blackpool. Admission is £1, OAPs 50p and under 14s free. Free raffle ticket and exhibition plan. **Peter Denton G6CGF. Tel: 051-630 5790.**

March 17: The Wythall Radio Club will be holding their 6th annual Radio Rally at Wythall Park, Silver Street, Wythall, Worcs., which is on the A435 near Junction 3 on the M42 south-west of Birmingham. Doors open 11am. There will be three halls plus a marquee, trade stands, Flea Market, Bring & Buy, a bar and snacks will be available, talk-in on S22 and admission is only 50p. **Chris Pettitt G0EYO. Tel: 021-430 7267.**

March 17: Tiverton South West Radio Club have the 1991 Mid Devon Rally at the Pannier Market, Tiverton. Easy access, only minutes from junction 27 on the M5 with excellent free parking. Two halls of trade stands, Bring & Buy stall and mobile snack bar. Further displays and full refreshment facilities in the club room bar, which is open throughout the day. Doors open at 10am. Talk-in on S22. **G4TSW, Mid Devon Rally, PO Box 3, Tiverton, Devon.**

March 24: Bournemouth RS will be holding its fourth annual Amateur Electronics Sale at the Kinson Community Centre, Pelhams, Millhams Road, Kinson. Doors open 11am to 5pm. Talk-in by G1BRS on 144MHz on S22. Further details from **Vic Sievey G4PTC, 3 Stratton Road, Bournemouth BH9 3PG. Tel: (0202) 516593.**

***March 24**: The RSGB VHF Convention will be held at Sandown Park Exhibition Centre, Esher, Surrey.

March 24: Pontefract & District ARS have their 12th Annual Components Fair at the Carleton Community Centre, Carleton, Pontefract. Doors open 11am to 4.30pm. Trade stalls, bookstall, Bring & Buy, licenced bar and refreshments. Talk-in on S20. Admission by Prize programme (three prizes). **Colin G0AAO, QTHR. Tel: (0977) 615549.**

March 31: The Centre of England Amateur Radio Rally will be held at the British Motorcycle Museum, Bickenhill, near the NEC Birmingham (junction 6 M42). Doors open 10.30am, admission £1, OAPs 50p, children free. Over 60 trade stands in three large exhibition halls, Bring & Buy, talk-in on S22, bar and restaurant available, ample free parking, concessionary rates to visit museum. **Frank Martin G4UMF. Tel: (0952) 598173.**

April 7: Lough Erne Amateur Radio Club will be holding their 10th annual mobile Rally in the Killyhevlin Hotel, Enniskillen. Doors open at 12 noon, talk-in on S21. Special guest Louis Varney G5RV. **Alwyn Magee GI0BFD QTHR. Tel: (0365) 323802.**

April 7: The 5th Launceston Amateur Radio Rally will be held at Launceston College. There will be a large Bring & Buy, well-known traders, hot snacks and a bar. Also official Morse Tests (pre-booked *via* the RSGB) will be held at the Rally. Doors open at 10.30am with talk-in on S22. **Maggie. Tel: (040921) 219.**

April 7: Cambridgeshire Repeater Group have their annual 'Extravaganza' at the Philips Radio Communications - Catering Centre, St. Andrews Road, Chesterton, Cambridge. There will be a Junk Sale, Bring & Buy and Auction. Doors open 10.30am, admission still only 50p. **G. M. Gardner G0HEM, New House, Birdbush Avenue, Saffron Walden, Essex CB11 4DJ. Tel: (0799) 23689.**

April 7: The 24th White Rose Rally will be held at The Refectory, University of Leeds. Doors open 11am. All the usual attractions, talk-in on S22 and SU22, extensive free parking, food and drink at very reasonable prices. Entrance £1 by numbered programme. Free monster prize draw. Senior citizens, bored wives and kiddies free of charge. **Tony G4DXA, PO Box 73, Leeds LS1 5AR.**

***April 14**: Trafford ARC will be holding their Great Northern Rally at G-MEX, City Centre, Manchester. Doors open 10.30am, rally closes 5pm. **Graham Oldfield 061-748 9804.**

April 21: Bury RS will be holding their Hamfeast '91 rally at the Castle Leisure Centre, Bolton Street, Bury. **Lawrence Jones G4KLT. Tel: 061-762 9308. PLEASE NOTE THE CHANGE OF DATE.**

***April 27/28**: The RSGB will be holding their National Amateur Radio Show at the National Exhibition Centre, Birmingham.

