SEPTEMBER 1989 £1.30

ISSN 0141-0857

Practical Wireless

REVIEWED The Lake Electronics 3.5MHz c.w. Transceiver Kit

SPECIAL OFFER

Miniature v.h.f./u.h.f. Mobile Antennas & Mounts

BOOK OFFER

Filter Handbook by Stefan Niewiadomski

YAESU'S DUAL BANDER GOES PLACES OTHER MOBILES DON'T.

FT-4700RH control head
(1 15/16" x 5 7/8" x 1")

Introducing Yaesu's FT-4700RH dual-band mobile. Choose Yaesu's FT-4700RH, and you open the door to a lot of tight spaces.

While other dual banders just won't fit in today's small cars, the FT-4700RH utilizes a versatile "remote head" design. So you can mount the "brains" on your dash, visor, or door, and hide the "muscle" under your seat. Optional YSK4700 required for remote operation.

High-performance package. Packing a solid 50-watt punch on 2 meters (40 watts on 70cm), the FT-4700RH includes Dual-Band Watch for simultaneous monitoring of both bands, with independent squelch settings on the main and secondary bands. When you transmit, opposite band monitoring goes on in a full-duplex mode.

You can adjust the relative volume of the two receive channels with the balance control, too. And with Yaesu's bright LCD display, transceiver status is clearly visible in sunlight or shade.

Convenience on the road. Human engineering, long a Yaesu speciality, is an important aspect of the FT-4700RH design. The ten-button front panel keypad includes a "do-re-mi" audible command verification, and all important controls are backlit for night operation.

Frequency range 144-146MHz on 2m and 430-440MHz on 70cm. Nine memory channels on each band. High/low power selection (low power five watts). One-touch reverse repeater shift button. Optional CTCSS module. And 16-key DTMF microphone.

Optional accessories. FTS-8 CTCSS unit. MH-15D8 DTMF microphone with 10-telephone number memory. SP-3 or SP-4 External Speakers. And YH-1 Headset/Boom Mic or MF-1A3B Flex-arm Boom Mic, both with SB-10 PTT Switch Unit. YSK4700 Remote Kit.

Discover Yaesu's FT-4700RH today. And see what "high performance" really means. For dual-band mobile operation Yaesu's FT-4700RH really fits!
Call us today for details of your nearest authorised Yaesu dealer.

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

Practical Wireless
The Radio Magazine

SEPTEMBER 1989 (ON SALE AUGUST 10) VOL. 65 NO. 9 ISSUE 990

NEXT MONTH

Indirect Conversion - A change of heart over the Novice Licence

Phase Locked Loop for Measurement of adjacent Channel Noise

A Go Anywhere Slim Jim for 430MHz

PW QRP Contest Results

and
All the usual features

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

On sale October 12

Contents subject to last-minute revision

Regular Features

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

Assistant Editor
Dick Ganderton C.Eng MIEE G8VFH
Art Editor
Steve Hunt
Technical Features Editor
Elaine Richards G4LFM
Technical Projects Sub-Editor
Richard Ayley G6AKG
Technical Artist
Rob Mackie

Editorial Assistant
Sharon George
Administration Manager
Kathy Moore
Accounts
Alan Burgess
Clerical Assistant
Rachel Parkes
Post Sales
Peggy Ganderton

Advertisement Manager
Roger Hall G4TNT
PO Box 948
London SW6 2DS
☎ 01-731 6222
Cellphone 0860 511382
FAX 01-384 1031

Advert Copy and Make-up (Poole Office)
Marcia Brogan
☎ Poole (0202) 678558 or 676033
FAX Poole (0202) 666244

PHOTO ACOUSTICS LTD

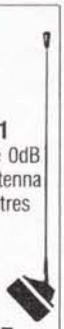
58 High Street, Newport Pagnell, Bucks. MK16 8AQ. **Telephone 0908 610625**

PHOTO ACOUSTICS LTD announce a NEW RANGE OF ON GLASS ANTENNAS FOR 2 METRES AND 70cm

- ★ Quick and easy to install
- ★ Simple SWR tuning by means of tuning screw on matching unit
- ★ Easy removable whip for car wash
- ★ Swivel joint for 180° angle adjustment
- ★ If removal of the antenna installation is necessary, a quick dismantling procedure leaves no trace of the installation
- ★ Ideal for the radio amateur who cannot fix anthing to the 'company car'

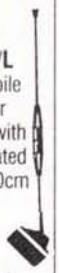
The two New Models are as follows:-

GF151
Half Wave 0dB mobile antenna for 2 metres



PRICE £27.99 p&p £4.00

GF411/L
3dB mobile colinear antenna with encapsulated coil for 70cm



PRICE £28.99 p&p £4.00

** Please Note: Maximum power handling of these antennas is 25 watts.

KENWOOD TM231E

New compact 2M Mobile Transceiver. Three power settings 50/10/5w. With *FREE* 5/8 aerial

£289.00 p&p £5.00

KENWOOD TM431E

New compact 70cms Mobile Transceiver. Three power settings 35/10/5w. With *FREE* GF411 On-glass antenna.

£318.00 p&p £5.00

KENWOOD TM701E

New compact 2M/70cm Mobile Transceiver, 25w. Full Duplex capability with *FREE* Dual Band Antenna.

£475.00 p&p £5.00

ICOM IC-3210E

2M/70cm Mobile Transceiver, 25w with Full Duplex and built in Duplexer. *FREE* Dual Band Antenna.

£499.00 p&p £5.00

ICOM IC-32E

2M/70cm Handheld Transceiver Full Duplex capability, high output power 5.5w on 2M and SW on 70cms.

SPECIAL OFFER £379.00 p&p £5.00

KENWOOD TR751E

Superb 2M Multimode Mobile or Base, 25w output with *FREE* 9 element Tonna.

£599.00 carriage £12.00

ICOM IC-290D

2M Multimode can be used either Mobile or on a PSU as a Base, 25w output. With *FREE* 9 element Tonna.

£559.00 carriage £12.00

ICOM IC-490E

70cms Multimode for Mobile or Base use, 10w output. With *FREE* 19 element Tonna.

£559.00 carriage £12.00

ICOM IC-471A

Superb 70cms Multimode Base Station, 25w output.

ONE ONLY LEFT!!!

£749.00 carriage free

ICOM IC-725

New HF Transceiver with General Coverage Receive, 100w output. USB, LSB, CW with *FREE* AM/FM Board.

£759.00 carriage £12.00

KENWOOD TS440S

HF Transceiver with General Coverage Receive, 100w output with heavy duty PA capable of 100% duty cycle Internal Auto A/U available.

£1138.00 carriage free

AUTHORISED AGENTS FOR KENWOOD, ICOM & YAESU. FULL SERVICE FACILITIES AVAILABLE

SPEND UP TO £1,200 INSTANTLY WITH A PHOTO ACOUSTICS LTD, CREDIT CHARGE CARD — APPLY FOR DETAILS
PART EXCHANGE WELCOME, ASK FOR KERRY G61ZF OR ANDY G4YOW
RETAIL SHOWROOM OPEN MONDAY-FRIDAY 9.30-5.30, SATURDAY 9.30-4.30

Goods normally despatched within 24 hours. Please allow 7 banking days for cheque clearance. Prices correct at time of going to press—E&OE

PHOTO ACOUSTICS

WSE — HAM RADIO STORE

ALINCO DJ500E Dual Bander

***2M & 70CMS**
***Full Duplex**
***Extended receive coverage**
***No Extras to Buy**

£375 + £3 carriage

The new ALINCO DJ500E has at last arrived! Covering both 2m and 70cms, it is the ideal handheld for those who demand the ultimate. Full duplex operation means telephone style crossband contacts. Receive coverage can be extended to cover 130-170MHz, 340-380MHz, 420-470MHz, and 870-900MHz. No extras to buy; price includes nicad pack, AC charger, wideband helical, carry strap and belt clip and built-in DC/DC converter for 13.8V supply. Quite a specification, and a lovely rig. Size, with standard pack and DC/DC converter, measure: 7.5" × 2.5" × 1.25" approx. Available now from stock, send for colour brochure.

AZDEN PCS-6000 2M FM + AIRBAND!

£329 + £3 carriage

This rig is unique. It provides 25 watts of FM on 144-146MHz plus full receive coverage from 108-180MHz AM/FM. 20 memories any duplex split in any memory, auto tone-burst, listen on input etc. etc. The airband section has been purpose designed for the job. Send today for colour brochure.

ALINCO DR110E (2M)

The new FM mobile transceiver from ALINCO is now in stock. 45 Watts output, completely redesigned front panel and display with extended receiver option of 130-170MHz. Main tuning dial can be used for frequency/memory change and usual memory scanning is included. Price includes all hardware, mounting bracket and up/down mic. Also tone squelch option available.

£299 + £3 carriage

ALINCO ALD-24E Dual Bander

If you thought that dual band rigs were expensive, then look again at this one. It gives true duplex operation with a single antenna output. Basically 2 rigs in one box, it has a superb specification covering 2m & 70cms FM. Extended receive coverage is possible upon request. Probably the most cost effective rig on the market. Send for full details today.

£449 + £3 carriage

MIZUHO POCKET QRP TRANSCEIVERS

HF SSB/CW

£189 + £3 carriage

The new Mizuho QRP rigs are proving very popular. Ideal for holidays, hotels, caravans etc. Beautifully designed, they incorporate high quality 11MHz IF filter with 2.4kHz selectivity, VXO xtal for high stability, noise blanker, IRT; rx attenuator; CW/SSB modes; built-in microphone, speaker and Morse key; nicad charger circuit (from 12V); external key socket/mic socket; and S-meter/RF-meter. Can be powered from internal batteries or external source and the size measures: 2.5" × 1.5" × 6" approx! Output power is 2 Watts and one plug in xtal is supplied giving 25kHz coverage on 80 or 40m models and 50kHz on 20m model. There is room for one further xtal. Also available are the telescopic whips for ultra portable work. We have so far worked 10 countries on 40m using a 4ft whip!

MX-3.5	SSB/CW transceiver fitted 3.525-3.550MHz	£189.00
MX-7	SSB/CW transceiver fitted 7.075-7.100MHz	£189.00
MX-14	SSB/CW transceiver fitted 14.200-14.250MHz	£189.00
AN-Whips	Base loaded telescopic single band 20, 40 or 80m	£29.00
PM1	12v to 9.6v converter	£19.95
MS1	Speaker/microphone	£29.00
XTALS	VXO cut xtals for above rigs	£8.00

STOP PRESS: G40GW Worked W1EII & KD3DK (599!) with MX14 2 Watt 14MHz rig & Sagant Zepp.

SHORT WAVE CONFIDENTIAL FREQUENCY LIST

£7.95 + £1 p&p

This brand new publication replaces the previous edition of UK Listeners Confidential Frequency List. Completely updated as of April 1989 with many new entries, this is now the foremost guide for short wave listeners who need a realisticly priced frequency guide prepared for listeners within Europe. Smartly bound and laid out, this manual will take you quickly to the right frequency. Covers Marine, Military, Naval, Aeronautical, Press, Broadcast, Fixed etc., and includes SSB, CW, FAX, RTTY, SITOR. Entries are numerical with station details, modes, callsigns, and time schedules. Don't be left in the dark, order your copy today!

Other titles:

CGTVHF	Complete Guide to VHF/UHF Frequencies	£5.95
VHF/UHF	VHF/UHF Airband Frequency Guide 1989	£5.95
OCEANIC	HF Oceanic Airband Communications	£3.50
MORSE	The Secret of Learning Morse Code	£4.95
RTTY	Pocket Guide to RTTY & FAX Stations	£2.95
MARINE	Marine Radio Frequency Guide (HF & VHF)	£4.95
ATC	Air Traffic Control by D. Adair	£6.99

Post on above items: £1.00 (2 or more £2.00 total)

Special Offers!

Lowe HF-125 Receiver	~~£375~~	£339
Panasonic B600 Receiver	~~£499~~	£449
Sony ICF 7600DA	~~£129~~	£109
Kenwood TM 221E 2M Mobile	~~£317~~	£279
Yaesu FT 211RH 2m Mobile	~~£309~~	£269
Icom IC2E H'held	~~£235~~	£199
Yaesu FT 727/ni-cad 2m/70cms h'held	~~£471~~	£399
BNOS LPM 144/1/100 Linear	~~£235~~	£195
BNOS LPM 432/1/50	~~£255~~	£199
BNOS LPM 432/3/50	~~£255~~	£199

Large stocks of second hand equipment. Please phone/write.

PACKAGE DEALS ON HF RIGS + PSU etc.

We are able to offer a special package deal on HF transceivers plus mains power supplies that shows a significant saving on the normal retail price. We can also offer packages for matching VSWR meters, aerials etc. All items carry the full 12 months warranty and come from the official UK sources! Phone for a quote.

WATERS & STANTON

RETAIL & MAIL ORDER:- 18-20, Main Road, Hockley, Essex SS5 4QS.
Tel: (0702) 206835, 204965
RETAIL ONLY:- 12, North Street, Hornchurch, Essex RM11 1QX.
Tel: (04024) 44765
Visa and Access by telephone. 24hr. Answerphone.

ICOM

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

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

45E, 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-51, Headset.** Headset with VOX function that allows you hands-free operation.
- **Carrying Cases.**

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

- **MB-30, Mounting Bracket.** Mounts the IC-2SE in a vehicle or on a wall.
- **OPC-235, Mini DC Power Cable.** For use with a 13.8 V DC power supply.

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

COMING IN 1990. A NEW AND PRESTIGIOUS EVENT

MAKE A NOTE IN YOUR DIARY NOW

LONDON AMATEUR RADIO SHOW

★ FREE PARKING FOR 3000 CARS

★ HUGE EXHIBITION AREA

L A R S
1990
MARCH 9TH
AND
10TH

★ RESTAURANTS AND BARS

★ DISABLED FACILITIES

★ ON-SITE LEISURE AND CAMPING FACILITIES

PICKETTS LOCK CENTRE, PICKETTS LOCK LANE, EDMONTON, LONDON N9

EASY ACCESS FROM M1, M11, M25 AND NORTH CIRCULAR ROAD

Ticket prices: £1.00 (on the door) 75p (in advance)

In the Lee Valley Leisure Park

Trade enquiries and ticket sales, please contact:-
The Secretary, London Amateur Radio Show, 126 Mount Pleasant Lane,
Bricket Wood, Herts AL2 3XD. Tel. 0923 678770.

Presented in conjunction with SOUTHGATE AMATEUR RADIO CLUB

MERLIN

MERLIN WAY, BOWERHILL,
MELKSHAM, WILTSHIRE SN12 6TJ.
Tel: 0225 706886. Fax: 0225 708594

SYSTEMS

WIZARDS PACKS

THIS MONTH'S WIZARDRY
Storno Mobile Radio Telephone
Type 662
420-470 MHz
25KHz Cannel Spacing
±5 KHz Deviation
Max Bandwidth 1000 KHz
RF Output Power 6 watts
Mod FM
Sensitivity 0.4UV at 20dB S/W
12 Volt or 24V Input DC with Control Gear and Data
OK for 70 cm.
Price £30.00 + £5.00 P&P

EX GOVERNMENT
Watches GS 1980/82 issue
With GS strap
Price £36.00 + £2.00 P&P

Watches Air Crew
Lemonia 1964/68 issue
With GS strap
Price £110.00 + £2.00 P&P

Watches Stop
All Swiss
Price £6.00 + £2.00 P&P

LINEAR AMPLIFIER BUILDERS
8 off 220uf 400v Electrolytics with mounting clips
Price £15.00 post paid

BENCH POWER SUPPLIES
OUTPUT 5 volts at 2 amp with over volt protection
+12 volts and −12 volts at 400ma
This is a linear PSU Merlin Cased with Terminals
Price £15.30 + £2.60 P&P

Storno Mobile Radio Telephone
Type 634
68-88 MHz
12.5 KHz Cannel Spacing
±2.5 KHz Deviation
Max Bandwidth 1000 KHz
RF Output Power 10 watts
Mod FM
Sensitivity 0.7UV
12 Volt or 24V Input DC with Control Gear and Data
OK for 4 mt.
Price £30.00 + £5.00 P&P

THE WIZARD POWER CUBE
Specification
1 20 Amp Hour Dryfit Battery
2 Inbuilt Mains Charger
3 RF Filtered
4 Solar Cell Input (Cells optional)
5 Compact Size/Portable
6 Merlin Made
Price £76.00 + P&P £8.00

Printed Circuit Permanent Magnet Motor/Generator with toothed belt reduction drive. Input/Output 2VDC to 30VDC at upto 10Amps. Price £14.00 + £3.50 P&P.

New in Controller Card for the above and others Input power + and − upto 50VDC. This will give a single 5k ohm pot variable speed forward and reverse. Price £7.50 + £2.50 P&P.

COMPRESSORS—Gast rotary air/vacuum pump 20Psi/29invac. 1/12th HP 240vac motor. Good for Desoldering/Airbrush work. Just £17.00 + £3.00 P&P

IN THE WIZARDS DEN!—We have from time to time the following new and S/H stock. Printers. Monitors mono/colour. Valve amps and PSUs. Lots of odds and ends.

MORE DATA—Ring the wizard on 0225 706886 (Day time) 0225 763027 (Home). For more information or for a visit to the works.

PAYMENT—Access, Cheque, PO and Cash Post and Packing on components £1.50, over £20.00 £1.00. Please add VAT to total. Thank you John and Adrian the Sorcerers Apprentice!

RST

RST MAIL ORDER CO.
LANGREX SUPPLIES LTD,
1 MAYO ROAD,
CROYDON,
SURREY CR0 2QP.

SPECIAL EXPRESS MAIL ORDER SERVICE

	£p								
AZ31	4.00	EL360	18.50	PL509	6.00	6AH6	5.00	6K8	3.00
CL33	6.50	EM81	2.50	PL519	6.00	6AK5	5.99	6KD6	12.00
DY86/7	1.50	EM87	2.50	PL802	6.00	6AL5	1.50	6L6G	7.50
DY802	1.50	EN91	6.50	PY33	2.50	6AM6	6.02	6L6GC	8.00
E88CC	10.33	EY51	2.75	PY81	1.50	6AN5	4.75	6L7	2.50
E180F	12.05	EY86	1.75	PY82	1.50	6AN8A	3.50	6LQ6	7.50
E810F	35.48	EY88	1.75	PY83	1.25	6AQ5	3.25	6Q7	3.75
EABC80	1.25	EY500A	3.00	PY88	2.00	6AR5	25.00	6RHH8/6KN8	10.00
EB91	1.50	EZ80	1.50	PY500A	4.00	6AS6	8.66	6SA7	3.00
EBF80	1.50	EZ81	1.50	PY800	1.50	6AS7G	8.75	6SC7	2.75
EBF89	1.50	GY501	300	PY801	1.50	6AT6	1.25	6SG7M	2.50
EC91	8.00	GZ32	4.00	QQV02-6	38.00	6AU5GT	5.00	6SJ7	3.25
ECC33	4.50	GZ33	4.75	QQV03-10	26.25	6AU6	2.50	6SK7	3.50
ECC35	4.50	GZ34	5.00	QQV03-20A	48.38	6AW8A	3.75	6SL7GT	3.00
ECC81	1.75	GZ37	4.75	QQV06-40A	46.00	6B7	3.25	6SN7GT	3.00
ECC82	1.75	KT61	5.00	QV03-12	6.80	6B8	3.25	6SS7	2.75
ECC83 Siemens	2.25	KT66	15.00	R18	3.00	6BA6	1.50	6U8A	2.25
ECC85	1.75	KT77 Gold Lion		R19	9.24	6BA7	5.00	6V6GT	4.25
ECC88	3.50		12.00	SP41	6.00	6BE6	1.50	6X4	3.00
ECC91	8.93	KT88	15.00	SP61	4.00	6BH6	2.50	6X5GT	1.75
ECF80	1.50	N78	15.00	U19	13.75	6BJ6	2.25	12AX7	1.75
ECH35	3.00	OA2	3.25	U25	2.50	6BN6	2.00	12BA6	2.50
ECH42	3.50	OB2	4.35	U26	2.50	6BQ7A	3.50	12BE6	2.50
ECH81	3.00	OC3	2.50	U37	12.00	6BR7	6.00	12BY7A	3.00
ECL80	1.50	OD3	2.50	UABC80	1.25	6BR8A	3.50	12E1	20.00
ECL82	1.50	PC86	2.50	UBF89	1.50	6BS7	6.00	12HG7	4.50
ECL83	3.00	PC88	2.50	UCH42	4.00	6BW6	6.00	30FL1/2	1.38
ECL86	1.75	PC92	1.75	UCH81	2.50	6BW7	1.50	30P4	2.50
EF37A	5.00	PC97	1.75	UCL82	1.75	6BZ6	2.75	30P19	2.50
EF39	2.75	PC900	1.75	UCL83	2.75	6C4	1.25	30PL13	1.80
EF41	3.50	PCF80	2.00	UF89	2.00	6C6	3.50	30PL14	1.80
EF42	4.50	PCF82	1.50	UL41	10.00	6CB6A	2.50	572B	65.00
EF50	2.50	PCF86	2.50	UL84	1.75	6CD6GA	5.00	805	45.00
EF54	5.00	PCF801	2.50	UY41	4.00	6CL6	3.75	807	3.75
EF55	3.50	PCF802	2.50	UY85	2.25	6CH6	13.00	811A	18.33
EF80	1.75	PCF805	1.70	VR105/30	2.50	6CW4	8.00	812A	52.50
EF86	5.00	PCF808	1.70	VR150/30	2.50	6D6	3.50	813	65.00
EF91	2.95	PCH200	3.00	Z759	25.00	6DQ5	7.50	866A	35.00
EF92	6.37	PCL82	2.00	Z803U	25.00	6DQ6B	4.75	872A	20.00
EF183	2.00	PCL83	3.00	2D21	3.25	6EA8	3.00	931A	18.50
EF184	2.00	PCL84	2.00	3B28	50.00	6EH5	1.85	2050	7.50
EH90	1.75	PCL85	2.50	4CX250B	58.00	6F6	3.00	5763	6.80
EL32	2.50	PCL86	2.50	5R4GY	5.50	6GK6	3.50	5814A	4.00
EL33	5.00	PCL805	2.50	5U4G	3.00	6H6	3.00	5842	12.00
EL34 Mullard	10.00	PD500	6.00	5V4G	2.50	6HS6	3.77	6080	14.00
EL34 Siemens	4.50	PFL200	2.50	5Y3GT	2.50	6J5	4.50	6146A	12.00
EL36	2.50	PL36	2.50	5Z3	4.00	6J6	8.93	6146B	12.00
ELL80	25.00	PL81	1.75	5Z4GT	2.50	6J7	4.75	6550	12.50
EL81	5.25	PL82	1.50	6/30L2	1.75	6JB6A	7.50	6883B	12.50
EL84	2.25	PL83	2.50	6AB7	3.00	6JE6C	7.50	6973	7.50
EL86	2.75	PL84	2.00	6K7	3.00	6JS6C	9.00	7025	4.50
EL91	7.39	PL504	2.50			6K6GT	2.75	7027A	11.00
EL95	2.00	PL508	5.50					7586	15.00
								7587	23.00
								7868	8.50

Tel. 01-684 1166 **Fax: 01-684 3056**

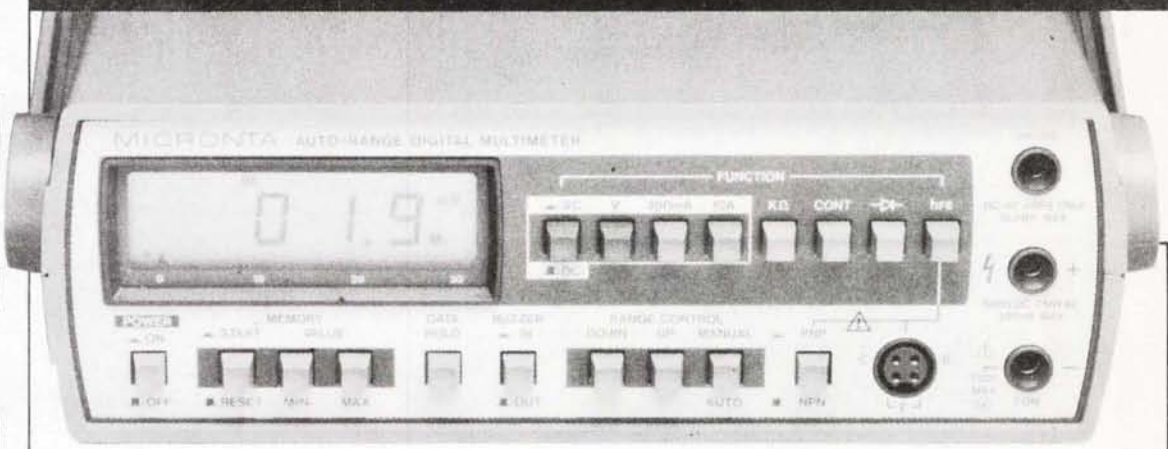
Open daily to callers: Mon-Fri 9 a.m.-4p.m.
Valves, Tubes and Transistors – Closed Saturday
Terms C.W.O. only, allow 7 days for delivery.

Prices excluding VAT add 15% Quotations for any types not listed S.A.E. **Post and packing £1.00 per order + VAT** **Telex 946708**

Prices correct when going to press

MICRONTA®

MULTIMETERS FROM TANDY®



BENCHTOP DIGITAL LCD MULTIMETER £79.95

- Measures AC/DC Volts, Current And Resistance
- Manual Or Autoranging Facility

22-195

POCKET AUTORANGING MULTIMETER £19.95

- Measures To 400V AC/DC
- Includes Mini Probes And Folding Case

22-171

PROBE-STYLE MULTIMETER £29.95

22-165

- Fully Automatic Range And Polarity

Tandy®

For The Best In High Quality Electronics

Over 400 Tandy Stores And Dealerships Nationwide. See Yellow Pages For Address Of Store Nearest You.

InterTAN U.K. Ltd., Tandy Centre, Leamore Lane, Walsall, West Midlands. WS2 7PS Tel: 0922 710000

ALTRON

COMMUNICATION EQUIPMENT

ALWAYS CHOSEN BY PROFESSIONALS AND DISCERNING RADIO AMATEURS.

COMPACT LATTICE TOWERS
SLIMLINE TUBULAR MASTS

Telescopic—Tiltover, Fixed—Mobile from 3M to 60M. Over 50 Models, suitable for a wide range of civil and military applications such as:

- Radio Communications
- Amateur Radio
- CCTV and Surveillance
- Meteorological Monitoring
- Aero & Marine Nav Aids
- Flood Lighting etc.

Purpose designed using 4·5m and 3m section modules for low retracted heights and cost effective shipping. Engineered to B.S.I. standards and hot dip galvanised to BS729 for protection. Wind loads are based on BS CP3 CHAP V PT 2 1972 for wind speeds up to 100mph/160kph. (BS8100).

ANTENNAS

AQ6-20 "SPACE SAVER" THE COMPACT 4 BANDER THAT IS DIFFERENT. 2, 3 OR 4 ELEMENTS 6, 10, 15 AND 20M.
Unique Fully Sealed Coils. Hi'Q'—Close Coupled capacity hat loaded Yagi with optimized performance. Ideal for small spaces. Send for full Spec. sheet. NOW!

QUALITY
RELIABILITY
KNOW HOW

WE DESIGN—WE MAKE—WE SELL—DIRECT.
At manufacturers prices—you get best value.
European Distributor
Classic International
Roermond (NL) 04750-27390
SEND S.A.E. FOR FURTHER DETAILS AND PRICES OF ALTRON PRODUCTS.

H.P. TERMS

ALLWELD ENGINEERING
Factory 6, 232 Selsdon Road,
South Croydon, Surrey, CR2 6PL.
Tel: 01-680 2995 (24 hr) 01-681 6734

TX-3 RTTY/CW/ASCII TRANSCEIVE

The high performance, low cost system

Split-screen, type-ahead operation. Unbeatable features. Needs TIF1 interface or T.U. **BBC, CBM64** tape £20, disc £22. **SPECTRUM** tape £35, +3 disc £37 inc. adapter board (needs TIF1 or TU also).

RX-8 for the BBC computer

Receives screen and printer **FAX** charts & photos, HF and VHF **PACKET**, Colour **SSTV, RTTY, AMTOR, CW, ASCII, UoSAT** 1 & 2.
Receive them all with every possible feature, superb performance and ease of use. Full printer and disc support. The best receive system ever. £259. **FREE** Klingenfuss Utility Guide for 1st 50 purchasers, **DISCOUNT** for RX-4 users. More details in June issue or send for full information.

RX-4 RTTY/CW/SSTV/ AMTOR RECEIVE

Performance, features and ease of use make this still a best-seller. Text and picture store, disc and printer support. Needs TIF1 interface. **BBC, CBM64** tape £25, disc £27. **VIC20** tape £25. **SPECTRUM** tape £40, +3 disc £42 inc. adapter board (needs TIF1 also) or software-only version £25.
TIF1 INTERFACE Optimum HF and VHF performance with our software. 4-pole filtering and computer noise isolation for excellent reception. MIC, PTT & KEY TX outputs. Kit £20, ready-made, boxed with all connections £40. Available only with TX-3 or RX-4 software.
Also **MORSE TUTOR** £6, **LOGBOOK** £8, **RAE MATHS** £9 for **BBC, CBM64, VIC20, SPECTRUM. BBC LOCATOR** with UK, Europe, World maps £10. All available on disc £2 extra.

technical software

Fron, Upper Llandwrog, Caernarfon LL54 7RF
Tel: 0286 881886

POWER UNIT Part of Army C.50 equip SUR.50 provides DC plate supplies at 1450v at 550 Ma, trans Pria 200/250v sec 1720v at 550 Ma into F.W Sil Bridge Rect DC O/P into Swinging Choke, these units req ext smoothing cap 4/8 Uf contained in Mil Patt transit case size 20×15×10" ext £85 we also have a few SUR.49 these have Med HT, Bias & Heater supplies at £25 with SUR.50 **MONITOR CRT** part of Army D.11 Tx provides checks over range tunable 2/22Megs in 5 bands as 2½" CRT, Yamp, Int T.B sync etc also contains 2× AF Osc with O/Ps at 1015 & 1605 c/s to enable two tone checks to be made on SSB Tx & Linear Amp units will also Mon AM reqs ext power supplied with circ & P.U. mods. £34.50 suitable mains trans for conv. £7.50 **MARCONI SSB ADAP** part of Army R234 Rx reqs 100Kc IF input as 3 filters U & L sideband 2·65Kc & Carrier recovery, provides low level AF out, use some 22 min valves 19" panel unit, as monitor meter etc. These units req ext power & 100Kc BFO I/P supplied with circ & tech description. £33 **EDDYS RXs**, type 730/4 Gen cov HF 500Kc to 30 Megs in 5 bands, BFO, S Meter, etc O/P for ph or Spk tested with circ. £135 also few only 770R VHF 19/165 Megs AM/FM at £145 **RECORD TAPE** Audio ¼" on 7" spools 1800ft at present recorded with morse traning lessons but not been issued. £11.50 for 4 spools (12 tapes appear to make one set) **AMP & SPEAKER UNITS** Army Gunsight P.A. amp & spk systems comprises Amp Transis for use on 24v DC will operate up to 4 spks over 100v lines, speaker unit 11" dia 15 ohm Re Entrant mounted in frams ass with local vol control, we have no tech info on these units est about 40 watts, we have limited no of accs i.e H/Sets, Cables etc. £95 for Amp & 2 Spk units.
SIG GENS Marconi TF995/A2 AM/FM 1·5 to 220 Megs in 5 bands int 1Kc Mod & Var Deviation, fine & coarse O/P atten, Carr/Mod meter size 17×12×9" for 240v supplied tested with book. £115 **AERIAL MAST**, Army No. 1 telescopic 27ft extended 5ft closed 6 section manual operation about 15Kg £38 Guy Kit if req £6. R.F. **PREA AMP UNITS** part of special Microwave Rx equip covers 2/11Gz in 3 bands as TWT Amp followed by crystal video Rx one TWT for each band with tuned cavities with 4 O/Ps per band, contained in A/C patt case, as int power supplies req 115v 400c/s. £95 **OPTICAL ACCS** Selection of items Inc. Eyepiece, Lense Cell, lenses, mirrors, prisms etc approx 10/12 items mostly new. £23. **X RAY SOURCE PORTABLE** Testing 40/140Kv at 0·5 Ma two part unit for 230/250v P.O.A.

Above prices include Carr/Postage & VAT. *Goods ex equipment unless stated new.*

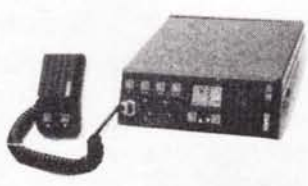
SAE with enquiry or 2 ×19p stamps for List 43/2.

A.H. SUPPLIES

Unit 12, Bankside Works, Darnall Rd, Sheffield S9 5HA. Ph. 444278 (0742)

NAVICO®

AMR1000
AMR1000S



FROM £234·89

Thames Marionics Ltd

244 Furtherwick Road, Canvey Island, Essex SS8 7BY
Telephone 0268 680930 Telefax 0268 510599

PW COMMENT

Representing Amateurs?

Here at *PW*, we have just seen a copy of a letter sent to *RadCom's* Editor by a well-known dealer with several interesting things to say about the "so-called" cartel and "grey" importing.
This controversial letter, doubtless left the Editor with a problem. Should he "publish and be damned" and risk annoying some of his advertisers, or should he not print the letter. A tough decision as the RSGB (and afterall, *RadCom* is the Society's official organ) exists to represent the best interests of all its members as well as all radio amateurs in the UK.
In order to get around this problem, *RadCom's* Editor canvassed several advertisers for their opinions, with a view to publishing the letter in July's *RadCom*, together with their responses. Now, it seems, the letter has been deemed to be "not suitable for publication in *RadCom*". Presumably the Editor has been advised against pursuing this interesting topic. That's a shame. The membership would, no doubt, have been interested in the findings - as would we. *RadCom's* Editor admits to the dealer concerned, that the original letter and any replies couldn't provide his readers with a clear, factual picture and he hasn't the resources to investigate the matter further. Perhaps some day we'll hear both sides of the argument.

OUR SERVICES

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

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

SUBSCRIPTIONS
Subscriptions are available at £15.50 per annum to UK addresses, £18 to Europe, and £19 elsewhere (by Accelerated Surface Post). For further details, see the announcement on page 52 of this issue.

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

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

COMPONENTS, KITS AND PCBS
Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics,** and from **FJP Kits** (see advertisements). The **printed circuit boards** are available from our **PCB SERVICE** (see page 38 of this issue).

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

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

CONSTRUCTION RATING
Each constructional project is given a rating, to guide readers as to its complexity:
Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate
A fair degree of experience in building electronic or radio projects is assumed but only basic test equipment is needed to complete any tests and adjustments.
Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

STAR LETTER
£10 TOKEN WINNER

RAYNET Exercise

Would ALL RAYNET controllers please note that it is not necessary to position disabled RAYNET members alongside doctors, St John Ambulance or the British Red Cross. They really won't drop dead unless medical assistance is not within three nano-seconds call!

In general (but do seek Controller's Advice, later) disabled RAYNET members do not require any special "treatment": are not "wilting flowers" who must be carefully watched, and are just as capable when performing RAYNET duties as able-bodied RAYNET members.

The worst thing about this positive discrimination is that the Controllers who assign disable RAYNET members to the medical services firmly believe that they are HELPING them!

You're not.

Don't do it.

Please.

Advice to RAYNET Controllers regarding disabled members

(a) There is no physical or mental injury which precludes anyone being useful to any RAYNET group.

(b) The disabled RAYNET member will tell YOU of any limitations they may have.

(c) As a Controller, you must tell the disabled member what you expect them to do. Do not tell them of the things which you think they might be capable of.

(d) Like everyone else, disabled RAYNET members enjoy drinking tea but hate making it!

Kevin M. Fox G4MDQ
Sheffield

Bright versus dull emitters!

First, as a retired professional electronics engineer, may I say how much I enjoyed your article on re-creating the ST-300. All young engineers are not VANDALS like Douglas Byrne G3KPO said (page 13 July issue). No doubt he could make a very useful lawn mower out of a fine vintage motorcycle!

Anyway, SG215, 210HL, HL2, etc., valves were NEVER, NEVER bright emitters. Mr Wilson is a danger to surviving, two volt, 1930s valves! Please, please use a dropper resistor of about 3.3Ω to keep the poor old infirm filaments at about two volts. We old early 1930s creations need loving care! Bright emitters were 1920, or so, "R" type valves replaced by "DER" then "HL" types. "R" valves need six volts via a rheostat.

Thank you again for a lovely article.

E.J. McLeary, Glasgow G13

Robert Wilson's re-creation of the ST300 (*PW* July 1989) brought a wave of nostalgia. This was the first set I built, under guidance from my father who had previously constructed the ST100. The baseboard was "shipyard mahogany", courtesy of an uncle working on the SS *Mauretania*, while the front panel was ebonite, then being manufactured at "the bushings" for Reyrolle & Co. Later, when I built a short wave converter to plug into the detector stage, the front panel had to be lined with metal foil to reduce hand-capacity effects which made accurate tuning and the critical adjustment of the reaction control difficult. The loud speaker was an original Blue Spot.

Older readers will remember that the 120 volt h.t. battery of the day usually incorporated a nine volt grid bias supply by the simple expedient of locating the earth tapping upstream of the negative end. Recharging of the filament accumulator at the local garage became a bore for many and when our local domestic supply was upgraded from d.c. to a.c. the ultimate luxury became an "eliminator" to provide all necessary supplies from the mains.

My schoolboy interest in radio was fired by meeting, at the South Shields Marine College, an instructor who had been a fellow student in Germany with Hertz. My short wave converter for the ST300 could just get down to 16m and I have happy memories of listening to VK2LR, W2XAL and (illegally) the testing of commercial transmitters at Addis Abbaba, Bound Brook (NJ) and the h.f. set on the *Queen Mary*.

It was great fun in those days: I hope that you still have many young readers and that some of your current articles will be as long remembered as the ST300.

Maj-Gen Eric Younson
Harpenden

Packet Radio

I was pleased to see that Packet Radio Update has engendered a response from Peter G3RZP, and I thank him for both reading and criticising the contents. Constructive criticism and suggestions are warmly welcomed. To answer the points Peter made.

1: We need an exclusive sub-band so that we do not have to compete with RTTY, something that packet just cannot do, as Peter said himself. Packet, on h.f. bands, does work well on a clear frequency, hence the need.

2: 20kHz is needed because packet operation is increasing at such a rapid rate that planning is needed within 20kHz to accommodate both BBS operation for passing traffic, and for normal QSOs to take place. Forwarding traffic is increasing every day. For example, I handle approximately 10 messages a day to the USA alone. Some of the mail is from G1, G6 and G7 stations who find the system very useful.

3: 1200 baud p.s.k. techniques are being used in some places, in VK for example, but then that requires another financial commitment from the sysop, who has already got himself into trouble with the bank manager, not to mention the XYL for all the time he spends maintaining the system! However, with the increased popularity of packet I feel certain that 20kHz would be justified. Give us time Peter, we will get there!

4: Last and by no means least, we did not "move out" of the RTTY segment, we were never in it in the first place. As I said, my TNC would just not have had a chance to transmit! The Americans were the first to put packet on 14.103, the activity just "happened" there, not without some thought in the first place. After all, we hi-jacked a band segment for RTTY in the late fifties, if that's the term applicable.

Compromise will probably be the name of the game but if we get what Peter suggests, that will be very welcome. Thanks for your support Peter, I do hope you sent a letter to Martin G3ZAY, in support of the h.f. argument.

Roger J. Cooke, Norwich

Antenna Clinic

With reference to Antenna Clinic Special June *Practical Wireless*. Mr Judd suggests two formula for calculating dBW, depending on whether N is greater or less than one.

How confusing.

Simply use dBW = 10 log10 (N/1) watts

If N < 1, the minus sign appears automatically.

Incidentally, I always found this table of great help in understanding the power doubling, +3dB relationship.

Power (W)	1	2	4	8	16	32	64	128	256	512
dB	0	3	6	9	12	15	18	21	24	27

Dennis C. Browning G0KKC, Bristol

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*

As a valve radio enthusiast I read the recent article in *Practical Wireless* on re-creating the Scott-Taggart ST300 receiver with considerable interest. I was dismayed to find it contained a number of errors which should be brought to the attention of anyone contemplating building such a set. In particular I am very disturbed by the thought of would-be constructors going to perhaps considerable trouble and expense to acquire valves only to damage them by improper use suggested in the article.

The types said to have been used in the prototype (SG215, 210HL, HL2) are certainly not, as stated, "bright emitters", a class of valve which disappeared in the late 1920s and which really did have filaments that shone like small lamps; they are, of course, "dull-emitters" having filaments designed to operate from a 2V accumulator. I was appalled to read in the article the assertion that they could be run from a 3V dry battery without any harm being done to them! In the words of the great P.P. Eckersley, "Don't do it!". If they had been intended for use with a 3V dry battery they would have had filaments suitably rated. As it is, connecting a 2V valve to a 3V supply imposes a 50 per cent overload which is, of course, quite unacceptable. They will work - for a while - but the over-heating of the filaments will rapidly destroy their emission and render them useless. It seems extraordinary and incredible that the thought of using a resistor to reduce the battery voltage down to 2V does not seem to have crossed the author's mind.

There is, in fact, a code of practice for the use of radio valves, British Standard Specification No. 1106 which gives the official limiting factors. Normally 2V valves should be operated within plus or minus 7 per cent, i.e. between 1.86 and 2.14V. The maximum tolerance is plus or minus 10 per cent, i.e. between 1.8 and 2.2V, at the risk of variation in the valve characteristics.

The author of the article also overlooks the fact that if a valve rated at 2V, 0.1A were connected to a 3V supply it would consume 0.15A. Thus the drain of the three valves quoted would total 0.45A, not 0.3A. Dry batteries are in any case an uneconomical source of power for receivers using 2V valves and it is far better to use an accumulator. These are still available.

Choosing and using the right valves for a set such as the ST300 is far more than just a matter of making guesses. All triodes are not the same. Those used by the author of the article are in fact direct equivalents and are medium impedance valves designed for use as detectors or a.f. amplifiers. They are not suitable for the output stage which requires a "power" valve such as the PM2A. This type of valve has a low impedance which means it needs only a fairly low value of anode load, in this case 7000Ω, permitting direct connection to the old-fashioned moving iron loudspeakers. To match this type of valve to a modern moving coil loudspeaker a transformer of the correct ratio must be used, not just one that has been picked up at random. The same applies to the inter-valve transformer which should have a primary that will match the anode impedance of the detector and a secondary giving a reasonable step-up ratio that will drive the output stage to the correct level. That described in the article cannot fulfil these requirements properly. Proper transformers are not so dear that it is worth spoiling the performance of the set by using unsuitable substitutes. The grid bias used on an output valve must be set to suit its characteristics, which may be found in data books that are still available. Incorrect bias can damage the valve by making it draw excess anode current, which in turn reduces the battery life.

I do hope that these criticisms will be accepted in the spirit in which they are offered, which is with the desire to put readers on the right lines when carrying out what is fundamentally a worth-while and interesting project.

Chas. E. Miller.
Stafford

I found Robert Wilson's article quite fascinating. I do congratulate him, but there are two points I would like to make. First, although the turns ratio of 1:4.5 of the LT44 is perfectly satisfactory, the low impedance of its small winding, used as anode load for V2, is most unsatisfactory. The overall gain of V2 at extreme treble will be some 30 times that at extreme bass. No wonder the output sounds "thin".

By far the best alternative is a good **pre-war** (not a cheaper post war) intervalve transformer. If that is too expensive, and a change to choke coupling is not considered too big a deviation from the original, the large winding of the LT44 could be used as the anode load, the small winding being left disconnected and a 0.01μF capacitor placed between the grid of V3 and an appropriate tapping on the grid bias battery. This will give far better quality than can be obtained using the LT44 as an intervalve transformer, but less gain than can be obtained using a proper intervalve transformer.

My second point is that a power valve, such as the 220P should be used for V3 rather than a high impedance type such as the 210HL or HL2. This will result in a large increase in undistorted output. There will be an increase in consumption of 0.1A from the low tension battery, but the high tension battery consumption should remain well within the estimated figure of 15mA.

Sir Douglas Hall Kingsbridge, Devon

I was very interested indeed in R.A. Wilson's re-creating of the ST300. It certainly set the memory buzzing.

I know that "nostalgia ain't what it used to be" but it did remind me of my earlier days. As a school-boy, I began with the Mullard "Master" Three (detector and two l.f. stages) of about the same era as the ST300. I later adapted this receiver to use the "Lucerne" Coil as specified in *Amateur Wireless*. Then I pro-gressed to a screen grid stage receiver and later on to short wave sets of various home-brew designs. What fun we had in those days with a couple of valves and a few other components!

Colin Dawson G4UZS
Portsmouth

I have read the interesting ST300 article, the constructor has gone to a great deal of trouble to make it appear authentic - very good.

However, I feel I should comment on the misuse of the term "bright emitter". Bright emitter filaments were used in such valves as the "R" type (pure tungsten) and the filament temperature was similar to that of the early metal filament vacuum lamp.

By 1925 or there abouts, the "dull emitter" types appeared. The first in this country was the DER, an outcome of earlier types LT1, LT2, LT3 and, of course, the famous LS5. The first screened-grid type was the S625, the double ended type, soon followed by the S215 and SG215. The triodes

Write on

mentioned in the article, 210HL and HL2, both had 2V 100mA filaments and were oxide coated filaments - a lower temperature one than the thoriated tungsten types such as the DER and DE5, for example.

In position V3, a better choice would have been a P215, or similar, so called power valve which would have been used originally.

G.R. Jessop G6JP
RSGB Historian

With reference to the recent article on the ST300. It may be of interest to readers to learn that we have other Scott Taggart items in stock. Also, we can supply about 90 per cent of the original vintage parts. For instance, a set of very good, used, vintage valves is available at a cost of £20 including P&P and VAT. An s.a.e. will bring all the details.

The Vintage Wireless Co. Ltd.,
Tudor House,
Cossham Street,
Mangotsfield,
Bristol BS17 3EN.

Congratulations on taking us all back to the days when hearing voices from afar was still magical and every young man was busy building a wireless set.

I hope I won't be running contrary to the spirit of the enterprise if I raise one or two points.

Unlike high tension, low tension (the valve filament supply) was never open to negotiation. If the manufacturers specified two volts, then two volts it had to be, with a recommended error of no more than 10 per cent. Supplying three volts will shorten the life of the valves, but it is only necessary to include a dropper resistor in each positive filament lead to put matters right. You'll find 10Ω is correct for each of the two triodes, which run 0.1A filament current; and 6.8Ω is required to drop the 0.15A current of the SG215 to two volts.

Incidentally, I doubt if any of these valves are correctly described as a "bright emitter". I think that bright emitters were a few years earlier. Now for the "intervalve transformer". The Eagle LT44 is designed to match an impedance of 20kΩ to 1kΩ. This means that the turns ratio is the square root of 20, that is, 4.5:1.

The ratios of the original articles of yesteryear were stated as turns ratio, and were, as Mr Wilson observes, between 1:2 and 1:6. Thus the LT44, used in reverse of course, is actually nicely within the range.

John S. Grice, Tyne & Wear

Newsdesk...*Compiled by G4LFM*

The Ultimate Morse Keyer?

The MM-3 from AEA has 2-99w.p.m. speed selection and approximately 8400 characters of storage, divided into 20 memories. The memories are "soft-partitioned" so that stored messages can be as long or as short as you like. Memory can be expanded to 36,000 characters. All memory is backed-up by an internal Lithium battery so that once a message is loaded, it will remain until overwritten.

There are three main ways to improve your Morse with the MM-3. It can be a proficiency trainer, a random word generator or a QSO simulator. It is a complete contest keyer with automatic serial number insertion and incrementing in any memory message. It also has an RS232 port so that it can be interfaced to a computer.

The MM-3 costs £189.95 from:

ICS Electronics Ltd.,
Unit V,
Rudford Industrial Estate,
Ford, Arundel,
West Sussex BN18 0BD.
Tel: (0903) 731101.

Star Generator

The SG4160B is a compact portable r.f. signal generator available from Alpha Electronics. A wide frequency range from 100kHz to 150MHz can be both internally and externally modulated.

The six frequency ranges of this stable, solid-state, generator are clearly marked on a large dial and go from 100 to 320kHz, 300 to 1100kHz, 1 to 3.3MHz, 10 to 35MHz and 32 to 150MHz. Accuracy is ± 3 per cent with frequencies up to 450MHz available on the third harmonic. Crystal oscillator facilities allow crystals from 1 to 15MHz of the HC-6U holder type to be plugged into the front panel. Output is controlled via a high/low attenuator and fine level control. Internal amplitude modulation is at 1kHz which is also available as an audio output. External modulating frequencies are from 50Hz to 20kHz.

The SG4160B is available from £79 excluding VAT from:

Alpha Electronics Ltd., Unit 5, Linstock Trading Estate, Wigan Road, Atherton, Manchester M29 0QA.
Tel: (0942) 873434.

The ATV Compendium

The British Amateur Television Club have produced their latest handbook, called *The ATV Compendium*. It's available from ***BATC publications, 14 Lilac Avenue, Leicester LE5 1FN***, priced £3.50. It is divided into three sections, video circuits, special projects and r.f. projects.

There aren't any 430MHz band projects included in this book as the author found more than enough information on other topics. He decided that, "with the pressure being placed on 70cm these days, from inside the amateur world as well as outside, perhaps the time has come for us to place the emphasis on the higher bands."

Membership of BATC is £6.00 per year and prospective members should apply to: ***The Membership Secretary, BATC, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD.***

Prefix Updates

In the April 1989 issue of *PW* we published a *World Map and Prefix List*. We have received an update to the list from Peter Strauss ZS6ET in South Africa.

The Kingdom of Swaziland has had a change recently, formerly 3D6 it's now 3DA0.

The callsign for Marion Island has been changed from ZS2MI to ZS8MI. Also, the callsign for the South African Antarctica base ZS1ANT has been changed to ZS7ANT.

