JULY 1984 90p

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Practical Wireless

THE RADIO MAGAZINE

Practical LC Filter Design

Beginning a new series by Ed Wetherhold W3NQN

Your Life In Your Hands !

Always remember - electricity can be dangerous

See your prints before you pay

What better way of ensuring your pleasure than to actually see your prints before you pay—and then to be charged only for the successful pictures within the price ranges quoted. That is the deal you get from our colour print service providing the best all-round value for money available.

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Superprint size ☐
Standard size ☐

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Practical Wireless

FOR THE Radio ENTHUSIAST ...

JULY 1984 VOL. 60 NO. 7 ISSUE 928

Contents

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Staff

EDITORIAL OFFICES
Practical Wireless
Westover House
West Quay Road
Poole, Dorset BH15 1JG
✆ Poole 671191

Geoff Arnold T.Eng(CEI) G3GSR
Editor

Dick Ganderton C.Eng., MIERE, G8VFH
Assistant Editor

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Alan Martin G8ZPW
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Elaine Howard G4LFM
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ADVERTISEMENT OFFICES
Practical Wireless
King's Reach Tower
Stamford Street
London SE1 9LS
Telex: 915748 MAGDIV-G

Dennis Brough
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✆ 01-261 6636
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✆ 01-261 6807

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LOWE SHOPS

Whenever you enter a LOWE ELECTRONIC'S shop, be it Glasgow, Darlington, Cambridge, London or here at Matlock, then you can be certain that along with a courteous welcome you will receive straightforward advice. Advice given not with the intention of "making" a sale but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

In Glasgow the LOWE ELECTRONICS' shop (telephone 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit . . .

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham Road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but now the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout. After passing a children's playground on your left turn left again into High Street. Easy and free street parking is available outside the shop.

The Capital City also has a LOWE ELECTRONICS' shop managed by Andy, G4DHQ. Easy to find, the address is 278 Pentonville Road, London N1 9NR (telephone 01-837 6702) and the shop is located on the lower sales floor of Hepworths. That's only a 3 minutes walk from Kings Cross railway station. So, when you're in the Capital City, visit LOWE ELECTRONICS.

Finally, here in Matlock David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

We cannot seem to keep the TR9130 in an "in stock" situation. No sooner has a shipment arrived than we are "out of stock". I must say that even I am surprised by its popularity. Based on the renowned TR9000, the TR9130 has additional features that make it the most popular multimode on today's market. We are still getting requests for second-hand TR9000's and even they are a rarity on our second-hand shelf. Having a clear green readout, reverse repeater, the ability to tune whilst transmitting, 25 watts output, 6 memories and of course memory scan: TRIO's two metre multimode, the TR9130.


TR9130

TR9130 **£442.52 inc. VAT.** carriage £6.00

There are two schools of thought regarding two metre mobile FM equipment. One group are of the opinion that the simpler the rig the better and refer to the TRIO TR7500 as the ultimate mobile transceiver ever made. There are others who require their mobile rig to have memory channels and all associated facilities in order to gain operational flexibility. TRIO cater for both.

The TM201A and the TM401A are simple rigs, designed to fit into the smallest of today's cars and provide the simple functions that make mobile operation a pleasure. Repeater shift and lockable reverse repeater are included as well as superb receive performance. 25 watts from the 2 metre TM201A and 12.5 watts from its 70 centimetre cousin, the TM401A, ensures a strong transmitted signal. A separate 77 mm (3 inch) speakers in a solid enclosure gives high quality receive audio even whilst mobile.


TM201A

TM201A ..... **£269.00 inc VAT.** carriage £6.00
TM401A ..... **£299.00 inc VAT.** carriage £6.00

A remote controller with a green backlit LCD frequency readout is also available as an optional accessory. The FC10 simply plugs into the side of the transceiver and comes complete with mounting bracket and velcro pads to ease fixing without drilling holes in the car's dashboard.