May 5: The 8th Anglo-Scottish rally will be held at Tait Hall, Kelso. Doors open 11am. All the usual attractions on this holiday weekend. Details from the rally co-ordinator **GM4UIB. Tel: (0573) 24654.**

May 6: Dartmoor RC have their rally at St. Annes Church Hall, Yelverton (A386), Devon. Doors open 10.30am. Trade stands, Bring & Buy, refreshments, parking. Talk-in on S22. **Dave G1YPD. Tel: (0752) 703101.**

May 12: Yeovil ARC have their 7th QRP Convention at the Preston Centre, Monks Dale, Yeovil. Doors open at 9am, admission is £1.50 which includes programme. All the usual traders, plenty of food and refreshments available. There will be four lectures during the day. **David Bailey at 7 Thatcham Close, Yeovil BA21 3BS.**

May 18: The Swindon Radio Rally is to be held at the Oasis Leisure Centre, North Star Avenue, Swindon, leave M4 at Junction 16. Doors open at 10.30am, trade stands, grand Bring & Buy, Repeater Group, etc, ample free parking. Talk-in by RAYNET on S22 from 0500hrs. For details contact **Jim G7GEA on (0793) 611859 or John on (0793) 619014.**

May 19: Mid-Ulster ARC have their annual 'Parkanaur' rally at the Silverwood Hotel, Lurgan, Co. Armagh. The rally will be open to the public from 12 noon. There will be the usual trade stands, Bring & Buy, bookstall, QSL bureau, etc. Talk-in on S22, 145.550. The proceeds of this rally will go to the Stanley Eakins Memorial Fund at Parkanaur, nr Dungannon. **Jim Lappin GI1YGS. Tel: (0762) 851179.**

May 26: The Maidstone YMCA ARS are holding their biennial rally at the YMCA Sportscentre, Maidstone. As usual the rally will feature Trade and Special Interest Groups stands, refreshments and ample free parking. **Alan Judge G0NCW. Maidstone 750709.**

May 26: Plymouth Radio and Electronics Fair is being held at Plymstock School, Church Road, Plymstock, Plymouth, Devon. Doors open at 11am. Attractions include large Bring & Buy, RSGB bookstall, many trade stalls, RSGB Morse testing and refreshments. Talk-in on S22. **Jan Fisher G0IVZ. Tel: (0752) 340946.**

***June 9**: The RNARS Rally will be held at HMS Mercury, near Petersfield. Gates open between 1000 and 1700. In addition to the dozens of Trade stands and the RNARS tent, there will be a Bring and Buy, a flea market offering tables for hire by the hour, a car boot sale, a large arts & crafts exhibition, radio-controlled power boats, cars and trains to mention but a few of the attractions. **Cliff Harper. Tel: (0703) 557469.**

***June 9**: Elvaston Castle Radio Rally will be held at Elvaston Castle Country Park, Derby. **Peter Neal (0332) 700265.**

June 9: The Southend Rally will be held in the Rocheway Centre, Rochford, Essex. Car Boot pitches will be available, either pre-booked or on the day on a first-come-first-served basis. **Stephen Blinkhorn G1XGP. Tel: (0702) 712595 evenings.**

June 9: Mid-Lanark ARS are holding their annual Open Day at Newarthill C. E. Centre, High Street, Newarthill. There will be the usual traders plus some new ones, a Bring & Buy stall, catering facilities, raffle prizes and a lucky catalogue number. Talk-in on S22. They have applied to hold Morse tests as usual, applications must be made in good time to the relevant department at RSGB HQ. Doors open 11am. Admission/Catalogue is £1. **David Williams GM1SSA, 32/34 Carfin Street, New Stevenson, Motherwell, Scotland ML1 4JL. Tel: (0698) 732403.**