Newsdesk...*Compiled by G4LFM*

On Air Again

Sixty years ago, on 30 September 1929, the first regular television broadcasts in this country commenced from the Baird studios on Long Acre, London and were transmitted from the BBC station 2LO on 361m. Up to that time, only experimental programmes were available from the world's first television station operated by the Baird Company using their callsign 2TV which was issued to them in August 1929.

To commemorate the occasion, members of the Baird Museum Amateur Radio Society will operate G2TV throughout the day on September 30 using 3.5 and 7MHz. The BBC Ariel Radio Group are intending to give G2LO an airing on the same day. It will be the first time since 1929 that these historic callsigns have been heard on the air together.

G2TV will have two of the original operators to run the station, Ben Clapp ex G2KZ and Ray Herbert G2KU.

World of Wireless

The World of Wireless and Communication is a collection of vintage wireless and associated equipment housed at ***The Mill, Hornsea, North Humberside HU18 1DZ.*** Viewing is by appointment (0964) 533331.

There are examples of domestic wireless sets from the early days, components, amateur equipment, military equipment, the history of broadcasting and archive 78r.p.m. records.

QRP Convention

The Yeovil Amateur Radio Club will be holding its 6th QRP Convention on 13 May 1990. You can get all the necessary detals from:
G1MNM, QTHR.

BARTG Changes

Two of BARTG's mainstays, Pat and John Beedie, have decided to retire from the BARTG committee. They do that with the sincerest thanks form BARTG. The new volunteers will take over from **November 4** - the date of the AGM.

The new membership secretary is: Ann Reynolds G6ZTF, 169 Bell Green Road, Coventry, Warwickshire CV6 7GW.

Components and software sales will now be handled by Ted Hatch G3ISD, 147 Borden Lane, Sittingbourne, Kent ME10 1BY.

BARTG booklets, including the growing and popular Beginners Guides will be handled by Peter Adams G6LZB, 464 Whippendale Road, Watford, Herts WD1 7PT.

Can You Help?

Omer Baras is restoring a transceiver, the FDK Multi II. He would like any information on this rig as well as information on the manufacturer and importer. ***Omer Baras, Rue Samain 2, B-7131 Waudrez, Belgium.***

Mr H. Tarrant has a modified RX1155 and a Codar PR30 which he hopes to get up to scratch. Are there other retired people with "antique" equipment wanting to correspond with each other, he wonders? ***Mr H. Tarrant, 46 Melrose Avenue, Fulwood, Preston PR2 4DE.***

Noel Carmody is in the Republic of Ireland and wonders if there are other Irish s.w.l.s interested in getting in touch. ***Noel Carmody, Caherhennessy, Ballingarry, Co Limerick, Eire. Tel: 069-68297.***

Stephen Nicholls would dearly like to be able to use his computer (an Amstrad PCW8256) for a log, or to retrieve data while working on the air. But, the QRM is too great, especially on 50MHz. Has anyone else experienced this and found a solution? Apparently, the QRM disappears when the antenna is disconnected so it's not mains-borne. ***Stephen Nichols, Tor Haven Hotel, King Street, Brixham, South Devon TQ5 9TH.***

Rallies

August 13**: Hamfest '89 will be held at the Flight Refuelling Sports Ground, Wimborne, Dorset. Gates open at 10am and there's free car parking as well as overnight camping facilities. The day will feature radio and electronics trade stands, field displays and a craft and gift fair. More details from: ***Rob G6DUN. Tel: (0202) 479038.

August 13: The annual Derby Radio Rally will again be held in the Lower Bemrose School, St Albans Road, Derby. All the usual attractions will be there including their Monster Junk Sale. More details from ***Martin G3SZJ. Tel: (0322) 556875.***

August 20: The West Manchester Radio Club's Red Rose Summer Rally will be held in the Sports & Leisure Centre, Silverwell Street, Bolton. Admission 50p (children free) with free cash draw on the programme. All the usual traders, Bring & Buy, snacks and meals available all day. More details from: ***D.R. Camac on (0204) 24104.***

August 27: The Galashiels & District ARS are holding their open day at the Focus Centre, Livingstone Place, Galashiels at 11am. There will be trade stands, a B&B and all the usual activities. Light refreshments will be available. Talk-in will be on S22. For more details, contact: ***John Campbell GM0AMB. Tel: (0835) 22686.***

August 27: The BARTG rally will be held at Sandown Park Racecourse, Esher, Surrey. Talk-in on S22 and SU22 by GB4ATG. Admission is £1 for adults and 50p for children and OAPs (babies are admitted free). Doors open at 1030 and close at 1700. Details from: ***Peter Nicol G8VXY. Tel: 021-453 2676.***

August 28: The Huntingdonshire ARS are holding a junk sale at The Medway Centre, Coneygeare Road, Huntingdon. Doors open from 10.30am to 5pm. Food and drink will be available all day and you can rent a table to get rid of all your junk for £5. The contacts for the day are: ***G1YVS on (0487) 830212 or G8LRS on (0480) 56772.***

September 3: The Preston ARS 22nd Annual Mobile Rally will be held at Lancaster University, as in previous years. It will be in the Great Hall, Nuffield Theatre, Minor Hall and A35 (for the Bring & Buy). The licensed bar and snack bar will be located in the Great Hall foyer. A separate restaurant will be available at lunch time too. Contact: ***Godfrey Lancefield on (0772) 53810.***

September 3**: The Telford Amateur Radio Rally will be held in the Telford Exhibition Centre, Telford Centre, Shropshire. Doors open at 11am, 10.30am for the disabled. Usual facilities and attractions, plus specialist group stands. Catering & bar, talk-in via GB4TRG on S22. Contact ***Martyn G3UKV (0952) 255416.

September 10: The 6th National Amateur Radio Car Boot Sale will be held at the Shuttleworth Collection, Old Warden Aerodrome, near Biggleswade. Trading starts at 10am. Fly-in is available and permission can be obtained on Northill 288. Further details on the boot sale can be obtained from: ***Tony Kelsey-Stead. Tel: (0582) 508259.***

September 10: The Vange ARS Mobile Rally and Electronics Fair will be held at Nicholas School, Nicholas Road, Basildon, Essex. The rally is open from 10am to 5pm and the entrance fee is 50p, with a free raffle being held at the door. There is free parking and refreshments available as well as a Bring & Buy and raffle. Further details are available from: ***G4NVT. Tel: (0268) 43025 or Mrs D. Thompson. Tel: (0268) 552606.***

September 16**: The 1989 Scottish National Radio Amateurs Convention will be held at the Fife Institute of Physical & Recreational Education, Glenrothes, Fife. Doors open at 10am. Features include amateur traders, RSGB bookstall, special interest groups, lectures, Morse tests, refreshments & bar, talk-in station as well as Bring & Buy. Further details from: ***John Hardwick GM4ALA. Tel: (0592) 742763.

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

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

Newsdesk

Catalogues

STC Mercator have a new 284-page catalogue. Fourteen sections cover capacitors, resistors, inductors, EMI filters, resonates, etc., to mention just a few. Copies are available free of charge from: ***STC Mercator. Tel: (0493) 844911.***

Electromail have their July to October catalogue available, although you'll need a reinforced bench to put it on - it weighs over 1.8kg! There are 1239 pages of components, etc., plus the index and stock number check lists. Each copy will cost you £4.95 from ***Electromail, PO Box 33, Corby, Northants NN17 9EL.***

Newsheet No. 133 is available from The Vintage Wireless Company Ltd. The subscription rate for these newsheets is £5 for 12 issues (£6 overseas including Eire). Each issues contains much more than just product information. ***The Vintage Wireless Company Ltd., Tudor House, Cossham Street, Mangostfield, Bristol BS17 3EN.***

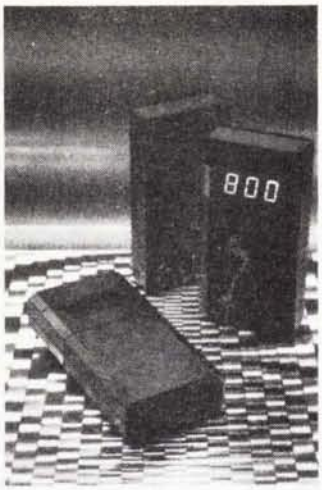
The Cirkit Summer 1989 catalogue contains details of all their products as well as a competition and £10 worth of discount vouchers. The catalogue is priced at £1.50. More from ***Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ.***

Aerial Techniques will send you a copy of their latest catalogue for 75p. The 29-page, A5, booklet represents their largest catalogue to date. They also have a customer consultancy service available. ***Aerial Techniques, 11 Kent Road, Parkstone, Poole. Tel: (0202) 738232.***

Inmac's 79th catalogue is now out (the July edition). It contains details of all their computer supplies, accessories, furniture and data communications. Catalogues are fee, call (0344) 860606 and you'll be put on the mailing list. ***Inmac (UK) Ltd., 16 Silver Road, London W12 7SG.***

The 1989/1990 edition of the *STC Multicomponent Catalogue* has recently been launched. The 136-page publication covers a range of semiconductor products from Hitachi, Mitsubishi, NEC, Philips and Toshiba. Over 15 sections cover DRAMs, SRAM, EPROMs, bipolar and logic devices, microprocessors, linear and interface circuits, diodes, transistors, m.o.s.f.e.t.s, triacs/thyristors, opto-electronics and l.c.d./drivers. You can call ***(0279) 442971*** for a free copy.

Instrument Cases



Two new cases for hand-held instruments incorporating a digital display have been launched by Bopla Ltd.

Called the BOS 500 and the BOS 800, the cases are moulded in black or RAL 7033 light grey and are sized 120 x 60 x 25mm and 196 x 100 x 40mm respectively.

The BOS 500 is designed for pocket-sized equipment such as pagers and annunciators, whereas the larger cases are suitable for mobile data recorders and many other digital measurement and control devices.

Three versions of both cases are available: one model has a full width, wrap-around window, another model has a recessed window (both have a shallow recess suitable for a membrane keypad), the third type is without a window or recesss.

An integral 9V PP3 battery compartment is standard with the BOS 500 and a compartment for four AA size batteries is optional with the BOS 800.

Bopla Ltd., 29 Faraday Road, Aylesbury, Bucks HP19 3RY. Tel: (0296) 399339

FT-101 Mods

If you own an FT-101 from the Mkl to the FT-101E (this doesn't apply to the Z or ZD) then Holdings Amateur Electronics have a mod available that gives your rig the new WARC bands. The modification kit costs £19.50 and comes complete with full instructions. Alignment is not usually needed.

Holdings Amateur Electronics, 45 Johnston Street, Blackburn BB2 1EF. Tel: (0254) 59595.

Restrictions

The DTI have announced changes to the Amateur Radio Licence (A), allowing additional types of transmission and higher powers on the 18 and 24MHz bands.

The WARC 1979 agreed that the 18.068 to 18.168MHz and 24.890 to 24.990MHz bands should be transferred to the amateur service on a primary basis. In order to protect existing users, while replacement frequencies were being found, these bands were made available to Class A amateurs on a restricted basis, with limitation on type of transmission, maximum power and antenna characteristics, subject to causing no interference to other services.

Arrangements have now been completed for the transfer of these other services. As from July 1, Class A radio amateurs may use these bands with all the permitted types of transmission (Morse, telephony, RTTY, Data, FAX and SSTV) subject only to the usual maximum power limitations applying to the amateur high frequency bands (20dBW carrier or 26dBW p.e.p.).

Filtered Four-Way

Filterline is a filtered four-way mains socket, providing protection to sensitive electronic equipment.

It removes unwanted high frequency noise from the mains, conforming to BS613, and protects equipment from the damaging effects caused by other electrical equipment on the same mains circuit.

Operating up to 13A and 240V, the series r.f.i. filter range is rated at 50dB at 1MHz. The sockets, complying with BS1363, are fitted with a neon mains indicator and supplied either with or without a two-metre cable and plug.

Briticent International Ltd., Crow Arch Lane, Ringwod, Hampshire BH24 1NZ. Tel: (0425) 474617.

A London Show

On 9 and 10 March 1990 there will be an amateur radio show at Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9, which is part of the Lee Valley Leisure Park complex.

There will be facilities for the disabled, restaurants and bars on site as well as free car parking for 3000 cars. If you're travelling a long distance to the show there is on-site leisure and camping facilties.

The tickets will cost £1 on the door or 75p for advance bookings of 10 or more. All enquiries should be sent to:

The Secretary, London Amateur Radio Show, 126 Mount Pleasant Lane, Bricket Wood, Herts AL2 3XD.

Reward!

In the Midlands there is someone making the lives of other amateurs a misery. Calling themselves "The Squeaker" they are irritating many from v.h.f. through to h.f.

There is a reward, currently £210 and growing, for the positive identification of this person. Any help in either tracking them down or adding to the reward would be welcome.

If you send details to the *PW* offices, marked "Squeaker" we will forward it on to the group trying to combat this type of operating.

RSGB HF Convention

The RSGB HF Convention is a one-day convention with a lecture programme included. It will be held on Sunday October 1 at the Belfry Hotel, Milton Common, Oxford. The doors open at 9.30am and the entrance fee is £3.50.

The lecture programme looks like:

1030-1130: HF Yagis by John Devoldere ON4UN, the well-known l.f. operator and author of LF DXing.

1145-1245: Are our rigs good enough? by Peter Chadwick G3RZP.

1330-1415: Trophy presentation by RSGB President Julian Ganaway G3YGF.

1415-1515 HF Q&A Forum to members of RSGB Committees. Chaired by John Forward G3HTA of the Western and Chiltern DX Clubs.

1530-1600: Young Amateur of the Year Presentation. A special ceremony at which the DTI will announce the 1989 winner.

1600-1800: DX slideshows including - Marquesas and Austral Islands by F6EXV; Cocos Keeling DXpedition by Steve Telenius-Lowe G4JVG; XF4L Revilla Gigedo expedition (OH2BH invited); 3D2CR Conway Reef expedition (DK9KX invited).

Light lunches and snacks will be available at the hotel. Tickets should be purchased from reception on arrival.

Other attractions include RSGB Bookstall, WAB Stand, G-QRP Club, RNARS QRQ Tests and more.

Further information is available from the RSGB or from ***Don Field G3XTT, QTHR, Tel: (0734) 724192.***

College Courses

Stockport: Reddish Vale Evening Centre, Reddish Vale Road, Stockport. An RAE course of 25 sessions will run on Monday evenings between 7 and 9pm. You can sit the December exam if you wish to obtain the licence quickly though. A Morse code course for all levels of ability to about 17w.p.m. will be run on Thursday evenings from 7 to 9pm. Enrolment for both courses will take place on September 18,19 and 20 between 7pm and 9pm. Further details from the course tutor, Dave Wood, on 061-480 9157.

Newcastle-upon-Tyne: Gosforth Adult Education Centre (3km north of Newcastle, next to Gosforth Metro Station). Classes start Tuesday September 19 and will run for three terms (right up to the exam). Enrolment is September 9, 10 and 11, 12 noon to 9pm. Course tutor Mike Stott G8BGU.

Coventry: Henley College, Henley Road, Bell Green, Coventry. RAE Course for the May 1990 exam starts September. You'll have to contact the college for the day and time.

Northampton: Duston Upper School, Berrywood Road, Duston, Northampton. The course starts September 19. More details from the Community Office at the school.

Leicester: Charles Keene College, Painter Street, Belgrave, Leicester. A short evening course of 10 meetings on Thursdays, starting September 28 at 7 to 9pm, to introduce students to the workings of their audio and television equipment.

Chingford: The Adult Further Education Centre, Simmonds Lane, Friday Hill, Chingford. Morse code course on Monday evenings at 7.30pm. Full course for beginners. For enrolment, call the tutor, Tom Langley G4PSY, on (0992) 715168.

Rugeley: Adult Education Centre, Taylor's Lane, Rugeley, Staffs. RAE classes commence at 7pm on Thursday September 14 for 22 weeks. The centre is also prepared to run a short course for those wishing to learn Morse operating if enough students are interested. Contact John Teece G4DBR on (0889) 582914.

Newark: Newark Technical College, Chauntry Park, Newark, Notts. The RAE course is from 7 to 9pm on Monday evenings. The course tutor is Alister Morrison G4YZG. For further details contact Bert Drury G1UMK at the college on (0636) 705921.

Stockport: Avondale Evening Centre, Heathbank Road, Cheadle Heath, Stockport. Morse classes will be held Monday evenings from 7 to 9pm, RAE classes on Tuesday evenings also from 7 to 9pm. Enrolment takes place during the week commencing Monday September 18. Further details from the school on 061-477 2382.

Manchester: Pendlebury High School, Cromwell Road, Swinton. RAE classes on Mondays at 7.30pm, course tutor P. Whatmough G4HYE. Morse classes on Tuesdays at 7.30pm, tutor W. Stevenson G4KKI. Both courses start mid-September. Details from the Swinton Adult Education Centre 061-794 5798.

Manchester: North Trafford College of Further Education, Talbot Road, Stretford. Tel: 061-872 3731. Lecturer, J.T. Beaumont G3NGD. Theory on Thursay evening or Wednesday morning; Morse Code on Tuesday evening or Wednesday afternoon; Amateur Television on Wednesday morning; Advanced Morse Code on Monday evening. Enrolment dates are September 6-8.

Broadstairs: Hilderstone House Adult Education Centre, St. Peters, Broadstairs, Kent. Lecturer, Dr Ken Smith G3JIX. Friday evenings 7.30 to 9.30pm commencing late September.

Winchester: Henry Beaufort School. Thursday evenings (2 hour lessons), 30-week course starts 7pm on September 21, lecturer John Wills G4AXO. For enrolment, contact Central Hants Community Education Institute, Tel: (0962) 54118.

Bristol: Brunel Technical College, Ashley Down. Tel: (0272) 41241. Lecturer Phil Brouder G3ZJH, Monday evening - Radio Amateur Theory, Tuesday evening - Morse, Thursday evening - Radio Amateur Practical.

PW REVIEW

Lake Electronics DTR 3 3.5MHz c.w. Transceiver Kit

If you would like to get involved with home construction but don't know where to start, the DTR 3, a 3.5MHz band c.w. transceiver from Lake Electronics, could well be just what you've been waiting for. Mike Richards G4WNC built the kit and describes his findings.

The DTR 3 uses the direct conversion reception technique which is ideally suited to kit construction as it is capable of very good performance yet uses a minimal number of components. One of the big attractions of the DTR 3 is that everything is included right down to smart front and rear panel stickers.

Construction

The instructions were supplied in the form of five sets of A4 sheets with each set stapled together. Altogether there were some thirty-two sheets of useful information.

For the beginner there was a separate pack of five A4 sheets giving some fairly detailed basic construction notes. This section included information on component markings as well as general hints on constructional techniques. There was also one sheet dedicated to fault finding and another covering the basics of how to operate the DTR 3 when you've finished the kit. I thought it covered the subject very well.

The main pack of instructions was twelve pages long and gave details on the construction and setting-up of each module.

The remaining packs comprised, drilling details, circuit diagrams and a full components list.

To further simplify the construction, the DTR 3 is built as a series of modules. This is a very good technique as it means that you could for example aim to complete one module per night, which is quite a realistic target. Another great advantage of this modular approach is that each module can be tested separately, thus avoiding the horrible confusion that can occur if all the testing is left until the end!

The packaging of the various modules was very good with each one contained in a separate resealable plastics bag. Items that would be used for several modules like wire and general hardware were supplied in another resealable bag.

The first module I built was the v.f.o. which was quite a good choice as it's quite a simple one. The first task was to wind the main coil, which needed thirty turns on a toroidal core. If you haven't wound a toroidal core before, I can assure you that it takes a bit of patience but you will soon get the hang of it. The wire supplied for the coil winding was, contrary to the instructions, of the self fluxing type which means that you don't have to scrape away with a pen-knife or emery cloth before you solder the connections.

One component that often causes confusion is the modern miniature r.f. chokes, as they look for all the world like resistors. Fortunately, Lake Electronics have realised this problem and this item was supplied in its own plastics bag.

The order of construction I used was to fit the coils first followed by resistors, capacitors and semiconductors. I found the v.f.o. very easy to build and it took me about an hour including checking all the resistor values with a multimeter.

Having completed the v.f.o. I tested it according to the instructions and, surprise surprise, it worked first time! At this stage in the construction it was not possible to calibrate the v.f.o. as it was not mounted in its case, but the simple functional test did at least prove that it was likely to work. Whilst testing the v.f.o. I took the opportunity to measure the quiescent current which for the review kit was 32mA when connected to a 12 volt supply.

Having had such good success with the v.f.o. I set about building the second module which was the product detector/ a.f. pre-amplifier. Again, the the first job was to wind the coils on toroidal cores which was slightly more difficult this time as one of the cores has two windings. This was further complicated as I had to search around to find out how many turns were required for one of the coils. I eventually found the answer in the components list.

One point that needed special care was the fitting of the dual gate m.o.s.f.e.t. This device was supplied in a static protected package, but there was no mention of special precautions in the instruction. If you don't have a static protection kit a temporary solution is to make up a lead with a 2.2MΩ resistor in series. This lead is then connected between earth and a conductive wrist band, a metal watch strap for example. If you wear this lead whilst handling static sensitive devices it will offer a degree of protection.

The only testing that was possible on this module was to check the d.c. voltages against those recorded on the circuit diagram. Yet again I met with success and my measured voltages were very close to those on the diagram which was reassuring. As with the v.f.o., I also measured the quiescent current which was 2.5mA with a 12 volt supply. The build time was also the same as the v.f.o. at about one hour, just right for another cup of coffee!

The next unit to build was the a.f. amplifier and side-tone oscillator which looked as if it was going to be a "doddle" as there were no coils to be wound. All seemed to go very well and it took me only half an hour to build. I powered it up and tested the a.f. amplifier by connecting a speaker and touching the input terminals whereupon I heard the expected hum. When I came to test the side-tone

oscillator, I found my first failure as I was greeted by silence instead of a nice 1kHz tone. On further investigation I found that the p.c.b. layout was rather confusing and showed the two diodes supplying the bases of the transistors to be reversed. Fortunately, this didn't cause any damage and was quite easy to put right. This time all was well and the 1kHz tone was working fine. The quiescent current for this module was 15mA again with a 12 volt supply.

The penultimate module was the driver/p.a. board. This was another board requiring coil winding and the instructions caused some confusion because they called for a 500mm length of wire for each coil - more than I had left! This appears to be a slight mistake as I managed to wind both coils with the 650mm I had left. This is not a serious problem providing of course you don't cut the wire to 500mm because if you do you will only have enough wire remaining to wind one coil. There was also no clear indication of which core was which, although you could work it out from the sizes shown on the p.c.b. layout diagram. None of these problems really caused any hold up in the construction, though perhaps if you were very new to kit building they might cause you to scratch your head a bit.

There wasn't really an effective way of testing this module, as it only springs to life when r.f. is applied. My testing was limited to seeing if the change-over relay operated. This module proved to be the most time consuming to build taking me about 90 minutes.

The final module was the control board which was so simple with its six components that it didn't even justify a set of instructions.

Hardware

As I mentioned in the introduction, a box and panel markings are supplied with the kit and the next stage is to drill the holes in this box. The front and rear panel markings comprised self-adhesive plastics printed sheets which are simply stuck onto the panels. These sheets also serve as drilling templates for setting out the holes on the front and rear panels. One point I would stress is that accuracy is essential if a professional finish is to be obtained. It really is worth spending plenty of time at this stage to ensure that everything is accurately aligned before you start drilling the holes.

Once the front and rear panel drilling had been completed the modules are placed in the box and the base panel is marked for the module fixings. When all the holes have been drilled, the box needs to be thoroughly cleaned to remove any traces of swarf and grease before applying the panel markings. I must admit that the markings are very good quality and give the DTR 3 a very professional finish.

It is well worth re-reading the instructions before starting the next stage, which is the final wiring-up of the modules. I found that some of the wiring layout was very critical, especially around the v.f.o. When I first wired the v.f.o. I found that I had terrible "microphony" which I eventually traced to the wire between the v.f.o. board and the tuning capacitor. If I had followed the instructions the problem would not have occurred!

Setting-up

Luckily, the direct conversion technique used in the DTR-3 means that setting-up is really very simple.

The first stage is to adjust the frequency coverage of the v.f.o. Ideally you should use a frequency counter for this operation but a good quality receiver makes quite a reasonable substitute. The frequency range of the v.f.o. was 3.5MHz to 3.6MHz tying in nicely with the type of dial used, which was marked 0 to 100, thus giving a simple and cheap 1kHz readout. The v.f.o. board supplied was a "mark two" version, the difference being that an extra trimmer had been added to make the fine adjustment of the v.f.o. tracking a bit easier. The setting-up process comprised the usual technique of repeatedly setting one end of the range followed by the other until the required tracking was achieved. I found it very easy to set-up and the resultant readout from the dial was surprisingly accurate. If you have a favourite frequency, i.e., the QRP calling channel, you can easily take special care to ensure that this one is spot-on.

Once the v.f.o. is set-up the next adjustment is on the product detector. This involves adjusting three trimmers for maximum gain. Two of these trimers adjust the resonance of the input tuned circuits whilst the third controls the coupling between these two tuned circuits. I did encounter some difficulty at this point as I could not obtain resonance within the range of the trimmers. I managed to overcome the problem by changing the value of the fixed capacitors until resonance could be obtained. I suspect that the problem was caused by variations in the core property and my winding technique. Just for the record I ended-up with 200pF and 180pF capacitors in place of the supplied 220pF types.

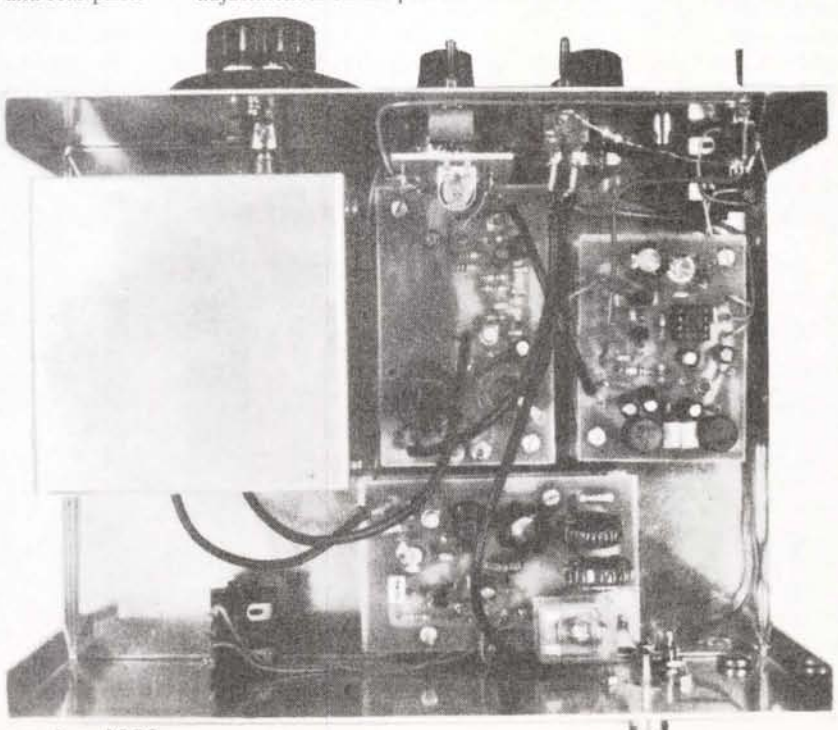
Next stage was to adjust a solitary trimmer on the r.f. power amplifier. This was simply adjusted to give maximum output measured with a dummy load and power meter.

The final adjustment was to a pre-set potentiometer on the control board. This was set so that the v.f.o. control voltage was the same on transmit and receive with the r.i.t. set to mid-point.

That was all there was to the setting-up procedure and other than the resonance problem on the product detector all went very well. The instructions were very good and the whole operation was completed in a very short space of time.

On-The-Air

By the time I had finished building the DTR 3, I was beginning to get quite excited about trying it out on the air. Before I actually went on air, I decided to try some experiments between the DTR 3 and my trusty Icom IC-720A, both on dummy loads. I set the DTR 3 to 3.55MHz, keyed-up and then tuned around on the Icom to find the carrier. You can imagine my delight when I found the carrier spot on frequency. The next step was to key-up the Icom and practice tuning with the DTR 3. The technique I found to work well was to set the r.i.t. to mid-point and tune the DTR 3 for zero beat against the wanted signal. The r.i.t. could then be adjusted until the required note was heard. By using this simple technique you could be sure that you were correctly tuned to the other station.



Having convinced myself that all was working. I decided to see if there was anyone about. In a very short time I located a station calling CQ QRP on 3.56MHz, I returned his call and was amazed when he came straight back to me with a 579 report. I soon established

that his QTH was at Chelmsford which I thought was quite good for 1.5W into a dipole at a mere 5m.

The first operational problem I encountered was with the side-tone. This was injected into the audio path before the volume control, so that the side-tone level varied with the volume setting. Unfortunately, the DTR 3 does not include any automatic gain control. Although this is not a serious problem it does cause a problem with the side-tone. If the band is flat you will need to use a fairly high volume setting to copy any signals, in this case the side-tone level was fine. If on the other hand conditions were good I found I only had to use a low volume setting, which resulted in the side-tone being virtually inaudible. You could of course turn the volume up between transmit and receive, but this is rather inconvenient. Another alternative is to use the 12dB attenuator to reduce the level of the incoming signal, but although this was a useful feature it didn't solve the problem. My personal solution to the problem was to add a small mod so that the side-tone was injected after the volume control and hence stayed at a constant level.

Returning to my success on the air, my second contact was all the way to Leicester again on just 1.5W which I was really quite proud of. By now I really had the bug and was pleased to find lots of QRP activity on 3.5MHz in the mornings and evenings. I never had any problems making contacts and there was always some slow c.w. about so it's a great mode for experienced amateurs and newcomers alike.

One feature that did impress me was the frequency stability of the DTR 3, I didn't actually measure it, but I found I rarely had to retune and if I did it was often the other station drifting and not the DTR 3.

I was fortunate in having the DTR 3 on review for quite some time and despite the few minor problems I identified I found the performance to be very good and well up to its task. The audio filtering was also very good and enabled me to continue working even when the band was very busy.

PW

Summary

I must admit I thoroughly enjoyed reviewing this kit from the construction right through to reviving my interest in QRP operation. I can recommend it as an excellent introduction to home radio construction providing you have had some kit building experience and you can call on the advice of an experienced amateur. The performance was very good for a receiver of this type and the sense of achievement you get from building and operating QRP equipment is tremendous.

As you can probably guess I liked the DTR 3 and can heartily recommend it.

The DTR 3 kit can be obtained from ***Lake Electronics, 7 Middleton Close, Nuthall, Nottingham NG16 1BX***, price £76.25 and my thanks to Lake Electronics for supplying the review kit. A ready-built transceiver would cost you £126.50.

The Dyfed-Powys Police Are Asking For Your Help

A double murder occurred on Thursday 29 June 1989 near Little Haven, Pembrokeshire, South Wales. Mr Peter Anthony Dixon and his wife, Mrs Gwenda Dixon, were shot whilst walking the coastal path. I'm sure many readers will have heard about this tragic incident on the national news.

It is known that Mr Dixon was a keen amateur radio enthusiast. Whilst in Wales he used the callsign GW0HFQ. The Dyfed-Powys Police would be interested in hearing from anyone who spoke to him during the period June 19 to June 29. The equipment was installed in his car, so it is likely that the /M call was used.

Shown here are photographs of Mr and Mrs Dixon, as well as a police artist's impression of a hiker/cyclist the police are anxious to trace.

If you can help at all, contact: **Haverfordwest Incident Room.**
Tel: (0437) 3721 or (0437) 3355 ext 156.

ARE COMMUNICATIONS
THE SHOP WITH THE SMILE

Our policy of direct imports of Yaesu and Kenwood ensure cheaper prices to the radio amateur.

Brenda G4VXL
"DID YOU FIND ANYTHING NEW AT FRIEDRICHSHAVEN BERNIE"

BERNIE G4AOG
"I FOUND A PRETTY LITTLE FRAULINE — AND 100 – FT470E DUAL BANDERS"

TS680S £929

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

PHONE 01-997 4476

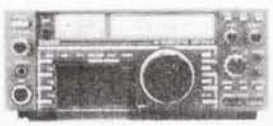
TS440S £1199

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

PHONE 01-997 4476

IC735/725

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



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

PHONE 01-997 4476

FINAL FINAL

I HOPE THAT OUR RECENT ADVERTISEMENTS HAVE FINALLY PUT TO REST THE ADVERSE CRITICISM WHICH HAS BEEN FIRED AT US ABOUT OUR DIRECT IMPORTS.

QUITE SIMPLY, WE BUY OUR YAESU AND KENWOOD OUTSIDE THE UK BECAUSE WE PAY LESS AND IF WE PAY LESS, YOU PAY LESS.

OBVIOUSLY, THERE ARE THOSE WHO DO NOT LIKE OUR POLICIES AS WE ARE COMPETING STRONGLY WITH THE MONOPOLY WHICH HAS BEEN CREATED BY THE MANUFACTURERS. TO SUGGEST THAT DIRECT IMPORTS BY US, OR ANY OTHER DEALER, CAN ONLY SPELL TROUBLE FOR THE AMATEUR IS TOTAL RUBBISH — KENWOOD IS MADE BY KENWOOD AND YAESU IS MADE BY YAESU, WHO EVER IMPORTS IT.

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

The YAESU FT 728 or FT 470

Both available.

Both are UK spec

FEATURES:

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

List price slashed!!!

£ phone!

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

Opening Hours Monday-Friday 9.30 to 5.30
NOW OPEN SATURDAY MORNINGS 10.00–1pm

ARE Communications Limited, 6 Royal Parade, Hangar Lane, Ealing, London W5A 1ET, England
Fax: 01-991 2565 Telex 94016185 AREC G
Tel: 01-997 4476

THE BALLOON GOES UP!

Ground to Air Wireless in 1899

Most people have heard or read about Marconi's early experiments with wireless between shipboard and shore stations, but far less well-known are the ground-to-air tests carried out by another pioneer, the Rev. J. M. Bacon, FRAS, as Chas E. Miller tells us.

In July 1899, the Reverend gentlemen made the first ever ascent in a manned, wireless equipped, balloon. His own account of it provides a fascinating glimpse of the state of the art of wireless telegraphy 90 years ago.

The descriptions of the primitive equipment in use at the turn of the century are couched in such quaint language that they have to be translated into modern terms before being fully understandable nowadays, but it's interesting to quote certain parts verbatim, such as the following discourse on the latest receiver:

"The ultimate form of this receiving instrument in the hands of investigators is subtle enough to utilise the influence of the invisible rays even when greatly enfeebled by distance. Further, the flood of these waves themselves has been augmented by a method depending essentially upon a pair of arms - the greatest efficiency is secured when one arm is replaced by an earth contact and the other raised vertically".

In other words, the receiver was pretty sensitive and worked best when a good antenna and earth system were used. But we should be careful not to decry the efforts of the early radio men as they were feeling their way in the dark, whereas we have had the benefit of all their combined experience.

Enter the Maskelynes

During the course of their experiments, several pioneers, including Marconi, used kites to raise their antennas to great heights. Captive balloons had been considered for the job, but as yet no one had contemplated using a free, manned balloon. Enter the perhaps unlikely team of Messrs J. N. and Nevil Maskelyne, illusionists extraordinaire and proprietors of an establishment in London called the Egyptian Hall which was devoted to exhibitions of their art.

The Maskelynes had been giving thought to wireless and the possibility of using it to keep in touch with a balloon; maybe they envisaged eventual show business applications. To put their ideas to the test they needed the co-operation of people experienced in both wireless and ballooning, which was where Rev. Bacon came in. Before the first flight could be made, however, a great number of technical problems had to be ironed out.

One of these concerned the impossibility of making a conventional "earth" connection for the receiver. This was solved by adapting an idea used by Lord Kelvin in his own experiments. He had found that "when a recording instrument, suspended in free air, has to be brought into the same electrical state as its surroundings, that fine material particles should be constantly given off from it into the air, so as to equalise electrical conditions". To put this into practice, Lord Kelvin used a can of water with a fine perforation to give off a continuous spray.

Method

The balloon team decided they would use the same method, working on the principle that a stream of water should provide an effective conductor from balloon to ground. The next problem was to build a receiver sensitive enough to pick up the signals from the earth station (and remember that in those days the only detector was a "coherer") whilst being robust enough to withstand the inevitable buffetings received during the flight and on the return to earth. The Rev. Bacon was at pains to explain the hazards involved.

It might be imagined, he said, that one corner of the "car" (the passenger carrying basket of the balloon) might be reserved for the receiver, or that it might be slung from the elastic netting that attached the car to the envelope, and thus be saved from injury, as he put it.

In practice however, this would not work as the swaying of the balloon made it impossible to predict exactly what part of it would hit the ground first on landing. In the past, attempts had been made to preserve fragile instruments by throwing them overboard before the impact occurred and hoping that they would alight on soft ground. Unfortunately, the usual result had been a disaster, due to the impetus of the descent and the difficulty of judging height combining to wreck anything jettisoned. In this way he had twice had fog trumpets (were they the "fragile instruments"?) twisted into such fantastic shapes as to baffle completely the simple countryfolk who retrieved them.

A better plan was to risk any damage until the first bump occurred and then to hand out any "delicate freight" before the balloon rose again - always supposing, of course, that there was some foolhardy soul on hand to risk being nutted by the car or its cargo as they grabbed at whatever was being delivered!

Packing Equipment

On the whole, the Rev. Bacon concluded, the best plan was to pack your fragile equipment with plenty of fresh, crisp straw into a wicker hamper, and sit upon it to keep it steady. It was astonishing, he said, how much knocking about the hamper would take without injuring its contents.

Presumably, stout clerical trousers would preserve the posterior from becoming patterned by the wickerwork during lengthy flights. In the event, however, a photograph taken immediately before the ascent shows the wireless receiver apparently being attached to a wooden spar outboard of the basket, which incidentally was circular and appears perilously cramped for the crew of four it was to carry. A length of wire was suspended from the gas valve at the bottom of the envelope to form the antenna, with the water dropper "earth" held in readiness to be lowered from the car and set going when a reasonable height had been reached.

The site chosen for the experiment was Newbury, Berks. Antenna photographs show that a capacious marquee had been set up for the occasion and that a large crowd had assembled to watch the proceedings. A tall antenna mast had also been erected for the spark transmitter. Its height was not recorded but judging from the photographs, which show it surrounded by wooden hurdles, it was in the region of 30m.

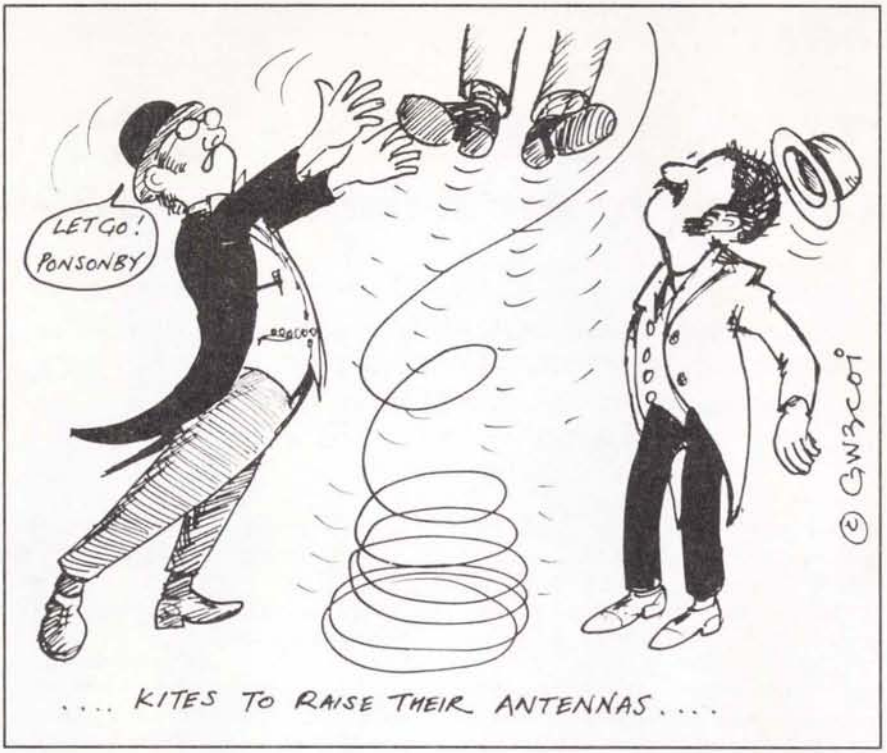
Balloon Crew

The crew of the balloon consisted of its pilot, a Mr Spencer, who was apparently an experienced aeronaut, a Mr T. Simpson and the Rev. Bacon's daughter as joint navigators and photographers and the Rev. Bacon himself on fog trumpet and water-dropper, as well as being the wireless operator. His daughter must have been a jolly plucky young lady and it's a great pity that no photograph of her in the balloon appears to exist.

The account of the flight contains some gloriously farcical elements that I am convinced could have occurred only in England. Immediately after take off, the first message received by the balloon read "Come back, you have my stop watch!" followed almost at once by "Beg pardon, Maunder has it. Oh, these astronomers!" Then there were admonitions for the crew not to tumble out and to "mind the moon" Clearly the scientific nature of the proceedings was not being taken too seriously. All the same, the flight resulted in communication being maintained for over twelve miles and indicated several times that distance might be achieved in future trials.

Message Acknowledgement

Acknowledgement that the messages had been received and understood was given by the waving of flags whilst the balloon was within visual range of the ground. As it passed from sight the fog trumpet was used, and when that was no longer loud enough, explosives were fired off. One receives an endearing impression of a bewildered bumpkin glimpsing a strange object floating through the sky with Rev. Bacon blasting away like some latter-day Gabriel, followed by powerful explosions indicative of the impending crack of doom. Then, as the bemused yokel raised his face to get a better view,



he received fair and square, the contents of the water-dropper, which probably do not arrive in the innocuous fashion described by Shakespeare in "The Merchant of Venice".

Finally, the poor fellow stumbles home to try and explain to an unbelieving spouse that his sodden condition is due not to drunkeness, but to having been urinated upon from a great height. They certainly don't write experiments like **that** anymore! ***PW***

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 17 of this series, R.F. Fautley G3ASG looks at the circuitry that goes with frequency modulation.

In the last part, we looked at both f.m. and p.m., now its onto the circuitry involved. From Fig. 17.1 you can see that the tuned circuit of the oscillator stage L1/C8 is enclosed in a dashed line. In this case the dashed line indicates that any circuitry within it is part of another stage and **not,** as in Part 8, a screening can around an i.f. transformer! It's shown on the frequency modulator circuit to help in understanding how the modulator works.

So, the oscillator tuned circuit is connected to gate 1 of Tr1 (an f.e.t.) via C7, C4 and R2. Capacitor C7 is usually a small device, able to pass the r.f. signal whilst isolating the tuned circuit from d.c. at the drain of the f.e.t. Capacitor C4 provides d.c. isolation between drain and gate 1.

The resistance of R2 is designed to be very high compared to the reactance of C2 (called X_C2) at the oscillator frequency. Capacitor C2 is shown with dashed connections because it isn't a discrete component, but represents the input capacitance at gate 1 existing **within** the f.e.t. Because R2 is very much greater than X_C2, the current flowing through the two components connected in series is determined mainly by the value of R1. More important is that the resistor controls the value of the current so it also makes sure that the current is very near to being **in phase** with the r.f. voltage across R2/C2. So what?

Well, as we know (Part 1 of the series) the current through a capacitor leads the voltage across it by 90°, therefore the voltage across C2 appearing at gate 1 is lagging 90° behind the current through C2 and the voltage across R2/C2.

Got that? Then on with the next bit.

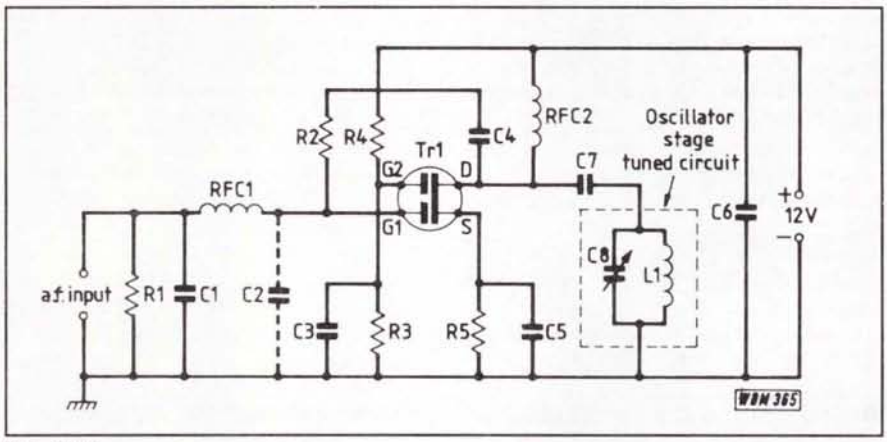


Fig. 17.1

The drain current is in phase with the signal voltage at gate 1 and consequently lags 90° behind the current flowing through C2. This lagging current is drawn through the oscillator tuned circuit, having the same effect as if another inductor had been connected across the tuned circuit. The result is that the effective inductance of the tuned circuit is reduced and the frequency of the oscillator increases. With the phase modulator switched on, but no modulation applied, the tuning of L1/C8 is adjusted to provide the wanted carrier frequency.

How does the audio input affect all this? Any voltage applied to the gate will change the gain of the f.e.t., but the r.f. voltage from the oscillator is fairly small and doesn't have much effect on the gain. The level of the audio voltage, however, is set high enough to change the f.e.t.'s gain, higher gain for one peak of the audio signal and lower gain for the other, resulting in higher or lower levels of r.f. drain current flowing through the oscillator tuned circuit. With the drain current changing, so the amount of inductance shunted across the oscillator tuned circuit changes and the oscillator frequency swings up and down on the unmodulated (no audio input) carrier frequency.

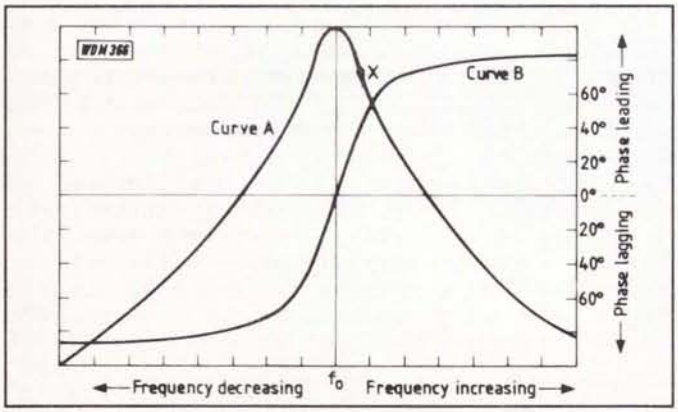


Fig. 17.2

Earlier it was stated that for **true f.m.**, a square wave (or for that matter, d.c.) applied as an audio signal would be transmitted without distortion. Can this criterion be applied to the circuit of Fig. 17.1? Yes, it can. Because the d.c. signal applied to gate 1 will either increase or decrease the gain of the f.e.t. depending on its polarity, it follows that an increase or decrease in gain will produce an increase or decrease in drain current which will add different amounts of shunted inductance to the oscillator tuned circuit. Thus, for the whole of the duration of one part of a square wave, the oscillator will change rapidly to a new frequency and then remain constant until the audio signal changes polarity, then it will change rapidly **through** the unmodulated frequency to another frequency on the other side of the carrier where it will remain until the audio signal changes polarity again, and so on. Certainly not so easy as the old a.m. to understand!

Phase Modulator

Frequency modulator circuits can also be used as **phase** modulators and, in Fig. 17.1, the only difference is that tuned circuit L1/C8 now represents a buffer amplifier or a frequency multiplier stage.

Such stages do not in any way control the **frequency** of the oscillator, which is ideally completely isolated from them. The circuit action is identical to that described previously, with the following exception.

Shunted reactance from the modulator is applied to L1/C8 again altering its resonant frequency, but this time as it

can't change, all the oscillator frequency does is change the phase (and amplitude) of the signal. We'll leave the effect of amplitude change until later as it isn't relevant to this part of the discussion. How does this **phase change** happen and what does it mean?

In Parts 1, 2 and 6 of the series, we looked at phase, parallel tuned circuits and selectivity. Now we must look closer to discover how the phase relationship between voltage across a tuned circuit and how the current through it is affected when the circuit is **detuned** from the signal applied to it.

Look at Fig. 17.2. This shows how a fixed parallel tuned circuit behaves when a signal of changing frequency is applied to it. Curve A represents the amplitude of the signal across the tuned circuit and Curve B shows how the phase of the signal changes. In our phase modulator we are actually concerned with a varying tuned circuit resonance and a fixed frequency signal, but the effect is the same.

At the resonant frequency f_o, the phase difference between the applied voltage across the tuned circuit and the current flowing through it is 0° (Curve B) meaning that the current is **in phase** with the voltage. This is the situation when L1/C8 in the buffer or frequency multiplier stage has been tuned to the carrier frequency with the phase modulator switched on but with the audio input at zero. If the correctly tuned circuit is then shunted by varying inductance, as we found happened when a modulating signal was applied to the stage, the resonant frequency of the tuned circuit is varied. Switching on audio signals to the modulator alters the tuned circuit resonance and thus alters the phase relationship between voltage and current. The extent of the phase difference is determined by the amount of de-tuning caused by the shunted inductance.

As the **frequency of the r.f. signal** does not change, because it comes from a stable source, the only thing that does change is the phase difference between the voltage across the tuned circuit, and the current flowing through it. Audio signals applied to the modulator change the f.e.t. gain and so also change the amount of inductance shunted across the tuned circuit. It follows that the amount of resonant frequency change and the amount of phase shift is also varied.

Earlier it was mentioned that phase modulators caused frequency deviation that depended on both the frequency and amplitude of the audio modulating signal. This is because the deviation is proportional to the **rate** at which the phase is changing as well as the total amount of phase change. The rate of phase change depends on the frequency of the audio signal as well as on its instantaneous amplitude.

Summarising, higher frequency audio signals produce more deviation than the same level of signals at lower frequencies, resulting in the output having built-in audio pre-emphasis or top boost.