TW4000A

FC10 .... **£41.20 inc VAT.** carriage £6.00

For a mobile transceiver having more operating features the TR7930 is the model to choose. The TR7930 is TRIO's logical progression from the very popular and reliable TR7800. The design of the TR7930 takes into account the minor and justifiable criticisms levelled against the TR7800. You will now find the frequency readout is a green backlit liquid crystal display that can be read in the brightest of sunlight. The memory allocation has been increased to a total of 21 channels and the rig can be instructed to hold on the received signal for either a timed period or until the signal disappears. Programmable band scan is also available between user defined limits. To make mobile operation safer the transceiver is pre-programmed so that if you select for example, 145.450 then the rig will adopt the simplex mode, if you select 145.650 then, automatically, you will get repeater mode. Of course TRIO have made it easy to over-ride this feature as you would naturally expect. I can say no more about the TR7930, a comprehensive rig for the mobile enthusiast.

TR7930 ..... **£312.00 inc VAT.** carriage £6.00

To improve mobile operation there is the TRIO MC55 boom microphone. Not jut an electret condenser microphone but having a transmission timer, up/down frequency shift switch, adjustable microphone gain and fitted with either a 6 or 8 pin microphone plug. To monitor the swr/output power of your mobile installation TRIO have produced the SWR100A/B. (model A: 1.8 to 150 MHz and model B: 140 to 450 MHz) Compact and easily fixed to your dashboard, be the first to know something is wrong with your mobile station.

MC55 ..... **£38.64 inc VAT.** carriage £2.00
SW100A/B ..... **£37.26 inc VAT.** carriage £2.50

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Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.
(Delivery of stock items normally by return of post)

For the real VHF/UHF enthusiast there is only one FM mobile rig that in one compact unit has both 2 metres and 70 centimetres. The TRIO TW4000A. Not a cheap piece of equipment, the TW4000A has to be seen to be appreciated. Having many features to assist mobile operation the TW4000A also speaks. Unless yc have actually operated the rig with the optional VS1 voice synth sizer fitted, then you cannot really make a considered judgem It is easy to say that such a feature is a gimmick but I, on journeys up and down the country, have found that havin frequency, memory number etc announced in clear distinct is much better than stealing a glance at the display. A review in AMATEUR RADIO magazine (December 198 more.

TW4000A ..... **£469.00 inc VAT.** carri
VS1 ..... **£24.50 inc VAT.** carr
(in fact the VS1 is not a voice synthesizer, it is th recorded voice of a Japanese girl programmed into chip, her Japanese diction can be had as an alternativ an internal switch on the VS1 board from position E

Don't let us forget the two handhelds from TR TR2500 and the 70 centimetre TR3500. Both very p equipment. Reliable and functional. Each havin memory scan, programmable scan, repeater an shift and a comprehensive range of accesso both models.

TR2500
inc
TR350
i
Tw
ce
TF
R

create the perfect recei again continuously 118 available. The nice th frequency readout of t tuned to 145.600 ther

R600 .....
R2000 ..... £4
VC10 ..... **£113.00**

It appears my enthusiasm for the TS530SP has made me forget to keep you informed of the TRIO TS830S HF transceiver. The problem is the number of superb products in the TRIO range. To tion them all each month is impossible.

20S valve transceiver (pair of 6146B valves) is by now requires no description. There must be within ur radio operation someone who uses a on is the equipment's best advertise- all amateur bands and has for its world wide contacts. The signed by TRIO and TS830S owner the IF anged. ing the at its ed using gnals are y compre- ol and RF nd rig. Take TS830S and

.638.00 inc VAT. carriage £6.00
£731.40 inc VAT. carriage £6.00
. £555.45 inc VAT. carriage £6.00
.. £752.10 inc VAT. carriage £6.00
. £1150.00 inc VAT. carriage £6.00

io station can be set up, TRIO have a microphones, headphones, separate s, for the TS430S and TS930S, the ATU's

erous to list, full details and prices can be WE ELECTRONICS shop.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