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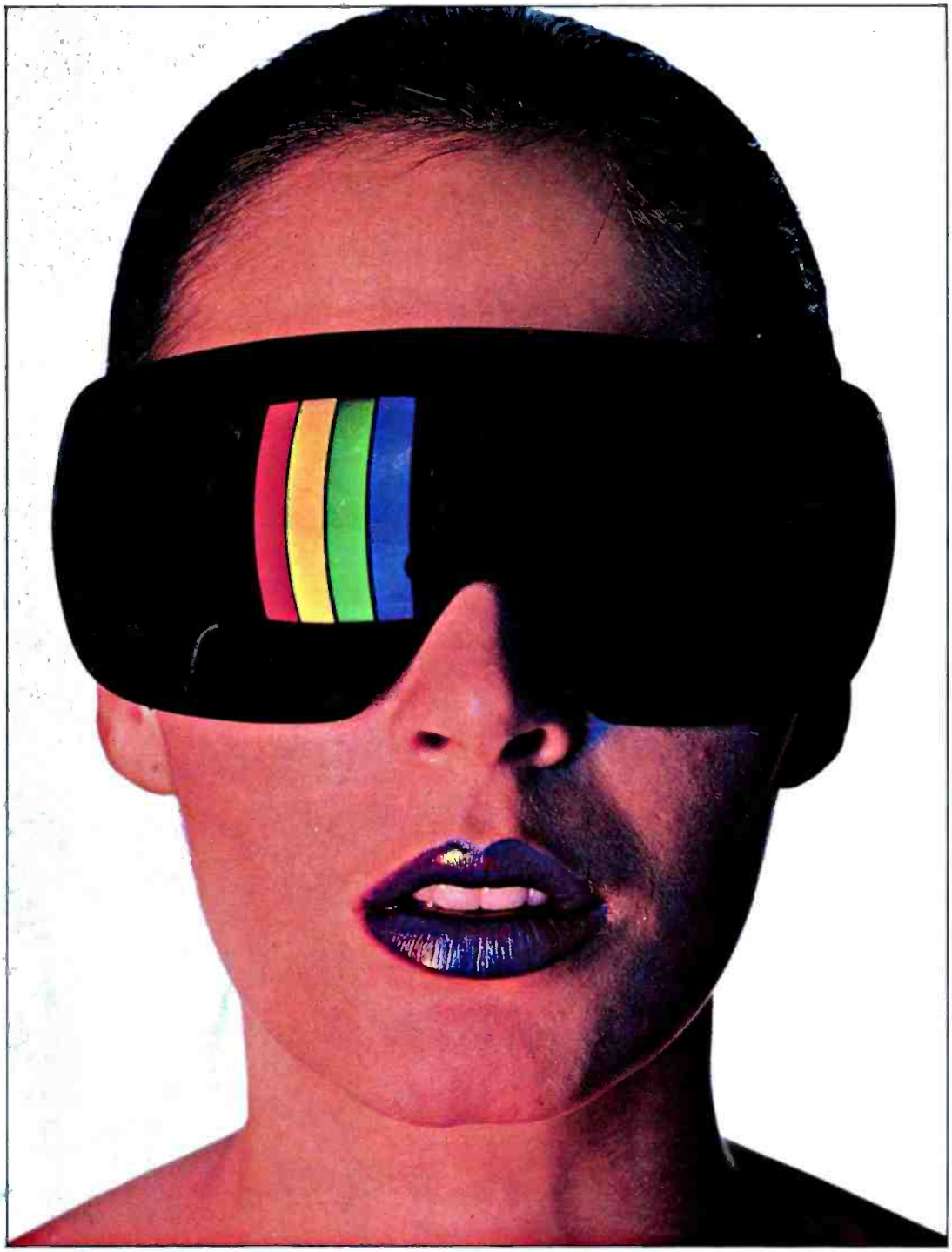

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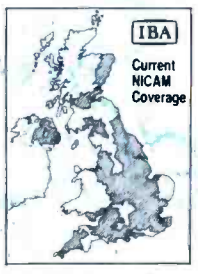

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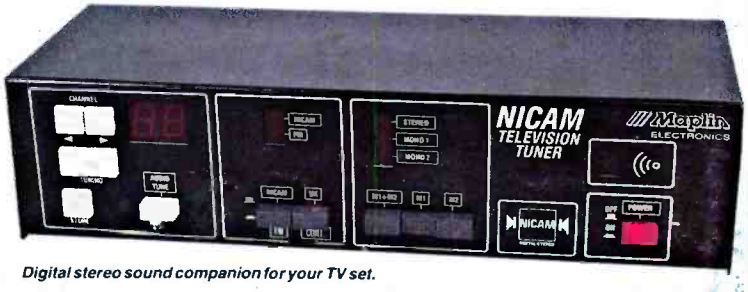

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