Since a phase modulator changes the **resonance** of a tuned circuit, it also changes the **amplitude** of the fixed frequency signal applied to it because it is detuned. In Fig. 17.2, Curve A shows how the voltage across the tuned circuit is reduced as its resonant frequency is changed above and below f_o. This change of amplitude results in spurious amplitude modulation of the phase modulated signal (two modulations for the price of one!) and the way to remove this unwanted product of the process is to ensure that subsequent stages are operated as **limiters**, i.e. they are operated under Class C conditions which has the effect of limiting the stage's output to a constant level, regardless of input level variations. This effect can only remove amplitude changes up to a certain amount, for example Morse signals which are either **maximum** or **zero** cannot be ironed out!

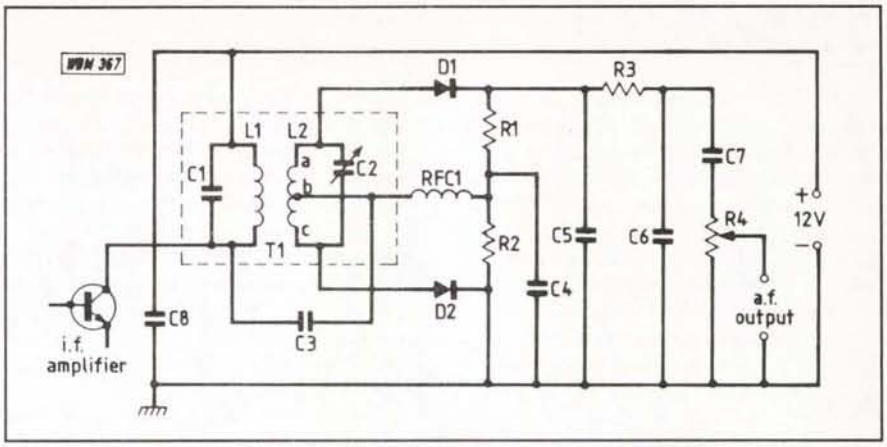


Fig. 17.3

Frequency multiplier stages will not only provide output at two, three, etc. times the input frequency but will also multiply the frequency **deviation** by the same factor. So, to ensure that an amateur f.m. transmitter is operated within the licence conditions, it is safest to adjust the audio level to provide the required deviation **at the final output frequency** rather than at the output of the modulator.

It is important to note that an f.m. receiver demodulator will receiver either f.m. or p.m. signals equally well, the only difference being that the p.m. signals will sound "tinny" unless an audio top cut (or de-emphasis) of 6dB per octave is included either at the transmitter or receiver.

It's the receiver de-modulator that we'll look at next.

FM Demodulator

The very simplest f.m. demodulator is an ordinary tuned circuit ahead of a simple a.m. diode detector, not used as normal (i.e. tuned for maximum audio output) but slightly mis-tuned so that the received carrier is someway down the slope of the tuned circuit's response curve as point X in Fig. 17.2. For sidebands **above** the carrier frequency, the audio output will be reduced as the frequency deviation is increased. Sidebands below the carrier will produce a higher level of output the greater the frequency deviation, up to the peak response at resonance.

How does this de-modulate the f.m. signal? It will have changed the **frequency** deviations into **amplitude** variations before the signal reached the diode rectifier and the detector would then see the signal just as an a.m. signal and detect it in the normal manner. If it's that easy, why bother to have special circuits to do the job? The slope detector isn't used because its efficiency is not very high and its fidelity leaves a lot to be desired. This is because the response is part of a **curve**, and therefore the change from frequency deviation to amplitude variation is not linear. However, it can be used as a simple means of occasionally receving amateur f.m. signals which have only small deviation. It would be unsuitable for reception of wideband f.m. broadcasting stations because of the very high deviations used by such stations.

For the serious amateur f.m. user, specially developed circuits provide far better results than the de-tuning method.

There are two popular f.m. demodulators, the frequency discriminator and the ratio detector. It's the frequency discriminator shown in Fig. 17.3 which will be described as an example of f.m. demodulation.

The i.f. transformer, T1, with the tuned circuits L1/C1 and L2/C2 are all tuned to the i.f. At resonance, the voltage across L1/C1 will be in phase with the current flowing into the parallel tuned circuit (Fig. 17.2 Curves A and B at f_o). Current flowing through the **inductive branch** of the tuned circuit (L1), however, will lag 90° behind the voltage across it (which also happens to be the voltage across the tuned circuit).

Due to the transformer action between the mutually-coupled inductors L1 and L2, the voltage induced across L2 will be 90° out of phase with the voltage across L1. Why does this phase shift occur? In any transformer, a.f., i.f. or r.f., it is the **alternating current** flowing through the primary winding which **induces a voltage** across the secondary winding.

Induces a voltage? Let's take the simplest case of an a.f. transformer with no other components connected across its windings. An alternating voltage applied across the primary winding will cause current to flow through it. Because the winding is inductive, the current will lag behing the voltage by 90° (see Part 1 of the series). This current will produce a magnetic field around the winding which is in phase with the current. That is, when

the alternating current is at a maximum in its cycle, so is the magnetic field; when the current is zero, so is the field.

Due to the close proximity of the secondary winding (both windings being wound around a common laminated core) the alternating field surrounding the primary also cuts the turns of the secondary winding. This interaction of magnetic field with the secondary causes a voltage to appear across the secondary winding. This voltage is in phase with the magnetic field and so also the current, thus it is 90° lagging on the primary voltage. With a.f. transformers this bit of theory doesn't matter very much as it's usually only the turns ratio between primary and secondary which concerns us most. Now, back to our i.f. transformer.

Consider the unmodulated signal. With the voltage across L2 90° out of phase with the voltage across L1, if the signal at L1 is also connected to the centre-tap of L2 via C3 (thus appearing across RFC1) the effective signal across each half of L2 will consist of two components. One half of the winding, say "a" to "b", would have half L2 voltage added to L1 voltage. These two voltages are 90" out of phase and hence cannot be added arithmetically but must be added vectorially, producing a resultant voltage which is rectified by diode D1. The other half of the secondary, "c" to "b", also has half L2 voltage added to L1 voltage, but as "c" to "b" is 180" out of phase with "a" to "b", the resultant voltage although being **numerically** the same value will have a phase difference. The diodes D1 and D2 don't know (or care!) about this phase shift, they just rectify each voltage. With the diode load resistors R1 and R2 connected in series, if both diode cathodes become positive by the same amount at the same time, the combined output will be zero. This is a very desirable result for zero modulation!

What happens when the carrier is frequency modulated? The only things that change when the carrier frequency swings up and down are the values of the voltages applied to the diodes. These voltages change in **amplitude** in sympathy with the amount of deviation (or level of modulation) and vary at a **rate** depending on the rate at which the deviation changes (modulation frequency).

Next, how does the modulation produce these changes?

When one half of the audio modulation causes the carrier to increase in frequency, the current into the tuned circuit L1/C1 is no longer in phase with the voltage across it. Referring to Curve B in Fig. 17.2, it can be seen that the phase of the current into the tuned circuit **could** change by, say, +20° relative to the voltage across it. This would mean that the current through the inductive branch L1 would then lag the voltage across it (which is the voltage across the tuned circuit) by 70°. Not 90° as in the unmodulated state. As L2 voltage is locked in phase to the current through L1, the phase of L2 voltage will also be +20° relative to L1 voltage. As L2 is centre-tapped, one half will be phase-shifted by +20° and the other by 180° + 20° = +200°. There must always be 180° phase shift between winding "a" to "b" in Fig. 17.3 and winding "c" to "b" because they are both parts of the same winding. The vector addition of L1 voltage to the voltage across part "a" to "b" of L2 is no longer numerically equal to the vector sum of L1 voltage and the voltage across part "c" to "b" of L2 as it was for the unmodulated case. As the connection of the output signals from diodes D1 and D2 provides the aritl metic **difference** between the two voltages across C5, instead of zero for no modulation we now have a resultant signal!

When the other half cycle of the modulation signal causes the carrier to decrease in frequency the whole process is reversed giving an output across C5 having the opposite polarity. That completes one whole cycle of the modualtion signal and we've recovered the audio from the f.m. signal. Was it worth all the effort, I wonder?

Other components in the circuit have the more mundane jobs. Capacitors C4, 5 and 6 with resistor R3 remove i.f. and unwanted very high a.f. signals from the audio output. Capacitor C7 prevents the d.c. component of the output from diodes D1 and D2 reaching the next stage (which would be some type of a.f. amplifier) and R4 is simply an a.f. audio gain (or volume) control. Capacitor C8 bypasses the h.t. supply.

"Vector addition" was mentioned earlier, so perhaps it needs to be explained that it's a method of adding (or for that matter, subtracting) quantities. Most mathematical and radio text books will provide full information for those who want to know, but it would be straying too far from the reason for this series to go into detail. After all, we're just trying to find out what the circuits mean and how they work.

Next, we'll look at some filters.

SWAP SPOT

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

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

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

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

Have 10GHz wavemeter, micrometer tuned, professional made by BTH Co. Ltd, in WG16. Would exchange for 144MHz hand-held transceiver. Mann. Tel: (0223) 860150. *G478*

Have Regency HX-850E scanner 75-106, 118-174, 406-495MHz. Would exchange for h.f. receiver. Tel: Millom Cumbria 4678 *G557*

Have new Hameg HM203-6 scope plus KDK FM2033 fully synthesised 144MHz mobile transceiver, complete with 5/8 antenna and gutter mount. Would exchange for h.f. transceiver, anything considered. Cash adjustment waiting if necessary. G4LAU. Tel: (0664) 60773 *G564*

Have 1.2m diameter Andrew dish, 0.25 f/d (focal plane). Would exchange for any Bird 43 element or LDF4-50 connectors, or w.h.y? Dish to be collected, unless local. Bob G8VOI QTHR. Tel: Portsmouth (0705) 250830 after 6pm. *G603*

Have crystal set, 1920s Gecophone style, working with Brown's "A" type headphones (plated wires). Would exchange for good s.l.r. camera. Mann. Tel: Cambridge (0223) 860150. *G610*

Have Panasonic DR-49 145kHz to 30MHz frequency read-out receiver. Would exchange for Uniden 28-30 or President, Lincoln or very similar 28MHz multimode transceiver. Andrew. Tel: Sheffield (0742) 510076. G614

Have good quality CB, 40 channel f.m. In good condition. Would exchange for 144MHz transceiver. Tel: Leicester (0533) 418260 *G615*

Have Suzuki X7 250cc motor bike 100 m.p.h.+ good condition. Would exchange for good general coverage receiver, valved or transistor or Bearcat 800XLT scanner. Write to Frank. 4 Parc Drea, Cury, Helston, Cornwall TR12 7BJ. *G624*

Have Icom IC-100E radio telephone. Would exchange for 144MHz hand-held or w.h.y? Chris Tong G7DSU. 36 Bryant Road, Strood, Rochester, Kent ME2 2ES *G633*

Have Realistic PRO-2021 200 channel scanner and Realistic PRO-2008 8-channel scanner. Both 68-512MHz with gaps. Plus u.h.f./v.h.f. antenna. Both in perfect condition. Would exchange for good small general coverage receiver with digital readout. J. Bowditch. Tel: (0305) 775353. *G642*

Have Beulah Electronics 405 line CCTV camera and 12in monitor, plus Link Electronics camera 1in tube. Would exchange for pre-1940's books, components, etc. D. Sweetman, 21 Norton Avenue, Surbiton, Surrey KT5 9DX. Tel: 01-390 0721. *G662*

Have Yaesu FR-50B receiver covers amateur bands form 1.8MHz to 28MHz, plus a.t.u. and full length trap dipole with coaxial feeder. Would exchange for any converted p.m.r. to cover 50MHz band. G7DCX.Tel: Newton Aycliffe 316984. Daytime only. *G663*

Feature

Packet Radio Update

Continuing with his series on what's happening in the packet world, Roger J. Cooke G3LDI starts Part 5 with news of a "first".

Congratulations are due this month to Ted Prothero G4RCI, who has recently worked 100 countries on packet. This must be a first for the UK, unless anyone knows different? Of course, getting the QSL cards is a different matter, as we all know, but attaining that magical 100 still has its thrill. Ted has been fishing for DX since he became active on packet and does not spend too much time using the BBS system. His score reflects his activity and a list of the DX he has worked is given in Fig. 5.1. Some of the calls seen in this list would be very welcome on any mode for quite a lot of people. There are some very rare countries now active on h.f. packet.

Ted uses a TS-940 barefoot into a 2-element tri-bander at about 8m. On the packet side he has the Digicom version 2.00 with a modem designed and built by Colin G4MQK. The computer is the Commodore 64 or 128.

Ted has some controversial views regarding BBS stations. He thinks there is a proliferation of BBS stations almost to the exlusion of normal packet DX working. This again supports the need for more planning and more organisation on the part of the h.f. forwarding network.

Ones that "got away" include AL7FL Alaska, TU2AA Ivory Coast, ZL3AN New Zealand, AP2SQ Pakistand, HH2BZ Haiti and 8P6SH Barbados. These, Ted has connected with but not exchanged sufficient information to constitute a QSO. Locally, we decided that to count for a QSO we had to exchange reports, names and QTHs.

Country	Callsign
Israel	4Z4ZB
Cyprus	5B4TX
Tanzania	5H3RB
Liberia	5L5G
Kenya	5Z4WB
Senegal	6W4OP
Jamaica	6Y5EE
Guyana	8R1RPN
Malta	9H1E
Kuwait	9K2DZ
Zaire	9Q5AH
Trinidad	9Y4DG
Oman	A4XKC
United Arab Emirates	A61XL
Qatar	A71BJ
Bahamas	C6AAA
Andorra	C31TO
Easter Island	CE0ZIG
Morocco	CN8FA
Bolivia	CP5PM
Portugal	CT1AEX
Azores	CU7AB
Uruguay	CX2GB
Comoros	D68JFL
Liechtenstein	DF5DP/HB0/P
West Germany	DL1ZBQ
Philippines	DU1GI
Spain	EA3CIW
Balearic Is	EA6IN
Canary Is	EA8YV
Ceuta & Melilla	EA9NP
Ireland	EI3ER
France	F6GWX
Guadeloupe	FG5GB
St. Pierre & Miquelon	FP5HL
Reunion Is	FR5DB
Northern Ireland	GI4SIZ
Jersey	GJ4YAD
Scotland	GM0FRI
Guernsey	GU4YMV
Wales	GW4UMR
Hungary	HA5BME
Switzerland	HB9AHJ
Ecuador	HC5K
Dominican Republic	HI1KZ
Colombia	HK7EEV
Panama	HP1KZ
Italy	I0JQB
Sardinia	IS0VCY
St. Vincent	J87BI
Japan	JA1CG
USA	K4MOG
Guantanamo Bay	KG4EM
Puerto Rico	KP4EKG
Norway	LA5TFA
Argentina	LU1WKJ
Luxembourg	LX2CP
Bulgaria	LZ2KIM
Peru	OA5CK
Lebanon	OD5NG
Austria	OE3FMB
Aaland Is	OH0NA
Finland	OH1AF
Belgium	ON1JO
Greenland	OX3CO
Denmark	OZ4YC
Netherlands	PA0SDL
Netherland Antilles	PJ2MI
Brazil	PY1JH
Surinam	PZ1AC
Armenia	RG8GWS
Sweden	SM5BKI
Poland	SO5GZE
Sudan	ST2SA
Egypt	SU1ER
Greece	SV1IW
Dodecanese	SV5TS
Crete	SV9ZP
Turkey	TA2BE
Iceland	TF3KB
Costa Rica	TI2ALG
Cameroons	TJ1DL
Corsica	TK5IU
Gabon	TR8AHO
Russia	UA3CR
Brunei	V85GA
Canada	VE3KUC
Australia	VK6SM
Hong Kong	VS6TU
India	VU2MAF
Mexico	XF3RM
Chile	XQ1ADQ
Macao	XX9TDM
Indonesia	YB3CFB
Yugoslavia	YU1CS
Venezuela	YV6DAZ
St. Helena	ZD7CW
Caymen Is	ZF1GC
South Africa	ZS2BK

Fig. 5.1

Fig. 5.2: Ted Prothero G4RCI with a catch of a different kind

Ted has been active on 28MHz with the following prefixes: TJ1, J87, CE0, 9Y4, TA2, W, OA, 6W, KG4, PY, LU, YV and HC. He has also worked a lot of these prefixes on 21MHz, so he doesn't miss much! Can anyone match, or better, this score? If so, let me know. The photograph in Fig. 5.2 shows Ted with his other hobby.

HF Opinions from 4X1RU

Jim 4X1RU is one of my regular correspondents on 21MHz, being a main path to the USA (due to the American Third Party traffic situation). He has some fairly forthright views regarding h.f. operation and the following is an extract from his letter.

"I have a lot of opinions about h.f. packet, but most are not printable! Basically packet radio is ideal for traffic use but there is absolute chaos on all frequencies.

"(1). Who needs all those beacons? Can you imagine what would happen if everyone turned on their beacons and idents? There are times when I see only beacons and idents and nothing else!

"(2). Who needs nodes operating on a traffic frequency? Nodes are a very good idea but should be set up on a separate frequency along with other keyboard-to-keyboard operation.

"(3). BBS operation on h.f. should be limited worldwide to specific stations acting as gateways and each individual country should be responsible for local internal distribution. Ideally, if there was one callsign for each country's gateway station with a different SSD, then once the station had a bulletin, even if they get another station on another band, they wouldn't try to send it again.

"(4). Local BBS operation should be limited to only those stations which are active (not once a week) to prevent glitches on the system.

"All this should be agreed upon by all club organisations and it should be the local clubs' responsibility to organise proper BBS operation."

Software

A new BBS software package by Steve Coleman G4YFB looks like being a very popular system. It is compatible with the MBL and RLI packages but has several advantages over the American versions. It runs in a small window, 64K, and has its own utility called Manager which eliminates the need for Btreive, which I know to my cost is a source of frustration having just lost my complete mail file! Steve is also looking at using the international hierarchical forwarding system which, in my opinion, will be adopted eventually once the bugs are ironed out. Steve has also incorporated auto-kill of bulletins, similar to MBL 5.12 and is making improvements all the time. The YFB software is currently in use by several BBS including Manos SV1IW, who is very pleased with it. He is forwarding lots of mail on h.f. and has had few problems so far. Several stations are using it in conjunction with the G8BPQ TheNode software. The current version is available from John G4MYP who is responsible for the distribution. This leaves more time for Steve to work on the software. If you would like a copy, please send a formatted IBM compatible disc with enough return postage, etc., to John G4MTP, QTHR.

The newest version of the W0RLI BBS is available from Ted Batts G8LWY. I notice from the Stateside BBS that the latest version is 10.06. This BBS already uses the international hierarchical forwarding system along with White Pages, which allows a user to request a @BBS of a call. Ted will be happy to supply the W0RLI on receipt of the usual formatted disc, mailer and return postage (QTHR).

Another BBS system which came to light at a recent sysops meeting is one written and developed by John Linford G3WGV, sysop at GB7WOK. This is based entirely on the Nascom computer. John will be pleased to let any Nascom owner have further details, don't forget the customary s.a.s.e.

Fig. 5.3: G4VLS with a look of admiration for the DCE station

Sysops Meetings

Users may not know too much about the work put in by BBS sysops in order to maintain an efficient packet network. Regular meetings are held at various places over the country and a wide range of items are discussed, with an agenda which takes all day to plough through, with a lunch break in the middle. A very pleasant "Sysops 6" meeting was held recently at the University of Surrey, the DCE station where all the ZS, VK and ZL traffic is passed via satellite. We had a conducted tour of the control centre and the photograph in Fig. 5.3 shows Paul G4VLS, sysop of GB7VLS and the GB3NP node, admiring the station.

I have been asked by several people about packet on the Spectrum. You will need an Interface 1 by Sinclair. The Maplin RS232 interface can be used but the data transfer between TNC and computer is restricted to 300 baud. The Maplin interface does not support Microdrive either. A bulletin was posted on the network a while back by Vince G1FBH regarding the software. Vince has three different versions and if you send him a microdrive, together with the usual post and packing, he will let you have a copy. He is QTHR in the April 1988 *Call Book*. Let him know what TNC you will be using as the program needs customising for the location of the user. The main disadvantage of the Spectrum is the limitation to 32 column display. This can be very confusing when reading a message in 80 column format. The connections for wiring the Interface 1 to the TNC is shown in Fig. 5.4. These connections hold good for most of the popular TNCs.

Interface 1 Pin No	TNC Pin No
2	3
3	2
4	5
5	20
7	7

Fig. 5.4

Finally this month, good news from the DTI. Several h.f. ports have been licenced: GB7GUR, GB7BNI and yours truly GB7LDI. GB7PLX also has an AMTOR link. I hope to have more details on h.f. forwarding to enable the users and sysops to use the different routes to their fullest advantage.

News, comments or suggestions to G3LDI @ GB7LDI or to my address, s.a.s.e. if a reply is wanted please. Alternatively you can telephone (0508) 70278.

73 and happy packeting.

SNIPPETS

Difficult-to-reach nut or screw positions can be overcome by the use of a long reach screwdriver with a plastics sleeve over the shank, for example, pvc tubing which can be purchased in motoring shops. This in effect makes an expandable nut or screw spinner. When using ferrous fasteners the screwdriver blade can be magnetised to hold the screw or nut. The blade is magnetised by rubbing it several times over the poles of an old loudspeaker magnet.

Another way of holding a difficult-to-reach nut in place while a screw is inserted from the other side of a panel, is to run a few threads of the nut on to a suitable diameter piece of soft wooden dowelling. Once the screw has bitten, the dowelling can be withdrawn and used to stop the nut from spinning as the screw is turned. **J.O.** *G305*

If you've been following our "On The Air" columns, you will know that the MIR space station crew can often be heard on 143.625MHz. This makes for interesting listening while waiting for a QSO with one of the cosmonauts on 145.550MHz. Fortunately, the norm is to equip most modern f.m. transceivers to receive out-of-band frequencies. However, some receivers need to be tricked into this coverage.

The following procedure enables the IC290H to receive signals on 143.625MHz. First, ensure that all power to the rig is off. Next choose Memory position 1, set M-R off (out) and VFO A (out). Then power up the rig and set duplex to left (-). Press and hold the WRITE button and select the frequency wanted. Press in the M-R button and switch from duplex to simplex (centre). Then release the M-R button and only then release the write button. You have now written 143.625MHz in to Memory position 1. Just press in M-R to review. **N.G.P.** *G127*

Low Battery Alarm

Loss of contact through NiCad failure is downright frustrating, says Basil Spencer G4YNM. At times it can even be dangerous, particularly if you are in the middle of passing vital RAYNET traffic. To avoid this situation, he has designed a neat little warning device which should fit into almost any of the larger types of portable transceiver.

A block diagram of the alarm is given in Fig. 1. A low frequency oscillator is used to enable an a.f. oscillator. The output at point "a" is a pulsed audio tone. The voltage dip detector constantly monitors the transceiver's or receiver's battery voltage. If the supply falls below a pre-determined value it gives a logic *0* output, which is inverted to a logic *1*.

The voltage dip detector's output is combined with the pulsed audio tone in a dual input NAND gate. The resultant signal is fed through a low-pass filter and then attenuated to a suitable level before mixing with the receiver's audio signal.

Circuit Description

The circuit is simplicity itself and uses parts that can easily be obtained, you might even have them in your junk box! The full circuit diagram for the low battery alarm is given in Fig. 2.

Gate "c" of IC2 forms the low frequency oscillator, which runs continuously with a nominal frequency of 1Hz, at a mark-space ratio of 1:1. That is, logic *1* for 0.5s and logic *0* for 0.5s.

The oscillator configured around gate "d" of IC2 only runs when pin 13 is at logic *1*, with a nominal frequency of oscillation of 1kHz. As this gate is controlled by the low frequency oscillator, formed by gate "c" of IC2, a series of 1kHz pulses appear at the output of the gate (pin 11).

The voltage dip detector is formed around a 741 operational amplifier configured as a Schmitt trigger (IC1). A voltage reference is set up by D1, R10 and R1 on the inverting input. The non-inverting input is set to half the supply rail voltage by R2 and R3, C2 is to decouple any stray r.f. pick-up. If the supply falls, then the non-inverting input follows suit.

If the inverting input falls below the reference, then the operational amplifiers output changes from a logic *1* to logic *0*, resistor R4 provides positive d.c. feedback for IC1 and gate "a" of iC2 inverts the logic *0* to a logic *1*. The logic *1* state on pin 3 of gate "a" is then fed to one input of gate "b", this having a NAND function only allow 1kHz pulses through when a logic *1* states is present on pin 6. The output of gate "b" is then fed though a low-pass filter and attenuator. The final low-level signal is then fed through to the audio amplifier stage of the transceiver.

The Schmitt trigger, (operational amplifier) has some built-in hysteresis to prevent unreliable warnings. This means that once the warning tone has been activated, the supply voltage has to rise by at least 0.5V to reset the alarm.

Construction

A double-sided p.c.b. construction is used, the upper-side acting as a common ground plane. The foil pattern and component placement diagrams are shown in Fig. 3. The values of R1, R10 and D1 are such that you should be able to preset the module to suit your particular supply voltage. The prototype, using the values shown, would reliably trigger and reset at anywhere I chose between 8V and 14V.

You need to use a nearly flat battery and adjust R10 until the alarm is activated, then use a good battery (i.e. 0.5V higher) and check that the alarm resets. Better still use a power supply with a variable output for this task.

The design of the oscillators used in this project are of the "dirt cheap" type and therefore are a little unpredictable in their operating frequency, in fact they can be out by as much as 50 per cent. If you want to change the pulse duration, change R5. If you want to change the the audio tone, change R6.

Current consumption of the circuit is less than 5mA, which isn't too bad, most of this current being taken by the Zener diode. Does anyone know of a voltage reference that's simple and draws less current?

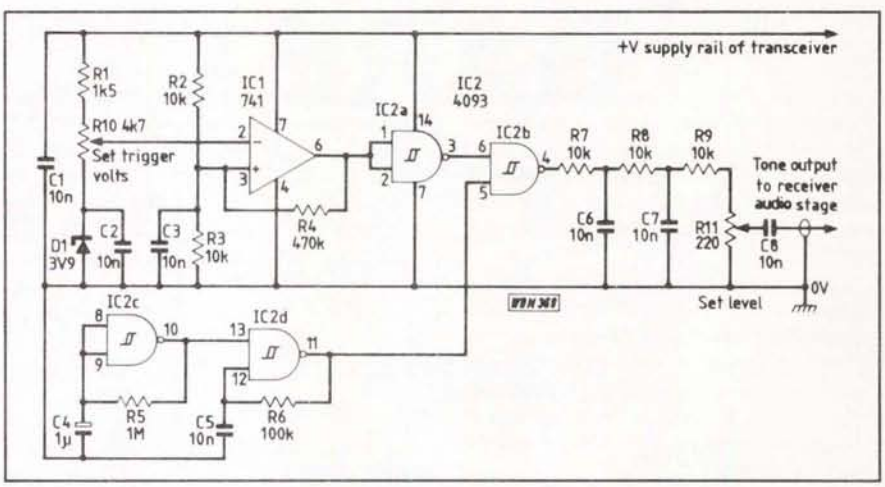


Fig. 2: Circuit diagram

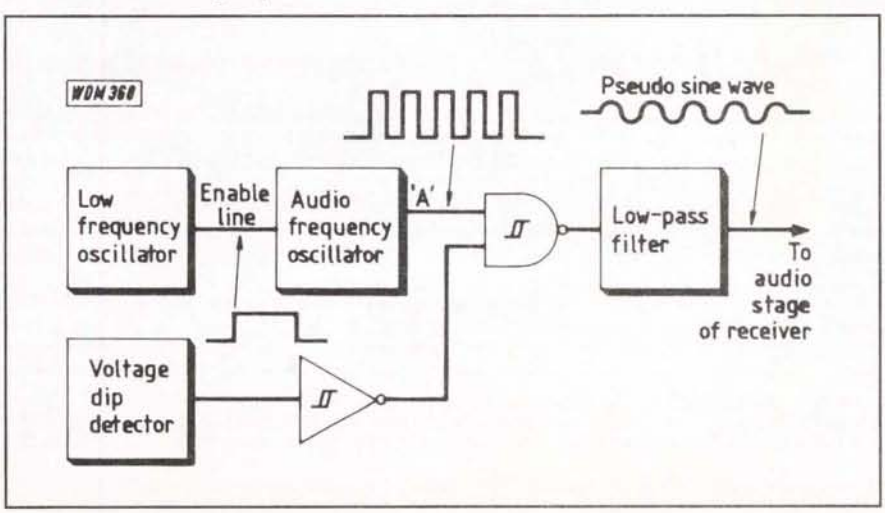
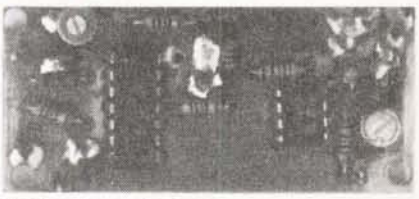


Fig. 1: Block diagram of alarm circuit



Author's prototype

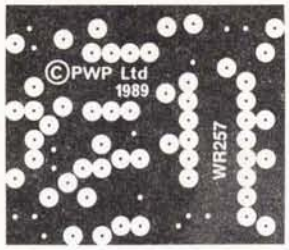
Installation

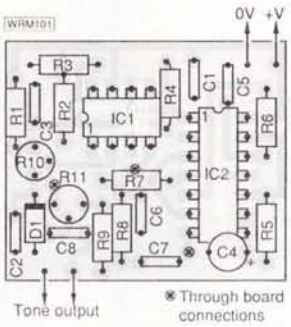
The output of the alarm should be taken via a small length of miniature coaxial cable to the transceivers volume control where it should be connected to the detector side of the potentiometer. It is suggested that the alarm's output should be adjusted to such a level that it can be heard in the background when receiving a station at normal volume. You may try different values of R11 to suit your own needs, start with 220Ω and go from there.

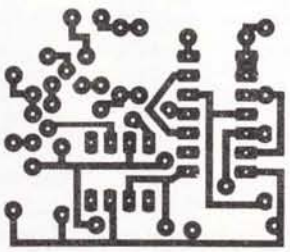
It's probably best to take the alarm's output directly to the transceivers audio stage and not bother to go through the squelch gate as most amateurs spend 90 per cent of their operating time on standby/receive. Mind you, the author knows some amateurs who spend 99 per cent of the time calling CQ and 1 per cent of the time thinking their batteries are flat because no one bothers to answer them! As a final point point, you will have no-doubt noticed that there are no mounting holes in the p.c.b. This is to keep the size of the p.c.b. down, which can be mounted in an odd corner using a Sticky Fixer.

PW

HOW MUCH ?
£11.50
HOW DIFFICULT
Intermediate







Shopping List

Resistors

0.125W 1% metal film

1.5kΩ	1	R1
10kΩ	5	R2, 3, 7, 8, 9
100kΩ	1	R6
470kΩ	1	R4
1MΩ	1	R5

Miniature cermet trimmers

220Ω	1	R11
4.7kΩ	1	R10

Capacitors

Monolithic ceramic 63V wkg.

10nF	7	C1-3, 5-8

Tantalum bead 35V wkg.

1µF	1	C4

Semiconductors

Diode

BZX79 C3V9	1	D1

Integrated circuits

4093B	1	IC2
741	1	IC1

Miscellaneous

Sticky Fixer; miniature coaxial cable; hook-up wire; p.c.b.

Fig. 3: Full-size, double-sided, track-pattern and component placement diagram

Sturdy 50MHz Dipole

When the commercial 50MHz antenna owned by Steve Nicholls G0JFM succumbed to the wild Devonshire winter climate, he decided it was time to get tough and build his own antenna of stronger things than plastics and aluminium!

I was never very happy with the 50MHz commercial Yagi I purchased in 1987. For one thing I could never get the v.s.w.r. down to an acceptable level and the second problem was it was impossible to keep the elements parallel; one good gust of wind and they would be all over the place. Finally the gales of last January saw the antenna pointing at a crazy angle into bedroom number 7 of my seaside hotel. Not knowing whether there was much difference between r.f. burns and sun-burn I decided, for the safety of the occupants of Room 7, to completely remove the antenna.

For two months I had no 50MHz antenna and during that period, needless to say, I missed some very fine openings to the USA, Africa and the Far East. Missing all this choice DX spurred me on to building a sturdy home-brew replacement for my ill-fated 50MHz beam.

Owing to the location of my QTH, 15m a.s.l. with an unobstructed sea view across Torbay, it was felt that any antenna put into this environment of gale force winds and salt-spray, etc., would need to be more robust than average, so a simple dipole was chosen over a beam.

The 50MHz band is a strange band as far as conditions are concerned, particularly when using a dipole. During normal flat conditions it's fine for local nets, but further afield contacts are rare. However, during the Sporadic-E season even a dipole can give a good account of itself.

Construction

A visit to the local d.i.y. store saw me leaving with a 3m length of 15mm copper tubing (the sort used for domestic plumbing), assorted hardware and a seven foot (2.13m) length of 13mm dia. dowelling ... so much for metrication! The dowelling fitted quite snugly inside the copper tubing, but not so tight that it could not be withdrawn again.

Each side of the dipole needs to be approximately 1.42m long. Yes, we'll keep it metric from now on! Anyway, the 3m of copper tubing was duly cut into two pieces, each 1.42m long, by removing a surplus 520mm section from the middle of the 3m length; thus leaving two uncut and unmutilated ends. I found it best to use a plumber's pipe cutter for this job as it has the advantage of slightly rounding and reducing the pipe diameter at the point of division.

Dowelling

The dowelling was cut into three lengths; one at 1.7m and two pieces at 40mm. A 40mm length was inserted into the clean, uncut, end of each pole and pushed well home to the other "cut" end, where the reduced diameter held it quite firmly. A tap with a centre-punch and hammer on each side of the tubing produced a pimple on the internal surface of the tube, holding each wooden plug in place (Fig. 1). The plugs help to reduce the ingress of moisture and also stop fluting in high winds.

The 1.7m length of dowel was marked in the centre and each side of the dipole was slid over the dowel until a gap of 20mm was left; 10mm of dowelling showing either side of the central mark. The centre-punch technique was again used to hold the dowel in place, approximately every 200mm.

To give the overall antenna further strength, and a means by which it could be mounted, the dipole assembly was mounted on a centre pad (Fig. 2), fashioned from an off-cut of exterior grade plywood (5-ply). I secured the dipole to the plywood pad with four, 6mm countersunk machine screws. These should either be stainless steel or brass, as any other material will cause an electrolytic action and corrosion. The pad and elements are drilled to the dimensions given in Fig. 1. The inner two securing bolts act as a terminal post to which the feeder is connected. The pad is also drilled to take two suitably sized exhaust clamps with nuts and washers. These are used to mount the finished dipole to the rotator stub.

Connections

I was lucky in the fact that I already had a low-loss coaxial feed of UR67 up to the mast head; the previous installation being well protected and just ready for connection of the new antenna. However, I had some reservations about connecting a balanced 75Ω antenna to a length of 50Ω unbalanced feeder. Ideally, I should use a balanced lead from the dipole into the shack, but with the coaxial feed already there I decided to use it and carry out some tests by the way of v.s.w.r. measurement and TVI observations.

If I had problems I could either convert the feeder to 75Ω flat twin and use a Transmatch a.t.u. in the shack, or fit a 1:1 balun at the mast-head. A suitable λ/4

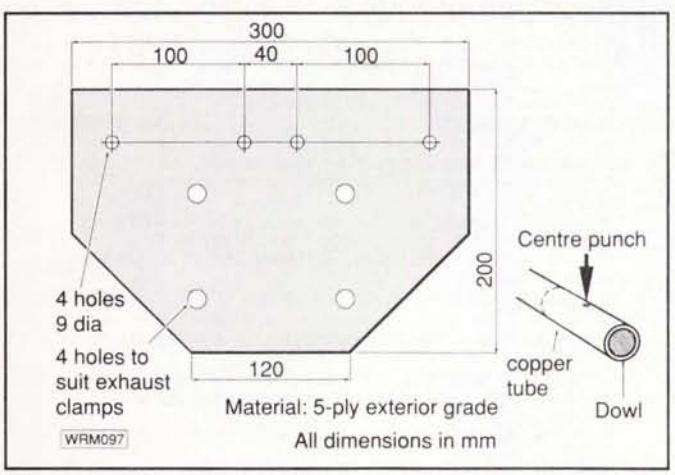


Fig.1: Drilling dimentions for pad and elements

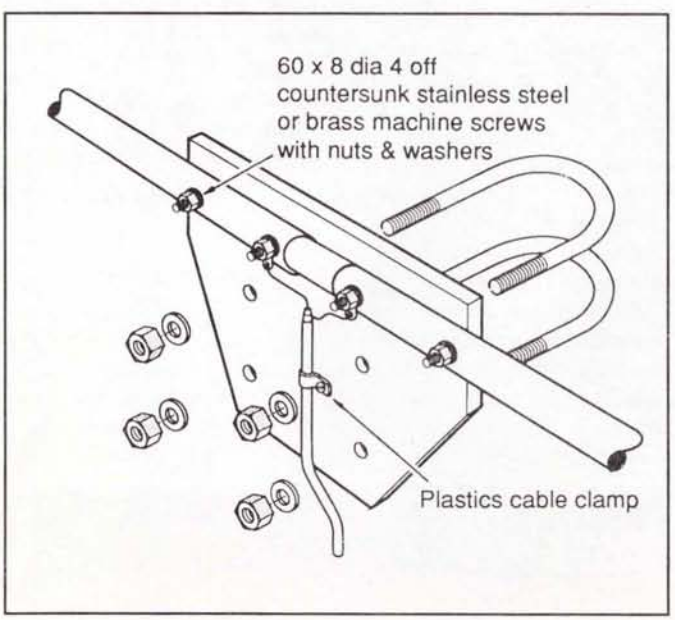


Fig.2: Mechanical construction of antenna and centre pad

coaxial sleeve balun is shown in Fig. 3. This consists of a suitable length of coaxial braid placed over the existing coaxial feed line and connected to the feeder braid λ/4 from where the feeder is split to connect to the dipole. The sleeve connection is made by removing a small patch of the feeder's outer sheathing and carefully soldering the matching sleeve to the feeder's outer conductor. No connection of the sleeve must be made at the end nearest the dipole. Once the sleeve has been fitted, cover the whole assembly in self-amalgamating tape, up and over the point where the feeder is split for termination. It should be noted that if the balun sleeve is to be made from a length of stripped back UR67 feeder braid, then the length needed will be longer than a λ/4 of unstripped feeder. This is to take into account the extra diameter of the feeder's outer sheath.

To join the dipole directly to the installation (minus balun), a short 200mm coaxial stub was fitted to the antenna while still in the comfort of the shack. I carefully separated the inner core from the outer braid, leaving me with two pig-tails. These were formed into two small eyelets and impregnated with solder to make them mechanically rigid. Each eyelet was then slipped over each of the two innermost protruding machine screw studs, and secured in place with nuts and washers. The other end of the stub was fitted with a PL259 socket, to mate with an in-line SO239 at the mast-head.

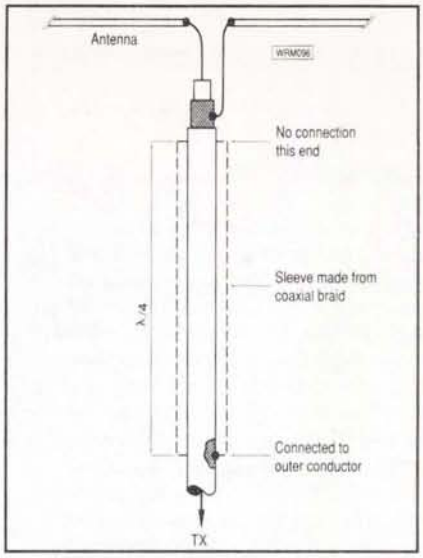


Fig.3: Quarter-wave sleeve balun. sometimes known as a "Bazooka" match

Weather Proofing

Bearing in mind the corrosive nature of a seaside town's atmosphere, I decided to give the entire structure of my new antenna two coats of exterior grade polyurethane varnish. So far, this has kept the antenna's elements free from the corrosion which would ultimately degrade its performance. The varnish was touch dry within an hour, keeping pace with my eagerness to try the finished product!

What Mismatch?

Subsequent tests have proved my fears about a mismatch between the antenna and feeder were totally unfounded. The v.s.w.r. ranged from 1.2:1 at the s.s.b. end of the band, to just 1.1:1 at the end of multimode section, and the TVI was minimal. One thing that did bother me about the top end of the band was that I couldn't raise a soul on f.m. I wonder what happened to all the people I used to chat to on 50MHz f.m? Just a gentle reminder of, use-it .. or lose-it! However, I was very happy with the results obtained, so a balun wasn't tried; the motto being, if it works first time, leave well alone!

Reports have been good using my new antenna, so all the time and effort seemed worthwhile. The pleasure gained from building and using my own design was far greater than buying the original 5-element Yagi. ***PW***

Shopping List

Copper tube 15mm dia. 3m; Dowelling 13mm dia. 2.5m; Exterior grade plywood (5-ply) 200 x 300mm; Exhaust clamps (2); Countersunk 8mm machine screws 60mm long in brass or stainless steel (4); 8mm nuts (6); 8mm washers (4); Cable clip plus wood-screw; Length of UR67 coaxial feeder.

The G2BX

Antenna Clinic

Session 8

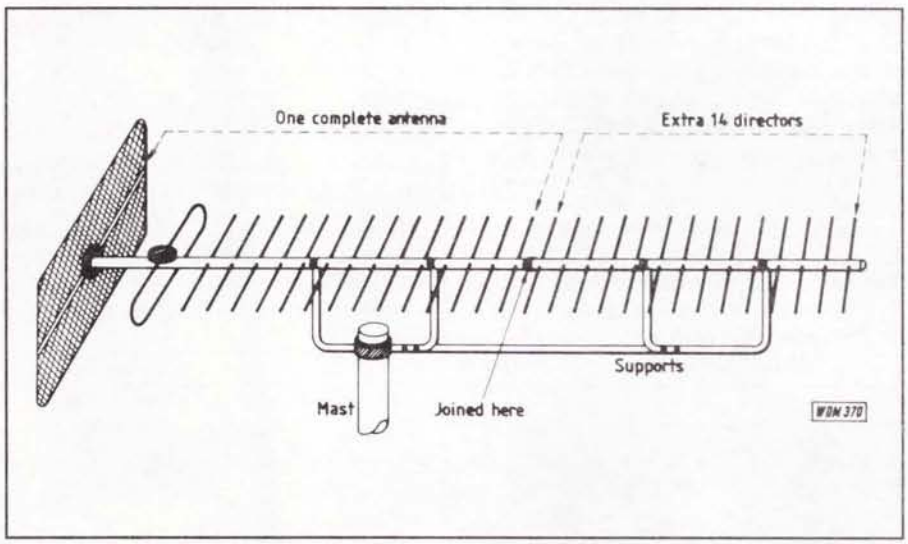
In the course of a year, antenna specialist F. C. Judd G2BCX receives many queries from radio enthusiasts, both about his own designs and about antennas in general.
These come not only from various parts of the British Isles, but also from as far afield as Austrailia, New Zealand, Indonesia, Sri Lanka and Several European Countries.
Often, several people will ask a very similar question, highlighting a point that seems to be widely misunderstood.
This series aims to explain some of these.

Q "I have just purchased a new TV set and being located on the south coast I get quite good reception of French TV stations with the antenna supplied with the receiver but am unable to receive stations in Belgium, Holland and Germany consistently. I thought it might be possible to overcome this problem by using a longer antenna, so I bought two multi-element antennas and chopped the ends off one. (By this the reader means he got rid of the active element and reflector of one leaving 14 directors attached to the boom). This section was then joined to the end of the other antenna, thus making a longer antenna as per Fig. 1. Instead of better reception as expected, it was very poor so I hope you can advise me on how I can improve results. For instance, do the elements (directors) have to be spaced wider apart?"

A If this reader had "stacked" the two otherwise perfectly good antennas, one above the other, and connected them in phase, he would have obtained nearly 3dB gain over the gain (dBd) provided by one only. On the other hand it might have been better and probably cheaper too, to have consulted a TV antenna specialist with a view to purchasing a TV antenna with a much higher gain (higher than obtainable with those he had purchased).

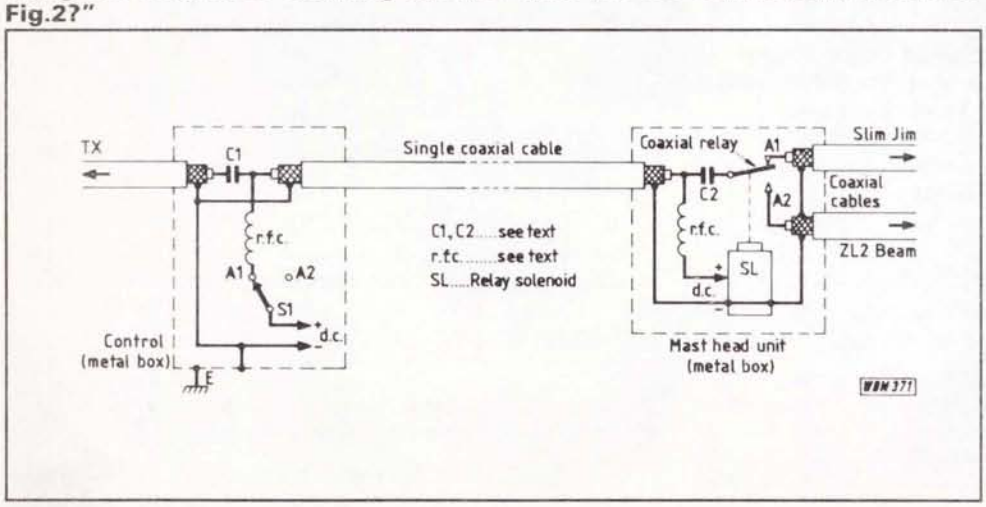
All multi-element antennas are designed to provide a specified directivity gain using a given number of passive directors with precise lengths and spacing in addition to the active (driving) element and passive reflector. One cannot just add more directors with the hope of obtaining greater gain without changing the design parameters.

It should be remembered that reception of distant TV stations depends a great deal on prevailing tropospheric conditions.



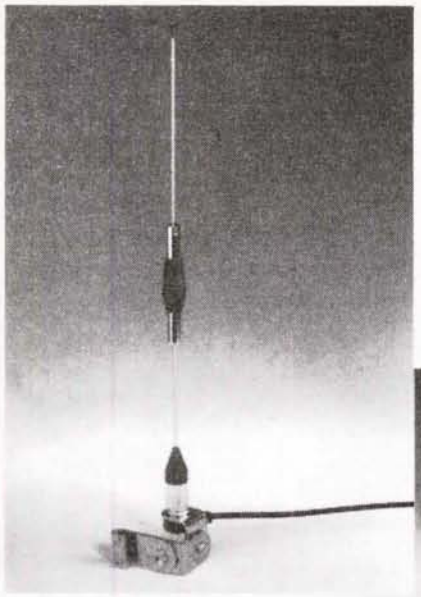
Q "I live on the second floor of a three-floor block of flats. The only external antenna(s) I am permitted must be 'small' and any coaxial cables must be 'inconspicuous'. Various indoor antennas have been tried but with poor results. I then constructed a Slim Jim (145MHz) and had it put up by professional antenna riggers on a mast attached to the gable end of the block. It performs very well despite a 30m coaxial cable run of UR67.

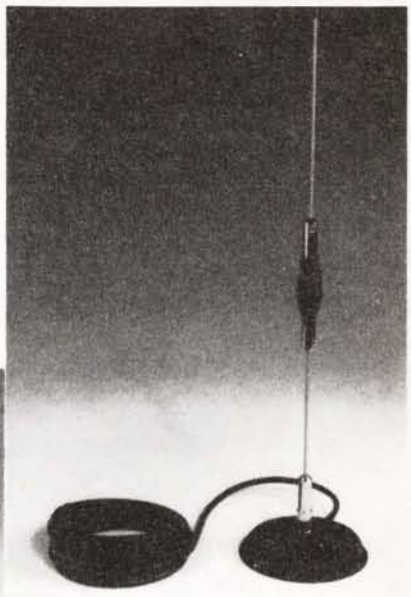
However, I would like to include a 2-element ZL Special (horizontal) on the same mast and locate it just below the Slim Jim. Bearing in mind that another coaxial cable is undesirable, would it be possible to switch the single cable from one antenna to the other by means of a masthead coaxial relay, with the operating (d.c.) voltage for the relay being carried by the coaxial cable and using the method of isolating the d.c. from the r.f. connections shown in Fig.2?"



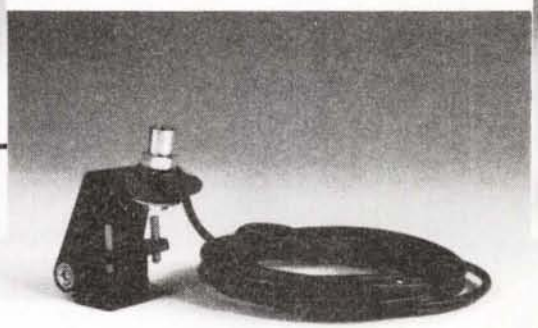
A There is no reason why the system should not work. Connections to the coaxial relay contacts carrying r.f. must be kept as short as possible. That is between C2 and the cable to each of the antennas. The r.f. isolating chokes (r.f.c.) at each end must have sufficient inductance to present a very high impedence at the coaxial cable connections (region of 1μH) and the d.c. resistance of these should be low enough to prevent a serious voltage drop to the relay solenoid. The isolating capacitors, C1 and C2, should be silver mica and not less than 1000pF each (reactance about 1Ω at 145MHz). The reactance with 2000pF will be about half an ohm. Remember that good protection against the entry of moisture or rain water into the masthead box containing the relay, etc., or into the coaxial cables, is absolutely essential.

SPECIAL OFFER





To *PW* readers
Miniature dual-band v.h.f/u.h.f. mobile antennas and mounts all for £21.50



The antennas, for the 144 and 430MHz bands, come with a variety of different mounts and fittings, it's your choice. You can even opt for just the antenna if you have a mounting bracket of your own. The gain figures for the antenna are: 1.5dB at 144MHz and 2.5dB at 430MHz (both referenced to a quarterwave).