40 CB transceiver is now well known on y have bought other rigs, only to be dissatis- ve then heard about the **TX40** from their ght one and been delighted. The rig performs esigned rig should. And for those who think the CB frequencies are now populated by opera- g pleasant contacts. The band has come of age. **E TX40** has been available for some time now for of £29.50 inc VAT, carriage £3.00.
he discerning a deluxe version is available for an onal £8.50.
s rig has an extra filter fitted to enhance listening when band is busy. Take this opportunity to buy at this special ce a LOWE TX40 CB transceiver.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THE BELCOM LS202E 2 METRE SSB & FM TRANSCEIVER.

Until now, dual mode 2 metre transceivers have been designed for shack, car or shoulder operation. Mobile they may have been but convenient hand portables they were not. That situation has now changed. You will remember that I told you about the new **BELCOM LS202E** SSB/FM 2 meter transceiver in a previous edition of RADCOM; at the time I said the price would be around £1000. You will, therefore, be extremely pleased to learn that the transceiver is available for **£225.00** inc VAT. Now for a few details; (if you want a colour leaflet to appreciate the full beauty of the LS202E transceiver then ring Beryl here at Matlock, alternatively you could always visit a **LOWE** shop).

★ Full coverage of the 2 metre amateur band from 144 to 146 MHz in 5 KHz steps on both SSB (Upper and Lower) and FM, selection of frequency by means of rotary thumb wheel switches. In addition, a VXO control giving +/– 5KHz frequency shift and RIT frequency readout and S meter can be illuminated by an internal LED.

★ The use of hybrid IC's and a miniature SSB crystal filter has made the LS202E even smaller than some of the existing FM only handheld portables. The rig measures 62mm wide, 40mm deep and 165mm high, small enough for your jacket pocket and weighs only 520 grammes.

★ RF power output SSB (PEP), FM:
3.5 watts (at 10.8 volts)
2.5 watts (at 7.2 volts)
1.5 watts (at 6 volts)
★ The LS202E is equipped for repeater operation having both frequency shift and 1750 Hz tone burst.
★ A comprehensive range of accessories is available...

NP6	Rechargeable battery pack (7.2 volts)
NP9	Rechargeable battery pack (10.8 volts)
CA910E	AC charger (for NP6)
CA110E	AC charger (for NP9)
CS912	Mobile charger (for NP6)
CS112	Mobile charger (for NP9)
SH1	Speaker/microphone
SFT207	Mobile console
LA207	Soft case
AN2	1 wave BNC rod aerial
LU2	25 Watt linear amplifier (for LA207 unit)

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.
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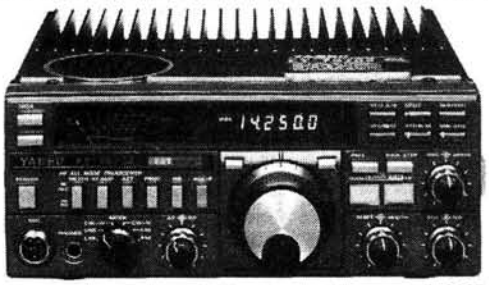
FT980	Transceiver with general coverage Rx	£1265.00 inc.
SP980	External L/S with audio filter	£58.65 inc.
SP980P	External L/S with phone patch	£74.85 inc.
FIF80	Computer interface for NEC PC8001	£99.65 inc.
FIF65	Computer interface for Apple II	£51.35 inc.
FIF232C	Computer interface R5232	£54.80 inc.

FT77

FT77	8 Band Rx/Tx 100W output	£459.00 inc.
FT77S	8 Band Rx/Tx 10W output	£425.00 inc.
FP700	Matching AC PSU	£135.00 inc.
FC700	Matching antenna tuner	£98.90 inc.
FV7000DM	Digital VFO unit	£200.00 inc.
MKT77	Marker unit	£10.35 inc.
FMUT77	FM Unit	£27.20 inc.