Antennas

Fittings available are a 3/8in UNF screw type, a tilt type to fit Revco, Pye, etc., mobile mounts or the popular PL259 type

Mounts

Mounts come in three versions - magnetic, boot/hatch-back or gutter types. Each is available to match any of the three antenna fittings

The antennas and mounts will be supplied direct from Sandpiper Communications.

HOW TO ORDER

Complete the coupon in ink, giving your name and address clearly in block capitals.
Making sure your choices are clearly marked.
Send the coupons with your cheque to: Practical Wireless, FREEPOST, Book Offer (Sept), Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard or Visa only), please fill in your card details and sign the coupon where indicated.
Available to readers of *PW* in England, Scotland, Wales, N. Ireland, Channel Islands, Isle of Man and BFPO.
Orders are normally despatched within 28 days, but please allow time for carriage.
The closing date for this offer is 15 September 1989.

(1)

To:
Practical Wireless, Antenna Offer (Sept),
FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP

Please send me.....**Antennas Only @ £12.00 each**
or.....**Antennas & Mounts @ £21.50 each**

Type of fixing required		**Type of mount required**	
3/8in UNF	❑	Boot / hatchback	❑
PL259	❑	Gutter	❑
Tilt type	❑	Magnetic	❑

❑ I enclose cheque/PO
(Payable to PW Publishing Ltd) £.....
❑ Charge to my Access/Visa Card
the amount of £.....
Card No.

Valid from ..... to .....
Signature.....Tel:.....

(2)

Name .....

Address .....

.....

.....

.....

Postcode .....

If you do not wish to cut your copy of *PW* you must send the corner flash with full details and remittance.

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

ANTENNA OFFER PW SEPT 1989

PRACTICAL WIRELESS PCB SERVICE

Access VISA

0202 678558

Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully tinned and drilled. All prices include postage, packing and VAT for UK orders.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole , Dorset BH15 1PP,** marking your envelope **PCB SERVICE**. Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of *PW* for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board	Title of Article	Issue	Price
NEW			£
WR257	LOW BATTERY WARNING	SEPT 89	5.88
WR256	ACTIVE FILTER	AUG 89	5.67
WR254	TX CONTROL FOR MOBILE USE	JULY 89	5.08
WR253	TS940S MODIFICATION	JUNE 89	5.54
WR252	TWO TONE OSCILLATOR	MAY 89	6.52
WR251	RF OPERATED RELAY	FEB 89	3.80
WR250	DC/AC POWER CONVERTER	JAN 89	3.22
WR259	"MARLBOROUGH" MF CONVERTER	DEC 88	4.60
WR248	"BADGER" 144MHz RECEIVER	OCT 88	9.10
WR247	ZENER DIODE TESTER	AUG 88	3.56
WR246	"PORTLAND" RF VOLTMETER	JULY 88	3.59
WR244	PRACTICE MORSE KEY	JULY 88	2.96
WR245	STOPBAND FILTER FOR PW BLENHIEM	JUNE 88	2.90
WR243	VHF MONITOR RECEIVER (AUDIO)	APRIL 88	2.30
WR242	"ORWELL" VARICAP TUNE OPTION	MAR 88	2.90
WR241	"ORWELL" MED. WAVE RECEIVER SET	MAR 88	
WR240	.. ..	..	2.90
WR239	.. ..	..	
WR238	"OTTER" 50MHz RECEIVER	JAN 88	7.10
WR237	RTTY TUNING INDICATOR	NOV 87	5.20
KANGA	HIGH STABILITY VFO (see issue)	OCT 87	-
WR236	"BLENHIEM" VHF CONVERTER	SEPT 87	20
WR235	MAINS ON/OFF FOR BATT RADIOS	SEPT 87	3.00
WR234	SIDE-TONE OSCILLATOR	JUNE 87	2.70
WR233	"DOWNTON" F-V CONVERTER	JUNE 87	3.90
WR232	"AXE" SIGNAL TRACER	MAY 87	
WR231	.. ..	..	9.20
WR230	.. ..	..	
WR228	"BLANDFORD" RECEIVE CONVERTER	APRL 87	
WR227	.. ..	..	9.70
WR226	.. ..	..	
WR298	"ITCHEN" LCR BRIDGE	APRL 87	3.40
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10

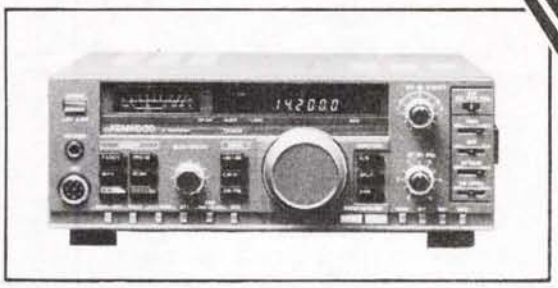
Board	Title of Article	Issue	Price
			£
WR219	MASTHEAD PRE-AMP PSU	FEB 87	2.50
WR218	MASTHEAD PRE-AMP FOR 144MHz	FEB 87	4.20
WR224	"WESTBURY"BASIC WOBBULATOR	JAN 87	3.50
WR214	MOD SRX-30D (AUDIO)	DEC 86	3.00
WR223	HIGH-IMP MOSFET VOLTMETER	DEC 86	2.90
WR222	"TAW" VLF CONVERTER	NOV 86	2.80
WR216	LF BANDS ACTIVE ANTENNA	NOV 86	2.40
WR220	GET STARTED LOW-COST CONVERTER	OCT 86	2.40
WR217	AUTOMATIC NICAD CHARGER	OCT 86	2.40
WR215	SIMPLE 50MHz CONVERTER	SEP 86	3.60
WR213	MOD FRG-7 (CARRIER Osc)	JUN 86	2.70
WR210	"ARUN" PARAMETRIC FILTER	MAY 86	8.10
WR211	"MEON" FILTER (SMALL)	APR 86	3.10
WR209	SIMPLE AUDIO OSCILATOR	MAR 86	4.30
WR208	RF SPEECH PROCESSOR	MAR 86	4.10
WR207	CRYSTAL CALIBRATOR	JAN 86	2.10
WR206	RTTY/MORSE MODEM (Plug-in)	JAN 86	2.80
WR205	RTTY/MORSE MODEM	JAN 86	5.40
WR204	WQ MEDIUM WAVE LOOP	NOV 85	3.00
WR203	SIMPLE CAPACITANCE METER	OCT 85	2.80
WR199	"MEON" 50MHz TRANSVERTER	OCT 85	6.70
WR202	ECONOMY UHF PRE-SCALER	SEP 85	3.70
WR201	ADD-ON BFO	AUG 85	2.50
WR200	LOW-COST CRYSTAL TESTER	JUL 85	2.50
WAD302	BATTERY CHARGER CONTROLLER	JUN 85	3.00
WR197	"COLNE" (Osc/Converter)	JUN 85	3.90
WR198	"COLNE" (Product Det/Audio)	MAY 85	3.90
A005	"COLNE (VFO)	APR 85	3.10
A004	"COLNE" 3.5/114MHz RX (RF Amp)	APR 85	3.10
WAD249	MOD FRG-7 (BFO)	FEB 85	3.00
WAD280**	TRIAMBIC KEYER	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	4.30
WA001	"TEME" (VFO/DOUBLER)	DEC 84	2.80
WAD246	"DART" FOLLOW-UP	DEC 84	4.00
WR196	"TEME" 7/14MHz WRP (TX)	NOV 84	3.70
WR195	STABLE TONEBURST	NOV 84	2.60
WR194	MOD FRG-7 (FM/SQUELCH)	NOV 84	4.50
WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
WR190	MOD FRG-7 (SWITCHING)	OCT 84	4.50
WR187	MORSE SENDING TRAINER	JUL 84	4.50
WR185	AUTO-NOTCH FILTER	JUN 84	6.50
WR184	SIMPLE TOP-BAND RECEIVER	JUNE 84	6.50
WR183	TOP-BAND DF RECEIVER	APR 84	6.50
WR179	TRANSCEIVER VOX UNIT	MAR 84	6.50
WR161	"MARCHWOOD" 12V 30A PSU	JUL 83	2.40
WR165 ect set	"SEVERN" 7MHz QRP TX/RX	-	14.90
WR169	"SEVERN" (TRANSMITTER)	JUL 83	6.50
WR168	"SEVERN" (CH.OVER/SIDETONE)	JUL 83	6.50
WR166	"SEVERN" (RECEIVER/AUDIO)	JUN 83	6.50
WR165	"SEVERN" (VFO)	JUN 83	5.20
WR167	RTTY TERMINAL UNIT FOR ZX81	JUN 83	7.80
WR160	LMS REGENERATIVE RECEIVER	FEB 83	5.20
WR156	REPEATER TIME-OUT ALARM	NOV 82	5.20
WR143	ATV CONVERTER	APR 82	7.10
WR144	IAMBIC KEYER	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCEIVER	AUG 81	7.70
WR095	TRANSCEIVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

DEWSBURY ELECTRONICS

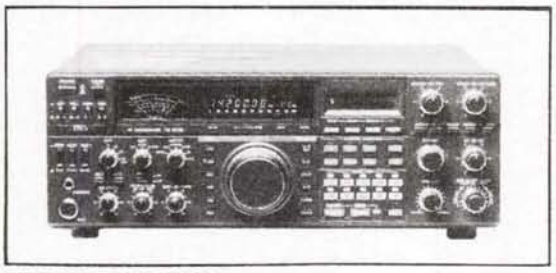
G4CLX

IF IT'S **KENWOOD** IT MUST BE **DEWSBURY**

A FULL RANGE AVAILABLE



TS-140S £862.00



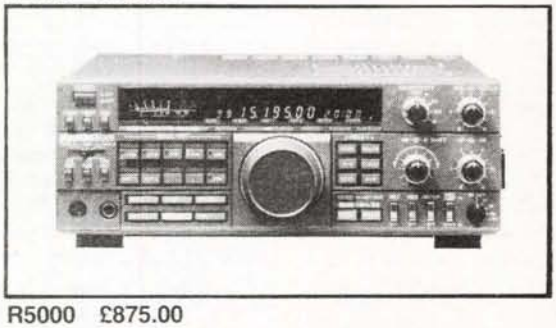
TS-940S £1995.00

TS-440S £1138.00

APPROVED KENWOOD DEALER

APPROVED KENWOOD DEALER

R2000 £595.00



R5000 £875.00

WAVECOM W4010

THE FINEST DECODER IN THE WORLD
NOW WITH FAX. FROM **£895** – SAE DETAILS

STAR MASTER – KEYER £54.70

REPAIRS

PROFESSIONAL
INDUSTRIAL
AMATEUR
PMR

Repairs and Service

- ★ 7 Working days guaranteed turnaround (subject to availability of parts)
- ★ 24 hour industrial service available
- ★ Collection and delivery of equipment, fully insured, arranged on request
- ★ Repairs to Kenwood, Yaesu, Icom, Ten Tec and all types of marine communications equipment

Stockists of DAIWA — WAVECOM — JRC — BENCHERS — VIBROPLEX — MICROWAVE MODULES — TENTEC — YAESU — ICOM

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG.
Telephone: Stourbridge (0384) 390063/371228. Fax: (0384) 371228
Telex: 336712 SHELTN G. Ref. D2850

Access

VISA

Instant finance available subject to status. Written details on request.

Q CODE MUSINGS

As Stan Crabtree G3OXC points out, the Q Code has been with us since the early days of maritime wireless telegraphy. Apart from abbreviating a frequently used question (or reply) it also serves to waive the language barrier.

Whether in amateur or commercial communications, the use of the occasional Q signal is often essential for the speedy exchange of information by Morse.

The first issue of Q signals were contained in the range QRA to QSX, but the following few years saw the expansion to QT. Later QA-QD and QF-QN were introduced to provide working signals for aeronautical communications. In the general category, QU was needed to define further additions and more recently, the expansion of subjects covered has seen codes issued in the QO series.

It is interesting how the definition of some Q signals has changed since their first publication. Very few have retained their original wording. Some have been amended and re-issued because their original interpretation became obsolete. Others have been swapped to a different combination of letters for no apparent reason. An example is QRJ which started off as, "How many words have you to transmit?" From the mid-thirties its interpretation was changed to, "Do you receive me badly?" (or "I receive you badly"). Whilst listening on the shipping calling frequency a few years ago I was puzzled to hear QRJ used as a statement (no ..—..) by a coast station to a ship station. I later learned it now means "I have a radiotelephone call for you". Some have changed to almost the opposite of their original meaning. The first QSV meant, "Public correspondence is being handled - please do not interrupt". By 1938 this had changed to its present meaning of, "Send a series of VVVs".

In some cases the wording of an expression has remained but the Q signal has been changed. For example, "I am receiving you badly" started life as QRL, moved to QRJ, but is now apparently no longer considered necessary.

The good manners of the Edwardian period come to the fore in the choice of English in definitions of the early code, published in the *Year Book of Wireless Telegraphy and Telephony* of 1914. QSY was listed as, "Let us transfer to the wavelength of .....metres". The present day version retains the meaning but is a little more businesslike: "Change to transmission on .....kHz". Another early code reminiscent of the time was QSX, which then queried: "Must I diminish the frequency of my spark?" A straight "QSX" in answer to this question would inevitably have meant a session adjusting the distance between the two or more balls of the spark gap. A change of dialogue in the reverse direction was noted in the code QRN. In 1914 this signal translated as the down to earth: "Are the atmospherics strong?" but in 1938 it appeared as the somewhat drawn out: "Are you troubled by atmospherics?" The current version is defined as "Are you troubled by static?"

Still on the subject of old time courtesy, how about QSD? In 1914 this was listed as: "Let us compare watches. My time is .....What is your time?" By 1920 the wording had been condensed to "What is your time?" and later the code was changed to the present QTR. QSD was later used for a completely different meaning: "Your keying is incorrect; your signals are bad". This will undoubtedly bring a smile to the face of all old-time professional operators. A realistic interpretation of QSD has always been: "Your Morse is awful". It was rarely used except possibly to a first tripper by a "senior man" on another ship. It was the worst admonishment a wireless operator could get and send over the air, it was generally followed by a silence in which the recipient was lost for words. There really was no answer. QSD could cause such embarrassment that a newcomer might well resume by making an even bigger hash of his Morse characters. Through the years the phrasing has changed and QSD is now listed, perhaps more diplomatically as: "Your signals are mutilated".

Many of the early "Q" signals naturally referred to the spark transmissions of the time. QSB, "Your spark is bad" was in use until the early thirties. By 1938 it had been changed to its present: "The strength of your signal varies". QSC: "Is the spacing bad?" invited a comment on the spark train frequency which was dependent upon the distance between the balls of the spark gap. QSC subsequently disappeared completely for around thirty years but has now returned as: "Are you a low traffic (cargo) ship?" Another in this group is QSQ which in 1914 was listed as "You are being called by ....." (now QRZ) and reappeared in the fifties as "Have you a doctor on board?"

QRM has retained its general meaning for over three quarters of a century although when the actual wording is compared, a different conclusion could quite reasonably be made. In the 1914 *Yearbook* it is recorded as: "Are you disturbed?". By 1922 this had been amended to the rather more direct "Are you being interfered with?" (linked with the admission "I am being interfered with"). However, the latest version brings the interpretation strictly back to the field of communications with: "Is my 'transmission' being interfered with?"

A rather poignant signal was the original QSN: "Are you in communication with the land?" A straight QSN indicated this was not the case. This signal was obviously necessary in the early days (before h.f.) when the vessel's m.w. transmitter was out of range of any coast station. QSN is not shown in the *Handbook for Wireless Operators* issued in 1938 by HMSO, probably because by this time its original meaning was considered obsolete. In fact, this signal could well have been used in the fifties as there were many vessels sailing the oceans of the world with only limited range m.f. transmitters at this time. QSN did not appear again until the seventies, but then as: "Did you hear me (or .....) on .....kHz?" Another signal of the early years of wireless was QRH: "What is your wavelength?" This was in the days before a frequency could be read off a directly calibrated dial. The receiving apparatus at sea was most likely the three stage Marconi multiple tuner which even with its beautifully engraved ebonite dials could not guarantee the actual wavelength being copied. It is reasonable that the receiving operator should query the wavelength of a transmission and make a note of his dial readings.

It is strange that only in recent years has the Q Code provided a comprehensive group of signals for emergency working. When first published, none of the signals had any reference to distress at sea. This is surprising as by this time the *Titanic* and other tragedies had shown what an important part wireless could play in maritime rescue. During the thirties, QSR, which was originally designated: "Will you forward the radiotelegram to .....?" was amended to represent: "Has the distress call received from ..... been cleared?" The 1938 *Handbook for Wireless Operators* was the first to show QUF: "Have you received the distress signal sent by .....?" and QUM: "Is the distress traffic ended?"

In the most recent list of abbreviations, published in the *Handbook for Wireless Operators* by Lloyds of London in 1985, most emergency situations are covered. QTD: What has the rescue vessel or aircraft recovered?"; QTW: "What is the condition of survivors?" QTY: "I am proceeding to the position of the incident and expect to arrive at ....." and QTZ: "I am continuing to search for .....", are a few of them. The "QU" series have also been extended to include, amongst others: QUR: "Have survivors: 1. Received survival equipment? 2. Been picked up? 3. Been reached by the ground rescue party? QUS: "Have you sighted wreckage or survivors?" QUP: "Will you indicate your position by 1. Searchlight 2. Black smoke trail 3. Pyrotechnic lights. Although the occasions when the above code signals

will be made by Morse is limited, their inclusion on telex messages can still cut down the plain language content of an urgent report.

From the start of wireless communication the Q Code has reflected the changes that have taken place. QRS and QRQ (send slower or faster) were in the very first codes devised and are still valid today. In recent years QRR has been introduced for the first time as: "I am ready for automatic operation ..... send at .....w.p.m. During the late fifties when radiotelephony began to be used in maritime communications there was an obvious need for QOA: "Can you communicate by telegraphy on 500kcs?" QOB: "Can you communicate by radiotelephony on Ch. 16 (156.8mcs)". Even language is now catered for in QUE: "Can you speak in .....(language) with an interpreter if necessary?" and QOD: "Can you communicate with me in .....?" This is followed by a number from 0 to 9 representing one of the main languages of the world. QOF queries: "What is the commercial quality of my signals?"

In many cases, modern telegraphy communication by radio-telex is preceded by hand-keyed Morse signals such as QOH: "Shall I send a phasing signal" and QOL: "Is your vessel fitted for reception of selective calls?" the latter referring to ARQ, RTTY working. Other codes for present day working are QOG: "How many tapes have you to send?" and QOI: "Send your tape".

At least two codes have progressed on from exclusive radio communication use, to be accepted as a standard for the passing of metereological information. QUB (Quebec Uniform Bravo) is now universally used as a request for (or reply to) the visibility, height of clouds, ground wind and weather state at a location. Similarly, QNH (Quebec November Hotel) is used phonetically to refer the the current barometric pressure at ground or sea level.

Even with the inevitable decline in hand-keyed telegraphy, it is unlikely that the Q Code will disappear completely. The group of three letters slip so easily from the tongue that they have developed into part of the radio-telephone operator's routine or working, and in general they are instantly recognisable; which is more than can be said for many present day TLAs (three letter acronyms).

PW

Feature

Practically Yours

Glen Ross G8MWR

Most c.w. operators like to hear what they are sending, if for no other reason than to gain confidence. Unfortunately, for many years the equipment suppliers have decreed, in most part, that this facility was not to be included in the spec of their transceivers.

So if you have a rig with no side-tone generator you might like to try your hand at constructing your own. The circuit given in Fig. 1 not only provides an r.f. driven side-tone but also doubles as a Morse practice oscillator.

Switching

A short pickup wire is placed near to the coaxial cable of the rig in use or, in the case of a QRP rig, near the final tuned circuit. The exact length of this pickup wire is not critical and can be adjusted as is convenient. When the transmitter is keyed the r.f. picked up is fed via C1 to a pair of diodes connected as a voltage-doubling rectifier. The resultant voltage turns Tr1 on and a supply voltage is then applied to Tr2 and Tr3, connected as an astable multivibrator. When the unit is used as a Morse practice oscillator the same effect is produced by closing the key which applies a positive voltage to the base of Tr1 via resistor R1.

Oscillator

The actual frequency at which Tr2 and Tr3 oscillate can be set within reasonable limits by adjusting preset resistor R5. In the original prototype the output of the oscillator was fed to a separate audio amplifier. However, in the course of experimentation it was found that adequate volume could be obtained by placing the loudspeaker in the collector circuit of Tr3. To adjust the volume of the oscillator a preset resistor (R6) was placed in series with loudspeaker. Both controls can either be p.c.b. mounted or added as front panel controls.

Construction

The construction is really not critical and the unit may be housed in any suitable enclosure. The prototype was built on Veroboard and the physical layout of the components can closely follow the layout of the circuit diagram. Power for the circuit can either be taken from the 12V shack supply or from a small 9V battery fitted inside the case. The impedance of the loudspeaker should be somewhere between 30 and 100Ω, these can be obtained from most component retailers or salvaged from surplus personal hi-fi speakers. These are often on sale at rallies for £1 a pair and are generally 32Ω.

PW

Components list

Resistors
0.25W 5% carbon film
2.2kΩ 3 R2,3,4
220kΩ 1 R1

Preset resistors
500Ω 1 R6
22kΩ 1 R5

Capacitors
Mylar film
10nF 2 C1,2
33nF 1 C6
47nF 2 C3,4
Electrolytic 16V
47µF 1 C5

Semiconductors
Diodes
OA90 2 D1,2
Transistors
BC107 3 Tr1,2,3

Miscellaneous
LS1 30-100Ω speaker; S1 s.p.s.t. switch; SK1,2 and 3 4mm type; PL1,2 and 3 4mm type; Veroboard; connecting wire; enclosure.

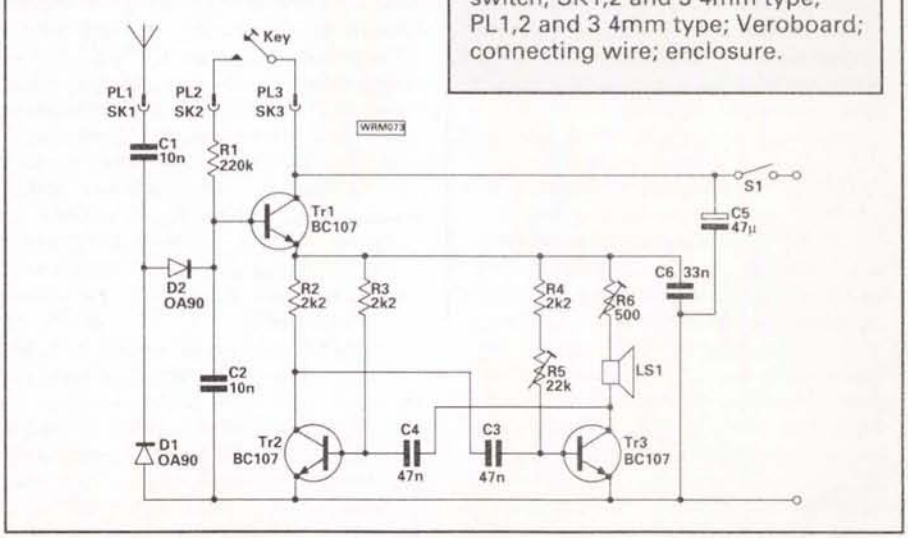


Fig. 1: Circuit diagram of the side-tone oscillator

Surface Mount Devices and the Amateur

Apart from providing a useful little receiver for the new WARC 30m band, this project by W. Mooney is designed to give some good practice in using surface mount devices. In Part 2 we look at the circuit and how it works.

The 30m band is new to the amateur service. It is c.w. only and covers the range 10.10 to 10.15MHz. A quick look at the h.f. predications for any month in *RadCom* reveals that this is no mean allocation as far as DX is concerned often offering better DX than the famous 14MHz band. The object of the design, however, is not to break records but just to get an ear on the band and see what's going on down there. If you don't read c.w., now's the time to learn because there's no s.s.b. section to turn to when you're feeling lazy. However, there is usually some slow QSOs on the band and you can always listen for the beacon, DK0WCY on 10.144MHz, to study conditions until some receiving proficiency is achieved.

This is not the simplest of s.m.d. projects and perhaps for the rank beginner to electronics and wireless, let alone s.m.d.s, it will take a little patience. The most difficult part of the project is the preparation of the p.c.b. which is a little compact by normal standards. There is no reason why a more generous size of board, say double the size, should not be used for this circuit. Some of the fun of s.m.d. work is in size reduction so the temptation to shrink the design is strong. Again, the actual finished device described here is not the ultimate in miniaturisation and almost no advantage is taken of the low profile.

The Circuit

A block diagram of the d.c. receiver is shown in Fig. 2.1. For those not familiar with this type of circuit it must be said that the d.c. design is very popular and there is little if any original circuit design here. Many variations on the theme have been published but its implementation in s.m.d. is new and should provide food for thought for those working with simple QRP or portable equipment. The circuit represents probably the simplest way of receiving signals off air with sufficient sensitivity to use with a low power companion transmitter and have reasonable chance of hearing what's coming back.

Essentially signals selected by the parallel tuned input circuit are mixed in the detector with the local oscillator signal running at about the same frequency. Sum and difference signals are produced in the detector. Sum signals are at r.f. input (10MHz) plus l.o. (10MHz) and therefore lie outside the audio range at 20MHz. Difference signals, however, lie in the audio range such that if a signal coming in at

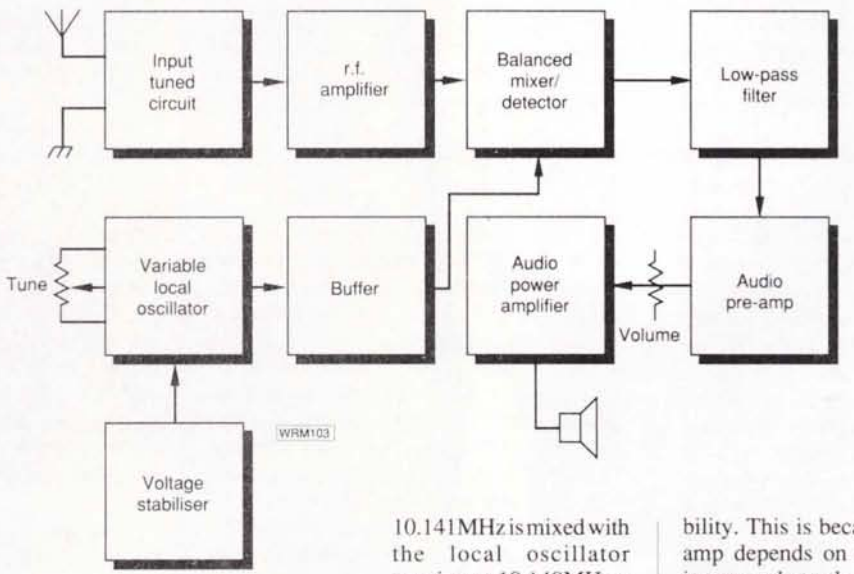


Fig. 2.1

10.141MHz is mixed with the local oscillator running at 10.140MHz a difference signal of 1kHz will be heard. Hence conversion is direct to the audio frequency range as opposed to the more normal intermediate frequency used in superhets. If the signal is on/off Morse code this will be received in the form of a 1kHz audio on/off tone. It is usual to employ some form of narrow audio filter, however, this is deliberately avoided in this design since the ear is quite capable of differentiating between several simultaneous c.w. transmissions on different frequencies. The particular audio tone being selected by concentrating on the pitch, style and character of the sending. More importantly a wide audio bandwidth gives a degree of whole band ambience which is useful in a "snoopy" receiver of this kind.

The circuit diagram of the complete receiver is shown in Fig. 2.2. Starting at the antenna and working inwards, we first meet a parallel tuned circuit. This helps to prevent strong out of band signals from desensitising the receiver and also reduces the inputs on 2x, 3x, 4x, etc., the local oscillator frequency which would appear as interfering signals. It also functions to match a low impedance antenna or a short whip to the pre-amplifier. The pre-amplifier device, TR1, is a grounded gate f.e.t. which provides some isolation between the l.o. and the antenna circuit. The local oscillator output needs to be quite high to drive the diode demodulator so the device will radiate a strong interfering signal. The signal emerging from the drain of TR5 is switched by the diodes D3 and D4 on alternative half cycles at the l.o. The balanced nature of this detector also reduces carrier radiation. Filtering of r.f. and supersonic products is provided by RFC2 and C20. Audio is passed to TR6, the pre-amplifier, by way of C19 to give a gain of about 20dB. The volume control, R14, is very necessary in a receiver without any a.g.c. there is sufficient gain at full volume to cause limiting or clipping in the audio stages on all but the weakest signals. This control should always be set for maximum audio without clipping, an effect easily heard as unpleasant distortion. The audio driver stage is a 741 op amp. This has minimal, but adequate, output power and is a simple gain block. It should be noticed that the positive input to the op amp is not decoupled as in many similar designs. Decoupling this input to either supply rail will simply inject supply ripple into the signal path, resulting in excess noise or instability. This is because the output of the op amp depends on differences between the inputs and not the absolute value of either input. With the high gain in IC1, it has a response which falls off above the middle audio range. Further upper audio frequency and r.f. attenuation is given by C21 in the negative feedback path of TR6. The audio output stage is a bit novel and consists of a CO4011 c.m.o.s. quad dual input NAND gate with all gates in parallel. The quiescent current is a little high at some 8mA. The output power is sufficient to drive a small 100mW loudspeaker. Although a larger external speaker will give improved audio, a feedback resistor ensures mid rail voltage at the output. Although the transfer is not linear the resulting disortion is immaterial in this application.

The local oscillator is again a very popular circuit design. Transistor TR1 is a standard Colpitts oscillator. Its source supply is voltage stabilised by TR2 and D1. This is a constant voltage generator (TR2) feeding a constant current supply (TR1). Noise from the Zener is removed by C10. A mere 10pF is used to couple the oscillator to TR3/TR4, a wide-band amplifier. The oscillator is

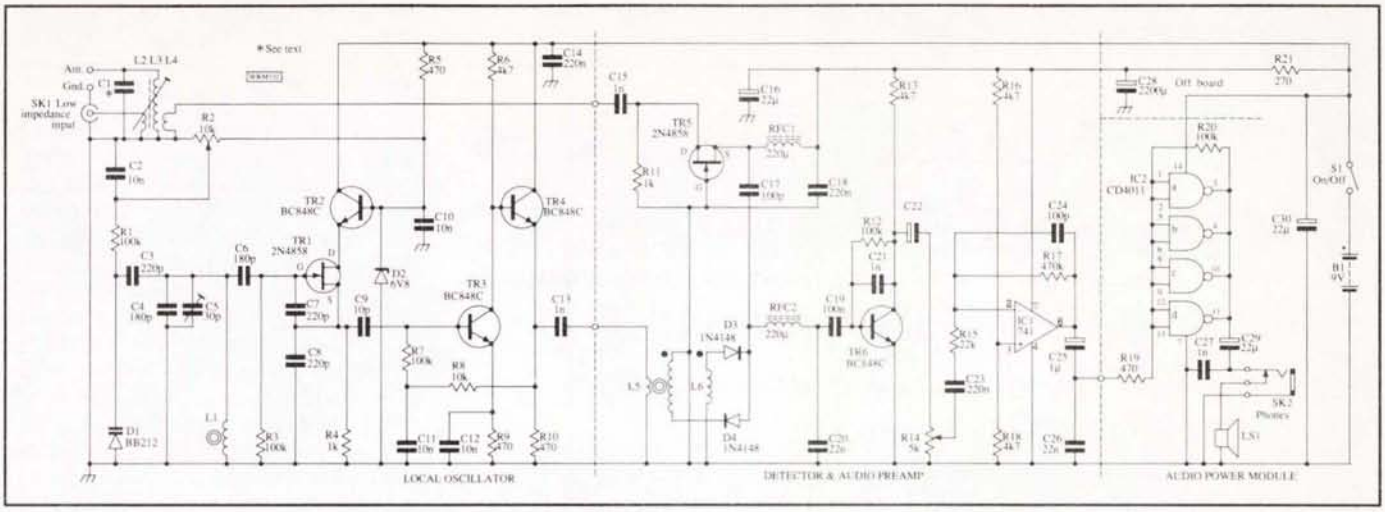
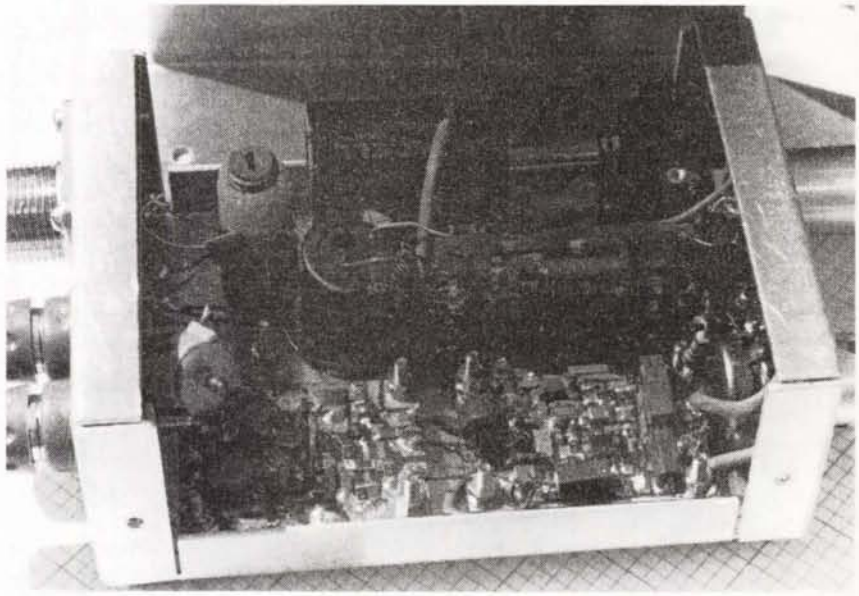


Fig. 2.2

therefore quite free from pulling and with the amplification provided by TR3/TR4 has sufficient output to drive the diode detector/mixer.

The oscillator was not temperature compensated in the prototype. The tuning range is about 200kHz and the 50kHz band remains somewhere in the range at all reasonable temperatures, the band being found by ear. The tuning control may be roughly calibrated but it is a simple matter to monitor the oscillator output with a frequency counter for better accuracy or if it is used with a transmitter for example. The tuning rate is very non-linear with potentiometer rotation, and this also makes a permanent calibration difficult. Access to the trimming, band set, capacitor through the cover could easily be arranged and the tuning pot marked in, say, 10kHz segments. Current consumption by the complete receiver is about 25mA and it will therefore need to be run on an alkaline or re-chargeable 9V battery.

A good antenna will obviously help a great deal but the receiver has sufficient sensitivity to work on a small whip antena or random length of wire, particularly for local stations. For this purpose two inputs are provided, a high impedance input for short lengths of wire and a low impedance PL259 coaxial input. Direct conversion receivers of this type are subject to broadcast band interference at times and shorter antennas will help.



This shows the author's prototype receiver, full constructional details will be given in Part 3.

SNIPPETS

The use of ordinary domestic lamps as r.f. dummy loads more or less stopped with the advent of fragile solid-state p.a. stages. However, they can still be utilised if used in conjunction with an a.t.u. and v.s.w.r. bridge, just like an antenna. Care should be taken when loading up semiconductor output stages, keeping key-down time to a minimum, until a good match has been obtained. Comparisons made between the brightness of two 100W lamps, one mains powered and the other r.f. powered, can give you a fair indication of your transmitter's output power. **J.W.** *F621*

Aluminium cooking foil can be used as an effective ground-plane for vertical antennas as well as broad-band elements of indoor dipoles. Application of foil to the underside of a glass fibre caravan roof would make an ideal ground plane for that discreet holiday based 144MHz vertical. Aluminium foil can also be used to screen the plastics enclosures of home computers. However, it is essential to put a layer of insulating material between the electronics and screen, to prevent short circuits. **D.B.** *F984*

Difficult-to-reach nut or screw positions can be overcome by the use of a long reach screwdriver with a plastics sleeve over the shank, for example, pvc tubing which can be purchased in motoring shops. This in effect makes an expandable nut or screw spinner. When using ferrous fasteners the screwdriver blade can be magnetised to hold the screw or nut. The blade is magnetised by rubbing it several times over the poles of an old loudspeaker magnet.

Another way of holding a difficult-to-reach nut in place while a screw is inserted from the other side of a panel, is to run a few threads of the nut on to a suitable diameter piece of soft wooden dowelling. Once the screw has bitten, the dowelling can be withdrawn and used to stop the nut from spinning as the screw is turned. **J.O.** *G305*

Special Book Offer

A special offer to *Practical Wireless* Readers on the *Filter Handbook - A practical design guide* by Stefan Niewiadomski.

Save £5 on the published price of £25

The *Filter Handbook* is a guide to electronic filter design and implementation. Stefan Niewiadomski studied for an honors degree in electronics at Liverpool University and a masters degree in modern electronics at Nottingham University. His interest in filter design began when designing radio projects, some of which have been published in *Practical Wireless*.

Contents include:

★ Passive and active filters ★
★ Computer programs to aid design ★
★ Overcoming practical problems ★
★ Worked examples ★
★ Switched capacitor and switched resistor filters ★

The *Filter Handbook* (ISBN 0 434 91378) is in hardback, comprising 200 pages 246 x 189mm with 200 illustrations, and will be published by Heinemann Newnes. The special pre-publication offer price to *PW* readers is £20 including post and packing. (Books are zero-rated for VAT.)

HOW TO ORDER

Complete both coupons in ink, giving your name and address clearly in block capitals. Coupon (2) will be used as the address label to despatch your book to you.

Send the coupons with your cheque to: Practical Wireless, FREEPOST, Book Offer (Sept), Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard or Visa only), please fill in your card details and sign the coupon where indicated.

Available to readers of *PW* in England, Scotland, Wales, N. Ireland, the Channel Islands, the Isle of Man, and BFPO. Orders are normally despatched within 28 days, but please allow time for carriage. **The closing date for this offer is 15 September 1989.**

(1)
To: Practical Wireless, Book Offer (Sept), FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP
Please send me.....Filter Handbook(s) @ £20.00
Name.....
Address.....
.....
.....
.....Postcode.....
❑ I enclose cheque/PO (Payable to PW Publishing Ltd) £.....
❑ Charge to my Access/Visa Card the amount of £.....
Card No.

Valid from ..... to .....
Signature.....Tel.....

(2)

Name .....

Address .....

.....

.....

.....

Postcode .....

If you do not wish to cut your copy of *PW* you must send the corner flash with full details and remittance.

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

FILTER HANDBOOK OFFER PW SEPT 1989

ENTERPRISE RADIO APPLICATIONS LTD.

THE MKII MICROREADER
A COMPLETE MORSE/RTTY DECODER WITH TUTOR
PRICE £139.95 includes VAT & Postage.

TO ORDER OR FOR MORE INFORMATION ON THIS OR ANY OF OUR OTHER PRODUCTS:—
ERA LTD
26 CLARENDON COURT
WINWICK QUAY
WARRINGTON WA2 8QP
Tel: (0925) 573118

ALSO AVAILABLE FROM

CRT: ST HELIER JERSEY
ELECTROMART: NEATH
HOWES KITS: DAVENTRY.
RAS: NOTTINGHAM.
STAR: TYNE & WEAR
WATERS & STANTON
ESSEX.

WHAT IS A MICROREADER?

The Microreader is a small compact unit that allows anyone, equipped with a suitable SW receiver, to read Morse and radio teletype signals simply and without fuss. No computers, interfaces or program tapes are needed. Just connect the Microreader into the ear or speaker socket and switch on. It really is that easy. The decoded words appear on the built in 16 character LCD display.

The Microreader has all the necessary filtering and noise blanking included to allow reception even under bad conditions. This makes it suitable for use with lower cost or home made sets. Receivers such as the Lowe HF125/225 with their smooth tuning are ideal. Even the SONY 2001D with its 100Hz step size will still give very good results. A three colour bargraph tuning indicator makes precise station tuning simple, while shift indicators take the guess work out of RTTY.

The main processor in the Microreader is an Intel 8032 running at 12MHz. This makes it fast enough to not only decode and display the text but also to measure and display the frequency a few thousand times each second. Its even fast enough to use its own dictionary to check and correct the text even down to punctuation. The RS232 port in the Microreader can if you wish be used to send decoded messages directly to the screen of a terminal unit or suitable computer. If a permanent record (hard copy) is needed, then just connect it directly to a compatible serial printer.

The Morse tutor can send and receive Morse. No more guessing what was sent at which speed. You see exactly what is being sent as it's keyed and you may repeat it as many times as you like. The random characters are sent as ten groups of five characters with precise digital control over speed, spacing and type. Plug in a Morse key and see what your reading is really like. Even experienced CW operators find this feature extremely useful for showing up embarrassing keying faults (especially own name and callsign).

ERA Ltd. is a manufacturing facility and as such has no showroom. We do however accept personal callers who may like to find out more about the Microreader or try one on their own equipment without obligation. Due to limited parking during the week we must restrict this to Saturdays only, but please do ring us first.

NORTH WAKEFIELD RALLY

SUNDAY 24th SEPTEMBER AT 10.30

Outwood Grange School, Outwood, Wakefield

Trade Stands ★ Repeater Groups
Licensed Bar & Refreshments
Bring & Buy ★ Talk-in on S22 & RB15

Details — evenings and weekends

Richard, G4GCX 0532-622139
John, G0EVT 0924-825443

J. BIRKETT

RADIO COMPONENT SUPPLIERS

25 The Strait
Lincoln, Tel. 20767
(LN2 1JF)
Partners J.H.Birkett.
J.L.Birkett.

ELECTROLYTIC CAPACITORS 32+32uf 275vw @ 45p, 40uf 400vw @ 45p, 50+50uf 275vw @ 45p, 1 Ouf 450vw @ 45p.
RAYCHEMM HEAT SHRINK SLEEVING 1" Dia 30m reel @ £6.50 (p+p £1.50).
SPECIAL METER 3" Dia 5-0-5 ua @ £4.95 each.
DISC CERAMICS 330pf 4kvw @ 10 for £1.
X BAND GUNN DIODES @ £1.65. X BAND DIODES like 1N23 @ 45p, SIM2 @ 45p, 1501E @ £1.65.
MINIATURE TOGGLE SWITCHES DPDT @ 5 for £1, 10 for £1.80.
TRIACS unmarked 400 piv 6amp @ 5 for £1.50.
ASSORTED MULTI-TURN TRIMPOTS @ 9 for £1, 18 for £1.50.
STORNO BOOT MOUNTING 10 CHANNEL 25 WATT FM TRANSCEIVER no accessories @ £8 (p+p £3).
EX-MILITARY COMMUNICATION RECEIVER R210 covering 2 To 16MHz in 7 switched bands with BFO, CW Filter crystal calibrator, noise limiter aerial dipole, long wire or whip converted to 240 volt AC with loudspeaker and lightweight pair of Headphones @ £79.80 (carr £8).
EX-MILITARY COMMUNICATION RECEIVER R210 in an unconverted condition @ £50 (carr £6).
8UF 600VW PAPER CAPACITORS @ £1 each 5 for £4.
NUT FIXING 'FEED' THRUS 500vw 1000pf or 4700pf @ 55p each.
DYMAR LYNX 830 DASH MOUNTING 16 CHANNEL FM 25 WATT TRANSCEIVER with suggestions for converting to 4m @ £15 (p+p £3).
PYE WESTMINSTER W15FM DASH MOUNTING FM TRANSCEIVER 79 to 110MHz @ £15 (p+p £2).

ACCESS AND BARCLAY CARDS ACCEPTED. P.P. 60p UNDER £5.00. OVER FREE UNLESS OTHERWISE STATED. C.M.HOWES AND WOOD AND DOUGLAS KITS AVAILABLE BY POST AND FOR CALLERS.

SMC SOUTH MIDLANDS COMMUNICATIONS

20% OFF
MET ANTENNAS

Designed and built to the specifications of the American National Bureau of Standards (N.B.S.), these British made Yagis are ideal for the discerning amateur radio enthusiast, offering both quality and performance, whilst remaining extremely durable.

Due to a massive stock purchase, SMC are pleased to offer a fantastic **20%** discount on the manufacturers R.R.P.

Stocks are limited — so phone today to avoid disappointment.

2m Antennas		Gain (dBd)	RRP	SMC	CARR
144/5	5 ele	9.2	24.20	**19.36**	7.50
144/7T	7 ele	10.0	29.85	**23.88**	8.00
144/8T	8 ele	11.0	38.65	**30.92**	8.00
144/14T	14 ele	13.0	57.75	**46.20**	8.00
144/19T	19 ele	14.2	69.10	**55.28**	8.00
144/6×	6 ele crossed	10.2	49.15	**39.32**	8.00
4m Antennas					
70/3	3 ele	7.1	37.25	**29.80**	8.00
70/5	5 ele	9.2	56.55	**45.24**	8.00
6m Antennas					
50/2	2 ele	4.7	34.40	**27.52**	8.00
50/3	3 ele	7.1	42.95	**34.36**	8.00
50/5	5 ele	9.2	64.40	**51.52**	8.00
70cms Antennas					
432/5B	5 ele	9.2	20.95	**16.76**	3.75
432/17T	17 ele long	15.0	48.45	**38.76**	8.00
432/19T	19 ele	14.2	44.00	**35.20**	8.00
432/17X	17 ele crossed	13.4	60.80	**48.64**	8.00
Power Splitters					
144-2	2m 2 way		32.90	**26.32**	2.75
144-4	2m 4 way		37.10	**29.68**	2.75
432-2	70cms 2 way		25.26	**20.21**	2.75
432-4	70cms 4 way		29.65	**23.72**	2.75

All prices are inclusive of VAT

SOUTH MIDLANDS COMMUNICATIONS LIMITED
HEAD OFFICE: S M HOUSE, SCHOOL CLOSE, CHANDLERS FORD INDUSTRIAL ESTATE, EASTLEIGH, HANTS
TEL: (0703) 255111 TLX: 477351 SMCOMM G
FAX: (0703) 263507

PW REVIEW

THE ERA BP34 COMMUNICATIONS FILTER

An advanced "one knob" audio filter for the radio amateur and short wave listener. The Rev. G.C. Dobbs G3RJV, an experienced amateur, who knows the value of simple-to-operate equipment, puts this unpretentious filter through its paces.

The radio amateur world needs another commercial audio filter like my garden needs slugs-so I thought as I was asked to test run the ERA Communications Filter. Everyone seems to do one and I have tried a lot of them. My interest in simple home built communications equipment often involves in me playing with relatively simple receivers, most of which lack inherent selectivity and can be improved by audio filtering. I have built several types of audio filter and have used many varieties of commercial filter.

Audio Filtering

Without doubt the best audio filter that the radio amateur possesses is a pair of ears. To avoid drifting into a homily, it is enough to say that those of us fortunate enough to have our full sense of hearing posess a remarkable instrument. One of its most useful facilities for listening to signals on a crowded amateur band is what has sometimes been called "the cocktail party effect"- the ability we have, in a crowded and noisy room, to pick out one conversation at the expense of the others. An experienced radio amateur can bring this facility into full effect when listening to c.w. signals on an overcrowded band.

Relying upon the ears alone does demand great concentration and can be very tiring for long periods of time and an optional filter is often very welcome. The problem with many types of audio filter is that they can become a distraction in themselves. In the attempt to introduce the filtering, the operator may have to concentrate on the unwanted signals, at the expense of losing the required signal, or have to perform a sequence of controls distracting the mind from the information being copied. Sophisticated filters may be complicated to use and defeat their very purpose.

Audio filters, however good, which simply switch in and out of the receiver circuitry can be just as bad. I have owned well-designed, narrow bandwidth, c.w. audio filters and switched them in when listening conditions have been difficult only to find I have lost the signal. The signal may not have been tuned exactly to the centre of the passband and in the effort to retune the signal so that I can hear it through the filter, it has been lost. Many active audio filters, commercial models not excepted, suffer from "over shoot" and give an unpleasant ringing effect. Initially the signal can sound good and clear but after a little time the brain begins to object to listening to "a penny rattling in a jam jar".

Why Bother?

Modern communications receivers tend to have well-designed mixer and i.f. stages, the products of today's technology. The audio stages can rarely claim such advances. It might be argued that hi-fi quality is not needed but I am disappointed by some communications receivers which offer poor quality audio amplification fed into an inadequate loudspeaker. Most receiver filtering is carried out before the high gain i.f. stages, where the inherent wideband noise from the i.f. amplification can degrade the signal to noise ratio. After which, the audio stages will probably pass higher and lower frequencies than are required for communication. An audio bandpass filter which passes signals within the required band of audio frequencies and blocks those above and below that band, can be a very useful addition to a receiver.

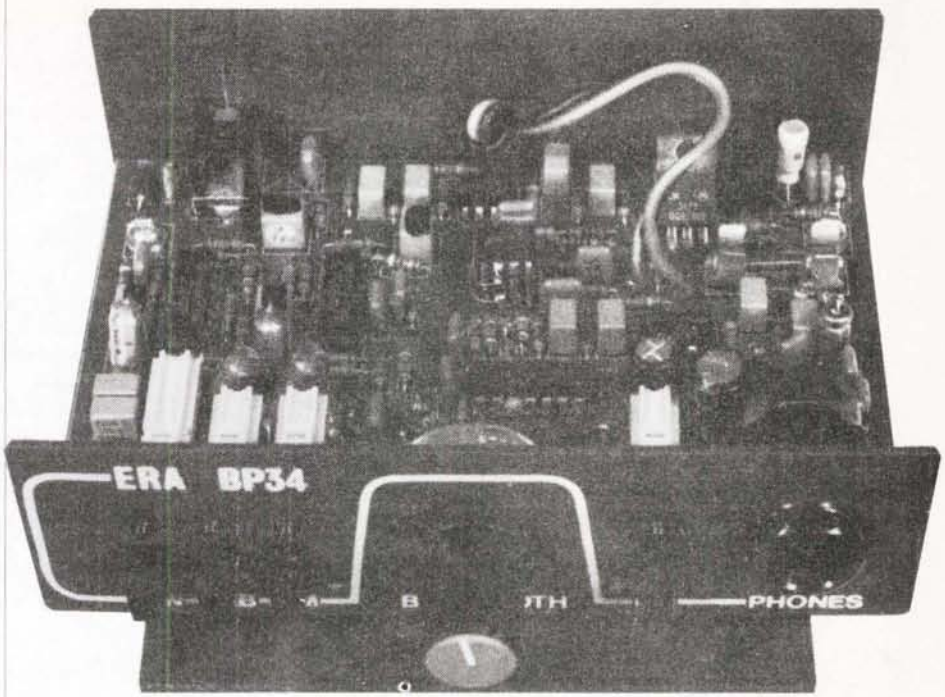
In single sideband (s.s.b.) communication the audio range covered is roughly between 300Hz and 2700Hz; a bandwidth of 2400Hz. In amplitude modulation (a.m.) the bandwidth is wider but most other forms of data transmission fall within the s.s.b. range. Morse (c.w.) communication requires very little bandwidth, but requires special attention because an intermittent tone can be heard at levels 10 to 20dB below that of a continuous tone. A good audio filter should cater for various modes by having a flat passband without introducing unnecessary ripples.

For a simple mode, the audio requirements for c.w. filtering are quite complex. The optimum listening frequency for a c.w. note depends upon the operator's hearing ability but a generally found range is as low as 400Hz and up to 1200Hz. It can be greatly affected by interfering signals which may superimpose one or more additional tones. In general, c.w. operators will have their own preferred listening audio frequency. This should be arranged to coincide with the transmitter's sidetone frequency, usually adjustable, so that the sidetone remains audible through a filter's narrowest passband.

In theory, a c.w. filter can have a very narrow bandwidth. Only a few hertz are needed for manually sent Morse. The limit is imposed by the

technology. The aim is to produce a clean note without any overshoot, ringing or other unwanted side-effects. A narrow steep-sided filter may look good on paper but may give blurred or ringing responses even at moderate speeds of sending. A super-narrow filter is useful until the required signal drifts out of the passband or (heaven forbid!) the operator's receiver drifts away from the signal. In these days of synthesisers and stable, solid state, variable frequency oscillators, a practical limit can probably be set at around a 100Hz or a little less.

Stopband attenuation can be an important factor especially on the 7MHz band where strong interfering signals can appear. A filter with 40dB of unwanted signal rejection may seem adequate but weak stations may well be 40dB down on unwanted signals. A weak station at -40dB will be masked by a signal 100 times stronger (0dB). So a high level of stopband attenuation is desirable.



The BP34 Filter

The first thing I noticed on unpacking the BP34 were the impressive specification figures (see maker's specification). The BP34 is a cascaded elliptic audio bandpass filter with two fixed lower cut-off frequencies and continuously variable upper cut-off frequencies. It combines 34 poles of filtering for maximum selectivity and stopband attenuation with minimum passband ripple. The block diagram in Fig. 1 shows that the BP34 contains several filter types; a 5th order bi-quad elliptic highpass, a 4th order Sallen-Key aliasing lowpass, three 7th order switched capacitor elliptic lowpass and a 4th order Sallen-Key smoothing lowpass.

The heart of the filter is a switched capacitor elliptic filter. In fact, it is three XR-1015 integrated circuits piggy-back cascaded on the top of each other for superior roll-off. For a description of switched capacitor audio filters see the article by Christopher Page G4BUE, on the SuperSCAF Filter in the May 1988 issue of *PW*. It is sufficient to say here that it is a digital process which stores samples of the signal on a capacitor. A clock controls the sampling and transfer rates. Whereas analogue active filters require critically matched component values, in this system only the ratio of the components is critical. The clock rate controls the high and low cut-off frequencies.

The SuperSCAF Filter uses thumbwheel switches to pre-set the values of lowpass and highpass cut-off frequencies but the BP34 has two fixed lower cut-off frequencies and variable upper cut-off frequencies. This allows for ease of operation with continuously variable bandwidths available from one control knob during operation. The low cut-off frequency depends upon the mode required and is 620Hz for c.w. and 200Hz for all other modes. The single control knob determines the upper cut-off frequency. The ranges are shown in maker's specification.

An example of this control range is shown in Fig. 2, which represents the filter response in the s.s.b. mode. The control range of the adjustable low pass has been chosen such that it only operates in the range that removable interfering signals occur. It should, therefore, be impossible to filter out required signal information. In the case of s.s.b. the lower lower cut-off -3dB point is set at 250Hz. This is lower than the theoretical 300Hz ideal point to give a more pleasant sound to the signals. Having the bottom end cut-off point variable would give very little gain in performance at the expense of addition complication in operating the filter. The upper cut-off frequency control gives a continuously variable bandwidth between 1500Hz and 3000Hz.

The c.w. range has a lower cut-off point at 620Hz and a continuously variable bandwidth from 80Hz to 1080Hz. On c.w. the filter is centred at 700Hz. This is a little lower than the common 800Hz frequency used in many filters, which is an advantage in that the conventional 800Hz is probably a little high in frequency for comfort of listening. In fact, given the choice, I would come down even lower to around 650Hz for comfortable listening. It depends upon our listening ability and taste, although as our age increases our hearing acuity, especially at higher frequencies, decreases. Men hear lower frequencies better than women. If you want a subjective indication of a comfortable listening pitch, listen to medieval plainsong! When using the BP34, the sidetone on the transmitter should be adjusted to 700Hz.

The minimum stopband attenuation is better than any other audio filter I have seen quoted. It cuts off steeper and goes down deeper than most, if not all, other filters. The passband is flat with very little ripple. The lack of ripple is useful for RTTY or data communications as both mark and space tones may be received at the same levels. The filter also has very low (typically -95dB) inherent noise with no signal present.

The Filter In Use

The BP34 certainly has impressive specifications but how does it perform in practice? I used the BP34 for over six months and have been most impressed. My first good impression was the simplicity of operation. Four push buttons select the main functions which are indicated by red l.e.d.s. A filter ON/OFF switch brings the filter into the speaker or phones lead. With the filter connected the signals should be heard at about the same level as they would come directly from the receiver. Releasing the filter ON button allows the signal to pass directly to the speaker or phones. In this direct switching position all frequencies from the receiver are allowed to pass with some reduction in low frequency hum.

The three other buttons provide the c.w., s.s.b. and a.m. modes. These switches can also be used in combination and the s.s.b. plus a.m. is quoted in the maker's specification.

Wide shift data transmissions may be received in the s.s.b.+c.w. combination. The a.m. bandwidth is tailored for speech reception and loss of bass and treble will be noticed when receiving music.

In short the BP34 was a joy to use. The combination of mode choice and one knob control of bandwidth helped it to do what a good filter should do: aid the readablity of a chosen signal. It is a great advantage to be able to locate required signals with the bandwidth fully or partly open and then with the simple operation of one control reduce the bandwidth by an appropriate amount depending upon the conditions. The value of the ears as a filter became noticable the more I used the BP34. The more I used the filter over the months the less often I seemed to find myself fully closing the passband. I was able to adjust the bandwidth to "my" advantage, not to any pre-determined bandwidth governed by a manufacturer.

The reduction in wide-band receiver noise was helpful even at the widest filter settings and the narrowest c.w. setting gave a pleasing signal quality which seemed clear of ringing and overshoot. Bringing the filter into operation did not interfere with my reading of the signal. The operation of the filter is so simple that total concentration can be given to the required signal, not to the change in the interfering signal, or the process of operating the filter. Even if the required signal had not been tuned into the centre of the passband, I found I could still concentrate on the signal as the bandwidth was reduced. I soon got into the practice of being able to operate the filter bandwidth control and as the passband got narrower, adjust the receiver incremental tuning (r.i.t.) with the other hand, if this was required.

Much of my use of the BP34 has been on 3.5MHz band QRP c.w., where my interest is in working other QRP stations. These are often weak signals on a noisy band and provide a good test for any filter. Without doubt the BP34 is the best filter I have used, so far, for this type of operating.

The BP34 Filter costs £94.50 inc. VAT/postage and is available from the makers ***ERA Ltd. Unit 26 Clarendon Court, Winwick Quay, Warrington WA2 8QP. Tel: (0925) 573118***

I would commend its use for any serious radio amateur and short wave listeners and especially c.w. fanatics. It is a sophisticated device and like any good sophisticated device, it works well and is simple to use. I think the makers may have a problem; it also looks simple. Sadly these days, many radio amateurs like their equipment to "look" complex with lots of controls. Quite a paradox when technical advance, to be any real advantage should make equipment simpler to use. I wonder....?

Maker's Specification

Cut-off frequencies: at -3dB points in all cases

c.w.	high pass 620Hz,	low pass (min 700Hz to max 1700Hz)
s.s.b.	high pass 200Hz,	low pass (min 1700Hz to max 3200Hz)
a.m.	high pass 200Hz,	low pass (min 2500Hz to max 4200Hz)
s.s.b. + a.m.	high pass 200Hz,	low pass (min 3200Hz to max 5100Hz)

Bandwidth: continuously variable, all at -3dB points

c.w.	min 80Hz to max 1080Hz
s.s.b.	min 1500Hz to max 3000Hz
a.m.	min 2300Hz to max 4000Hz
s.s.b. + a.m.	min 3000Hz to max 4900Hz

Passband ripple:

c.w.	between 680Hz and 1650Hz <0.25dB
s.s.b.	between 250Hz and 3000Hz <0.30dB
a.m.	between 250Hz and 4000Hz <0.50dB
s.s.b. + a.m.	between 250Hz and 4500Hz <1dB

Minimum stopband attenuation: low pass >80dB, high pass >60dB

Gain: unity gain of 1 or 0dB

Input impedance: >100kΩ all filter modes

Maximum input signal: 5V p.p. or 1.8V r.m.s.

Output power: typical 400mW into 8Ω speaker at maximum input

Connections:

Signal input to phono socket on rear panel
Speaker output to 3.5mm chassis socket on rear panel
Phone output to 0.25 inch jack socket on front panel (switches off speaker output when phone jack is used).
DC power, via hard-wired red and black cable (red is positive).

Protection:

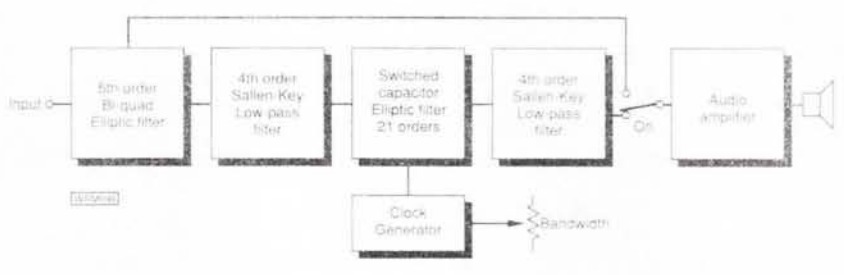
Reverse polarity on d.c. supply via diode, d.c. input current limited by 500mA slow-blow fuse, audio output devices short circuit protected.

Supply:

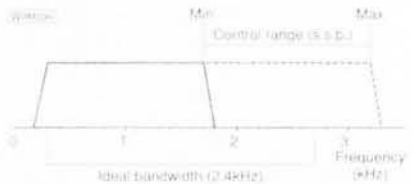
Nominal +13.8V d.c., 12V to 26V d.c. at full rated audio output. Current 60mA quiescent 200mA at maximum input to an 8Ω load.

Dimensions: W x H x D, 134 x 54 x 123mm (including feet).

Weight: 540g



Block diagram of BP34 filter.



Filters response in s.s.b. mode.

VISA 0202 678558 0202 678558

PW BOOK SERVICE

The books listed have been selected as being of special interest to our readers. They are supplied from our editorial address direct to your door. Some titles are overseas in origin.

HOW TO ORDER

Add 75p per order postage (overseas readers add £1.50 for surface mail postage) and send a postal order, cheque or international money with your order (quoting book titles and quantities) to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.** Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Books are normally despatched by return of post but please allow 28 days for delivery. Prices correct at time of going to press.

* A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

RADIO

AIR & METEO CODE MANUAL
10th Edition
Joerg Klingenfuss
Detailed descriptions of the World Meteorological Organisation Global Telecommunication System operating FAX and RTTY meteo stations, and its message format with decoding examples. Also detailed description of the Aeronautical Fixed Telecommunication Network amongst others. *289 pages* **£14.00**

BETTER RADIO/TV RECEPTION
A. Nallawalla, A. T. Cushen and B. D. Clark
An Australian book giving guidance and advice to listeners seeking reliable reception of distant radio stations, and to DX listening hobbyists. *134 pages.* **£9.95**

BETTER SHORTWAVE RECEPTION (USA)
W. S. Orr W6SAI and S. D. Cowan W2LX
Receivers, antennas, propagation, DX listening techniques for the short waves and v.h.f. *158 pages.* **£5.50**

NEW LOW PRICE

PASSPORT TO WORLD BAND RADIO 1989
This book gives you the information to explore and enjoy the world of broadcast band listening. It includes features on different international radio stations, receiver reviews and advice as well as the hours and languages of broadcast stations by frequency. *398 pages.* **£10.95**

SCANNERS (updated)
Peter Rouse GU1DKD
A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating prodedures. *177 pages.* **£7.95**

SCANNERS 2
Peter Rouse GU1DKD
The companion to Scanners, this provides even more information on the use of the v.h.f. and u.h.f. communications band and gives constructional details for accessories to improve the performance of scanning equipment. *216 pages.* **£9.95**

SHORT WAVE RADIO LISTENERS' HANDBOOK
Arthur Miller
In easy-to-read and non-technical language, the author guides the reader through the mysteries of amateur, broadcast and CB transmissions. *207 pages.* **£6.99**

RADIOTELETYPE CODE MANUAL
10th Edition
Joerg Klingenfuss
This book gives detailed descriptions of the characteristics of telegraph transmission on short waves, with all commercial modulation types including voice frequency telegraphy and comprehensive information on all RTTY systems and c.w. alphabets. *96 pages.* **£8.00**

THE SATELLITE EXPERIMENTER'S HANDBOOK (USA)
A guide to understanding and using amateur radio, weather and TV broadcast satellites. *207 pages.* **£9.25**

1934 OFFICIAL SHORT WAVE RADIO MANUAL
Edited by Hugo Gernsback
A fascinating reprint from a bygone age with a directory of all 1934 s.w. receivers, servicing information, constructional projects, circuits and ideas on building vintage sets with modern parts. *260 pages.* **£9.75**

HIGH POWER WIRELESS EQUIPMENT
Articles from *Practical Electricity* 1910-11
Edited by Henry Walter Young
A reprint of interesting practical articles from the early days of radio. *99 pages.* **£6.85**

BEGINNERS

AN INTRODUCTION TO RADIO DXING (BP91)
R. A. Penfold
How to find a particular station, country or type of broadcast and to receive it as clearly as possible. *112 pages.* **£1.95**

BEGINNER'S GUIDE TO RADIO
9th Edition
Gordon J. King
Radio signals, transmitters, receivers, antennas, components, valves and semiconductors, CB and amateur radio are all dealt with here. *266 pages.* **£6.95**

ELECTRONICS SIMPLIFIED - CRYSTAL SET CONSTRUCTION (BP92)
F. A. Wilson
Especially written for those who wish to take part in basic radio building. All the sets in the book are old designs updated with modern components. *72 pages.* **£1.75**

QUESTIONS & ANSWERS RADIO
Eugene Trundle
Basics of electrical theory, radio and semiconductors, receivers, amateur and CB radio, and test equipment. *110 pages.* **£3.95**

THE SIMPLE ELECTRONICS CIRCUIT AND COMPONENTS Book One (BP62)
The aim of this book is to provide an in-expensive but comprehensive introduction to modern electronics. *209 pages.* **£3.50**

TELEVISION

AN INTRODUCTION TO SATELLITE TELEVISION (BP195)
F. A. Wilson
Answers all kinds of questions about satellite television. For the beginner thinking about hiring or purchasing a satellite TV system there are details to help you along. For the engineer there are technical details including calculations, formulae and tables. *104 pages.* **£5.95**

A TV-DXERS HANDBOOK (BP176)
R. Bunney
Information on transmission standards, propagation, receivers including multi-standard, colour, satellites, antennas, photography, station identification, interference etc. Revised and updated 1986. *87 pages.* **£5.95**

GUIDE TO WORLD-WIDE TELEVISION TEST CARDS
Edition 3
Keith Hamer & Garry Smith
Completely revised and expanded, this is a handy reference book for the DXTV enthusiast. Over 200 photographs of Test Cards, logos, etc., world wide. *60pages.* **£4.95**

SATELLITE TELEVISION INSTALLATION GUIDE
2nd Edition
John Breeds
A practical guide to satellite television. Detailed guidlines on installing and aligning dishes based on practical experience. *56pages.* **£11.95**

THEORY

COMMUNICATION (BP89)
Elements of Electronics Book 5
F. A. Wilson
Fundamentals of line, microwave, submarine, satellite, digital multiplex, radio and telegraphy systems are covered, without the more complicated theory or mathematics. *256 pages.* **£2.95**

FROM ATOMS TO AMPERES
F.A.Wilson
Explains in simple terms the absolute fundamentals behind electricity and electronics. *244pages.* **£3.50**

LEVEL II RADIO & ELECTRONICS THEORY
Ian Ridpath ZL1BCG
A sequel to Amateur Radio & Electronics Study Course, covers advanced theory to a level for most technician courses. The handwritten format aims to make the student feel these are his own notes. *169 pages.* **£6.70**

PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP53)
F.A.Wilson
This has been written as a workshop manual for the electronics enthusiast. There is a strong practical bias and higher mathematics have been avoided where possible. *249 pages.* **£3.95**

SOLID STATE DESIGN FOR THE RADIO AMATEUR
Wes Hayward W7ZOI and Doug DeMaw W1FB
Back in print by popular demand! A revised and corrected edition of this useful reference book covering all aspects of solid-state design. *256 pages* **£10.95**

The ARRL ELECTRONICS DATA BOOK
Doug DeMaw W1FB
Back by popular demand, completely revised and expanded, this is a handy reference book for the r.f. designer, technician, amateur and experimenter. *260pages.* **£8.95**

LISTENING GUIDES

AIR BAND RADIO HANDBOOK
David J. Smith
Listen to conversations between aircraft and ground control. The author, an air traffic controller, explains more about this listening hobby. *174 pages.* **£5.99**

AIR TRAFFIC CONTROL
David Adair
A guide to air traffic control with maps, drawings and photographs explaining how aircraft are guided through crowded airspace. *176 pages.* **£6.99**

DIAL SEARCH
5th Edition 1988/89
George Wilcox
The listener's check list and guide to European broadcasting. Covers m.w., l.w., v.h.f. and s.w., including two special maps. *46 pages.* **£3.25**

FLIGHT ROUTINGS 1989
T.T.Williams
Identifies the flights of airlines, schedule, charter, cargo and mail, to and from the UK and Eire and overflights between Europe and America. *104pages.* **£4.00**

GUIDE TO BROADCASTING STATIONS
20th Edition 1989/90
Philip Darrington
Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc. *240 pages.* **£9.95**

GUIDE TO FORMER UTILITY TRANSMISSIONS
3rd Edition
Joerg Klingenfuss
Built on continuous monitoring of the radio spectrum from the sixties until the recent past. A useful summary of former activities of utility stations providing information in the classification and identification of radio signals. *126 pages.* **£8.00**

GUIDE TO UTILITY STATIONS
7th Edition
Joerg Klingenfuss
This book covers the complete short wave range from 3 to 30MHz plus the adjacent frequency bands from 0 to 150kHz and from 1.6 to 3MHz. It includes details on all types of utility stations including FAX and RTTY. There are 15802 entries in the frequency list and 3123 in the alphabetical callsign list plus press services and meteorological stations. *494 pages.* **£19.00**

HF OCEANIC AIRBAND COMMUNICATIONS
3rd Edition
Bill Laver
Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. *29 pages.* **£3.50**

INTERNATIONAL RADIO STATIONS GUIDE (BP255)
Revised and updated in 1988, this book shows the site, country, frequency/wavelength and power of stations in Europe, the Near East and N. Africa, North and Latin America and the Caribbean, plus short wave stations worldwide. *128 pages.* **£4.95**

MARINE UK RADIO FREQUENCY GUIDE
Bill Laver
A complete guide to the UK s.w. and v.h.f. marine radio networks. Useful information, frequency listings and the World Marine Coastal Phone Stations. *62pages.* **£4.95**

NEWNES SHORT WAVE LISTENING HAND BOOK
Joe Pritchard G1UQW
A technical guide for all short wave listeners. Covers construction and use of sets for the s.w.l. who wants to explore the bands up to 30MHz. *288pages.* **£12.95**

THE COMPLETE VHF/UHF FREQUENCY GUIDE
Updated 1988
This book gives details of frequencies from 26-2250MHz with no gaps and who uses what. Recently updated, there are chapters on equipment requirements as well as antennas, etc. *88 pages.* **£5.95**

THE INTERNATIONAL VHF FM GUIDE
7th Edition
Julian Baldwin G3UHK and Kris Partridge G8AUU
The latest edition of this useful book gives concise details of repeaters and beacons worldwide plus coverage maps and further information on UK repeaters. *70 pages.* **£2.85**

THE POCKET GUIDE TO RTTY AND FAX STATIONS
Bill Laver
A handy reference book listing RTTY and FAX stations, together with modes and other essential information. The listing is in ascending frequency order, from 1.6 to 27,1MHz. *46 pages* **£2.95**

SHORT WAVE LISTENERS CONFIDENTIAL FREQUENCY LIST
Bill Laver
Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. **£7.95**

VHF/UHF AIRBAND FREQUENCY GUIDE (Updated)
A complete guide to the airband frequencies including how to receive the signals, the frequencies and services, VOLMET and much more about the interesting subject of airband radio. *74 pages.* **£5.95**

WORLD RADIO TV HANDBOOK 1989
Country-by-country listings of long, medium and short wave broadcast and TV stations. Receiver test reports. English language broadcasts. The s.w.l.'s "bible". *576 pages.* **£17.95**

INTERFERENCE

INTERFERENCE HANDBOOK (USA)
William R. Nelson WA6FQG
How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. *253 pages.* **£6.75**

RADIO FREQUENCY INTERFERENCE (USA)
What causes r.f.i? Are all r.f.i. problems difficult, expensive and time-consuming to cure? These questions and many more are answered in this book. *84 pages.* **£4.30**

TELEVISION INTERFERENCE MANUAL (RSGB)
B. Priestly
TV channels and systems, spurious-radiation TVI, strong-signal TVI, audio breakthrough, transmitter design. *78 pages.* **£2.94**

AMATEUR RADIO

AMATEUR RADIO CALL BOOK (RSGB)
Winter 88/89 Edition
Now incorporates a 48-page section of useful information for amateur radio enthusiasts. *310 pages.* **£7.00**

AMATEUR RADIO LOGBOOK
Standard logbook for the transmitting amateur in horizontal A4 format. 25 lines per page. *96 pages.* **£2.30**

AMATEUR RADIO OPERATING MANUAL (RSGB)
A mine of information on just about every aspect of amateur operating. International callsign series holders, prefix lists, DXCC countries list, etc. *204 pages.* **£6.16**

AMATEUR RADIO SATELLITES the first 25 years
Arthur C. Gee G2UK
This souvenir publication mainly a pictorial account of the pattern of developments which have occurred over the last 25 years. *34 pages.* **£2.25**

CARE AND FEEDING OF POWER GRID TUBES (USA)
This handbook analyses the operation of EIMAC power grid valves and provides design and application information to assist the user of these valves. *156 pages.* **£6.75**

HINTS AND KINKS FOR THE RADIO AMATEUR
Edited by Charles L. Hutchinson and David Newkirk
A collection of practical ideas gleaned from the pages of *QST* magazine. *152pages.* **£4.95**

PASSPORT TO AMATEUR RADIO
Peprinted from *PW* 1981-1982
The famous series by GW3JGA, used by thousands of successful RAE candidates in their studies. Plus other useful articles for RAE students. *96 pages.* **£1.50**

PRACTICAL IDEAS FOR RADIO AMATEURS
Ian Poole G3YWX
Offers a wealth of hints, tips and general practical advice for all transmitting amateurs and short wave listeners. *128 pages* **£5.95**

QUESTIONS & ANSWERS AMATEUR RADIO
F. C. Judd G2BCX
What is amateur radio? The Radio Amateurs' Exam and Licence. Technology, equipment, antennas, operating procedures and codes. *122 pages.* **£3.95**

RADIO AMATEUR'S GUIDE TO RADIO WAVE PROPAGATION
(HF Bands)
F. C. Judd G2BCX
The how and why of the mechanism and variations of propagation in the h.f. bands. *144 pages.* **£8.95**

THE 1989 ARRL HANDBOOK FOR THE RADIO AMATEUR
This is the 66th edition of this very useful hardback reference book. Updated throughout it has several new sections covering oscilloscopes, spectrum analysers, digital frequency synthesis, phase-noise measurement and new constructional projects. *1200 pages* **£15.95**

***THE ARRL OPERATING MANUAL**
Another very useful book from the ARRL. Although writen for the American radio amateur, this book will also be of use and interest to the UK amateur. *684 pages* **£12.95**

THE COMPLETE DX'ER
Bob Locher W9KNI
Now back in print, this book covers equipment and operating techniques for the DX chaser, from beginner to advanced. *187 pages* **£7.95**

THE RAE MANUAL (RSGB)
G.L.Benbow G3HB
The latest edition of the standard aid to studying for the Radio Amateurs' Examination. Updated to cover the latest revisions to the syllabus. *132 pages* **£5.00**

THE RADIO AMATEUR'S DX GUIDE (USA)
15th Edition
The guide contains information not easily obtained elsewhere and is intended as an aid and quick reference for all radio amateurs interested in DX. *38 pages.* **£2.95**

THE RADIO AMATEUR'S QUESTIONS & ANSWER REFERENCE MANUAL
3rd Edition
R. E. G. Petri G8CCJ
This book has been compiled especially for students of the City and Guilds of London Institute RAE. It is structured with carefully selected multiple choice questions, to progress with any recognised course of instruction, although is is not intended as a text book. *258 pages.* **£6.95**

VHF HANDBOOK FOR RADIO AMATEURS (USA)
H. S. Brier W9EGQ & W. I. Orr W6SAI
VHF/UHF propagation, including moonbounce and satellites, equipment and antennas. *335 pages.* **£7.95.**

VHF/UHF MANUAL (RSGB)
G. R. Jessop G6JP
Theory and practice of amateur radio reception and transmission, between 30MHz and 24GHz. *520 pages.* **£8.94**

MAPS

IARU LOCATOR MAP OF EUROPE
DARC
This multi-coloured, plastics laminated, map of Europe shows the AIRU ("Maidenhead") Locator System. Indispensible for the v.h.f. and u.h.f. DXer. *692 x 872mm.* **£5.25**

RADIO AMATEUR'S MAP OF NORTH AMERICA (USA)
Shows radio amateur prefix boundaries, continental boundaries and zone boundaries. *760 x 636mm.* **£2.50**

RADIO AMATEUR'S PREFIX MAP OF THE WORLD (USA)
Showing prefixes and countries, plus listings by order of country and of prefix. *1014 x 711mm.* **£2.95**

RADIO AMATEUR'S WORLD ATLAS (USA)
Seventeen pages of maps, including the world-polar projection. Also includes the table of allocation of international callsign series. **£3.50**

DATA REFERENCE

DIGITAL IC EQUIVALENTS AND PIN CONNECTIONS (BP140)
A. Michaels
Equivalents and pin connections of a popular selection of European, American and Japanese digital i.c.s. *256 pages.* **£5.95.**

INTERNATIONAL DIODE EQUIVALENTS GUIDE (BP108)
A. Michaels
Possible substitutes for a large selection of many different types of semiconductor diodes. *144 pages.* **£2.25.**

INTERNATIONAL TRANSISTOR EQUIVALENTS GUIDE (BP85)
A. Michaels
Possible substitutes for a popular selection of European, American and Japanese transistors. *320 pages.* **£3.50**

LINEAR IC EQUIVALENTS AND PIN CONNECTIONS (BP141)
A. Michaels
Equivalents and pin connections of a popular selection of European, American and Japanese linear i.c.s. *320 pages.* **O/P**

NEWNES AUDIO & HI-FI ENGINEER'S POCKET BOOK
Vivian Capel
This is a concise collection of practical and relevant data for anyone working on sound systems. The topics covered include microphones, gramaphones, CDs to name a few. *190 pages. Hardback* **£9.95**

NEWNES COMPUTER ENGINEER'S POCKET BOOK
This is an invaluable compendium of facts, figures, circuits and data and is indispensable to the designer, student, service engineer and all those interested in computer and microprocessor systems. *203 pages. Hardback* **£8.95**

NEWNES ELECTRONICS POCKET BOOK
5th Edition
Presenting all aspects of electronics in a readable and largely non-mathematical form for both the enthusiast and the professional engineer. *315 pages. Hardback* **£8.95**

NEWNES RADIO AMATEUR AND LISTENER'S POCKET BOOK
Steve Money G3FZX
This book is a collection of useful and intriguing data for the traditional and modern radio amateur as well as the short wave listener. Topics such as AMTOR, packet radio, SSTV, computer communications, airband and maritime communications are all covered. *160 pages. Hardback* **£8.95**

NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK
17th Edition
Keith Brindley
Useful data covering math, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semi-conductors, components, etc. *201 pages. Hardback* **£6.95**

NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK
Eugene Trundle
This is a valuable reference source for practitioners in "entertainment" electronic equipment. It covers TV reception from v.h.f. to s.h.f. display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. *323 pages. Hardback* **£9.95**

POWER SELECTOR GUIDE (BP235)
J. C. J. Van de Ven
This guide has the information on all kinds of power devices in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. *160 pages.* **£4.95**

RSGB RADIO DATA REFERENCE BOOK
G. R. Jessop G6JP
The 5th Edition of an essential book for the radio amateur's or experimenter's workbench. *244 pages. Hardback* **£8.56**

SEMICONDUCTOR DATA BOOK
A.M.Ball
Characteristics of some 10000 transistors, f.e.t.s, u.j.t.s, diodes, rectifiers, triacs and s.c.r.s. *175 pages.* **£9.95**

TRANSISTOR SELECTOR GUIDE (BP234)
J. C. J. Van de Ven
This guide has the information on all kinds of transistors in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making seletion of replacements easier. *192 pages.* **£4.95**

FAULT FINDING

ARE THE VOLTAGES CORRECT?
Reprinted from PW 1982-1983
How to use a multimeter to fault-find on electronic and radio equipment, from simple resistive dividers through circuits using diodes, transistors, i.c.s and valves. *44 pages.* **£1.50**

GETTING THE MOST FROM YOUR MULTIMETER (BP239)
R. A. Penfold
This book is primarily aimed at beginners. It covers both analogue and digital multimeters and their respective limitations. All kinds of testing is explained too. No previous knowledge is required or assumed. *102 pages.* **£2.95**

OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK
Ian Hickman
This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them. *133 pages.* **£7.95**

PRACTICAL HANDBOOK OF VALVE RADIO REPAIR
Chas E. Miller
The definite work on repairing and restoring valved broadcast receivers dating from the 1930s to the 60s. Appendices giving intermediate frequencies, valve characteristic data and base connections. *230 pages. Hardback* **£20.00**

SERVICING RADIO, HI-FI AND TV EQUIPMENT
Gordon J. King
A very practical book looking at semiconductor characteristics, d.c. and signal tests, fault-finding techniques for audio, video, r.f. and oscillator stages and their application to transistor radios and hi-fi. *205 pages.* **£10.95**

TRANSISTOR RADIO FAULT FINDING CHART (BP70)
C. E. Miller
Used properly, should enable most common faults to be traced reasonably quickly. Selecting the appropriate fault description at the head of the chart, the reader is led through a sequence of suggested checks until the fault is cleared. *635 x 455mm (approx)* **£0.95**

CONSTRUCTION

HOW TO DESIGN AND MAKE YOUR OWN P.C.B.s (BP121)
R. A. Penfold
Designing or copying printed circuit board designs from magazines, including photographic methods. *80 pages.* **£2.50**

INTRODUCING QRP
Collected articles from PW 1983-1985
An introduction to low-power transmission, including constructional details of designs by Rev. George Dobbs G3RJV for transmitters and transceivers from Top Band to 14MHz, and test equipment by Tony Smith G4FAI. *64 pages.* **£1.50**

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT767	HF Transceiver	1599.00	(—)
FEX767(2)	2m Module (767)	169.00	(3.00)
FEX767(70)	70cm Module (767)	215.00	(3.00)
FEX767(6)	6m Module (767)	169.00	(3.00)
SP767	Speaker	69.95	(2.50)
FT747GX	Budget HF Transceiver	659.00	(—)
FT757GX	Mkll HF Transceiver	969.00	(—)
FP700	20A P.S.U.	219.00	(4.00)
FC700	Manual ATU	149.00	(3.00)
FP757HD	Heavy Duty 2m P.S.U.	258.75	(4.00)
FAS14R	Remote Aerial Switch	80.00	(3.00)
FT4700	New 2m/70cm Dual Band FM Mobile	675.00	(7.00)
FT290	Mkll Super 290 2m Multimode 2.5W	429.00	(—)
FT690	Mkll 6m M/Mode 2·5W	399.00	(2.00)
YHA15	2m Helical	7.50	(2.00)
YHA44D	70cm ½wave	12.50	(2.00)
YM49	Speaker Mike	23.00	(2.00)
MMB15	Mobile Bracket	14.55	(2.00)
FT411	New 2m H/H Keyboard	225.00	(3.00)
FT811	New 70cm H/H Keyboard	239.00	(3.00)
FT470	New 2m/70cm Dual Band H/H	389.00	(3.00)
FT23R	2m Mini H/H	209.00	(3.00)
FT73R	70cm Mini H/H	229.00	(3.00)
FNB9	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB10	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB11	Nicad Battery Pack (23/73)	67.85	(2.00)
NC.18C	Charger (23/73)	17.71	(2.00)
SMC28	Charger (23/73) 13A Plug	17.71	(2.00)
NC.28	Charger (23/73)	17.71	(2.00)
NC.29	Base Charger (23/73)	69.00	(3.00)
PA6	Car Adap/Charger (23/73)	24.15	(2.00)
MH12A2B	Speaker Mic	31.05	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	31.05	(2.00)
FNB3	Spare Battery Pack (FT209)	41.00	(2.00)
FNB4	Spare Battery Pack (FT709)	46.00	(2.00)
FNB5	Empty Cell Case (FT727)	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	29.00	(2.00)
MMB10	Mobile Bracket	10.00	(2.00)
NC9C	Charger	11.50	(2.00)
PA3	Car Adaptor/Charger	21.85	(2.00)
YM24A	Speaker Mike	31.05	(2.00)
FRG8800	HF Receiver	649.00	(—)
FRV8800	Converter 118-175 for above	100.00	(2.50)
FRT7700	RX ATU	59.00	(2.50)
MH1B8	Hand 600 8pin mic	21.00	(2.00)
MD1B8	Desk 600 8pin mic	79.00	(2.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	Lweight Mobile H/set-Boom mic	28.75	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	PTT Switch Box 270/2700	22.00	(2.00)
FT736 **NEW**	2/70cm 25W Base Stn	1,359.00	(—)
FT2311R	23cm FM Transceiver	475.00	(—)
FT211RH	2m 45W FM Mobile	309.00	(—)
FT212RH	New 2m 45W FM Mobile	349.00	(—)
FL2025	25W Linear	115.00	(3.00)
FL6020	6m 10W Linear	109.00	(3.00)
QTR24D	World Clock	39.00	(3.00)

— Antennas —

VLF	50-500MHz RX Discone	22.50	(3.00)
D130	26-1300MHz Discone	75.00	(3.00)
Jaybeam	TB3 Mkll 3e HF Tribander	348.45	(8.00)
Hygain	TH3JNR 3e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	349.00	(8.00)
CA2X4KC	2/70cm Mobile	39.95	(3.00)
WX1	2m/70cm Base Fibre Glass	49.95	(4.00)
CA2X4Max	2m/70cm Base Fibre Glass	99.95	(4.00)
IC765 **NEW**	HF Transceiver	2499.00	(—)

ICOM

IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
IC725	HF Base TRansceiver	759.00	(—)
AT100	100W ATU (751/745)	365.00	(3.50)
AT150	150W ATA (735)	315.00	(3.50)
PS55	Ext PSU (725)	185.00	(3.00)
IC505	50MHz multi-mode portable	499.00	(—)
IC290D	2m 25W M/Mode	542.00	(—)
IC228E	2m 25W FM Mobile	365.00	(—)
IC Micro	2E New Mini H/H	239.00	(3.00)
IC2GE	FM H/Held **NEW**	265.00	(3.00)
IC275E	New 2m 25W Base Stn	1039.00	(—)
IC4GE	70cm H/Held **NEW**	299.00	(3.00)
ICmicro4E	70cm H/Held	299.00	(3.00)
IC32E **NEW**	2m/70cm Dual Band H/Held	399.00	(3.00)
IC490	70cm 10W M/Mode	617.00	(—)
IC3210	2m/70cm FM Dual Band Mobile	499.00	(4.00)
IC12E	23cm H/H	428.00	(3.00)
ICR71	Gen Cov RX	825.00	(—)
IC7000	VHF/UHF Scanner	957.00	(—)
AH7000	25-1300MHz Discone	82.00	(3.00)
SP3	Ext Speaker	61.00	(2.50)
CK70	DC Cable (R70/R71)	7.00	(2.00)
EX257	FM Board (R70/R71)	41.00	(2.00)
GC5	World Clock	43.00	(2.50)
AG2	Waterproof Bag all Icom H/H	14.38	(2.00)
BC35	Desk Charger	70.15	(2.50)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90	(2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.20	(2.00)
BP5	Battery Pack 10.8V	60.95	(2.50)
CP1	12V Charge Lead BP3/7/8	6.90	(2.00)
DC1	DC/DC converter operate from 12V	17.25	(2.00)
HM46	**NEW** Mini speaker mic	24.15	(2.00)
HM9	Speaker/Mic	21.85	(2.50)
HS51	Headset inc PTT/Vox unit	41.25	(2.00)
LC24	Micro + BP22/23	7.50	(2.00)
LC41	IC32 + BP3	9.20	(2.00)
LC42	IC32 + BP5	9.20	(2.00)
SM8	1.3kμ/600μ 8P Base Mic	82.00	(2.50)
SM10	Comp/Graphic Mike	116.00	(3.00)

— CW Keyers —

HI-MOUND

HK702	Straight key (adjustable tension)	42.49	(2.00)
HK703	Straight key (adjustable tension)	38.45	(2.00)
HK704	Straight key (adjustable tension)	26.35	(2.00)
HK705	Straight key (adjustable tension)	22.45	(2.00)
HK706	Straight key (adjustable tension)	21.80	(2.00)
HK707	Straight key (adjustable tension)	20.15	(2.00)
HK802	Straight key (Deluxe-Brass)	109.00	(3.50)
HK803	Straight key (Brass)	104.50	(3.50)
MK703	Squeeze key	34.50	(2.00)
MK704	Squeeze key	30.00	(2.00)
MK705	Squeeze key	32.78	(2.00)
MK706	Squeeze key	30.48	(2.00)

STARMASTER

Dewsbury	Electronic Keyer Unit (No Paddle)	54.70	(3.00)
Dewsbury	Electronic Memory Keyer (No Paddle)	95.00	(3.00)

— Rotators —

G250	Light Duty	78.00	(4.00)
AR200XL	Light Duty	38.50	(4.00)
G400	Medium Duty	139.00	(4.00)
G400RC	Medium Duty (Round Face)	169.00	(5.00)
G600RC	Medium/Heavy Duty	219.00	(5.00)
G200RC	Heavy Duty	445.00	(5.00)
G500	Elevating Rotator	149.00	(5.00)
GR5400	Azimuth/Elevating	279.00	(5.00)

KENWOOD

TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(3.00)
SP940	Ext Speaker	87.55	(3.00)
TS140	HF 9 Band Gen. Cov. TX/RX	862.00	(—)
TS680S	HF/6m TX Gen. Cov. RX	985.00	(—)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(3.00)
PS50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
SP230	External Speaker Unit	66.49	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM220	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2kW Linear	1495.00	(7.00)
TH25	**NEW** 2m H/Held	238.00	(3.00)
TH45	**NEW** 70cm H/Held	269.00	(3.00)
TH75	**NEW** 2m/70cm H/Held	P.O.A.	(—)
TH205	2M H/H	215.26	(3.00)
TH215	2M H/H Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mobile	599.00	(—)
TS790	VHF/UHF Transceiver	1495.00	(—)
R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.50)
R5000	General Coverage HF/RX	875.00	(—)
TM701	**NEW** 2m/70cm FM Mobile	469.00	(5.00)
TM721	2m/70cm FM Mobile	675.00	(5.00)
TM231E	**NEW** 2m FM Mobile 50/10/5W	289.00	(5.00)
TM431E	**NEW** 70cm FM Mobile 35/10/5W	318.00	(5.00)
SMC30	Speaker/Mic TH21/4/2600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC60A	8P Desk Mic	88.22	(3.00)
MC80	Electret Desk Mic	53.98	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	8P Fist Mic	22.22	(2.00)
MC35	4P Fist Mic	21.72	(2.00)
MC55	Mobile Mic (6p.o. 8p)	52.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS6	Lightweight H/phones	24.36	(2.50)
HS5	Deluxe H/phones	37.54	(2.50)
TW4100	2/70cm FM Dual band model **SPECIAL**	499.00	(5.00)
RZ1	500Hz-950MHz AM/FM Scanner	465.00	(6.00)
VC20	118-174MHz Converter (R5000)	167.21	(2.50)

— SWR/PWR Meters —

HANSEN

W720S	130/440MHz 20/200W	52.75	(2.50)
JD110	1.5-150MHz	12.50	(2.00)
YMIX	3.5-150MHz	31.50	(3.00)
Yaesu Y560	1.6-60MHz	93.15	(3.00)
Yaesu YS500	140-525MHz	81.65	(3.00)
Hanson FS500H	1.5-30MHz	53.40	(3.00)

— Miscellaneous —

SMCS 2U	2 Way SO239 Switch	18.95	(2.50)
SMCS 2N	2 way 'n' Skts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch 'n' Socket Deluxe	27.00	(2.50)
T30	30W Dummy Load	10.29	(2.50)
T100	100W Dummy load	45.00	(3.00)
T200	200W Dummy load	65.00	(3.00)
WAI	Wavemeter 120-450MHz	24.95	(2.00)
PK232	Packet/RTTY Terminal	299.95	(3.00)
Datong D70	Morse Tutor	63.40	(3.00)
Datong FL2	Audio Filter	100.91	(3.00)
Datong FL3	Audio Filter/Autonotch	145.54	(3.00)
Datong ASP	Processor 4pin	93.15	(3.00)
Datong ASP	Processor 8pin	93.15	(3.00)
Datong AD370	Active Antenna	77.62	(3.00)
Datong PCI	General Coverage Converter	154.60	(3.00)

VISA

Instant credit available. Mail/Telephone order by cheque or credit card. Cheques cleared before goods despatched. (E&OE)

Access

OPEN TUES.-SAT. 9.00-5.30 (CLOSED MONDAYS)

STOCK ITEMS USUALLY DESPATCHED WITHIN 48 HRS

DELIVERY/INSURANCE PRICES IN BRACKETS

ANTENNAS TONNA (F9FT)

THE VHF/UHF ANTENNA SPECIALIST

50MHz

5 element	£50.71(a)

144MHz

4 element	£29.39(a)
4 element crossed	£37.26(a)
9 element fixed	£33.12(a)
9 element portable	£35.19(a)
9 element crossed	£62.10(a)
13 element	£49.06(a)
17 element	£66.24(a)

435MHz

9 element	£30.43(a)
19 element	£36.64(a)
19 element crossed	£42.44(a)
21 element 432MHz	£47.61(a)
21 element ATV	£47.61(a)

144/435MHz

9 & 19 element Oscar	£61.07(a)

1250MHz

23 element	£61.07(b)
4 × 23ele – stacking frame – power splitter	£175.00(a)

1296MHz

23 element	£32.29(b)
4 × 23 ele – stacking frame – power splitter	£175.00(a)
55 element	£49.27(a)
4 × 55 ele – stacking frame – power splitter	£250.00(a)

2300MHz

25 element	£43.47(b)

POWER SPLITTERS

2 way 144MHz	£48.36(b)
4 way 144MHz	£57.53(b)
2 way 435MHz	£45.69(c)
4 way 435MHz	£55.76(c)
2 way 1250MHz	£38.35(c)
4 way 1250MHz	£43.36(c)
2 way 1296MHz	£38.35(c)
4 way 1296MHz	£43.36(c)
2 way 2300MHz	£38.35(c)
4 way 2300MHz	£43.36(c)

ANDREW HELIAX

LDF4-50A	£4.70/m
'N' Connectors	£16.80(c)

TELESCOPIC MASTS – STACKING FRAMES – COAXIAL CABLE – ROTATORS ETC.

All prices include VAT. Please add carriage (a) £5.00 (b) £2.20 (c) £1.20. U.K. MAINLAND ONLY. ACCESS or VISA cardholders telephone your order for immediate dispatch. Callers welcome, but by telephone appointment only, please. Send 50p for our catalogue which contains the full specifications.

SOLE U.K. DISTRIBUTOR **RANDAM ELECTRONICS (P)**
FREEPOST, ABINDON, OXON, OX14 1BR.
Tel: (0235) 23080 (24hrs)

RADIO AMATEURS EXAM? PASS FIRST TIME!

Before you enrol check the benefits of RRC'S unique Home Tuition Service

RRC has helped thousands of students to success in their examinations with this unique system of postal tuition, one which guides you, step-by-step, to qualify in the shortest possible time. Only The Rapid Results College offers you all these advantages:

- A qualified personal tutor
- Study material prepared by specialists
- Completely self-contained courses
- Handy pocket-sized booklets
- Personal study programme
- Regular marked tests
- Courses regularly updated
- 48 hour despatch
- Free advice before you enrol
- Telephone Helpline
- Free 'How to Study' Guide
- Instalment Plan
- Free Postage on course material
- Worldwide Airmail Service
- Extra tuition free if you don't pass first time

POST COUPON TODAY FOR FREE RADIO AMATEURS PROSPECTUS

Please send me my prospectus as quickly as possible.

Mr/Mrs/Miss/Ms _____

Address _____

Postcode _____

RRC **The Rapid Results College** CACC

Dept. JX32, Tuition House, London SW19 4DS. FREE ADVICE: 01-947 7272 (9am-5pm) PROSPECTUS: 01-946 1102 (24 hour Recordacall Service quoting Dept. No. above).

R.A.S. (Nottingham)

G6XBH G1RAS G8UUS

Visit your Local Emporium
Large selection of New/Used Equipment on Show

AGENTS FOR:
F.D.K. ● AZDEN ● ICOM ● YAESU ● ALINCO

ACCESSORIES:
Welz Range, Microwave Modules, Adonis Mics, Mutek Pre-Amps, Barenco Mast Supports, DRAE Products, BNOS Linears & P.S.U.'s
★ ERA Microreader & BPS4 Filter, SEM Products ★

AERIALS, Tonna, New Diamond Range of Mobile Whips, Jaybeam
BRING YOUR S/H EQUIPMENT IN FOR SALE
JUST GIVE US A RING

Radio Amateur Supplies

3 Farndon Green, Wollaton Park, Nottingham NG8 1DU
Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)
Monday: CLOSED Tuesday-Saturday: 10.00 a.m. to 5.00 p.m.

Tel: 0602 280267

R.A.S. (Nottingham)

MORE ADVANCED POWER SUPPLY PROJECTS (BP192)
R. A. Penfold
The practical and theoretical aspects of the circuits are covered in some detail. Topics include switched mode power supplies, precision regulators, dual tracking regulators and computer controlled power supplies, etc. *92 pages.* **£2.95**

POWER SUPPLY PROJECTS (BP76)
R. A. Penfold
This book gives a number of power supply designs including simple unstabilised types, fixed voltage regulated types and variable voltage stabilised designs. *91 pages.* **£2.50**

PRACTICAL POWER SUPPLIES
Collected articles from PW 1978-1985
Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mainsdriven power supplies, including the *PW* "Marchwood" giving a fully stabilised and protected 12V 30A d.c. *48 pages.* **£1.25**

QRP NOTEBOOK
Doug DeMaw W1FB
This book deals with the building and operating of a successful QRP station. Lots of advice is given by the author who has spent years as an ardent QRPer. All the text is easy-to-read and the drawings large and clear. *77 pages.* **£4.95**

TEST EQUIPMENT CONSTRUCTION
R.A.Penfold
Describes, in detail, how to construct some simple and inexpensive, but extremely useful, pieces of test equipment. *104pages.* **£2.95**

50 (FET) FIELD EFFECT TRANSISTOR PROJECTS
F.G.Rayer
50 circuits for the s.w.l., radio amateur, experimenter or audio enthusiast using f.e.t.s. *104pages.* **£2.95**

AUDIO FREQUENCIES

AUDIO (BP111)
Elements of Electronics Book 6
F. A. Wilson
This book studies sound and hearing, and the operation of microphones, loudspeakers, amplifiers, oscillators and both disc and magnetic recording.
320 pages. **£3.50**

ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)
Practical designs including active, loop and ferrite antennas plus accessory units. *96 pages.* **£2.50**

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain figures.
109 pages. **£5.50**

ALL ABOUT VERTICAL ANTENNAS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Theory, design, construction, operation, the secrets of making vertical work.
191 pages. **£7.50**

AN INTRODUCTION TO ANTENNA THEORY (BP198)
H. C. Wright
This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved.
86 pages. **£2.95**

BEAM ANTENNA HANDBOOK (USA)
W. I . Orr W6SAI & S. D. Cowan W2LX
Design, construction, adjustment and installation of h.f. beam antennas. *198 pages.* **£6.75**

HF ANTENNAS FOR ALL LOCATIONS (RSGB)
L. A. Moxon G6XN
Taking a new look at how h.f. antennas work, and putting theory into practice. *260 pages.* **£5.19**

***NOVICE ANTENNA NOTEBOOK**
Doug DeMaw W1FB
Another book from the pen of W1FB, this time offering "new ideas for beginning hams". All the drawings are large and clear and each chapter ends with a glossary of terms. *130 pages* **£5.95**

OUT OF THIN AIR
Collected Antenna Articles from PW 1977-1980
Including such favourites as the ZL Special and '2BCX 16-element beams for 2m, and the famous "Slim Jim", designed by Fred Judd G2BCX. Also features systems for Top Band, medium wave/long wave loop designs and a v.h.f. direction finding loop. Plus items on propagation, accessories and antenna design. *80 pages.* **£1.80**

SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS (USA)
W. I. Orr W6SAI & S. D. Cowan W2LX
Efficient antennas for Top Band to 2m, including "invisible" antennas for difficult station locations.
191 pages. **£6.75**

NEW LOW PRICE

THE ARRL ANTENNA BOOK (USA) 15th Edition
A station is only as effective as its antenna system. This book covers propagation, practical constructional details of almost every type of antenna, test equipment and formulas and programs for beam heading calculations. **£12.95**

THE ARRL ANTENNA COMPENDIUM (USA)
Volume One
Fascinating and hitherto unpublished material. Among the topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. *175 pages.* **£9.25**

WIRES & WAVES
Collected Antenna Articles from PW 1980-1984
Antenna and propagation theory, including NBS Yagi design data. Practical designs for antennas from medium waves to microwaves, plus accessories such as a.t.u.s, s.w.r. and power meters and a noise bridge. Dealing with TVI. *160 pages.* **£3.00**

W1FB'S ANTENNA NOTEBOOK
Doug DeMaw W1FB
This book provides lots of designs, in simple and easy to read terms, for simple wire and tubing antennas. All drawings are large and clear making construction much easier. *124 pages.* **£5.95**

25 SIMPLE AMATEUR BAND AERIALS (BP125)
E. M. Noll
How to build 25 simple and inexpensive aerials, from a simple dipole through beam and triangle designs to a mini-rhombic. Dimensions for specific spot frequencies including the WARC bands. *80 pages.* **£1.95**

25 SIMPLE INDOOR AND WINDOW AERIALS (BP136)
E. M. Noll
Designs for people who live in flats or have no gardens, etc., giving surprisingly good results considering their limited dimensions.
64 pages. **£1.75**

25 SIMPLE SHORT WAVE BROADCAST BAND AERIALS (BP132)
E. M. Noll
Designs for 25 different aerials, from a simple dipole through helical designs to a multi-band umbrella.
80 pages. **£1.95**

25 SIMPLE TROPICAL AND MW BAND AERIALS (BP145)
E. M. Noll
Simple and inexpensive aerials for the broadcast bands from medium wave to 49m. *64 pages.* **£1.75**

THE RADIO AMATEUR ANTENNA HANDBOOK
William I. Orr W6SAI & Stuart. D. Cowan W2LX
Yagi, quad, quagi, l-p, vertical, horizontal and "sloper" antennas are all covered. Also towers, grounds and rotators. *190 pages.* **£6.75**

COMPUTING

AN INTRODUCTION TO COMPUTER COMMUNICATIONS (BP177)
R. A. Penfold
Details of various types of modem and their applications, plus how to interconnect computers, modems and the telephone system. Also networking systems and RTTY.
96 pages. **£2.95**

AN INTRODUCTION TO COMPUTER PERIPHERALS (BP170)
J. W. Penfold
Covers a wide range of computer peripherals such as monitors, printers, disk drives, cassette recorders, modems, etc., explaining what they are, how to use them and the various types of standards.
80 pages. **£2.50**

MICROPROCESSING SYSTEMS AND CIRCUITS (BP77)
Elements of Electronics Book 4
F. A. Wilson
A comprehensive guide to the elements of microprocessing systems, which are becoming ever more involved in radio systems and equipment.
256 pages. **£2.95**

MORSE

INTRODUCING MORSE
Collected Articles from PW 1982-1985
Ways of learning the Morse Code, followed by constructional details of a variety of keys including lambic, Triambic, and an Electronic Bug with a 528-bit memory.
48 pages. **£1.25**

THE MORSE CODE FOR RADIO AMATEURS (RSGB)
Margaret Mills G3ACC
A guide to learning to send and receive Morse code signals up to the 12 w.p.m. required for the radio mateur aspiring to a Class A licence having passed the RAE.
19 pages. **£2.88**

THE SECRET OF LEARNING MORSE CODE
Mark Francis
Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student.
87 pages. **£4.95**

STOP PRESS

GUIDE TO FACSIMILE STATIONS 9th Edition
Joerg Klingenfuss
This manual is the basic reference book for everyone interested in FAX. Frequency, callsign, name of the station, ITU country/geographical symbol, technical parameters of the emission are all listed. All frequencies have been measured to the nearest 100Hz. *318 pages* **£12.00**

SUBSCRIPTIONS

Fil in the Order form below and post it to: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required). Credit Card Orders taken on (0202) 678558.
Overseas subscriptions outside Europe are now despatched by Accelerated Surface Post for faster delivery.
If you already have a subscription you can still take advantage of our offer, but you must quote your subscription number.

Please indicate the type of subscription required:

PRACTICAL WIRELESS 1YEAR
❑ £15.50 (UK)
❑ £18.00 (Europe)
❑ £19.00 (Overseas)

PRACTICAL WIRELESS 3 YEAR
❑ £40.00 (UK)

SHORT WAVE MAGAZINE 1 YEAR
❑ £17.00 (UK)
❑ £19.00 (Overseas)

SPECIAL JOINT SUBSCRIPTION 1 YEAR ONLY
❑ £28.00 (UK)
❑ £32.00 (Overseas)

Prices current at August 1989
To commence with issue dated.....

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP

Name.....

Address.....

.....

.....

❑ I enclose cheque/PO (Payable to PW Publishing Ltd) £.....

❑ Charge to my Access/Visa Card the amount of £.....

Card No.

Valid from ..... to .....

Signature.....

On The Air
On The HF Bands

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

Since last month, I have taken myself for a little ride up to the far North of GM and Orkney, disregarding all thoughts of DX in favour of photography and visiting DXers, notably GM0EXN in Brough, Dunnet Head, which lies north of John O'Groats and regular contributor GM3JDR. On the return journey I managed to sign GM, G and GW on v.h.f. during the same day! Truly a worthwhile visit, and my thanks to everyone who made it so. Hence, I haven't spent as much time as I would have liked in the shack and when I have, I seem to have picked times when 18MHz and up were dead, with 14MHz and below seriously affected by static!

Top Band

This is one area where, of late, reports have been thin on the ground. However for this time, I have the pleasure of the *Top Band Annual News Digest* from VE3DO. Ivan is probably better known to readers under his old call of VE3INQ. First, and perhaps of most importance to many older Top Band ops, is a note from Marguerite Perry, wife of Stewart Perry W1BB. Stew is still, alas in a nursing home and receiving specialised care, but although most of his station has gone to a museum, equipment is still held at home on the chance that if he can at some future time get home, then he will be able to get on the air. However, we gather Stew is at least in touch with all that is going on. It seems too odd for words to reflect that it is seven years since last we heard the W1BB signal snapping-up the DX.

As to the question of DXCC countries available on Top Band, perhaps the top scorer at the moment is K5UR at 221, with seven other Stateside stations at 200 or over. As for the "proper" WAZ, there are now five holders: HB9AMO, ON4UN, G3RBP, LZ2DF, JA1GTF and DJ8WL, completed in that order.

Still with VE3DO, an interesting Top Band receiving antenna is offered there, called "The Snake". Take 145 feet of solid-polythene coaxial cable short the far end inner-to-outer; at the home end, leave the braid unconnected and plug the inner to the centre of the receiver coaxial input connector. Lay the completed antenna, preferably in a straight line, on the ground, return to the receiver, and wait for the snake to bite some DX. Thus the "simple" version. For an alternative, more complex version take two 145-foot lengths of coaxial and strap them side by side; at the home end, plug one inner into the receiver as for the simple snake, and leave the other three insulated from each other and disconnected. At the far end, the inner of the coaxial cable connected to the receiver is connected to the outer of the other piece; the inner of the latter to the outer of the first-mentioned. Again go to the receiver and wait for a bite! However, neither version of the snake can be regarded as a transmitting antenna for DX or course.

G2HKU (Sheppey) recently got his licence renewal and suddenly realised he had had some 50 years with the callsign; although he was obviously not on the air during the war years Ted kept up his Morse as a Signaller, added lamps and flags to his skills, and on occasion when he had his hands on a transceiver or receiver, he was able to lend an ear to the bands. As for this month's Top Band activity, there was s.s.b. with ON7BW, plus c.w. contacts with YT2RY, U3MM and HG9R.

Our only other reporter on this band is G3HZL; Don notes that his activity has been reduced by good weather, trips to HMS *Mercury*, RAEN exercises, and trips to Crich Tramway Museum.... as for the latter, G3HZL hasn't yet tried "tram mobile" as yet, but perhaps, one day? Be that as it may, the Top Band QSO was with HB0/DJ9CB.

The 3.5MHz Band

G3HZL just says he worked a few Europeans; and G2HKU skipped this position of the bandswitch altogether!

Now to **G0HGA** (Stevenage) who is still less rig; however, Angie has 2 watts of c.w. available on 3.5MHz, into an 26m Best Bent Wire and with that she has managed to work SP3DG, OK1DMS, ON4AGJ, PA3BTH, DF3XN for a one-hour natter), F6IBR, G2CNN, G2BB, G3BPM, G3LD, G3JUQ, G3KFB, G3FGR, G3KHZ, G3BEX, G4VHH, G0BLE, G0GZN and G0IPX.

Finally for this band, a new reporter in **ON7PQ**; Pat reckons the pick of his crop on the band were OH2AP/OH0M, UF6FEI and PP1RR, the latter at 2302UTC on June 17, all worked on c.w.

The 7MHz Band

What a neglected lump this is! However, a few people persist with their activities, and others hide their light under a bushel. G3HZL mentions HB0/DL1GGT, OY3QN, PR7MS, PY4ZO, UT4UXX/MM, VE3BCH, NU1W, KE2FP, W2FC, K3WUW, W5WQN and W8KIC. All c.w. of course.

ON7PQ next: Pat found his c.w. able to reach V27T, OH3MPS/OH0, JH1FNS/CE3, EA2CW/EA9, OH2AP/OH0, SV0MO/8 and 9Q5DX.

As for G2HKU, Ted managed to sneak into the shack inbetween bouts of gardening, to hook OH2AP/OH0 and SM2CLS/MM.

New Bands

Here the most important news is of the full release of the 18 and 24MHz bands from July 1 to UK amateurs; so we now have similar power, antenna and mode privileges on these bands to those on other bands.

G2HKU mentions that his c.w. was deployed on 10MHz for NU1W, while on 18MHz the same mode managed K2QAA, AB4KX, KA1ASD, W5IMV, W6OV, VE3FGG, W9SYV, NE1I, N4VZ, VP2MT and W2FJ. No contacts were mentioned for 24MHz.

Turning to G3HZL, Don says that on 10MHz he raised EA/F9VN, VK2DUY and ZL4HB - the latter is a daily 30 minute contact, although signals are weak at times, and others are welcome to join in. On 18MHz there was another one with VK2DUY and again nothing said of 24MHz.

The 14MHz Band

G3NOF (Yeovil) noted that the band was often open round the clock, with conditions notably good in the early mornings and late evenings. The long path to VK/ZL has been open 0600-0900, and the short path often from 2100-2300Z. Exchanges with s.s.b. were made between Don and CE3AGM, CE0DFL on Easter Island, FR5ZN, OH2AP/OH0M, TF3IM, TI2JJP, TV6UIT, V85AH, VE8RCS, VKs, VK2BDJ/MM, VP2EXX, VP5S, W7IHI (Utah), YI7KRN, 7J6CAW and 9K2KS.

G2HKU offers c.w. contacts with OY7ML, VK1PG, W6VX, HL9EP, CH3ICR, UR0RWH, YV1AD, OH2AP/OH0M, VK9NL/JW, VK5GZ, WL7E, U0AG, V27T, W5HW and VE6OU/3.

G0JEE has moved to Burton-on-Trent from Stafford since he last wrote. At the new place nothing can be fixed to the roof, so the 14MHz wire beam idea had to be passed over, and eventually a Butternut HF6V was ground-mounted with some 82 radials each of some 2.5 metres long. New ones since the last report include JX7DFA, 4J1FS, JY6RS, and T5GG, all s.s.b.

Now we turn to ON7PQ; T27RA, JX7DFA, TA1AZ, HL7DU, KE7V, KH6IJ, HX6JUN, VK9NL/JW, 9X5AA, 3A2EE, TT8CW, 4U1UN and HL9EP.

On to G2HZL, and more c.w. activity, by way of K2TNO/EA8, HB0/DL1GGT, VK9NL/JW, WL7E/KH6, KL7PJ, NL7G, OH0/DF4XG, OH2AP/OH0, OY7ML, PP2WV, SV2UF, DK6AS/J49, RD8D/UZ3QWX, UC8/UB1RR, RL7AB, VE6GUS, VE7FNP, VE7SR, VK2ALH, VK2FYM, VK3MJ, VK3KS, VK3XB, VK4LX, VK4XA, all USA call areas, YV1AD, ZD8IAN, ZL3GQ, ZS5BK and 4X6MP; and, just to prove he knows how, Don used s.s.b. on ZB2ID and ZB2IJ.

The 21MHz Band

ON7PQ first: Pat is all-c.w. on this band, and mentions his contacts with CU3AA, VP5WV5M, T27RA, D68TW, FR9FD, JX7DFA, VP2M/WC0W, XM1ASJ, HL1EX, JAs, OH2AP/OH0M, 9Q5DX, FR5FO, FP5DX, ZD8SE, 3D2RW, HL4SF and ZY0TA.

G3NOF notes the North Polar path was frequently good 0700-1000 into the Pacific along with the usual VKs and ZLs. On the short path JAs have been noted 0900-2200Z, and Africans mornings and evenings. Contacts on s.s.b. were made with A35ST, A41JR, AT0T(=VU), CO2VG, CP5TR, D68TR, FM5DN, FO0BEF, HC1H, HC1JH, HC5EA, HH2GI, HK3NTI, HK4NBQ, J28DN, JAs, JT1KAA, KH6IJ, N2HLZ/KP2, S79J, T20AA, TI8CBT, UA0FF (Zone 19), UA0QFL (Zone 23), UA0TO, UA0ZAW, UW0CI, UW0CK, UW0LT, VKs, VS6CT, W7EOE, WA7RGA, YB/YCs, YI1BGD, YJ8JS, ZC4RF, ZD8BOB, ZLs, 5B4WW, 9J2BO and 9M8PV.

From the key of G3HZL we find contacts with EC8ASY, HC1LT, OA9DX, RT0UN, VE4FA, various USA, plus s.s.b. to EA8BUF.

Now to G0JEE who mentions new ones in S0IDX, HZ1AB, FK/JH6SOR, 5N0GRC, OA4ED, HK4HHG and KM9P/KP2.

Now to G2HKU who says his earth-connection needs some of the water the

weather-map showed over to his west; it seems the r.f. is drying up and worse the wells are dropping too! Contacts using c.w. were nonetheless made with LU2YA, ZX1DFF, LU1EWL, PY1WAS, PY4ZO, EA6ZY, K4BAI, CX6BM, 7S6DO, LU1HDC, W3VT, PY5VX, VK4XA and VP2M/WC0W.

The 28MHz Band

I never seem to be able to catch an opening on this band at a time when I can give it a whirl, and I note G2HKU also makes no mention of it. However, others are more lucky. For instance, G3NOF noted quite a lot of short-skip summer conditions, and around 0800Z there were a few short-path openings to VK and Asia. Contacts using s.s.b. were recorded with HK3JJH, RL8PYL, TU2VC, UJ8JCM, UL7ACI, VP2M/WC0T, VS6UP, XF3RK, ZF1JH, ZS1IS (Walvis Bay) 3X1SG, 5N9NRK and 5Z4BH.

G3HZL offers for kit-inspection his c.w. contacts to A2AA, CX4SB, CX5BW, LW1EZK, TK/PA3EBT, VP8BWL, ZS1VP, ZS5WT and ZZ5FO.

Now an s.w.l. report from **Tom Davies**, (Muizenberg, South Africa) who notes that on June 11, he heard OE3HPD, DL8PC, IK5FQY, IK3GHW, FF2LY, G4YLO, LU2FXH, W8CUR and KB4T, but that most were working stations to his north who were thus not audible to him off the back of their beams. The exception to this rule was 9Q5DE, Kinshasha when he was working the two Ws mentioned. Tom by the way uses an FRG-7 receiver fed on the day in question by a dipole cut for 19 metres.

Continuing with 28MHz, G0JEE says his crop included new ones in CX3VB, 9J2WS and CP6XK.

On to ON7PQ. Pat mentions OH2AP/OH0M, VK2PS, ZS6YW, UL7GE, 9J2AL, J28CW, TK/PA3EBT/P, A22AA, 3A/G0FUN/M, 5N0SKO and HZ1AB.

Obituaries

I was shocked to hear of the sudden death of Herbert Nauck GW0GXK at the age of 65; Herbert was a member of the local Powys Amateur Radio Club and a keen chaser of DX preferably by way of the satellites. Herbert came to this country as a prisoner of war, and after marriage settled here for the rest of his life. As a club member, he was always ready to stop and chat to new members, and to support committee members with quiet words of wisdom. Herbert will be sorely missed, and our sympathies go out to his wife Olive and the other relations.

The 3V8AZ DX-pedition crew, Marcel Aouizerate, F2SA, and Henri Belmont, F1HJW, were killed on Sunday June 4, when their Cessna aircraft crashed on the Spanish side of the Pyrenees at about the 3000m level while on the return flight to France; there were four people in all aboard, but rescuers who reached the spot found no survivors. Marcel was, in fact, Tunisian by birth and 3V8AZ was his own callsign; negotiations were in progress for a full-blown DX-pedition to Tunisia under FDXF aegis, but this has now been postponed indefinitely. Meantime, **DO NOT QSL DIRECT OR WRITE**, as the families of F2SA and F1HJW do not wish to receive correspondence. If the logs can be found, the French DX Foundation will seek permission to QSL every contact in memory of these fine operators; but a later indication suggests that there is virtually NO HOPE of ever confirming these contacts.

Here & There

As always, thanks to *DX News Sheet, The DX Bulletin, Canadian Radio Amateur,* the *Ex-G Bulletin,* and all your letters and personal messages.

In the June issue, we mentioned the passing of Jim Kirk G6ZO, and referred to the Farnborough meeting in 1940. This provoked a nice letter from G6XM, Bill James, enclosing photostat prints of two of the photographs taken by G2YL at that event. The point of all this is that Bill reckons I "got it wrong" in two directions. All I can say is that I took our details from G6CL's book *World at Their Fingertips* page 183. In fact, it now seems likely that in that book, VE5ZM was indeed a misprint for VE7ZM, which I missed and transferred into the notice as G6XM says. Sorry, everyone!

WAB's press release for this month indicates that they have a new Awards Manager in Dave Rogers G4VID, and that he is duly being kept hard at it dishing out awards in answer to valid claims. For details on all to do with this very worthwhile programme and who benefits, write to Brian Morris G4KSQ, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED.

If you worked A51PN at all lately, then you raised a Slim, as Pradhan has been off the air since 1982. Slim has also been involved with the SMOM since we hear that the last time that 1A0KM was operational was October 1988. Slim was also his pestilential self signing XX9GP calling for QSLs via a KL7 was NG, says VS6CT.

You may have been one of the lucky ones to raise PA3CXC/ST0 on his first trip, or you may have been waiting for the full-blown operation. Alas! four days before that could happen, there was an attempted political coup, and so PA3CXC had to cancel everything for the foreseeable future. It also follows that his proposed plan for putting Ethiopia on the air is also in jeopardy.

If you are looking for Pacific stations, we hear that OH1RY is putting together an expedition scheduled for October/November, covering Vanuatu, Fiji, and Conway Reef. In addition, between us writing this and you reading it, Amir 4X6TT will have done his one-month swing-around of the Far East and Pacific, during which he promises to operate from as many places as possible.

Remember Minerva Reef? Rumour hath it that an operation from here later in the year is being planned; this one was deleted as far back as 1972, but a scan of available maps suggests that although currently it counts for Tonga, it could again be a DXCC country in its own right.

As far as BY activity goes, quite obviously things have been curtailed; however some stations are still about. NS7Z Mike Bragassa was actually operating BY1QH Qinghua University on June 3, and was on his way back to his hotel when the troops cleared Tiananmen Square. His recommendation is simple; if in QSO with a BY station do not enquire or discuss anything on the situation, for Mike fears for the future of Amateur Radio in China. As he says, Qinghua is one of the two universities where the whole thing started. Certainly such BYs as have been heard here have not been from the Beijing area.

Perhaps not really DX, but a different sort of "first" in that four of the HAs (HA8UB, HA8RA, HA8XF, HA8ZC) will be operating from Malta between June 28 and July 10, everywhere between Top band and 28MHz. QSLs to the Bureau. And talking of firsts, we hear that RB5JZ, Stan, and his wife Svetlana, have been able to pay a personal private visit to G3FXB, and that a special permission was obtained from the DTI for Stan to operate the G3FXB gear on this visit.

NCDXF report they have supported some seventeen DX operations over the past year, to the tune of grants worth nearly $2500; in addition some 317 slide show or videotape presentations were made to 284 groups. As a final note, the Foundation indicates with pleasure that the Rotuma, 3D2XX operation returned the $2500 grant made to them after it was all over. NCDXF can always use some support; the address is : NCDXF, PO Box 2368, Stanford CA, 94309-2368.

VHF Up

David Butler G4 ASR
Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP

144MHz Sporadic-E

In the July issue of *PW,* I wrote that statistically the Monday and Tuesday after the first weekend in June usually gives some Es enhancement to the band. Although conditions on 50MHz over this period were quite reasonable with CT, CT3, EI, F, PA, OH, SV, ZB, ZS and 9H1 being worked, things were looking pretty gloomy up on 144MHz. Fortunately a report from **Paul G1UUX** located near Evesham gets me off the hook. In a brief opening on June 5, lasting only 3 minutes, 9H1GB in JM75 was worked.

It was not until Saturday June 10 that the UK Sporadic-E season really got going. Stations situated from southern England way up to northern Scotland were able to work into Yugoslavia, Bulgaria, Romania, Austria and Italy. Some groups setting up early for the *PW* contest on Sunday were also fortunate to get in the action.

Starting in the far flung north, **Andy Napier GM1TBW** (IO97) reports contacts from 2100UTC with IW8XCO, IK6CWQ, I6LTP, I6XOA, IK6HKX, IK4KNG and I4PVU. **Derrick Dance GM4CXP** (BDS) discovered the band wide open to Italy at 2330UTC. Stations in locators JN45, 52 and 61 were worked at S9 until the band faded out at 0000UTC. **Ian Harwood G8LHT** in Doncaster stumbled across the opening just after midnight. Between 2329 to 2352UTC s.s.b. contacts were made with I4BXN, I4RHP, IW5BOL and I0UZF/0. The lateness of this opening has led some "experts" to suggest that this event may have been via auroral Es.

Although **Paul Baker GW6VZW** missed the start of the event, he still managed to work YU1EV, YT2DF, YU7AS, YU7CV and OE6TGD. One of the stations setting up for the *PW* contest was **Dave Robertson G4FRE**. Operating from a site near the Black Mountains, Gwent, Dave was heard

working strings of LZs, YUs and YOs. Situated only a few kilometres from GW4FRE/P, I managed similar results. Between 2100 to 2213UTC, s.s.b. contacts were made with LZ1QM (KN12) at 2210km, YO2BBR (KN05), 31 x YUs and 6 x OEs.

In central England, **John Fitzgerald G8XTJ** (BRK) made his first Yugoslavian contacts by working, from 2100UTC, YU1AFS, YU1ZF, YU2VR, YU7AS, YU7CV and YZ3TTI. Over on the east coast **John Regnault G4SWX** worked pretty much the same by contacting 6 x LZ, 22 x YU, OE8HOQ and IV3BBR.

Down to the south coast, **Steve Richardson G4JCC** located on Hayling Island is never far from the action. From 2054 to 2202UTC Steve worked LZ1KDZ, LZ1KL, YO2BBT, YO2FP, YO2IS, YO3ACX, YO3ARK, YO3RG, 14 x YU, 2 x OE and 2 x HG.

Another station situated on the south coast, **Steve Damon G8PYP** (IO90), made contact between 2052 to 2203UTC with YO2AUM, YO2BBT, YO2IS, 8 x YU, 2 x OE and HG8ET.

Openings via Sporadic-E continued throughout the week, to southern Spain on June 11, Italy at midday and eastern Europe during the evening on June 12, and to southern Spain on June 13 and June 16.

In a very short opening around 1230UTC on June 11, **Collin Morris G0CUZ** worked EA7AJ and EA7DZI. Paul GW6VZW worked EA7AJ (IM87) for a new square.

A good lunchtime opening to Italy on June 12 started around 1200UTC and continued for nearly 90 minutes. G4JCC worked IV3VFP, IK4GNG, I7QHE, IK7MCJ, IW7AQO, I8OMA, IK8EVE, IK8GGT, IW8BZN and I0UZF. G8LHT also worked into Italy and in addition contacted IT9VDQ, 9H1CG and 9H1GP/M. **Ela Martyr G6HKM** worked 6 Italian stations, a contact with IK0FEC (JN63) giving Ela her 200th square. GW6VZW worked 10 Italian stations in call areas I3, I4, I6, I7, I8 and I0.

For stations located in East Anglia, the evening opening was something special. Commencing around 1655UTC and lasting for over 2 hours, contacts could be made Bulgaria, Romania and Yugoslavia. It was between 1845 to 1915UTC that events took a turn for the better. A number of lucky operators in Suffolk and Essex worked UO5KWB (KN27), UO5OB (KN45), UO5OIW (KN46), UO5OX (KN46), RB5GU (KN66), UY5HF (KN66) and UB5GHB (KN67).

Another Es opening on June 13 was a brief event to southern Spain. Between 1215 to 1225UTC, Collin G0CUZ worked EA7GKF (IM87) and EB7BQI(IM76).

An Es opening on June 16 gave many stations contacts into central and southern Spain. **Ian G0FYD** in Blackpool worked EA4CD (IN80), EA4BVE (IN80) and EA7AJ (IM87) for 2 new locator squares and country number 21. At the QTH of **G4ASR**, EA4CD, EA4BVE, EA7GTF and EA7GTG (IM87) were worked in the opening commencing 1243UTC and lasting 10 minutes. G4JCC (IO90) heard EA7DZI at 1240UTC and up in north Wales, **Ian Wright GW1MVL** had QSOs with EA7GTF and EA7AJ, both in IM87.

On Saturday June 17 there was a very large-scale Es opening which lasted for about 6 hours. Stations in southern, eastern and central England seemed to fare better than most, although some stations in the Republic of Ireland and southern Scotland also participated in the event, but to a much lesser extent. The opening started at 1600UTC with stations in the south-east of England working into Poland, Czechoslovakia and Hungary. It was noted that stations in central and western England could also work into these countries but were aided by tropo extension into the main Es zone. Consequently, the well sited tropo stations, although not in the optimum position for the Es propagation, were doing quite well from the start of the event. The Es propagation then swung slowly clockwise over the course of the next 6 hours enabling many operators to work into Romania, Yugoslavia, Bulgaria, Greece, Italy, Sicily, Sardinia, Corsica, Malta, Balearic Islands, Spain and Portugal. As the Es moved south-east, so the distance became more favourable for stations located in central England and those not fortunate in having a good tropo site were then able to enjoy the event.

A fascinating report of events comes from **Geoff Brown GJ4ICD**. Indications of the impending event came on 50MHz around 1530UTC when many French stations were heard. These were located fairly close and therefore the m.u.f. was quite high. At 1550UTC several HG calls were noticed on 144MHz and by 1600UTC the band had opened up dramatically. HG0KLZ/P, HG0LZ, HG6NQ, LZ2KRT, LZ2KRU, LZ2PP, LZ2AB, LZ2KVA, LZ2FU were just a few of the very many HG and LZ stations contacted. At 1700UTC propagation moved to Yugoslavia with 117 YUs being worked before it swung back again to LZ, YO, HG, OK and SP. From 1800UTC contacts continued with YO9CN, YO5BWD, YO5ZL, YO5DE, YO3DE, YO5DES, YO5CRI, YO5TP, YO3ACX, YO2FP, YO7NE, YO2NM, YO3ARK, YO2AVM and many many more. For the next two hours QSOs continued with LZ, YO, YU and OK. At 2000UTC the Es moved to the south allowing contacts with IT9, IS0, 9H1 and TK. After 5 hours of tremendous activity the 144MHz band eventually went quiet. In total Geoff claimed over 400 contacts, most of them at an average distance of 1500km.

New countries in the form of HG, YO and YU were worked by Ian GW1MVL (CWD). Although both LZ1JVA and LZ1KCP came back to Ian, these stations were subsequently lost in the terrific QRM.

I missed the first two hours of the opening whilst having a barbeque but still monitored what was going on with the aid of the kids' Fisher Price walky-talkies! Between 1816 - 2046UTC contacts included LZ1JD (KN32) at 2400km, LZ1RK, LZ1WL, LZ1ZB, LZ1KSP, LZ2KHM, HG8CE, 11 x YU, 6 x I, 7 x IT9 and 4 x IS0.

Steve G4JCC made the grade by working 7 x LZ, YO, YU, 3 x I, 2 x IT9 and 2 x IS0 between 1840 to 2040UTC. Best DX was LZ2KRT (KN33) at 2300km.

Ian Cornes G4OUT, the RSGB VHF Awards Manager, concentrating on c.w. worked LZ1KDP, LZ1RB, LZ2VR, YU1AFS, YU2CBE and HG8UN between 1833 to 1906UTC.

Ela G6HKM was monitoring 144.300MHz on her TR-9130, installed in the dining room, when a number of stations were heard getting very excited. A quick move to the shack gave Ela a good start for 5 hour Es opening. Rather than get stuck in a pile-up situation, it was found more productive to call CQ. In total, contacts were made with 13 x YU, 5 x YO, 5 x LZ, 2 x HG, 3 x I and 2 x IS0.

G8LHT worked 2 new countries, LZ and YU, in the opening between 1624 and 2030UTC. Ian's total included HG, YO, 5 x YU, 4 x LZ, 4 x I and 2 x IS0.

Steve G8PYP recognised that the early part of the Es opening was tropo assisted and, as the event progressed, so the stations worked exhibited the normal Es characteristics. Steve said the footprint at the early stages of the event appeared to extend from GW through to DL. Your scribe made exactly the same observations. Stations, for instance, in IO81 were competing for the same DX as were stations in JO31. From 1747 to 2155UTC contacts were made with LZ2PP, YU1LA, YU7AJH, I7QHE,IK8IOM, IT9TVF, IW9AIG and IS0AJY. Gotaways included 9H1ED and an EA3 station.

Ian G0FYD (IO83) used an IC-290H with a 50W amplifier and 15-element Yagi at 10m to work IC8CQF. Snatches of LZ, HG and YU were heard but the force wasn't with him on this occasion. G0FYD comments that this opening seemed to favour stations in southern regions and that there was no indication of Es on Band I TV during the opening. The latter situation is easily understandable, especially to operators that have equipment for both 50MHz and 144MHz. An early indicator that 144MHz will open via Es can be obtained from the way the ionisation is affecting the skip distance on 50MHz. Simply put, as the skip distance shortens on any particular band, so the maximum usable frequency (m.u.f.) is increasing. If you notice very short skip on 50MHz, let's say under 350km, then you can be fairly certain that the m.u.f. is approaching 144MHz. At first hand you may think it is difficult to find countries active on 50MHz that are 350km or less from the UK, but don't lose sight of the fact that these may be found working crossband on 28.885MHz. So, the next time you hear very strong GM stations on 50MHz via short skip Es, go straight to 144MHz. It's open! Returning to the comment from G0FYD. You will now see that when 144MHz is open via Sporadic-E, the skip on Band I will be very short and may have moved into an area of western Europe that does not have any v.h.f. television transmitters. There are, of course, always exceptions to this rule. Incidentally, the same rules apply to signals heard on 28MHz and this band can be used as a very effective indicator for detecting openings on 50MHz.

144MHz Aurora

As a precursor to the Sporadic-E event on Saturday June 10, an auroral event took place. Commencing about 1300UTC, it enabled the more adventurous operators to work into DL, HB, HG, LA, OH, OK, OZ, SM, SP, Y, UB, UC and UR. Note that you really must take your Morse test if you want to work the real DX!

G0FYD (IO83) worked DF2ZC, SP6GZZ (JO81) and OK1KRU/P (JN79), all on c.w. for two new squares. Ian G4OUT (SFD) put the key to good use by working EI, G, ON and PA between 1609 to 1810UTC. SP6GZZ was heard 54A at 1615UTC.

It was the lads' on the east coast that were working into the Russian Republics. John G4SWX (SFK) and **Andy G4PIQ** (ESX) worked UR2RJ (KO29), RB5PA (KO21) and UC2ICU (KO13). RB5PA was also worked by G3XBY in IO92.

At my QTH, only the last hour of the aurora from 1700-1800UTC was participated in. Contacts on c.w. were made with HG8CE, HG0HO, SP6AZT, SP9EWU, SP9NW, OK1ATQ, OK1CDM, OK1KRU/P, OK1SC, Y24QO, 16 x DL and 6 x PA.

Derrick GM4CXP (IO85) was pleasantly

surprised at the number of countries worked in the event between 1320 to 2000UTC. Derrick made the grade by contacting DL, F, G, GW, HB9, LA, OK, ON, OZ, PA, SP and Y.

Ela G6HKM worked about 40 stations in the opening. In additiont to DL, GI, GM, ON, OZ and PA, Ela also had QSOs with SM1PDA (JO97), SM6KKX (JO67) and SM7FMX (JO65).

Concentrating on s.s.b., Ian G8LHT (IO93) picked up 3 new locators. Contacts included GM1SMI/P (IO89), GM0EWX (IO67), GM3JIJ (IO68) and GM0EXN (IO88).

Another station who worked the aurora on s.s.b. was Ian Wright GW1MVL. Two new locator squares were provided by GI4KIS (IO64) and GM0ERB (IO76). QSOs were also made with GM1SMI/P (IO87), GM1IKQ, GI4LKG,ON1ANI and DB1HX (JO43).

The 50MHz Band

The workhorse of 50MHz propagation, Sporadic-E, was very prevalent throughout June allowing European contacts to be made on an almost daily basis. Dual-mode propagation in the form of Es plus TE existed during the early part of the month and opened up the possibility of contacts into Africa and South America. Auroral activity is, of course, more prevalent on 50MHz than it is on 144MHz and June was no exception with a number of fine events being recorded. The latter weeks of June saw a gradual improvement in propagation to South and North America and a particularly good opening to the west coast area.

The log from Steve G4JCC (IO90) shows just what an advantage it is to be located in the south of the country. June 2 was an African day with the ZS3VHF beacon being heard peaking S9 from 1600 until 1810UTC. ZS3E in beacon mode was copied from the same time and later, at 1700UTC, Kosie ZS3E was heard working stations in Europe. Nic 5B4AZ was putting in a good signal around 1750UTC on June 3, as was the Cyprus beacon 5B4CY. This beacon was also heard on June 5 between 1750 to 1845UTC, June 10 from 1745 to 1935UTC, June 11 from 1825 to 1900UTC, June 13 from 1640 to 1700UTC, June 15 in a mid-morning opening from 0852 to 1000UTC and on June 19 in another early opening from 0942 to 1040UTC. Propagation was good to South America on June 3 with CX4HS, LU3DCA, LU7DZ and LU8DIO being copied at strengths up to S9, from 1840UTC. Presumably the mechanism for this was Es plus Trans-equatorial. Radio conditions on June 4 favoured stations on a south-easterly heading. SV1EN and SV1OE were heard working into the UK for over an hour in an opening which commenced from 1525UTC. SV1OE was heard again the next day at 1030UTC, with the ZS3VHF beacon rolling in at 1813UTC. Steve also worked many stations via crossband during the month, including HG1YA and LZ1KWF.

Bill Biltcliffe G6NB reports on excellent month with Es on 50MHz. ZB2/G0LFF and FC1EAN/7X were the star signals on most days and were audible for very long periods. Other stations worth mentioning included CT1DTQ, CT1WB, CR2LN, FC1GXN, F2BJ, G4VXE/CT3, LA1DI, OH1ZAA, OH5NQ, OH8MT, SV1OE, T77A, T77C, 5B4OG and 9H5EE. Bill asks if 5B4OG has a permit for 50MHz. As I understand it, 5B4 stations do have permits which allow them to use frequencies other than the fixed 50.500MHz which was formerly the case. So far, 5B4AZ and 5B4OG have been reported on 50MHz. Bill didn't ask about the validity of T77A. Unfortunately this station is a pirate. It has been known for some time that an Italian operator has been active using the callsigns T77A or T77C. T77A does not exist, the correct club callsign is T70A. T77C is a valid callsign but is being pirated on both c.w. and s.s.b. The real owner of the call does operate 50MHz but his licence states that he must only use c.w. within the bottom 20kHz of the band. Anywhere else in the band on c.w. is very suspect and almost certainly a pirate if heard on s.s.b. One of the French stations that Bill mentioned does not have a permit for 50MHz and must also be looked upon as being an illegal operator. Six metre stations in France are only allowed to operate between 50.2 - 51.2MHz. Most of the illegal French operators can be heard below this band, usually clogging up the inter-continental calling frequency on 50.110MHz.

	Band (MHz)			
Station	1296	430	144	Total
G3IMV	48	124	412	584
G4KUX	—	120	372	492
G3UVR	82	135	246	463
G4RGK	50	124	284	458
GJ4ICD	59	119	262	440
G0DAZ	27	128	277	432
G3XDY	89	147	196	432
G3JXN	87	134	179	400
G1EZF	—	93	263	388
G4XEN	—	111	274	385
G6DER	78	110	183	371
G6HKM	45	107	207	359
G4RRA	—	80	255	335
G3COJ	44	103	186	333
G4DEZ	48	37	248	333
G4SSO	—	93	229	322
G4FRE	72	146	102	320
G4TIF	—	110	200	310
G1KDF	37	98	174	309
G4DHF	—	—	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G6MGL	59	89	141	289
G8PNN	63	98	128	289
G4NBS	63	105	119	287
G1LSB	—	133	150	283
DL8FBD	—	—	280	280
G8ATK	45	91	143	279
G4MUT	28	90	149	267
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G8LHT	6	85	164	255
G6DZH	—	87	154	241
G0EVT	—	56	184	240
G4IGO	—	—	238	238
ON1CAK	—	33	204	237
G3FPK	—	—	236	236
G0EHV	—	75	154	229
GM4CXP	—	31	198	229
EI5FK	—	56	172	228
G6STI	24	69	130	223
ON1CDQ	—	32	182	214
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G8MKD	—	49	150	199
GJ6TMM	—	48	151	199
G4YCD	—	—	197	197
G4DOL	—	—	186	186
GI1JUS	—	—	181	181
G1SWH	—	49	118	167
G6MXL	16	45	91	152
G4ZTR	30	45	73	148
G4AGQ	1	41	104	146
GW6VZW	—	6	138	144
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G0FYD	—	—	116	116
G8XTJ	—	—	116	116
G1IMM	—	17	98	115
GW1MVL	—	20	95	115
G8PYP	—	19	95	114
GM0HBK	—	—	107	107
GI4OWA	—	—	103	103
G1TCH	—	6	88	94
G1SMD	—	—	93	93
G6MEN	4	26	63	93
GM0GDL	—	20	73	93
G4WHZ	7	—	76	83
G1DOX	4	11	61	76
G0HEE	—	—	73	73
GU4HUY	—	—	73	73
G1CEI	—	—	68	68
G0HDZ	—	—	64	64
G1NVB	—	—	58	58
G2DHV	2	7	33	42
G7CLY	—	—	38	38
GM0JOL	—	—	37	37
G7AHQ	—	—	34	34
GM1ZVJ	—	—	26	26

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

QTH Locator Squares Table

At my QTH, the first few weeks of June appeared to offer little in the way of DX. George SV1AB (KM18) was worked at 1055UTC on June 5 and later in the day at 1745UTC a brief exchange of 59 reports were made with Kosie ZS3E (JG89). Following the 144MHz Es opening on June 10, SV1OE (KM17) was worked for a new square at 2230UTC. Sunday June 11 was a really good day. ZB2/G0LFF, G4VXE/CT3 (counts as Africa) and OH2BOZ/OH0M (JP90) on Market Reef were worked but best was yet to come. For two hours the presence of an Es cloud on a bearing of 250 degrees from the UK had been noticed. It was a simple matter to confirm its existence by working stations in the UK via backscatter. At 1500UTC whilst listening on 50.110MHz a weak s.s.b. signal was heard which initially sounded very much like a Caribbean station. A quick BK de G4ASR and back came 8R1AH (GJ06) in Guyana, South America. Signals built up very quickly and reports of 55 were exchanged both ways. Propagation was very brief and within seconds the signal had disappeared into the noise. Five days later a QSL was received indicating that this QSO was the first and only contact with England. Surprisingly, 8R1AH had been active from Guyana for about six months but was due to close down the very next day to return to his native Canada. Other interesting contacts in the month included SV1AB (KM18) on June 12, FC1EAN/7X (JM36) on June 13 and SV1DO (KM17) on June 17.

John Fitzgerald G8XTJ, the WAB Publicity Officer, runs 10W from a Howes HC266 transverter into either a dipole or an HB9CV antenna. On May 28 John worked two new squares and a new country in the form of FC1HQM (JN23) and FC1GTU (JN05). An Es QSO with OH3MF (KP20) was made on June 7 and during the aurora on June 10, G0JHC in Lancashire was worked. No luck was had on June 12 when the band opened up to Scotland via short skip Es. GM1SMI/P, GM3XOQ and GM6RGN were heard at S9 but the pile-ups were terrific. However, by way of consolation, LA5WQ (JO59) and OH2BOZ/OH0M were worked later in the day. June 17 was a good day with F6BNX (JN33), ZB2/G0LFF and FC1EAN/7X appearing in the log. Another new country, Portugal, was bagged by working CT1DTQ (IM58) on June 19.

Ela G6HKM spent most of her time on 144MHz during the aurora on June 10, but still found time to work GM4WTA (GRN) and GI8AYZ (ATM). Later in the month, Sporadic-E propagation allowed some new locator squares to be picked up by working CT1WB (IN51), FC1EAN/7X (JM36), FC1MDT (JN23), FC1MKY (JN33), GM1SMI/P (IO89), GM0ILB (IP90), OH2BOZ/OH0M (JP90), OH7AI (KP33), OH7NFE (KP42), OH9NLO (KP26), SM6AEK (JO66), SM0HP (JO99), SM0MXR (JO89) and ZB2/G0LFF (IM76).

June "*wonderful*" June is how **Doug Hanson G8KOM** (IO91) sums up his results on 50MHz. Using an FT-290R, RN Electronics transverter and a 5-element beam all the usual European countries such as CT, F, LA, OH, PA and 9H were worked. In the aurora on June 10, con-

tacts were made with GM0HSC and GI6FHD, both 59A on s.s.b. and with PE1JPX (JO33) at 55A. In the Es event which followed SV1OE (KM17) was easily worked. If you think June was wonderful, Doug, *then you really ain't seen nothing yet!*

Paul Feldhahn G7CFK has been slowly adding to his country total on 50MHz. Recent additions have included CT, F, 7X and 9H worked direct and HB, I and OZ via crossband. Paul mentions that he has kept a record of daily solar flux and A index since December 1988. By converting to graphical form the 27 day solar rotations can easily be seen. Whether there is any practical value in doing this will be seen when I return to this subject later in the year.

A comprehensive report was received from **Paul Thompson G6MEN**. I've had to dilute it a little but I think you will still get the flavour of it. Paul, located near Shrewsbury, runs 10W into a dipole, and shows just what can be worked on this band with low power, provided you are in the right place at the the right time. QSOs were made with LA9DI, OH1YP and OH2BOZ\OH0M on June 12. The next day saw propagation being mainly to the south with the ZB2VHF and CT0WW beacons being heard most of the time between 0730 to 2100UTC. Contacts were made with CT1DTQ, CT1WW and a few French stations on the Mediterranean coast. On June 14 the prevailing southerly Es propagation allowed a contact with CT4KQ (IN60). At 1347UTC on June 15, FC1AEN/7X was worked for a new country and square. Many stations, including DK1KO, HB9QQ, SM7AED and YO2IS were heard around 28.885MHz working crossband for most of the afternoon. A considerable amount of traffic was copied from all around Europe on June 16. Countries heard between 0645 to 2100UTC included CT, F, T77C, ZB2/G0LFF, ZB2IW and FC1EAN/7X direct on 50MHz and DL, EA, HB9, I, OE and OZ available via crossband.

For a few stations in Cornwall and Devon, Saturday June 24 was a red-letter day. It started with an opening to the east coast of the USA from about 1415UTC. K1JRW, K1TR, W1AMG, W1GCI, W1JR, WA1OUB, WA1VRH, W2CAP/1 and W3EP were among those heard working stations in locators IO70 and IO80. At 1425UTC an extension to the propagation path allowed K7KV (DN16) in Washington State to work G3ZYY, G6JDX, G6ION, G7BXS and G4UPS. Apart from Ted G4UPS, all the other stations were located within 10km of each other.

The first opening of the season to the Caribbean area came on Tuesday June 27. From 1320 to 1440UTC, KP2A on the Virgin Isles was working stations in the UK from Devon right up to North Yorkshire.

The 70MHz Band

The increase in Sporadic-E propagation and the chance of working CT3 for a new continent livened up the band somewhat. Auroras during June also brought about an increase in activity and it was pleasing to note many new callsigns on the band compared to this time last year.

With the temptation of a possible contact with G4VXE/CT3, I put my 10-element Yagi back on the tower. However, as all "aficionados" of the band already know, although the m.u.f. at times was well over 70MHz it never seemed to reach this frequency on a south-westerly heading. At least the aurora on June 10 provided some recompense with contacts being made the length of the UK, between G4CVI (IO90) in the south and GM0EWX (IO67) in the north. On June 12, the Cyprus beacon 5B4CY was heard peaking 559 at 1720UTC. At the same time, operators in eastern England were enjoying an Es opening on 144MHz to YO, LZ, UB5 and UO5.

The 144MHz Band

The 144MHz band was probably the jewel in the crown of the v.h.f. bands during the month of June. With high pressure situated over the UK for many weeks tropospheric conditions were excellent with many contacts being made into Western Europe and Scandinavia. A number of auroral openings occurred, with the event on June 10 being particularly good. About 30 minutes before the aurora really got going, a few stations in central and eastern England were working into Sweden (JP93) via Auroral Es. As predicted Sporadic-E openings became more prevalent with three very good openings occurring by the middle of the month. The sporadic meteor rate during June was high and with the addition of a number of reliable showers few of the ping jockeys had much to complain about.

David Shaw G8MDG sent in a brief extract of his log giving details of the stations worked via the good tropo conditions on May 26. Contacts were made with OZ1IWE, OZ/PE0AJN, SM6DWF, SM7AED, GM1WAB/MM (IO98), DL5HA, DL4LAT and HX6JUN.

Another station making use of the lift in conditions was Steve G8PYP. On May 27 he worked a number of German stations in JO43 and OZ9FW in JO65. Andy GM1TBW had a fine time of it during the period of good tropo. On June 15/16 Andy worked 13 Dutch stations, with mostly 55 to 59 reports. Sunday June 18 was even better with 35 Dutch stations being worked over the north sea path. One interesting contact was made with PA3EXS who despite running just 5W was 55. Albert reduced his power down to the 1W level and was still very readable. Other contacts made included 10 Belgians, FA1JNY, FC1LUW and DG6PY/P in JO30JF. Surprisingly not very much was heard from the UK. GW1LNY (IO83) was worked at 1031UTC, G6BBE (IO93) at 1930UTC and G1NIG (JO02) at 2209UTC. Andy passes on some tips to stations trying to get a QSO with a rare square. He suggests giving your locator first and then the callsign. This technique has worked well for Andy on several occasions when trying to bag a new square. I would suggest, however, that although this would undoubtably work from IO97, down in the real world, in IO91 for instance, this technique would probably eliminate your chances of a contact. Another method that Andy uses is to speak a bit of the other operators language. This can at times be very worthwhile. It is quite likely that the first person to work a ZA on 144MHz is the one who can conduct a QSO in pidgin Albanian!

Angie Sitton G0HGA sent in a very interesting letter describing her station and details of recent contacts. Angie is using an old and faulty Totsuko TR-2100 which only delivers 800mW output. This is used to drive a VJ-90PL amplifier giving 15W to a rather battered home-brew Yagi. The Yagi is mounted 3m above ground on a hand rotated pole, in the middle of a big housing estate at 156m a.s.l. Maybe not state of the art equipment but Angie's keen interest in the c.w. mode has enabled her to work much DX. Angie, as a member of the High Speed Club, Fists and AGCW/DL can often be heard rattling the key, working her fellow c.w. enthusiasts. From her location in Stevenage, contacts are regularly made into F, ON, PA, DL and around most of the UK. Recent Sporadic-E openings gave contacts with YU1AFS (KN04) on June 10 and YU7CV (JN95), LZ1KDP (KN12), LZ2XU (KN23) on June 17. Good tropo conditions on the same day, allowed Angie to contact SM6DWF (JO57) and SM4KYN.

THE NEXT THREE DEADLINES ARE AUGUST 23, SEPTEMBER 27 & OCTOBER 31

The 432MHz Band

Although tropo conditions during June were good, not many stations made the effort to come on the band. I have been forced to put a number of Yagis upon the tower to keep tabs on the band, even if it means reporting that nothing happened.

At least I can rely on Ela G6HKM to send in regular reports. Although an opening to Norway was missed on June 19, Ela caught a good one on June 22 with OZ1CFO (JO57) and Martin LA8AK (JO38) being worked.

The Microwave Bands

G6HKM (ESX) reports that 1296MHz came alive on June 16 when QSO's were made with PA3CEG, PA3DIJ, PA0AD, PA0TMP, PE1NBC, DC4BK (JO43) and DL5BAW (JO43). A contact with PA0TMP (JO22) was particularly pleasing as Peter was running just 100mW. Propagation during the evening of June 22 was good to Scandinavia with the beacon LA3UHG running at 55 for some time but unfortunately no other activity was heard. An attempt to work OZ1CFO was not successful even though he was a very good signal on 432MHz.

Following on from my report in July regarding the first GM to GI contact on 24GHz, I am pleased to say that progress has been made and that further contacts have taken place. **Dave GM3WIL/P** located at Dunure, south of Ayr, worked GI8GJX/P on Agnew Hill, north of Belfast. Signals peaked R3 S3 over the 96km path, and beat the previous contact with GI4SQL/P by over 40km. Interestingly these paths have been mainly overseas where one would expect high humidity levels. It had previously been assumed that long distance 24GHz contacts would only be made under low humidity conditions. This should give encouragement for other operators to try even longer sea paths. Let me know how you get on. It is acknowledged, however, that comparison of signal strengths between 10GHz and 24GHz show considerable differences. The effect of humidity on 24GHz can be very pronounced at times. For example, when Barry G8AGN recently worked Peter G3PYP over a 115km path on 10GHz, signals were 62dB over noise. At the same time signals on 24GHz were just above the noise level, or put another way, approximately one million times weaker than those on 10GHz.

Harold Groves G3UYM is very interested in trying some tests on 24GHz from Dunstable Downs. You can telephone Harold on (0462) 33878.

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

Readers' Letters

I will start with an apology to **Kenny Allen GI4RSI**. Kenny sent me a very good report of the Allesandro Volta contest in May but I managed to lose his letter in my wonderful filing system! Anyway just for the record Kenny uses a Sinclair ZX computer which has been upgraded to a "plus" model and runs G1FTU software for RTTY and SSTV. The rig in use is a Yaesu FT-707 running about 15 watts out into a trapped dipole at about 6m. Although Kenny is using a totally software-based system at present he is hoping to build a filter unit shortly to improve the performance.

I received a very interesting letter from **Ron Collins VK5RY** the other day. Ron moved out to Australia back in 1965 to get away from the depressing economic climate. Ron's interest in RTTY started in 1973 when he visited a local amateur who was running an old Creed model 7 teleprinter. From this point on Ron was sold on RTTY and soon aquired his own model 7 which was followed by a Creed 75 and 444. Finally, Ron decided he needed something rather quieter and more modern, so changed over to a Commodore 4016 computer.

The latest aquisition being an Amstrad 1640HD IBM compatible computer which he will be using for RTTY.

My thanks to Ron and Kenny for taking the trouble to write.

FAX Transceive Program

The equipment review for this month is the FAX transceive package for the Spectrum from J & P Electronics. The package has been designed to operate with a 48K or 128K Spectrum computer using either tape or Microdrive as the storage medium. Although there are quite a few FAX receive programs on the market, there are not very many that boast a transmit capability, so it was with great interest that I started the review of this latest release from J & P.

There are two parts to the FAX package - the hardware and the software. The hardware comprises a 90 x 70 x 30mm plastics box which contains the clock and tone generators which are necessary to produce a stable reference for the FAX signal. The tone generators produced 1500Hz and 2300Hz audio tones for direct connection to the microphone input of the transceiver. The hardware module was fitted with a standard expansion socket which mated with the connector on the rear of the Spectrum. So that you can continue to use any other equipment requiring access to the expansion port, this port is extended through the hardware module. The only word of warning here is that if very much is added to this connector the whole thing becomes rather flimsy. To be fair to J & P, the problem lies with the connection system used in the Spectrum.

The connection from the hardware module to the transceiver was via two 3.5mm jack sockets which were mounted on the side of the module. One of these was used for the audio output to the microphone socket whilst the other was used for the p.t.t. line, which used the normal standard of ground to transmit.

The audio output level to the microphone was around 70mV r.m.s. which should prove to fine for most transceivers and, whilst the waveform was more of a rounded square-wave than a sine-wave, the audio filtering of the microphone amplifier in the transceiver should sort this out.

The only other connection required was the received audio from the transceiver. This was connected to the EAR socket on the rear of the Spectrum and was designed to take the audio output from the external speaker socket of the transceiver. The problem of course with this system is that this normally cuts off the internal speaker so you can't hear what's going on. All is not lost, as a crude form of audio is available from the speaker in the Spectrum. In my own set-up I have a separate "fixed level" audio feed from my transceiver which is buffered by an op-amp and then used to feed a variety of FAX and RTTY decoding equipment. This has the advantage that the speaker level and volume control settings have no effect on my decoding equipment, which I have found to be a great boon.

Software

With all the connections sorted out it was time to load-up the software and see what it was like to operate. One very important point to remember was that the hardware module must be connected before you apply power or you will be certain to get either a crash or a blown integrated circuit or two - not to be recommended!

The review model was supplied with software on tape and the loading process proved to be very simple with each program calling the next so the operator only had to type LOAD"". Loading of software from tape can be rather tedious but, in this case, the whole package only took about 1.5 minutes and I never had any problems with data errors. Incidentally I didn't use a special tape deck, just a simple and cheap, top loading, portable.

When loading was complete the screen displayed the main menu with its six options which were:

receive, transmit, set clock, save/load, view screen and dump screen.

The first operation was to set the clock, as this was sent automatically with every transmission. Rather than just being a simple clock, this function also included a calender. Setting the clock involved two operations, the first to input the time and the second to input the date, month and year.

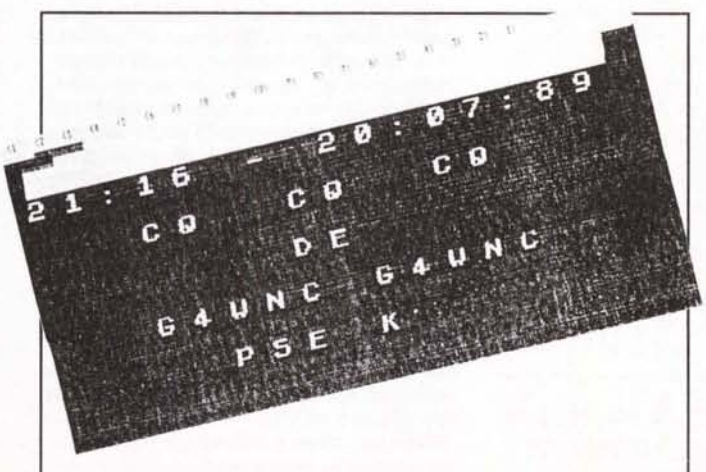
The best way to start, as with all amateur modes, is to listen, so I tuned to 14.105MHz on my Icom IC-720A and selected RECEIVE from the main menu. Incidentally, the best time to listen for amateur FAX is usually mid-morning on a Sunday. Once the program goes into receive it starts trying to decode everything it receives, which of course produces a fair amount of rubbish on the screen unless you are tuned into a FAX signal.

With no built-in tuning indication, I thought I might have a problem, but in fact I found it quite easy to select the correct tuning point with amateur FAX signals. The best tuning method was to catch the station as it started to send the sync signals of white with a black pulse. It was then a simple matter of adjusting the tuning so that both the black and white were as clean as possible. When receiving this type of sync signal the black pulse produces a vertical bar on the screen which marks the edge of the picture. The next problem was to actually shift the bar to the edge of the screen. The J & P program included two methods of achieving this. The first was to press the H key which moved the picture half a screen line to the left. Obviously this was fairly crude and a finer adjustment was achieved using the L and R keys to move the picture to the left or right in small increments. I found that these two adjustments made positioning the picture very quick and easy.

The next area for attention was the adjustment of the picture contrast, with simple text transmissions where there is only black or white this is obviously not a problem. However, when receiving a picture with grey scales, it is very useful to be able to adjust the contrast. The most basic way of achieving this is to fine tune the receiver, but often the tuning steps on the receiver are too coarse. The J & P program overcomes this problem with a contrast control which is operated by pressing either U to increase the contrast or D to reduce it.

The final display adjustment was the width control which allowed the user to zoom-in on part of a picture. This may seem an odd feature to include but it was actually very useful indeed as the screen resolution of the Spectrum is somewhat limited. The width control can be set to any value between 1 and 9, with 9 being the default value for full width. The width reductions were achieved by pressing the required number which was nice and simple. The width value in use was displayed at the top of the screen on the status line as W=9.

Once a screen had been received the



An Example of The FAX Program

J & P program allowed you to store it in memory by pressing S on the keyboard. This system allows up to 25 screens to be stored in memory which was quite useful. As you saved each screen it was allocated a letter of the alphabet between A and Y with the next free letter indicated on the status line by S=A to Y. I thought that this was an excellent system of storage as it was very quick and easy to use. Once an operating session had been completed the whole batch of screens could be saved to tape or Microdrive using the save/load commands from the main menu.

There was also provision for obtaining a hard copy of the screen by pressing Z on the keyboard. One point to note though is that this only works with a Spectrum compatible printer. If you want to obtain hard copy but use a standard Epson type printer, J & P can supply a program called DECODE which allows saved displays to be printed (this costs just £1).

Transmiting

Having sorted out the receive options and familiarised myself with the program, it was time to explore FAX transmission. Once this option had been selected from the main menu you were presented with another smaller menu at the bottom of a blank screen. The options from this screen were: transmit, abort transmission, clear screen, screen load, text, exit to receive and exit to menu. The blank screen can be likened to the transmit buffer in a RTTY program and it is here that the image is prepared for transmission.

The simplest option for creating a screen, and the only one that is supplied with the program, was the text option. When this mode was selected, the date and time appeared at the top of the screen along with a blinking cursor. At this point you could use the Spectrum keyboard to build-up a screen for transmission. Once you had completed the screen, pressing RETURN thickened-up the text ready for transmission. If you wanted to avoid thickening-up the text, you could press STOP instead of RETURN. If, on the other hand, you should need to completely clear the screen, this was easily achieved by pressing the C key.

With the transmit screen prepared the transmission process was started by pressing T. Once started the transmission could be aborted, during the first 30 seconds only, by pressing the A key.

Although the text editor was fine for basic work and creating CQ messages, its limitations were soon reached. If you wanted to be rather more adventurous with your graphics the J & P program had the ability to load in screens that had been created using graphics programs like ART STUDIO. An additional bonus being that J & P can now supply a digitiser, which will allow images to be captured from a video camera and stored in the Spectrum's memory. These images could then be transferred to the FAX program for subsequent transmission.

On-Air Tests

The connections to my trusty Icom IC720A were very straight forward with no interfacing problems at all. I started by attempting to receive a few weather charts from a variety of short wave meteo stations. At this point I became acutely aware of the resolution limitations of the Spectrum screen. Fortunately, the width control facility of the J & P program allowed me to overcome the problem to a large extent, by choosing to receive just part of the image but using the whole screen. An additional problem that occured when receiving complicated weather charts, was that of selecting the optimum tuning point during a transmission. The best solution I found was to very slowly tune from h.f. to l.f. of the signal

When I moved on to amateur transmissions the display and tuning problems were not a real problem, mainly due to the fact that a lot of amateur FAX transmissions contain fairly large-sized text.

I must admit that I found the reception of amateur FAX signals to be very simple, which is after all what the program was designed to do!

On the transmission side, I found the text entry system to be ok for getting going, but I would want to build up a range of more sophisticated screens using a separate graphics package or the digitiser. One criticism I did have concerned the transmitted format, which comprised a 30 second synchronising or tuning signal followed by a full 120 r.p.m. by 288 IOC FAX picture. Although technically fine, this did mean that a quick QRZ or CQ message became rather lengthy. I would have liked to see a way to force the program to send a shorter screen.

Summary

Overall then, I thought that this package from J & P was certainly very good value for money. The technical quality attainable was a long way short of that possible with a good quality FAX machine, but nevertheless it was perfectly satisfactory for the newcomer or the amateur who wants to explore the world of FAX occasionally.

The FAX package is available from J&P Electronics, Unit 45, Meadowmill Estate, Dixon Street, Kidderminster DY10 1HH. As I mentioned earlier, the package comes in two parts, with the software priced at £15.00 for tape and £18.00 disk. The hardware tone and clock generator costs £48.00 making a total of £63.00 for a complete tape system. If you are upgrading from a J & P Electronics receive only FAX program there is a trade-in allowance available. My thanks are due to J & P Electronics for the loan of the review package.

THE NEXT THREE DEADLINES ARE AUGUST 23, SEPTEMBER 27 & OCTOBER 31

Amateur Satellites

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

OSCAR-9

UoSAT-1 continues to fall to earth, with a generally increasing mean motion but a drag factor varying according to the solar flux condition. **Dave Rowan G4CUO**, has been keeping a close eye on the changing orbital parameters and the satellite's telemetered temperatures, and found that during the big solar flare of June 11, giving a flux of 320, channel 38 shot up considerably, to reduce again once the high solar activity period had decayed. In the same period, a marked increase in drag was evidenced, also to smooth out again after the solar event.

With the competition claim of re-entry time and date for the contest needing to be in with the organisers one month ahead of that prediction given, to provide readers with possibly the final opportunity to calculate the re-entry of U-O-9, here are the most recent sets of Keplerian data available, spaced by sixteen days, during which considerable change can be seen to have resulted.

OSCAR-11

UoSAT-2 continues as normal, but, a few hitches have occurred with the news bulletin updating. These have been mainly due to the demands of time and prior work commitment made upon the University of Surrey staff for the finalising of UoSAT-D and E.

Satellite	OSCAR-9	OSCAR-9
Epoch Year:	89	89
Epoch Day:	153.05909289	169.611317
Inclination:	97.5559	97.5601
Right Asc.of Ascending Node:	205.7301	223.3123
Eccentricity:	0.0003769	0.000078
Argument of Perigee:	145.5602	111.7501
Mean Anomaly:	214.6018	248.3816
Mean Motion:	15.58280695	15.615149
Decay rate or Drag Factor:	6.3831E-4	1.235E-3
Epoch Orbit Number:	42663	42921
Beacon Freqs:	145.825, 7.002, 14.002, 21.002, 29.510MHz +/- Doppler	

RS-10/11

All continues well with the existing RADIO pair, with lots of activity and daytime path downlink attenuation, but with few problems from f.m. users in the passband. For this we have to thank the change of propagation and the lowered m.u.f. When the autumn equinox approaches, and particularly during late October, through November to mid December, terrestrial F2 communications will reach a big high, and undoubtedly the popularity of 29MHz f.m. will again spill over into the satellite sub-band. Late December and January will provide a majority of dark paths throughout Europe, with far lower m.u.f.s at these times, so RS-10/11 communications should improve then.

Ron G3CAG, and **Don G3BGM** both report that whilst plenty of European users are in evidence, very few Ws or VEs seem to be using the satellite. Similarly, very few new or rarer countries seem to be active. We have to assume that they are enjoying the benefits that the peak of the sunspot cycle has brought to the terrestrial path.

Andy Mironov, operator of RS3A, the RS satellite command station, reports that mode A on RS-10 is still being kept as the active transponder, with RS-11 in reserve. No Mode K or T is envisaged. In order to keep the 29MHz downlink transmitter power up to help overcome the present attenuation problems, the 4kHz sub-channel a.g.c. limiting each of the 10 segments

to 400mW output is currently being kept off, so that the optimum output of 5Wp.e.p. for the entire 40kHz downlink bandwidth is possible. This will mean more power down for fewer users.

FO-12

No further news has come in on Fuji this month, and no new long term schedule of transponder operation either. It was noticed that the publication of the times when the JA and JD mode transponders would be active well ahead of schedule last time round provoked far more activity, but, with the depleted solar cell efficiency charging and the ailing battery, this might not be good news for this particular prematurely aging orbiter. It may be that we have to await the coming launch of JAS-1-B to enjoy the reliable and full benefits that mode J operation can bring.

OSCAR-10

The first Phase III satellite continues to perform well, and may be used for transponding at all times except from Mean Anomaly 226, through perigee, to MA 024, when the satellite is in darkness, until July 20. From then on, until September, it should prove possible to employ the continuously activated Mode B transponder for the whole orbit duration, on the acceptance of the usual proviso that uplink powers are modest, and that the beacon shows no signs of f.m.

The monopole antennas continue to supply the aging satellites transponders for both uplink and downlink, but provide an adequate signal for those with effective ground station antennas and quiet receivers.

OSCAR-13

Graham Radcliffe VK5AGR reports that the current transponder operational schedule until August 16, with the satellite attitude at Lon/Lat 178.3/2 is Mode B from Mean Anomaly 000 to MA 110, Mode JL from MA 110 to 145, and back to Mode B once more from MA 145 to MA 255. Mode S is planned to be active from MA 150 to MA 160. In other words, thanks to both excellent sun angles and to the absence of eclipses, we have continuous transponder operation, with both the 435MHz and 145MHz omni-antennas commanded in for use around perigee from MA 230 until MA 30. This low part of the orbital path will not be "seen" from the northern hemisphere, but is good news for those down under!.

The A-O-13 eclipses return in August, so from August 16 until November 16 this year, with the attitude at Lon/Lat 210/0, Mode B will be activated from MA 003 to MA 160, Mode JL from MA 160 through 200, a return to Mode B from MA 200 to 240, and then an all transponder off period from MA 240 to MA 003. Mode S will be on from MA 210 to MA 222, the period of best earth pointing.

Following the mid-June re-orientation of the satellite, the "ZRO Tests" return. One is set for Saturday July 29 from 0420UTC, and the next from 2020UTC on Saturday August 12, on a frequency of 145.840MHz. If you wish to participate and need a brochure telling you the historical background, the test procedures, and how to obtain your certificate, please write to Andy MacAllister, WA5ZIB, AMSAT Vice President for User Operations, 14714 Knightsway Drive, Houston, Texas 77083, USA, enclosing a s.a.e. plus 2 x IRCs. Your reports, listing date and time, plus all numbers copied, go to the same address. If you do not intend to participate, please avoid operating on or near that frequency at the times specified, and please keep your uplink power to a minimum to avoid a.l.c. elevation.

Don't forget to keep an ear on the AMSAT Operations Net coming down on 145.950MHz for Mode B or 435.970MHz on Mode JL according to the satellite operational status at the time. These take place several times per month, normally Sundays, and are a mine of satellite and AMSAT information. When available, OSCAR-10 is sometimes used if OSCAR-13 is absent.

Lunar Eclipses

At 2200UTC on June 3, AMSAT Ground Command Station Controller James Miller G3RUH, was observing the A-O-13 p.s.k. telemetry, when he suddenly noted that the battery voltage was falling fast, a zero spin rate was being recorded, and the beacon had started wobbling in frequency! With trepidation, he then noted that the solar panel temperatures were falling fast, from the normal solar illuminated +8° Celsius down to -10° C! As the spin rate is evolved from a sun sensor, and this was showing a zero spin rate, an alert condition was signalled!

All the signs were that a solar eclipse was in progress, but, as no such eclipses were forecast until much later in the year, this was apparently impossible! James, having an inkling of what was happening, then checked his astronautical almanac, and discovered the problem. It was a **lunar** eclipse, e.g. the moon intervening between the sun and OSCAR-13 causing the loss of solar cell power! To avoid any future problems, James has produced a listing of coming lunar eclipses, so that users may be aware when their operations should briefly cease so as not to damage the satellite under zero power or partial solar disc charging conditions. They are:

Date	UTC	Orbit Duration	From MA to MA
31 Aug.89	0709	929 33 min.	13 - 25
26 Jan.90	1500	1240 26 min.	25 - 34
25 Feb.90	0636	1302 25 min.	70 - 80
26 Mar.90	2215	1364 33 min.	115 - 128

The first will be visible from ZS, VK and VU, the second from VK and the Pacific, the third from North America, Europe, JA and UA, whilst the third can be seen from Europe, Africa and JA. Tom Clarke W3IWI adds the precautionary memo NOT to look at the sun directly, to avoid retinal damage.

In The Pipeline

Now for the news on the coming amateur radio satellites.

RS-12/13: Just at the time we were expecting the two new Soviet 145/29MHz transponders to fly aloft with the new Cosmos Navsat in mid-June, word came through from Leonid Labutin UA3CR and Andy Mirinov RS3A, that the launch had been postponed. No new date has yet been supplied, only that the mission had been "re-scheduled" to a later but non-specified future time. The reason for the delay was not supplied either, but it may be guessed that it rests with the plans of the Cosmos launch agency, and their future requirement date for a new Navsat replacement. We should not have to wait too long, and RS-12/13 may well be up and on when you read these words. Look out for both RS-12 and 13 for those mode A new h.f. beacons and ROBOTs on 29.408, .454, .458 and .504MHz, and the T mode signals on 145.862, .908, .912 and .958MHz for first indications of activity.

Micro-satellites

UoSAT D and E are rapidly approaching completion and all the machining work, baseplates, solar panel testing and fit-checks are now accomplished. Michael Meerhan G0/PA3BHF, of the University of Surrey AMSAT team, says that apart from a few minor difficulties both expected and experienced during the power level and indication testing, all has gone very well with the entire operation.

The Bramsat Dove satellite downlink message spoken f.m. has now changed from the originally intended 145.970MHz downlink frequency to transmit on the same frequency as the present UoSAT OSCAR-9 and 11 pair, i.e. 145.825MHz. The reason for the change is to provide continuity, especially for the many educational users and schools who have equipped themselves with crystal controlled mono-frequency receivers on UoSAT. As OSCAR-9 will have most probably reached its re-entry time, hence demise, just before the November 9 new UoSAT pair launch date, no real QRM problems are foreseen, although OSCAR-11 may from time to time compete for the use of the frequency. Richard Ensign N8IWJ, (address in earlier columns) who supplied the excellent Ski-Trek educational handout packs, has produced as part of the AMSAT education programme a similar information pack on the Dove as a classroom aid to students and teachers.

Jose Machao LU7JCN of AMSAT Argentina reports that the LU-SAT exciter boards are complete and have been tested for stability from +5 to +15°C, showing excellent results. The efficiency of the flight transmitter is measured at an excellent 72 per cent.

Jeff Zerr of AMSAT-NA in Colorado reports good progress with their satellites, with the flight computers p.c.b.s approaching completion, all four baseplates complete and accepted, and the lateral solar cells complete, with the top and bottom sets on the way. Designed and built by Jon Bloom KE3Z, using ARRL resources, the battery charge regulators on are the way, the first set already glued into place in the battery module. The receiver modules built by Tom Clarke W3IWI will have arrived by now.

The expected postponement of the *SPOT-II* Ariane launcher carrying the microsats has now been verified and the new launch date is now officially given to be 9 November 1989. Part of the reason is the inevitable delay in enabling the Ariane third stage, and partly that the new *SPOT-II* is not really required for operation until the known cessation of the existing *SPOT-I* satellite.

Following the launch of the Ariane vehicle from FY7 at 0135:27UTC November 9, the SPOT payload separation will occur at 17 minutes 17 seconds into flight time. At 20 minutes and 09 seconds, UoSAT-D and E will be placed into orbit and at 21 minutes and 06 seconds, out will pop all four microsats separately, to gradually spread apart due to slightly different velocities. The third stage will re-orientate and manoeuvre out by some 30-100km before burning off its spare fuel, to ensure that a collision with its payload, as happened with OSCAR-10, is avoided.

It is expected that AMSAT will broadcast the event from the pre-launch to the separations and the first hearings of the new group of amateur satellites on the

usual h.f. frequencies, plus perhaps 18.155MHz, which, following the band de-restrictions, is a new and additional AMSAT Net frequency. As the hour of the operation is late in Europe and h.f. propagation a little uncertain, the University of Surrey may also organise with AMSAT-UK a land-line to transmit the main sequences and events on 3.780MHz.

MIR

Currently in a high parking orbit to avoid premature re-entry, awaiting refurbishing, MIR has continued to orbit earth without a crew since the Soyuz return of cosmonauts Volkov, Krikalyov and Polyakov to Dzheskazgan at 0259UTC on April 27. The new crew will leave earth in SOYUZ-TM-8 on August 30 (plus or minus 2 days) to take up the manned mission. The main mission will be first to get the MIR systems up to the mark once more, then to prepare for the space scooter missions, and then to organise the docking system and ports to take Buran, the new Soviet space shuttle, in 1991 - 1992.

Both upgoing cosmonauts will have been trained for a continuity of the amateur radio operations, and in split-frequency employment, which, as before, will take place during free time.

Boris Stepanov UW3AX, editor of *Radio* magazine and QSL manager for the "U" many numbered prefix "MIR" suffix calls from the cosmos reports that cards for the previous MIR 145MHz f.m. operations are on the way, and should be arriving direct or via the national QSL bureau very soon now.

DX Satellite Transmission

On August 25 the outbound *Voyager-II* satellite will perform a Neptune flypast. In the days leading up to this, during the encounter and following, W6VIO, the club station of the Jet Propulsion Laboratory at Pasadena will be re-transmitting the received pictures on 14.235MHz SSTV. The actual encounter is at 0500UTC on August 25, when the 14MHz h.f. path from Europe to California should be excellent, so some good results can be expected by those equipped with standard amateur SSTV facilities.

Satellite DX

Further to the listing in last month's column, an additional number of stations known to be active on either B or JL mode on OSCAR-13 has been provided by **Reinhard Schulze DC8TS**.

CT3BX (JL mode only), EI1CR, EA6s T and QB, EA8/DJ3OS, FK1TK, f.m. 5AB, FO5KP, GJ6TMM, HB0s ATA and MSU, HC2FG, HG2RD, HZ1AB, KH6s IJ and JJI, KP4EKG, OX3AM, PJ9JT, RA9s f.m. T and MH, RA0ADC, TR8s BL and CA, TU4DA, UA6BAC, UA0's ALA and OB, VE4AMU, VE6LQ, VK2AOU, VK6BCP, VK7s AZ, ZAR and Z f.m. (Tasmania), VS6EL, XE1s CI, EEF, GGO, HYG, OE, OGG, TU and XA (Mexico) and XF4L (Revilla Gigedo), YI1BGD, YOs 2IS and 9CN, YV5ZZ, 4S7AVR, 7J1AFL, 9H1s EJ and EY, 9X5NH are all active, plus, of course, lots of Ws and JAs in all call areas. At around the time this column reaches you, an OSCAR DX operation is being planned from Market Reef by OH0AP/OH0M.

Max XE1XA put on the rare Revilla Gigedo call XF4L during the DXpedition visit of April 12-19, for an all time new satellite DXCC country. Jim Smith VK9NS, was said to have been on from the new Banaba Island as T33JS or T33RA, which may well count as an all time new DXCC country if the DXAC approve. The 4J1FS DXpedition to the joint Soviet/Finnish owned Malyj-Visotskij island was very active on many passes, with an excellent station and a quiet noise background, to the delight of the many modestly powered station that worked them. KP4EKG is planning to take his satellite gear to the West Indian island of Aruba (P4) soon, as this island now counts separate for DXCC from Curacao. Jean-Louis TR8JLD, will soon be going to Comoro Island to operate as D68JL. QSLs for him go to AK1E. KH0AC may soon come up from the Northern Marianas group of Islands soon to give yet another new satellite DXCC country. Mike, who was HL9KT, has now left Korea, but hopes to be on soon from Sabah as a new 9M6 call. QSLs for him may go with a large s.a.s.e. to KL7GRF. Conrad, active as 6W1CK and 5T5CK, has DL1HH as his QSL card manager.

It would appear that AMSAT-OSCAR-13 is now beginning to live up to its heralded expectation as being "..a new DX band..", and will undoubtedly become more so as the sunspot cycle begins to decline in three years time.

Rather a Drag?

A number of computer users have pointed out that they do not have a slot or line in which to enter the decay rate or drag factor, and have asked how they may use it. Most certainly, the original Basic Orbits program by Dr. Tom Clarke W3IWI did not incorporate it, and most modern versions of tracking programs composed by GM4IHJ have omitted this with good reason. Similarly, many other versions based on the above have followed this tradition, and no space for the drag, decay or orbital acceleration is provided.

It can be done, as John Branegan GM4IHJ has patiently explained, by changing the basic lines in his programs. If the mean motion of the satellite is greater than 0.1, then one may change line 1850, which currently reads the following:

1850 IF N0 >.1 THEN LET A0 = ((G0 / (N0 **2))**(1/3)) by replacing with the following line: 1850 IF N0 >.1 THEN LET A0 = ((G0 / (N0 + N1 *(T-T0))**2)**(1/3)) so incrementing N0 by N1 for each day since the epoch. N1 is the Drag Factor etc., so we need a new line input for this new term: 1605 LET N1 = the factor given under Decay Rate or Drag Factor as listed in the set of Keplerian Elements, e.g. (for OSCAR-9) 6.8785E-04, or, if you so prefer, the direct arithmetical equivalent, 0.000678. Unfortunately, with low earth orbiting satellites, e.g. a high N0 or mean motion value, this is not the whole story, as we need also to update the mean anomaly since the given epoch time. The old line 2230 performed this by saying (where 'Q' is the mean anomaly): 2230 Q = N0 * (T -T0) + Q0. This line now becomes: 2230 LET Q = (N0 + N1*(T - T0 -1) / 2) * (T - T0) + Q0.

Ron Pearson G3CAG, is using a line in his GM4IHJ basic computer programs for his Spectrum, calling the Drag Factor D0. He pops in the new line: "2210 LET Q = N0 * (T - T0) + Q0 - (0.5 * (T - T0)**) * D0".

Having said all this, one has to ask oneself if it is worth it. The higher orbit satellites will not be seen to change much at all within the bi-monthly updating of our element inputs, as they are well above the worst of our expanding atmosphere. The lower orbiting Earth Resources satellites such as Cosmos-1870 at 270km altitude and space stations such as MIR have booster rockets to put them up into higher orbit every three weeks or so in order to overcome the lowering effects of the drag, so, there is no point in applying it for long term predictions. This only leaves the very low orbiting non-booster assisted satellites such as OSCAR-9, the currently unmanned hence presumably unboosted SALYUT-7, (plus MIR at this point in time until it is re-manned in August) and, to a lesser extent, OSCAR-11 and the main NOAA and METEOR weather satellites to worry about.

If the drag were constant and fully predictable, all would work well, but, as NASA have discovered, it is not as simple as that. The frictional effect at a given altitude varies with the solar cycle, with the 27 day solar rotation (which has its own variables), the solar flare times and intensities, the satellite attitude, the ratio of time in orbits that it spends in solar illuminated condition to that of eclipse, and a few more non-predictable variables. All of these combine together to make long term predictions for LEO (Low Earth Orbiting) satellites more a matter of "guesstimation" rather than a scientific possibility, especially at this time of rapidly increasing solar activity.

To quote John Branegan GM4IHJ: "Drag is caused by the upper atmosphere, the density of which fluctuates violently due to irregular inputs from the Solar Wind. NASA discovered in 1979 that as solar cycle maximum approached drag became more variable and intense. We approach such a maximum today, and it will be a big one. Already the drag on low earth orbiting satellites has multiplied enormously. Whereas in 1987 you could use drag factor to continue to track UoSAT by ±4 minutes, that is now impossible. All you can do is to get new Keplerian data every 14 days since by the time AMSAT data is published, it is already out of date. As an instance," continues John, "recently MIR was completing 15 orbits per day 10 minutes faster than NASA predictions, so I stopped including drag corrections because they only gave a false sense of accuracy".

Nico Janssen PA0DLO tries to keep one step ahead by continuing to use the latest Keplerian set available, but modifying the drag factor by trial and error to bring it into line. If the satellite is seen to be arriving ahead of predictions, he adds to the drag factor until the predictions made from the set is seen to agree with his latest found AOS, TCA and LOS times. Similarly, if the AOS, TCA and LOS are late, he reduces the drag factor until his calculated results show a close match.

The best advice that can be given for those keen to follow the very low orbiters is to keep a very close eye on the degree of agreement between the calculated and found passes, and a close ear on the various AMSAT nets. As soon as a noticeable discrepancy is discernible, put in the latest available set, and start again. If it does not fit, then try the PA0DLO method until it does, and in this way you will do as well as any powerful computer.

THE NEXT THREE DEADLINES ARE AUGUST 23, SEPTEMBER 27 & OCTOBER 31

Propagation

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

Solar

Ron Livesey (Edinburgh), projecting the sun's image from a 2.5in refractor telescope, located an average of 7 active areas on the disc (photosphere) on May 7, 13, 16, 20, 21, 26 and 27. **Mike Bennett** (Slough) sent three illustrations showing spots scattered across the sun from his observations during the evenings of May 20, 21 and 31. **Ted Waring** (Bristol) counted 33 sunspots on May 30 and 65 on June 12 and remarked, "large group crossed CM (Central Meridian) around June 14." **Neil Clarke G0CAS** (Ferrybridge) told me that the mean numbers of sunspots and solar flux units for May are 138.4 and 191 respectively. The daily variations of s.f.u. can be seen in his computer print out, Fig. 8. Among the drawings made by **Patrick Moore** (Selsey) is the progress of a large sunspot group which he observed, by the projection method, (**NEVER** look directly at the sun) from June 12 to 17. Please read the drawings for the 16, 14 and 12th, Figs. 2, 3 and 4 respectively, from right to left, because most astronomical observations are relatively backwards. The numbers of sunspot groups and the state of the sun seen by **Cmdr Henry Hatfield** (Sevenoaks) with his spectrohelioscope, Fig. 5.

Henry also recorded individual bursts of solar radio noise, at 136MHz, on May 31 and June 2 (violent), 3, 8, 10, 12, 13, 14, 15, 16, 18, 19, 21, 22 and 25 and a minor noise storm on the 27th. In addition he logged bursts at 1297MHz on June 2, 3, 8, 15, 20 and 21. Cloud and rain, plus a large thunder cloud prevented Henry's optical and radio observations at 1297MHz on June 3 and 6 respectively. **Dave Coggins (Knutsford)** recorded individual bursts of solar noise on 146MHz on May 29, on 50MHz on the 30th and June 1 and 3 and on 28MHz on May 30 and June 1, 11, 22 and 24. "It was interesting to observe the 28MHz bursts a couple of seconds later than the 50MHz outbreaks," said Dave (as per the book Dave) and **Fred Pallant G3RNM** (Storrington) heard high noise levels on 28MHz between 0700 and 1000 on June 16, at 1630 on the 18th and bursting at midday on the 22nd.

Aurora

More information about the extent of the great aurora on March 13 which manifested in the atmosphere above both of the earth's poles, known as aurora australis in the south and borealis in the north. In his solar report for the May issue of *Canopus*, the newsletter of the Transvaal Centre of the Astronomical Society of South Africa, Jim Knight says that the event was seen in Florida, USA, Howic in Natal, Free State, Southern Transvaal, Cape and S.W.A/Namibia. Apart from Florida which is between 25 and 30 degrees lat. N, the South African sightings were between 30 and 25 degrees S. "Our aurora was predominantly a purply-crimson colour with 2 tongues of yellow and was seen from Natal just before dawn," said Jim. He added a fascinating report that, "All frequencies, including the gigahertz arena were affected in one way or another. All communications including computer networks were severely disrupted. The telephone line network and the Escom power grid provided antennas that were targets of opportunity. Surges, fluctuations, etc., were piped to all sorts of things electronic, many of which seem to have an allergy to such stimuli! Certain sections of the military wondered who was jamming them, the press went mad, as did radio and TV."

O/NIGHT	VISUAL REPORT	OBS	OBSERVERS LOCATION
May 2/3	glow at 0030	1	Alness
May 4/5	homogenious arc and rayed band	1	Edinburgh
May 4/5	rays to 40 degs	1	Alness
May 4/5	active storm	1	Kilbirnie
May 4/5	auroral light to 10 deg	1	ocean weathership Cumulus
May 5/6	auroral light to 25 deg	1	ocean weathership Cumulus
May 5/6	auroral light at 0330	1	Alness

Fig.1

"The summer twilight is now affecting observers in the higher geographic latitudes and auroral reports will therefore be minimised in summer," wrote Ron Livesey, the auroral co-ordinator for the British Astronomical Association. However, Ron did get the reports listed in Fig. 1.

Both Dave Coggins and **Ern Warwick** (Plymouth) report hearing tone-A signals from the German beacon DK0WCY on 10.144MHz at 0937 and 1530 on June 10 and **Doug Smillie GM4DJS** (Wishaw) logged weak auroral signals on the 50 and 144MHz bands on May 7 and 24.

Magnetic

Ron Livesey received reports that the fluxgate magnetometer used by **Karl Lewis** (Saltash) showed storm conditions for periods on May 5, 7, 23 and 24 and very unsettled on days 20, 26 and 27. Doug Smillie's Hall effect instrument was unsettled on May 5, 25 and 31, showed large deviations on days 20, 21, 22 and 23 and detected storm pulses on the 30th and 31st. Referring to his print out of the Ap index for May, Fig. 9, Neil Clarke points to the peaks of 45 on the 7th, 31 and 56 on days 23/24 and the "quiet to unsettled" period from the 8th to the 22nd.

Sporadic-E

Mid June saw intense outbreaks of Sporadic-E which influenced radio and television signals from about 20 to 100MHz and, for about 25 minutes on the 11th, up to 200MHz. During the latter opening **Simon Hamer** (New Radnor) received pictures at the lower end of Band III from Algeria, Libya, Morocco and Tunisia. In addition he heard programmes from Gibralter (GBC and BFBS Gibralter) and Spain in Band II and the next day logged more stations in Band II from Iceland, Italy and Scandinavia and after seeing pictures in Band I (48-68MHz) from Czechoslovakia, Finland, Italy and Scandinavia he suddenly saw the caption JTV Suweileh from Jordan.

From Arbroath, **David Glenday** received east European broadcast stations between 66 and 73MHz on June 5 and 11 and I counted 18 of these on the 5th and an average of 60 on days 12, 16 and 17. At times during the larger events some TVDXers received pictures and sound on Chs. R3 (77.25/83.75MHz), R4 (85.25/91.75MHz) and R5 (93.25/99.75MHz). From 2300 to 2350 on the 10th, David heard Italian Ch. Ic sound on 87.75MHz and on 50MHz, Dave Coggins logged France and Holland on May 27, Portugal on the 28th and Yugoslavia and Algeria on June 3 and 21 respectively.

My thanks to John Allaway G3FKM, secretary of IARU Region 1, for the July issue of Region 1 News in which I see that the first 8 licences for the 50MHz band (50-52MHz) have been issued in Greece and, for the period March 1 to December 31 1989, the band (50-51MHz) can be used by 50 experimental licencees in Sweden. Among the restrictions in Sweden are, "No Amateur transmission is allowed as long as the TV-transmitters in the 50MHz band are switched on" and "No mobile, maritime mobile or areonautical mobile transmissions are allowed." Further meetings will be held with the authorities in 1989 and 1990 and it is hoped that a beacon will be operational from the north of Sweden in the future.

The 28MHz Band

"It's interesting to note that DX is still around in midsummer, last night I worked ZL4OD long path again and today I have worked a mixed bag - OH6, HB9, CE1, LU, UQ, ZP6 and 5Z4 - when the band is not at its best," wrote **Don Hodgkinson G0EZL** (Hanworth) on June 25. Dave Coggins logged signals from the Ascension Islands and Cuba on May 28 and 30 and Indonesia on June 4, Australia on the 17th and several parts of Africa on the 23rd. **John Levesley G0HJL** (Bransgore) heard stations in Africa on June 8 and 16, Asia on days 13 and 17, Australia and New Zealand on the 13th and south-America on May 28 and 30 and June 7, 16 and 17. He also reports "lots of short skip with deep and fast QSB," on signals from Europe and Scandinavia on June 7, 8, 13 and 16.

Propagation Beacons

First, as always, my thanks are due to **Chris van den Berg** (The Hague), **Mark Appleby G4XII** (Scarborough), Dave Coggins, **John Coulter** (Winchester), **Vaclav Dosoudil OK2PXJ, Franta OK1HH** and **Lada OK1AYQ** (Kvasice), Henry Hatfield, Don Hodgkinson, **Ken Lander** (Harlow), John Levesley, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), Fred Pallant, Ted Waring and Ern Warwick for their detailed 28MHz beacon logs which have enabled me to combine their efforts and produce the chart in Fig. 7.

"Reliable Zs as usual!," said Greg Lovelock and "a bit thinner once again with more Sporadic-E and less DX," wrote Don Hodgkinson. From 0710 to 0730, Mark Appleby heard "mmm 5Z4ERR mmmBCN DE RSK, BOX 45681 NAIROBI/KENYA, QTH KI88MX OF 5Z4RT mmm" around 28.242MHz and Ern Warwick heard a Spanish beacon sending "VVV EA1EVE EA1EVE LOC IN71PP PWR 1W PSE QSL" plus our old friend in Darmstadt sending "TEST DE DF0TDH QTH JN49HU PSE QSL"

In addition, Ern Warwick logged IK6BAK (24.915MHz) and PY2AMI (24.931MHz) on most days between May 26 and June 24 and on 14.100MHz he heard CT3B, OH2B, LU4AA, ZS6DN/B and 4X6TU/B almost daily and occassionally JA2IGY and 4U1UN/B and a strong signal each day from DK0WCY on 10.144MHz. At 0943 and 1758 respectively on June 2, Ern noted that IK6BAK and ZS6DN/B were subject to very sharp and sudden fading. "This is

USED AMATEUR EQUIPMENT?

I Buy, Sell & Exchange

WANTED!— Your TOP QUALITY USED EQUIPMENT! We pay best prices for all types of used amateur radio equipment. Is YOUR gear for sale? Is it in top condition? Why not give us a call? If our offer isn't up to your expectation, why not join the growing ranks of amateurs selling their gear through our **'RIGSEARCH'** service? By the time you read this, our new showroom should be open where we can display your rig until sold, or alternatively you hang on to it until we find a suitable buyer. This service costs you nothing, your gear is offered to every prospective purchaser that calls, and we achieve the price YOU require. All with least hassle for you. Why not give us a try!

DON'T FORGET – IF YOU'RE SELLING, IT'S G4TNY and RIGSEARCH!

BUYING? – If you're looking for quality used amateur equipment, it has to be G4TNY. We have a large stock of used equipment ourselves, but, if we don't have what you're looking for, our new amateur radio brokerage **RIGSEARCH** possibly will.

Phone or write with your Requirements, here or on RIGSEARCH! We can always help you buy, or sell your used equipment!

WHY NOT VISIT OUR NEW SHOWROOM? ONLY 5 MINS FROM DARTFORD TUNNEL & M25.

Much equipment now on display. Do please call before setting out on a long journey though, as I'm still a one man band! (For that personal touch!).

Phone Dave, G4TNY on (0708) 862841 or (0836) 201530. From 9.30 am to 7 pm, Tuesday to Saturday.

VISA

SAE PLEASE FOR LISTS. CALLERS BY APPOINTMENT, PLEASE.

MAIL ORDER? OVERNIGHT DELIVERY NOW AVAILABLE!

G4TNY AMATEUR RADIO
UNIT 14, THURROCK COMMERCIAL CENTRE, JULIET WAY, SOUTH OCKENDON, ESSEX RM15 4YG.

PART EXCHANGE POSSIBLE

QRP KITS AT QRP PRICES!

AN 80m CW QRP TX/RX KIT FOR £76.25!

- ★ Ready Built — £126.50
- ★ Complete in EVERY detail!
- ★ VFO, AF Filter, Sidetone etc!
- ★ Fully Detailed Manual!

Other Super Kits include:
3 BAND RECEIVER, ATU's, AUDIO FILTER etc etc . . . all 'well styled' and complete!

For full details of the DTR3 and the rest of our range, send a SAE to:

LAKE ELECTRONICS, 7 MIDDLETON CLOSE, NUTHALL, NOTTINGHAM NG16 1BX.
Or ring Alan G4DVW on (0602) 382509 (callers by appointment only).

VALVES

*High Quality **Very High Quality

Prices correct as at 15/5/1989 but may fluctuate. 15% VAT incl.

A1065	2.40	EBF89	0.80	EF91	1.60	EY81	1.10	PL62	0.70	UCC85	0.70
A2293	7.00	EC52	0.65	EF92	2.15	EY86/87	0.75	PL83	0.70	UCH42	2.50
A2900	12.75	EC91	5.20	EF95	1.40	EY88	0.85	PL84	0.90	UCH81	0.75
AR8	1.40	EC92	1.70	EF96	0.65	EZ80	0.80	PL504	1.25	UCL82	1.60
ARP3	1.45	ECC81	1.25	EF183	0.75	EZ81	0.80	PL508	2.00	UF41	1.85
ARP35	1.50	ECC82	0.95	EF184	0.75	GM4	11.05	PL509	5.25	UF80	1.60
ATP4	0.90	ECC83	1.10	EF812	0.75	GN4	6.30	PL519	5.85	UF85	1.45
B12H	1.60	ECC84	0.60	EFL200	1.85	GY501	1.50	PL802	6.60	UL84	1.50
CY31	2.40	ECC85	0.75	EH90	0.85	GZ32	2.80	PY80	0.90	UM80	1.60
DAF70	1.75	ECC88	1.25	EL32	0.85	GZ33	4.20	PY81	0.75	UM80*	2.30
DAF96	1.35	ECC189	1.20	EL34	3.25	GZ34	2.45	PY81/900	0.85	UM84	1.30
DET22	32.80	ECC804	0.65	EL34*	8.60	GZ34*	5.00	PY82	0.75	UY82	1.10
DF92	0.95	ECF80	1.25	EL82	0.70	GZ37	3.95	PY88	0.60	UY85	0.85
DF96	1.15	ECF82	1.25	EL84	1.35	KT77**	14.00	PY500A	2.10	VR105/30	2.75
DH76	1.15	ECF802	1.80	EL86	1.45	ML4	3.20	QQV03/10	5.95	VR150/30	2.75
DL92	1.70	ECH42	1.65	EL90	1.75	ML6	3.20	QQV03/10*	7.50	X66	4.95
DY86/87	0.65	ECH81	1.25	EL91	6.50	MX120/01	29.50	QQV03/20A	27.50	Z749	0.75
DY802	0.70	ECH84	0.90	EL95	1.80	N78	9.90	QQV06/40A	28.50	Z759	19.90
E92CC	1.95	ECL80	0.75	PC82	0.95	OB2	1.70	QQV06/40A*	46.00	Z800U	3.45
E180CC	9.80	ECL82	0.95	PC86	0.80	OD3/12	7.40	Z801U	3.75		
E1148	0.75	ECL85	0.95	PC88	0.80	PC97	0.80	SP61	3.20	Z803U	21.15
EA76	1.60	ECL86	1.10	PC92	0.95	QV03/12	7.40	Z900T	4.30		
EB34	1.15	EF6	2.80	PC97	0.80	TT21	47.50	Z900U	3.75		
EB91	0.60	EF22	3.90	PC900	0.80	TT22	45.00	1A3	1.90		
EBC33	2.20	EF37A	2.45	PCC84	0.80	UABC80	0.75	1L4	0.95		
EBC90	1.20	EF39	1.40	PCC85	0.80	UBF80	0.95	1R5	1.20		
EBC91	1.15	EF80	0.65	PCC88	0.80	UBF89	0.95	1S4	1.20		
EBF80	0.75	EF83	3.90	PCC189	0.80	UCC84	0.85	1S5	0.85		
		EF85	0.90	PCF80	0.80			1T4	0.75		
		EF86	1.45	PCF82	0.80						
		EF89	1.60	PCF86	0.80						
		EY51	0.90	PL81	1.30						

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. Retail, trade and export 743 0899. **POSTAGE:** £1-£3 65p; £3-£5 85p; £5-£10 £1; £10-£15 £1.20; £15-£20 £1.75; Over £20 £2.30; Over 2kg at cost. Delivery by return.

COLOMOR (ELECTRONICS) LTD 170 Goldhawk Rd, London W12 8HJ
Tel: 01-743 0899 Fax 01-749 3934. **Open Monday to Friday 9 a.m.-5.30 p.m.**

DATONG ELECTRONICS LIMITED

Clayton Wood Close
West Park
Leeds LS16 6QE
Tel: 0532 744822
Fax: 0532 742872

For products you can rely upon to give amazing results

For information on ***Active Antennas, RF Amplifiers, Converters, Audio Filters,*** *the* ***Morse Tutor*** *and* ***Speech Processors*** *send or telephone for a free catalogue and selective data sheets as required.*
All our products are designed and made in Britain.
Orders can be despatched within 48 hours subject to availability.

BARCLAYCARD VISA — *VISA AND ACCESS WELCOME* — ACCESS

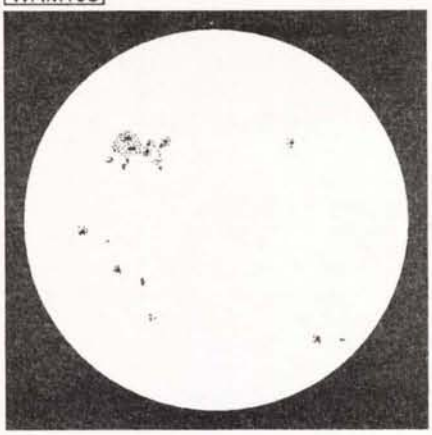


Fig.2

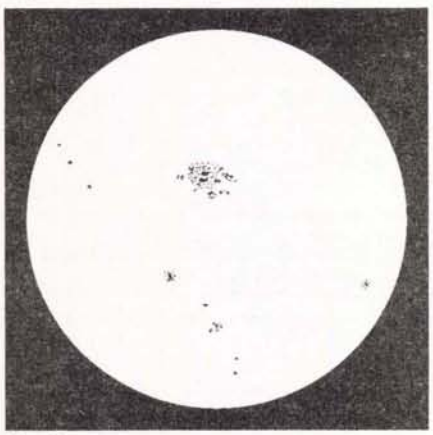


Fig.3

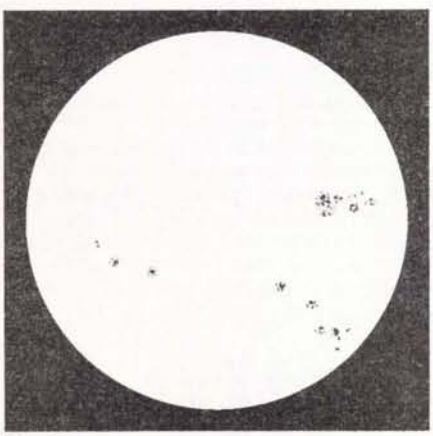


Fig.4

the first time I have heard such a phenomena," said Ern. Dave Coggins copied VK2RSY via the short path at 0600 and via the long path at 2100 on June 17 and logged signals from the 50MHz beacon in Gibraltar (ZB2VHF) on May 27 and 28 and the beacons in Angelsey (GB3SIX), Angus (GB3ANG) and Buxton (GB3BUX), almost daily during the month prior to June 24.

Tropospheric

The slightly rounded atmospheric pressure readings in Fig.6 were taken from my own barograph charts covering the period May 26 to June 25. While the predominantly high pressure, coupled with high temperatures, fluctuated a little, several tropospheric openings occurred which influenced the paths of signals from the f.m. broadcast band (87.5-108MHz) to the u.h.f. television Bands IV and V (470-860MHz). From his home in north-Wales, Simon Hamer received programmes in Band II from Denmark on May 27 and from Cornwall, Devon, Eire, the Isle of Man, Norfolk, Scotland and Ulster on the

Date	Groups	Filaments	Quiescent Prominences	Notes
31.05.89	3	21	1	1 large spray on E limb
02.06.89	3	30	7	small intense eruptive fil and medflare
04.06.89	5	27	8	tall detached eruptive prom on E limb
09.06.89	3	27	12	
10.06.89	4	28	13	
11.06.89	5	33	12	small flare at 1100
12.06.89	5	31	14	a small flare subsiding
13.06.89	5	21	5	observation hampered by high cloud
14.06.89	3	22	15	patches almost flaring
15.06.89	3	?	?	high hazy cloud, small ribbon flare
16.06.89	3	23	10	small ribbon flare, 2 small flares subsiding
18.06.89	3	23	4	3 subflares, the area looks very angry
19.06.89	3	28	6	
20.06.89	4	22	8	eruptive prom about 480,000km high
21.06.89	4	22	8	a triple spot has fairly bright round plage
23.06.89	4	21	8	
24.06.89	3	23	8	
25.06.89	3	23	8	nothing visual to cause radio bursting
26.06.89	4	20	9	some areas almost flaring
27.06.89	4	20	9	at least 3 groups have very bright patches

Fig.5

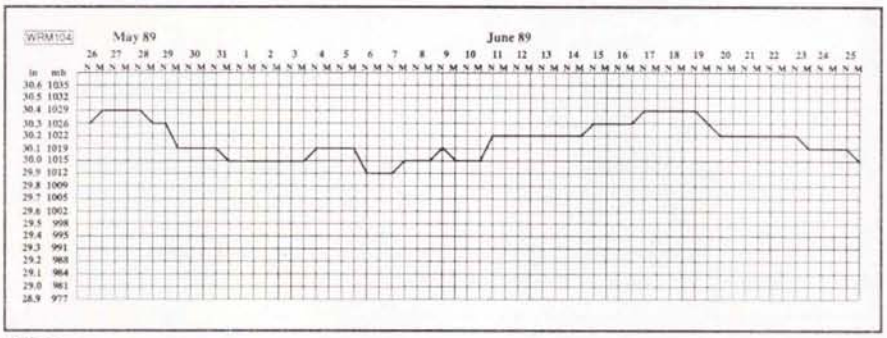


Fig.6

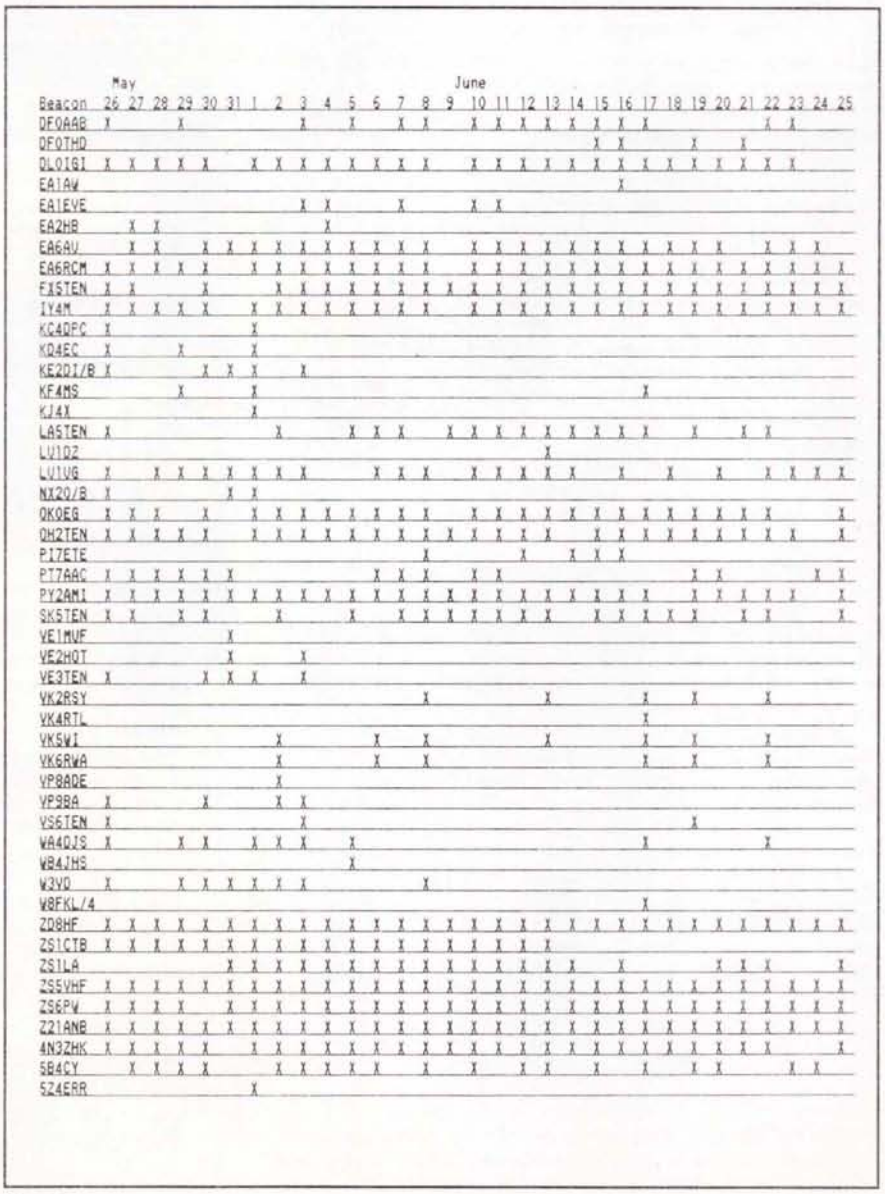


Fig.7

28th. Simon was one of a number of TV enthusiasts who received strong colour pictures in the u.h.f. band from Belgium, France, Holland, Germany and all Scandinavia between June 10 and 14. As the pressure fell during the afternoon of the 16th, I heard several French stations coming up between 96 and 100MHz while parked at Alfriston, Sussex, using my Plustron TVR5D with its own rod antenna.

In Essex, Ted Owen's barometer peaked at 1031mb (30.45in) on May 27 and was low at 1008mb (29.75in) on June 6.

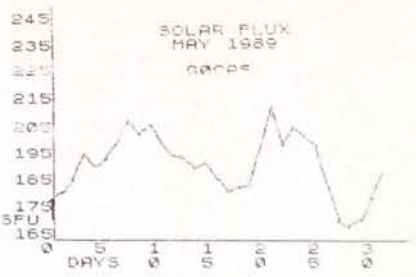


Fig.8

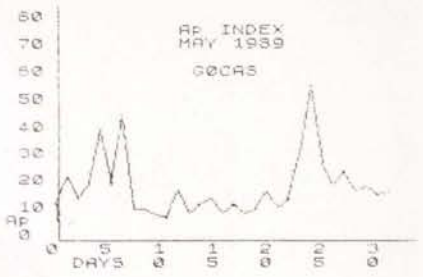


Fig.9

934MHz

"High pressure during May and June brought good to excellent tropospheric openings, enabling contacts to be made with stations at greater distances than usual," wrote **Terry Wyatt UK-845** from Walton on Thames. He worked stations in Bournemouth (128km), Felixstowe (144km), Sheffield (240km) and Southampton (100km) on May 14, Ipswich (135km) and Manningtree, Essex (120km) on June 16, Attleborough, Norfolk, (176km), Brightlingsea, Essex (112km), Canvey Island (96km), Jersey (280km), Sheringham, Norfolk (136km) and Wisbech (160km) on the 17th and heard a signal from the yacht *Sea Sprite*, 24km off the French coast sailing to the Channel Islands on May 23.

John Levesley UK-627 received signals from Bridgend at 136km on June 14 and Guernsey at 161km on May 29 and 30 and June 14, 15, 16 and 19 and worked into Guernsey on May 28 and June 17. John is also the contest manager for the UK 934MHz Club and reports that during their recent National Field Day competitors were on the air from Bedfordshire, Devon, Dorset, East Sussex, Guernsey, Hampshire, Jersey, Lancashire, Lincolnshire, North Yorkshire, Wiltshire and Worcestershire and others giving active support to the event, including counties already mentioned, came from Avon, Derbyshire, Cambridge, Cheshire, Clwyd, Cornwall, Co. Durham, Essex, Gloucester, Herts, Humberside, Isle of Wight, Leicester, London, Manchester, Merseyside, Northants, Oxon, Somerset, Surrey and "last but not least" a /MM off Herm in the Channel Isles. John wishes to thank the 143 non-club members from AC-02 to ZBG-44 who contributed so much to this competition by being on the air,

THE NEXT THREE DEADLINES ARE AUGUST 23, SEPTEMBER 27 & OCTOBER 31

Broadcast Round-up

Peter Shore

With the summer here in the northern hemisphere, it seems to have been a relatively quiet period for news from the world of international radio broadcasting - everyone seems to be off on their holidays!

However, Radio France International has been busy lately, inaugurating a new English programme to SE Asia for 30 minutes every day. In August the station will be increasing its broadcasts to Africa through the facilities at Moyabi in Gabon. French, Portuguese and English programmes are to be broadcast for an extra thirty frequency hours a day through Moyabi, and in addition, the station will be renting 7 hours from the Africa No. 1 station.

RFI is also planning the launch of RFI No. 2 for the broadcast of special programmes to Africa in English, French and Portuguese - five hours a day in French, and one each in the other two languages. No date has been established for the start of this service yet.

For listeners in Europe with satellite receiving equipment, a relay will soon be starting of RFI programmes 24 hours a day on the TDF-1 satellite.

Some s.i.d.s or sudden ionospheric disturbances have plagued listeners during recent weeks, making listening extremely difficult at times. They affect the lower frequencies first, so tuning to lower metre bands may help, but there is little more frustrating than having found a good frequency and listening to an interesting programme, only to have it fade away for several minutes, or longer. This seems to be one of the penalties for being near a sunspot maximum, for many solar storms are occurring. However, since we are near a maximum, it would be interesting to hear from readers of their experience on the higher frequency bands - 25MHz in particular. Drop a line to me at the *PW* office in Poole.

Anyone into computers and bulletin boards in particular, will be interested to learn of the new Radio Australian board, known as, surprisingly enough, Matilda. It can be reached on +01 3 894 1517.

Europe

All times UTC (=GMT).

The Radio France International transmission to South East Asia mentioned in the opening of this month's column is on the air at 1600 until 1630 on 21.78MHz. This is beamed to the Indian sub-continent.

Radio Berlin International's English service to Europe:

0500 on 5.965 & 6.115MHz
0745 on 6.115 daily, 6.04, 7.185 & 9.73MHz Sat/Sun
0945 on 6.115MHz
1100 on 6.115, 9.665 & 17.775MHz
1300 on 6.115MHz
1345 on 9.73MHz
1545 on 7.295 & 9.73MHz
1715 on 7.26, 7.295 & 9.73MHz
1945 on 6.115 & 1.359MHz
2145 on 5.965MHz

Radio Station Macedonia on Thessaloniki is transmitting to Cyprus and the Mediterranean on 11.61MHz at 1800 until 2000, in parallel with 9.425 and 11.595MHz.

The *Media Network* programme from Radio Netherlands on Thursday has been carrying a series of reports about Forces broadcasting in Europe. On August 24, the final part will look at the American Forces Network with some amazing stories of how it all started. Other topics in August include, on the 10th, a profile of Latin America in *Sounds of the Tropics* and an all-news programme on August 17.

Regular listeners will be aware that we have reported on the proposed sharing of Radio Norway's transmitters with Danmarks Radio. Recent intelligence has lead us to believe that the arrangement was due to start on July 1, but at the time of writing, I have been unable to confirm this as reception of the listed frequencies has proved all but impossible. Watch this space, though, for the latest news. Speaking of Denmark, I must make an apology for an item in the July column, when I incorrectly stated that German news has been dropped from the P1 service on 254kHz. In fact, German is heard on the P3 network which uses 1.062MHz at 0710-0715. This runs until around September 1. My thanks to **Eric Koie** in Danmarks Radio for taking the trouble to FAX this information through to *PW*.

Radio Exterior de Espana en Las Islas Canarias transmits to Latin America in Spanish daily at 2205 on 17.715MHz.

Radio Minsk in Belorussia transmits German language programmes on Wednesdays, Saturdays and Sundays at 1730 for half-an-hour on 7.33, 9.56, 9.60 and 11.78MHz. On other days of the week at this time, Belorussian is carried, in addition to the daily Belorussian broadcast at 2030-2100 on 7.3, 7.205 and 6.185MHz.

African & Middle Eastern Stations

Abu Dhabi's Voice of the UAE Arabic domestic service can be heard on short wave.

0215-0600 on 25.9, 25.67 & 21.515MHz
0600-1300 on 25.9, 21.515, 17.705 & 15.135MHz
1300-1600 on 25.9, 21.515, 17.705 & 17.645MHz
1600-2130 on 13.605, 11.965, 11.815 & 9.78MHz

English is broadcast in the External Service at 2200 until 2400 on 13.605, 11.965 and 9.595MHz.

Radio Africa, a commercial station in Equatorial Guinea with 50kW is on the air during weekdays with religious programmes on 9.582MHz. The station's address is c/o Pierce International Communications, 10201 Torre Avcenue, Suite 320, Cupertino, CA 95014, USA.

The latest schedule from Voice of Islamic Republic of Iran had landed on my desk and shows English broadcasts.

1130-1225 on 11.79, 11.715, 9.575 & 7.215MHz
1930-2030 on 9.022 & 6.030MHz

VOIRI purports to use medium wave frequencies for the Arab world, 702kHz at 1400 for the south-west USSR and 1.404MHz at 1930.

Radio Baghdad's English Service at 2000 until 2200 is now using the frequency of 13.66MHz.

Israel Radio's summer schedule for English is:

0000-0025 and 0100-0125 on 15.64, 15.615 & 11.605MHz
0400-0415 on 17.685, 17.63, 17.575, 15.64, 15.485 & 11.655MHz
1000-1030 on 21.76, 17.685, 17.59, 17.575, 15.65, 15.485 & 11.585MHz
1700-1715 on 11.655 & 11.585MHz
1900-1930 on 17.685, 17.63, 17.59, 15.64, 15.4875, 13.75 & 11.605MHz
2130-2200 on 17.685, 17.63, 15.64, 13.75 & 11.695MHz
2300-2330 on 15.64, 15.615 & 11.615MHz

Radio Jordan's English Service is:
0500-1420 on 13.655MHz
1420-2200 on 9.56MHz

Radio RSA in Johannesburg broadcasts to Europe in English:
1100-1200 on 21.59 & 11.90MHz
1400-1600 on 25.79, 21.59, 17.745 & 11.925MHz
1800-1900 on 21.59MHz

This column has kept you up-to-date with happenings in clandestine stations broadcasting to Chad. We reported last year that Radio Bardai, a station hostile to the government of Chad, had gone off the air. Now a new station has been heard on the old Radio Bardi frequency of 6.009MHz, calling itself Voice of the Chadian Popular Revolution. This is heard from around 1600 or 1630 until around 1800, or just before, and is believed to come from the old Bardai transmitters in Libya. As well as Arabic, French is carried.

Asian & Pacific Stations

Rather late, the new schedule (dated May) from Radio Australia has arrived. There appears to be few changes, but I thought that it might be interesting to run down the times and frequncies of some of the signals which do make it to Europe, in addition to the regular morning 9.655 and evening 7.205 and 6.035MHz.

2100-0730 on 15.160MHz (to Papua New Guina) (355')
2200-0730 on 21.740MHz (to New Caledonia/ Vanuatu)
2100-0800 on 15.160MHz (to New Caledonia/ Vanuatu) (053')
0500-0900 on 15.395MHz (Indonesia & Malaysia)
0900-1100 on 15.415MHz (Indonesia & Malaysia)
0100-0900 on 17.715MHz (SE Asia)

Radio Ulan Bator in Mongolia has retimed English to Europe, now broadcast at 1845 until 1915 on 11.87 and 9.985MHz.

North & South America

RAE Argentina has move frequency for English to Europe at 2200 (not Tuesdays and Thursdays) from regular 15.345 to 11.71MHz. They still use 15.345MHz at 1730, but the new 25m band channel is used to the Americas during the European night at 0200 and 0400.

Radio Canada International has transmissions to Europe Monday to Friday:
0515-0530 on 15.225, 11.775, 9.75, 7.295, 6.14 on 6.05MHz
1830-1900 on 21.675, 17.875, 15.325, 9.555 & 7.235MHz
2100-2200 on 17.875 & 15.325MHz

At weekends, there is just one transmission:
2100-2200 on 17.875 & 15.325MHz

The complete weekday schedule for the World Service of The Christian Science Monitor is:
0000 on 13.76, 9.85 & 7.405MHz
0200 on 13.76, 9.85 & 9.455MHz
0400 on 13.76, 9.87 & 9.455MHz
0600 on 11.98, 9.84 & 9.455MHz
0800 on 17.855 & 9.455MHz
1000 on 9.53, 9.495 & 9.455MHz
1200 on 11.93, 9.53 & 9.495MHz
1400 on 21.78, 17.555 & 13.76MHz
1600 on 21.64MHz (until 2000)
2000 on 21,64, 17.555 on 15.39MHz
2200 on 17.555, 15.3 & 9.465MHz

In the last two hours, European target transmissions are at 0600, 1400 and 2000. At weekends, some different languages may be heard at the times shown. The World Service is only heard on weekdays with the *Herald of Christian Science* broadcast at weekends.

THE NEXT THREE DEADLINES ARE AUGUST 23, SEPTEMBER 27 & OCTOBER 31

ATV

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

I have been very impressed by the many articles on 10GHz TV in recent issues of *CQ-TV* - clearly we have some valuable expertise in the club. Tom W6ORG says 16 - 24km is commonplace on line-of-sight paths in the USA, using 25mW and 0.6m dishes. I'm impressed, though I suppose the paths really do have to be optical. Would someone with more experience like to comment? Local clutter (treetops, TV antennas, etc.) are probably a killer, but it would be nice to work stations from home.

Given the way 24cm ATV has moved from the status of virtually exotic to commonplace in the last 5 years or so, I'll make a gratutitous prediction and suggest that X-band ATV will do the same. There should be plenty of surplus kit soon (failed satellite TV receivers) and if Japanese power trasnmitting semiconductors for these frequencies become affordable, who knows how 10GHz might take off? What do you think?

405 Alive!

If you have a soft spot for 405-line TV you may be interested to know that I have taken over running the *405 Alive* newsletter from Bill Journeaux. Issue 2 is out now and has letters and articles from some very interesting (and interested) people. So far we have nearly 50 subscribers. A large advertisement section caters for people buying, selling and swapping old TVs, components and recordings. We also have a very detailed 3-part article by an expert on BBC test card music. Subscription costs £5 a year plus four large (A4) size s.a.e.s with 26p stamps, and you can get more information by sending an s.a.e. to *405 Alive* , 71 Falcutt Way, Northampton NN2 8PH.

Desktop video

Following desktop publishing, the latest in-thing in computing seems to be desktop video (DTV). Gimmick or not, it is obviously a field of interest to many ATVers and videots. The Commodore Amiga computer is well suited to DTV and also seems to be very much the flavour of the month nowadays and since it is a relative latecomer, it is only now that suppliers are providing the add-ons that we amateurs expect. The computer is also used for professional video production purposes, for instance on *Network 7* and *The Chart Show,* also Central TV's satellite weather forecasts. I suppose it stands a good chance of becoming the *de facto* standard in amateur circles as well, notwithstanding the excellence of the Philips NMS 8280 used by some BATC members.

I don't have an Amiga, nor do I have any intention of buying one, but I thought I had better "do the business" since nobody else seems to have done a survey of the video software and hardware available. So here goes ... and note that the descriptions are based on manufacturers' claims and are not necessarily endorsed by me. I suggest you get their literature to assure yourself of the suitability of this gear. Some is clearly aimed at the professional end of the market. Remember that prices can vary according to supplier, so you may be able to beat those shown.

ZVP VideoStudio (£79.95 from Probe Marketing, Probe House, Burnham on Crouch CM0 8HR.). See separate review next month. An attractive, if slightly pricey program, with some rough edges to be knocked off.

TV Text (£34.95 from Database Direct, Freepost, Ellesmere Port, South Wirral L65 3EB.). Select any of nine fonts in two sizes, then re-size, rotate or stretch them. Many other effects possible.

TV Show (£34.95 from Database Direct, as above). More than 40 wipes, reveals, cuts, rolls, fades and so on. Claimed to be easy-to-use.

Photon Paint (£34.95 from Database Direct, as above). State-of-the-art drawing and colouring package.

Fantavision (£29.95 from Database Direct, as above). Two-dimensional animation package.

Deluxe Video (£69.99 from Electronic Arts, 11/49 Station Road, Langley, Slough, Bucks. Tel: (0753) 49442). Enables captions and screens to be created, animated and linked together to form a frame carousel presentation. Also suitable for titling videotapes.

Deluxe Paint II (No price given, from Triangle Television, 130 Brookwood Road, London SW18 5DD. Tel: 01-877 1029). High resolution graphics animation tool.

Deleuxe PhotoLab (No price given, from Triangle Television, as above). Print and manipulate photo quality images.

Deluxe Productions (No price given, from Triangle Television, as above). Produce broadcast TV graphics, e.g. for weather maps. Several other USA-sourced programs were featured in the special *Go Video!* February 1989 issue of *Amiga World.* These showed fabulous effects and techniques, but I suspect only in NTSC versions.

G2 VideoCenter (£595 + VAT from G2 Systems, 5 Mead Lane, Farnham, Surrey GU9 7DY. Tel: (0252) 737151.). A professional standard television production centre which simply plugs into the Amiga 500, 1000 or 2000 to give the facilities of a professional video mixer, genlocker and PAL/NTSC encoder. It features video mixing, fade to black, RGB buffered and PAL/NTSC output, and is fully S-VHS compatible. Fading is controlled by software or by the high-quality manual faders provided. Special YC inputs and outputs ensure top performance when used with S-VHS format recorders.

I have not seen this unit but the photographs look superb and this firm has a very good reputation in the broadcast and sub-broadcast video field. They also supply units and software for the BBC B and Master computers.

Video Digitising kit (£395 + VAT from Triangle Television, 130 Brookwood Road, London SW18 5DD. Tel: 01-877 1029). No further details, though the firm has impressive literature and customer base.

Colour Frame Grabber (£469 + VAT from Triangle Television, as above).

Genlock units: see the VideoStudio review.

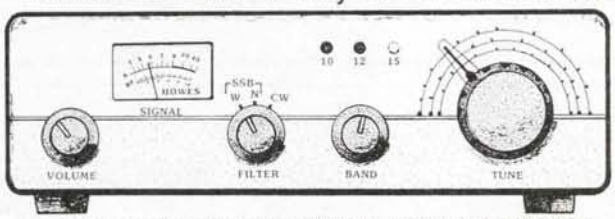
C.M. HOWES COMMUNICATIONS

BARCLAYCARD VISA

Access

Mail order to: EYDON, DAVENTRY NORTHANTS NN11 6PT
Tel: 0327 60178

NEW RECEIVER
– Catch the DX on 10, 12 & 15 Meters!



concept receiver featuring DXR10, DCS2 and CSL4 Kits

Now that the sun's activity is high, propagation on the highest frequency shortwave bands is becoming excellent, with many DX stations, and much intercontinental working.

A brand new **HOWES** receiver, the **DXR10** has been developed to give the home constructor the opportunity to get in on the action. This is a three band receiver covering 10, 12 and 15 Meters. The prototype I have been using certainly pulls in the stations in a most impressive manner!

Like our very popular **DcRx** single band receivers, the **DXR10** is designed to be easy to build and within the scope of the beginner, whilst offering an amazingly good level of performance for a simple set. Technical features include a double balanced mixer, bandpass input filtering (which requires no tuning or set up adjustment), active AF filter, and plenty of audio output to drive a loudspeaker or headphones. Suitable for holiday, portable and home station use.

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

Some other HOWES KITS:–

ASL5 Dual Bandwidth Filter – worthwhile extra filtering and selectivity for virtually any receiver. Simply connects in line with external 'speaker or headphones.
Kit: £14.90 **Assembled PCB: £22.50**

CSL4 Dual Bandwidth Filter – the same excellent filtering as the ASL5, but designed for internal fitment with our receiver kits. Really sharp selectivity for CW or SSB.
Kit: £9.90 **Assembled PCB: £15.90**

CTU30 Antenna Matching Unit – an ATU for use on all **HF bands and 6M** for receiving or transmitting at up to 30W RF. High quality performance at a sensible price.
Kit: £27.90 **Assembled PCB: £33.90**

DCS2 Relative Signal Strength Indicator – or "S meter" in common parlance! Special **HOWES** custom made meter (see picture), with a two chip driver circuit for use with all our receiver kits. Adds a touch of "class"!
Kit: £7.90 **Assembled PCB + meter: £11.90**

There are over thirty different kits in our range. We have **receivers from £14.80,** and **QRP transmitters from £13.80.** HOWES KITS interlink, so that you can start with, say, a simple receiver and if you wish, expand it into a full transceiver at a later date. Most kits are suitable for the inexperienced constructor, as well as the "old hand"!

If you would like more information on any item, or a copy of our catalogue showing our whole range of kits, simply drop us a line enclosing an SAE. Technical advice and sales are normally available by 'phone during office hours.

All **HOWES KITS** come with full, clear instructions, good quality PCB (drilled, tinned and screen printed with the parts locations), and all board mounted components. Delivery is normally within 7 days.

PLEASE ADD £1.00 P&P to your total order value.

73 from Dave G4KQH, Technical Manager.

Manufacturer of
MET ANTENNAS

FULL RANGE OF 432, 144, 50, 70MHz ANTENNAS AVAILABLE FROM YOUR LOCAL STOCKIST

For a full Glossy Brochure & Current Price List send SAE to:
ALAN KELLY COMMUNICATIONS LTD
3 STOKE ROAD, ASTON FIELDS, BROMSGROVE, WORCS B60 3EQ
Tel: 0527 71165 Fax: 0527 32042

Please mention Practical Wireless when replying to Advertisements

---

SPECIAL NOTICE TO READERS

Although the proprietors and staff of *PRACTICAL WIRELESS* take reasonable precautions to protect the interests of readers by ensuring as far as practicable that advertisements in *PRACTICAL WIRELESS* are *bona fide*, the magazine and its Publishers cannot give any undertakings in respect of claims made by advertisers, whether these advertisements are printed as part of the magazine, or are in the form of inserts.

While the Publishers will give whatever assistance they can to readers having complaints, under no circumstances will the magazine accept liability for non-receipt of goods ordered, or for late delivery, or for faults in manufacture. Legal remedies are available in respect of some of these circumstances, and readers who have complaints should address them to the advertiser or should consult a local Tradings Standards Office, or a Citizen's Advice Bureau, or their own solicitor.

SPECTRUM COMMUNICATIONS
MANUFACTURERS OF RADIO EQUIPMENT AND KITS

	PCB Kit	Box Kit	Box Built
WEATHER SATELLITE RECEIVER, good immunity to paging. Set of 5 crystals for WSRX **£25.**	£52.50	£121.55	£162.50
RECEIVE CONVERTERS, sensitive, low noise, 2 or 10m IF Types RC2-10, RC4-10, RC6-10, RC6-2, RC4-2	£17.25	£29.95	£41.00
TRANSMIT CONVERTERS, 500mW out, FM/SSB/CW, 2 or 10m drive. Types TC2-10, TC4-10, TC6-10, TC6-2, TC4-2	£25.00	£37.00	£50.50
NEW SINGLE BOARD TRANSVERTER, 500mW out, 2 or 10m drive.			
Types TRC4-10, TRC6-10, TRC6-2	£49.00	£64.00	£99.00
Type TRC2-10 with repeater shift and crystal.	£55.00	£70.00	£105.00
Buffer (B) unit for TRC's for low drive on 10m or Interface (I) for 250mW to 5W drive on 2m, add	£8.00	£8.00	£15.00
TRANSMIT AMPLIFIERS, for TRC's, 0.5W in 25W out, Types TA2S2, TA4S2, TA6S2	£46.50	£58.50	£72.75
TRANSMIT AMPLIFIERS, for MEON etc, 0.5W in 25W out. Types TA2U2, TA4U2, TA6U2	£41.25	£45.00	£59.25
TRANSMIT AMPLIFIERS, for FT290, FT690 etc, 2.5W in 25W out. Types TA2S1, TA4S1, TA6S1	£33.00	£39.00	£49.50
RECEIVE PREAMPS, switched, 20dB gain, low noise, 100W handling. Types RP2S, RP4S, RP6S, RP10S	£14.75	£25.00	£35.50

MULTIMODE CB CONVERSION KITS, for all popular types, phone for price and details.

	PCB Built	Fitted
CB to 10FM CONVERSION for rigs with LC7137 or TC9119, type SC29	£18.50	£31.50
CONVERSION for rigs with MM55108, type SC29F	£15.00	£28.00
FM CONVERSIONS for HF rigs with SSB/CW/AM, type FD311X & FM2000	£64.00	£108.00
FM CONVERSIONS for HF rigs with SSB/CW only, FD311X & FM3000	£74.00	£118.00
NOISE SQUELCH, cure for FM background noise, type NS1000	£14.00	£18.50
FREQUENCY MOD-DEMOD, quality FM add-on for AM CB's, type FM455	£12.25	£21.25

Fitted prices include carriage on the rig

MANY OTHER KITS FOR AMATEUR AND CB, SEND SAE FOR LIST PLEASE.

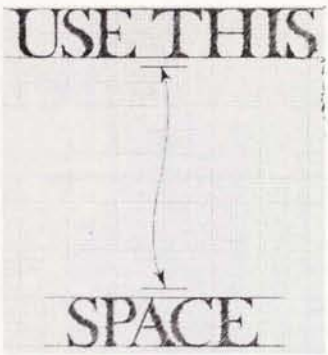
VAT & P&P INC PRICES
Delivery within 14 days if available
24 hr answering.

SHOP TIMES: 9am-1pm & 2pm-5pm TUES-FRI
9am-1pm & 2pm-4pm SAT
CLOSED SUNDAY & MONDAY

Access

UNIT B6, MARABOUT INDUSTRIAL ESTATE,
DORCHESTER, DORSET. TEL: 0305 62250

VISA



SMALL ADS

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5 cms). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 676033.

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

Receivers and Components

QUARTZ CRYSTALS and FILTERS

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications.
Stock crystals **£5.50** each (inc. VAT and UK post). Any frequency or type made-to-order from **£6.50.**
Phone or SAE for lists.

GOLLEDGE ELECTRONICS
Merriott, Somerset, TA16 5NS.
Tel: (0460) 73718.

NEW REALISTIC SCANNERS PR2005 25mHz – 520mHz and 760mHz – 1300mHz 400 channels. Full features £329.95. Free Scanner book and free P&P. LINK ELECTRONICS, 228 Lincoln Road, Peterborough PE1 2NE. Tel. 0733 45731. Access or Visa cards accepted.

B.F.O. KITS, resolves single-side band on almost any radio, £11.95. Also Steepletone FM/AIR/MW £9.95. CORRIGAN RADIOWATCH, 7 York Street, Ayr KA8 8AR.

Kits

KANGA PRODUCTS

Kits for the Amateur, Budding Amateur and the Listener

Sudden DC Receiver	£17.95
Power Supply Kits	£14.95
A.F. Amplifier Kit	£12.95
Morse Practice Oscillator	£12.95
Iambic Keyer Kit	£16.95
100 Watt Dummy Load	£10.45
Crystal Marker Kit	£13.95
Frequency Counter/Dial	£21.95
'Oner' HF Transceiver	£27.50
Top Band Kit for the FT707 & FT77	£29.95
Dual Band Receiver (20m & 80m)	£36.95

(some kits are supplied semi-complete) Please add £1.00 P&P

SEND A LARGE SASE FOR FREE CATALOGUE
3, LIMES ROAD, FOLKESTONE CT19 4AU
Tel: 0303 276171

KITS. Microtransmitter, VHF/FM. Can be built to cover 70/144MHz, 1 ¼" × ½", free microphone, £4.50. Bleeper transmitter, VHF, £8.49. Telephone transmitters stocked. SAE list, remittance to A.C.E.P.W., 99 Greenheath, Hednesford, Staffs. Access order 05438 71902 (24hr).

Wanted

SURPLUS ELECTRONIC COMPONENTS. Test gear, computers, amateur. Bought for cash. 0425 274274.

Service Sheets

ACCESS **MASTERCARD EUROCARD**

TECHNICAL INFO SERVICES (PW)

76 Church St., Larkhall, Lanarkshire ML9 1HE
Callers during business hours to 2 John Street, Larkhall ML9 2ET
Phone 0698 884585 Mon-Fri 9-5, 0698 883334 any other time FOR FAST QUOTES
IMMEDIATE DESPATCH OF ALL Phone Orders by ACCESS, etc. or to Listed Customers
WORLD'S LARGEST COLLECTION OF SERVICE MANUALS . . . from £3.50 to £50 . . . Most unobtainable elsewhere
Every issued FULL SIZE SERVICE SHEET in stock: CTV's or Combinations £3.50/Singles £2.50; Plus LSAE
LSAE for any Quotation, plus FREE large Catalogue, STREE Review, Pricelists, etc.
For £3 . . . Comprehensive Service Manuals & Sheets Catalogues PLUS 1988 Chassis Guide & £4 Vouchers
Spectrum Repair & Service Guide **£5.00** Kings CTV Servicing **£14.95** Video Recorders Service Guide 3rd Ed **£20.00**

TECHNICAL MANUALS, AR88, CR100, R210, HR0, £4 each. Circuits only 150 pence, plus LSAE, lists thousands. BENTLEY, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Phone 01-554 6631.

WORKSHOP SERVICE MANUALS

Video Recorders – **£12.50**
Most Colour TV, Audio, Test, Vintage,
Amateur etc. – **£6.00**
Please state Make/Model/Type with order.
FREE Catalogue Unique Repair and Data Guides with all orders or LSAE for your copy.
MAURITRON ELECTRONICS LTD (PW),
8 Cherry Tree Road, Chinnor, Oxon, OX9 4QY.
Telephone: (0844) 51694.

Veteran and Vintage

FOR VALVES, Service Data, Amplifiers and Radios, try the Vintage Wireless Co., first. Send for free information package. 1989 Catalogue available April £4.00. Cossham Street, Mangotsfield, Bristol BS17 3EN. Tel. 0272 565472.

Computer Software/Hardware Cont.

COMMODORE COMPUTERS (+4, C16, 64, 128). "MICROCOM" cw/rtty tx/rx with superb morse tutor. "TURBO LOG" ultimate high speed station log. "MICROCOM INTERFACE" ready built. S.A.E. to: Moray Micro Computing, Enzie Slackhead, Buckie, Moray, AB5 2BR. Tel. 0542 7384.

SPECTRUM FBAX25 Packet Radio System now available in software £49. As featured in PW Nov. 88 issue. Interface/modem with printer port supplied extra or full details to make free with software. Z21FB, Box 1215 Harare, Zimbabwe.

Computer Software/Hardware

NOW YOU CAN
SEND FAX
USING YOUR
SPECTRUM

JOIN THE GROWING GROUP OF FAX USERS. SEND AND RECEIVE FAX, USING YOUR SPECTRUM.
ALL THE BENEFITS OF OUR VERY POPULAR RECEIVE ONLY PROGRAM, AND THE ABILITY TO TRANSMIT AS WELL!!
INTERFACE INCLUDES AUTO PTT, TONE GENERATOR AND DRUM SPEED GENERATOR!
SEND PREPARED DISPLAYS (SCREENS) OR JUST TYPE IN YOUR MESSAGE AND SEND IT.
COMPATIBLE WITH EXISTING FAX MACHINES.

PROGRAM ONLY £15
SUPPLIED ON TAPE. ADD £3 +3 DISC.
INTERFACE £48
A "TRADE IN" ALLOWANCE OF £18 IS OFFERED AGAINST YOUR RECEIVE ONLY SYSTEM.
SEND LARGE SAE FOR FULL DETAILS & PRODUCT LIST.

J.B.P. ELECTRONICS LTD.
Unit 45, Meadowmill Est, Dixon Street, Kidderminster DY10 1HH. Tel: (0562) 753893

COMPUTER REPAIRS & SALES. Fixed price repairs from £16 inclusive of p&p, VAT, and 3 month guarantee. We repair and sell Amstrad, Acorn, Atari, Commodore, Sinclair – Phone NOW for details. Advance Electronics (NE) Ltd, The Old Ropery, Deptford Terrace, Sunderland SR4 6DD, telephone (091) 5108040.

COMMODORE 64 converts from MHz to metres, calculates aerial length, testcard and colour bars, menu driven. Cassette £5. R. Measey, 8 College Crescent, Oakley, Nr Aylesbury, Bucks.

Antennas

TRAPS FOR D.I.Y. Tribander Beams & Anti-T.V.I. Trap-Dipoles. Aerial D.I.Y. Bits, Baluns, Data: 28p SAE. Aerial guide £1. G2DYM, Uplowman, Devon, EX16 7PH (03986) 215.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for ..... insertions. I enclose Cheque/P.O. for £ ..... CAT. heading .....
(Cheques and Postal Orders should be made payable to Practical Wireless)

NAME .....

ADDRESS .....

.....

PRACTICAL WIRELESS
Classified Advertisement Department,
Enefco House, The Quay, Poole,
Dorset BH15 1PP. Telephone (0202) 676033
Rate **42p** per word, minimum 12 words.
Box No. **60p** extra.
PLEASE ADD 15% VAT TO TOTAL

Company registered in England. Registered No. 1980539. Registered Office: Towngate House, 2 Parkstone Road, Poole, Dorset, BH15 2PJ. 9/89

For Sale

70MHz FULL SPEC CRYSTALS. Pye Westminster 70.26 AM/FM; 70.450, 70.425 and 70.475MHz FM. Ex stock at £10.50 per pair. C.A.R.E. (North West) Ltd., 12 Leeside Close, Liverpool L32 9QT. Tel. 051-426-2546.

RCS VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY
1 to 24 volts up to ½ amp. 1 to 20 volts up to 1 amp. 1 to 16 volts up to 1½ amps. D.C. Fully stabilised. Twin panel meters for instant voltage and current readings. Overload protection.
Fully variable. Operates from 240V A.C. Compact Unit: size 9×5½×3ins.

£39 Incl. VAT + Post £2
RADIO COMPONENT SPECIALISTS
ACCESS 337 WHITEHORSE ROAD, CROYDON SURREY, U.K. Tel: 01-684 1665 VISA
List, Large S.A.E. Delivery 7 days Callers Welcome Closed Wednesday

QSL CARDS. Individual and personal designs. In 1/2/3 colours. A new service from K Cards. Send SAE for details to 289 Church Street, Blackpool FY5 3HJ.

DRAKE TR7 AND PSU. Updated, all filters, all bands, £725. 0432 267876.

GW3C01 CARTOONS personalised for QSLs, greetings, Shack from £7. GW3CO1 Penrhynbach, Abersoch, Gwynedd. Tel: 2675.

USED SCOPES Sig. Gens., Power Meters, P.S.U's DVM's etc. COOKE INTERNATIONAL 0243 545111.

LOWE HF-125 RECEIVER cost £375. First sensible offer taken. Telephone Sheffield 302915 (day).

T-SHIRTS/SWEATSHIRTS printed with your call sign. £5 and £8.50. 0462 674726.

Please mention Practical Wireless when replying to Advertisements

Miscellaneous

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys (new material only) from stock. Special sizes to order. Call: EARTH STATION 01-228 7876. 22 Howie Street, London SW11 4AR.

G2VF LOOP ANTENNAS COMPLETE WITH ATU FOR H.F. HAM BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) **AND SWL's, AND LONG AND MEDIUM WAVE BANDS FOR BCL's.** Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly data. **HIGH FREQUENCY LOOP** 80 to 10 Metres **£5. LONG AND MEDIUM WAVE LOOP** for BCLs **£3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCL AND SWL £8. SHORT WAVE ATU FOR LOOP OR LONG WIRE ANTENNA £4. SHORT WAVE ATU BUILT IN PRE AMP FOR LOOP OR LONG WIRE £7.** Pre-amp LW, MW and SWave **£2. MW LOOP** with pre amp ATU **£3. PRE AMP FOR G2VF HF** Loop or ATU **£4.** SAE for details. All projects DIY. Photo Copy HRO Manual £4.
F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF Tel. (0703) 775064

HEATHKIT U.K. Spares and Service Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

Call Marcia on 0202 676033 for your Classified Advertising enquiries

INDEX TO ADVERTISERS

Published on the second Thursday of each month by PW Publishing Limited, Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Blackmore Press, Shaftesbury, Dorset. Distributed by Seymour, Windsor House, 1270 London Road, Norbury, London SW16 4DH, telephone 01-679 1899, FAX 01-679 8907, Telex 8812945. Sole Agents for Australia and New Zealand – Gordon and Gotch (Asia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions INLAND £15.50, EUROPE £18, OVERSEAS (by ASP) £19, 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, resold, 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, resold, 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.

YOUR LOCAL DEALERS

SOUTH WALES

ELECTRO MART

Equipment, Components, Howes Kits, Eldy Kits, AR Gear and much more.

TAILLWYD ROAD
(off Main Road)
Neath Abbey, Neath
Tel: 0639 644111

IRELAND

Radcom Electronics

Icom, Yaesu and most Amateur Radio Accessories ex stock.

NEW PREMISES:-
Unit 4, Albert Quay, Cork City.
Tel: 021-632725 and 088 553947
(Mon-Fri 9-5 and Sat 9-3.45)

LONDON

Henry's

27MHz/934MHz Rigs & accessories in stock.
Lists – S.A.E. (A4) – 26p
Full catalogue (TG/P) – large S.A.E. £1.00

404 Edgware Road, London W2 1ED
Tel: 01-724 0323
(Open 6 days a week)

ESSEX

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment

203 High Street, Canvey Island, Essex
Tel: 0268 691481
(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

HERNE BAY

ICOM

ICOM (UK) LIMITED

The Official Icom Importer

Unit 8, Sea Street
Herne Bay, Kent CT6 8LD
Tel: 0227 369464
Fax: 0227 360 155
Open Mon-Sat 9-5.30,
(Lunch 1-2.00 pm)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh Hants SO5 3BY.
Tel: 0703 255111

PORTSMOUTH

Nevada Communications

Importers of the Nevada range of 934MHz equipment

189, London Road, North End, Portsmouth, Hants, PO2 9AE
Tel: 0705 662145

DEVON

Reg. Ward & Co. Ltd.

The South-West's largest amateur radio stockist. Approved dealer for Kenwood, Yaesu and Icom

1 Western Parade, West Street, Axminster, Devon, EX13 5NY
Tel: 0297 34918
(Closed 1:00-2:00 and all day Monday)

BUCKINGHAMSHIRE

Photo-Acoustics Ltd.

Approved Kenwood, Yaesu and Icom dealer (part exchange always welcome)

58 High Street, Newport Pagnell, Buckinghamshire MK16 8AQ
Tel: 0908 610625
(Tues-Fri 9.30-5.30, Sat 9.30-4.30)
Closed Mondays

TO FILL THIS SPACE CALL: 0202 676033

YORKSHIRE

YAESU ICOM

Alan Hooker Electronics

42, Nethernall Road, Doncaster.

Tel: 0302 25690
Open Mon-Sat 10-5pm
Closed Thursdays

MERSEYSIDE

MGR COMMUNICATIONS

ICOM — YAESU — Navico — Aerials — M.M. & Kits — Scanners — PMR — MARINE & BAND III

Part-ex welcome

48 Shrewsbury Rd., Oxton, Birkenhead L43 2HZ
051 653 3437

Unit 5, Miton St., Waterloo Ind. Est., Widnes, Cheshire
051 420 2559

SOUTH WALES MAIL ORDER RETAIL

A.C.S. SYSTEMS

PACKET RADIO: ST-PC-AMIGA COMPUTERS
AMATEUR SOFTWARE FOR MOST COMPUTERS
SATELLITE TELEVISION SYSTEMS

ICS DEALER FOR DATA COMMUNICATIONS

19, GILHAUL TERRACE, MOUNTAIN ASH, MID GLAMORGAN SOUTH WALES, CF45 3ND TEL 0443 476040 SAE CALLERS BY APPOINTMENT 9am-9pm Mon-Sat LIST

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

WEST SUSSEX MAIL ORDER RETAIL

BREDHURST ELECTRONICS LTD.

High St., Handcross, West Sussex
Tel: (0444) 400786

Situated at the Southern end of M23. Easy access to M25 and South London.
Open Mon-Fri 9am-5pm
except Wed 9am-12.30pm
Sat 10am-4pm.

YAESU ICOM

SALE – SALE – SALE – SALE – SALE

BUILDING CLEARANCE SALE STARTING AUGUST 28th, BANK HOLIDAY MONDAY UNTIL SEPTEMBER 8th

HUGE REDUCTIONS ON EVERYTHING!

FROM MICROPHONES AT £1 TO TRANSCEIVERS AT £000's, ENCOMPASSING: RECEIVERS, SCANNERS, TRANSMITTERS, ACCESSORIES, COMPUTERS, PRINTERS, SOFTWARE, ANTENNAS EQUIPMENT BY NAVICO, AMSTRAD, BENCHER, COLLINS DRAKE, CAMBRIDGE, ICOM, KENWOOD, YAESU, HY-GAIN, JAYBEAM AND DOZENS OF OTHERS.

CLEARANCE ON EVERYTHING: NEW AND USED GEAR: CURRENT AND OBSOLETE MODELS — ANCIENT AND MODERN

COME AND GET A BARGAIN!

Access

RADIO SHACK LTD

188 BROADHURST GARDENS, LONDON NW6 3AY

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 *Fax: 01-328 5066* Telephone: 01-624 7174

VISA

ICOM

Count on us!

IC-765 HF ALL BAND TRANSCEIVER

We enjoy listening. It's part of what we do well. So when ICOM heard you talking, our engineers designed a transceiver specially for you – the serious DX enthusiast with worldwide contacts in mind. The result is the new super advanced IC-765, an HF all band transceiver built to expand your HF world.

The IC-765 is equipped with ICOM's exclusive DDS (Direct Digital Synthesizer) System, a fully automatic antenna tuner, an electronic keyer with iambic operation and a full break in function.

Fully Automatic High Speed Antenna Tuner

A built in CPU automatically memorises the pre-set position of each band without pre-set controls. tuner speed is ultra fast since tuning starts from a preset position. If the tuner cannot tune from the previous preset position, the re-try function changes the preset position and memorises the best position.

10Hz Digit Display

The large fluorescent display shows 7 digits for the operating frequency, the 10Hz digit is displayed.

Band Stacking Register

Each band memorises the last used frequency, mode and IF filter condition (narrow or wide).

Complete System for CW Operators

The IC-765 has many advanced functions for CW operators such as CW pitch control, a built-in electric keyer, a keying speed control and high speed full break-in capability.

New PLL Circuit

The advanced ICOM DDS System ensured high speed PLL lock-up times, clear signal emissions, and high C/N characteristics. A high speed PLL provides very fast CW full break-in performances.

Convenient Miscellaneaous Functions

- 105dB dynamic range
- 10dB preamp and 10, 20 30 dB attenuator
- 99 memory channels
- Split memory on channels 90-99
- Built-in FL32A and FL52A CW narrow filters
- Programmed scan and memory scan
- IF, shift and Notch filter
- Fast/Slow/OFF Selectable AGC
- RF type speech compressor
- Noise blanker
- DATA switch for advanced data communications

Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders. thank you.
Datapost: Despatch on same day whenever possible.
Visa & Mastercards: Telephone orders taken by our mail order dept. instant credit & interest-free H.P.

VISA MasterCard

AMAZING LOW PRICE
SOLDERING IRONS

FLAME MASTER
HOT GAS SOLDERING TOOL

Superb Pocket Size Portable Gas Soldering Iron

ONLY £12.95 FSI50

★ Interchangeable Tips ★

- ★ Powered by Butane Gas
- ★ Simple to Refill
- ★ Temperature up to 400°C (750°F)
- ★ Up to 2 Hours Continuous Use

FLAME MASTER
5 IN 1 HOT GAS TOOL KIT

Complete with tough moulded to measure case and including:

MULTI-PURPOSE TOOL

- ★ 4 Interchangeable Soldering Iron Tips
- ★ Soldering Iron
- ★ Hot Cutting Knife
- ★ Wide Area Flame Torch
- ★ High Temperature Flame Torch
- ★ Hot Air Blower

GREAT FOR

- ★ Electrical and Electric Work
- ★ Cutting Plastics and Fibres
- ★ Sealing, Bonding and Shrinking
- ★ Removing Paint and Putty

ONLY £19.95 FMK50

The Flame Master hot gas tool kit has many uses. It can be a soldering iron, a pencil flame torch, a hot air blower or a wide (flat) flame torch.
You can fit the soldering head with a selection of soldering tips and the hot knife, or you can fit the flame head, onto which you can attach the hot blower or the wide flame unit.
The choice is yours!

Post Your Order Now . . .

Order Coupon Send this coupon to P.O. Box 3, Rayleigh, Essex SS6 8LR

Quantity	Description	Code	Price

Name .....
Address .....
..... Post Code .....

Add Carriage 50p
If order below £5 please add 50p
Total

I authorise you to debit my Credit Card account for the cost of goods despatched.

Credit Card No. | | | | | | | | | | | | | | | | |

Access Amex Visa ..... Delete as required.

If ordering by Credit Card please sign .....

Expiry date of Credit Card ..... PW

/// Maplin ELECTRONICS
CREDIT CARD HOTLINE

mapCARD MAPLIN privileged account holder 555555 M. SMITH Expiry Date Nov. 89 | Access | AMERICAN EXPRESS | VISA

0702 554161

PHONE BEFORE 5PM FOR SAME DAY DESPATCH

ALL PRICES INCLUDE VAT.

All items subject to availability, both items will be on sale in our shops in Birmingham, Bristol, Leeds, Hammersmith, Edgware, Manchester, Nottingham, Southampton and Southend-on-Sea.