FT757GX THE 'NO OPTIONS' RADIO



FT757GX	All Modes and Filters Fitted	£685.00 inc.
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FP757HD	Heavy Duty PSU 100% Duty	£162.50 inc.
FC757AT	Automatic Antenna Tuner	£231.50 inc.

THE BUY OF THE YEAR
FT707 8 BAND HF TRANSCEIVER

~~£499.00~~
now only
£425 inc

FP707	Matching AC PSU	£125.00 inc.
FV707DM	Digital VFO	£149.00 inc.

FT102 ALL MODE TRANSCEIVER

FT102	Transceiver 9 band	£685.00 inc.
SP102	External speaker	£52.50 inc.
FC102	Antenna coupler	£179.00 inc.
AMFMUT102	AM/FM unit option	£46.75 inc.
FAS14R	4 way Remote Antenna Selector	£41.75 inc.

FT ONE 'THE ULTIMATE'

FT ONE	Transceiver HF All Mode	£1495.00 inc.
KEYT901	Curtis Keyer	£28.75 inc.
DCT1	DC Power Cable	£10.35 inc.
RAMT1	Non volatile memory	£13.80 inc.
FMUT1	FM unit	£42.85 inc.

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What price

HF Equipment

IC-751	All band AM FM SSB CW + Gen Cov Rx 32 Memories	1049 00
PS35	Internal switched mode power supply	149 00
SM6	Desk microphone	34 50
HM12	Hand microphone with up down scanning	16 50
EX310	Voice synthesizer module	39 00
RC10	Frequency controller unit	29 95
CR64	High stability xtal unit	49 95
FL32	9MHz CW RTTY filter - 500Hz	39 00
FL63	9MHz CW RTTY narrow filter - 250Hz	39 00
FL33	9MHz AM filter - 6KHz	32 50
FL70	9MHz SSB wide filter - 2 8KHz	35 50
FL52a	455KHz CW RTTY filter - 500Hz	79 00
FL53a	455KHz CW RTTY narrow filter - 250Hz	79 00
IC-745	All band SSB CW AM(Rx only), Gen Cov Rx 16 mems	839 00
PS35	Internal switched mode power supply	149 00
SM6	Desk microphone	34 50
HM12	Hand microphone with up/down scanning	16 50
EX310	Voice synthesizer unit	39 00
EX242	FM unit Tx & Rx	32 50
EX241	Marker unit	15 95
EX243	Curtis keyer unit	39 00
FL45	9MHz CW filter - 500Hz	45 00
FL44a	455KHz SSB narrow filter - 2 4KHz	79 00
FL52a	455KHz CW RTTY filter - 500Hz	79 00
FL53a	455KHz CW RTTY narrow filter - 250Hz	79 00
FL54	9MHz CW RTTY narrow filter - 270Hz	39 00
IC-740	No longer available Accs still in stock	
PS740	Internal switched mode power supply	149 00
SM5	Desk microphone	34 50
EX241	Marker unit	15 95
EX242	FM unit	32 50
EX243	Curtis keyer	39 00
FL44	455KHz SSB filter - 2 4KHz	79 00
FL45	9MHz filter - 500Hz	45 00
FL52	455KHz CW RTTY filter - 500Hz	79 00
FL53	455KHz CW RTTY narrow filter - 250Hz	79 00
FL54	9MHz CW RTTY narrow filter - 270Hz	39 00
IC-730	10-80 Mtrs compact transceiver	659 00
PS15	External power supply - 20amps	119 00
PS20	External power supply with speaker - 20 amps	176 00
SM5	Desk microphone	34 50
HM7	Hand microphone with pre amp	14 95
EX202	LDA unit for use with AT100/500	13 50
EX203	CW audio filter	14 50
EX205	Transvertor unit	14 00
EX195	Marker unit	17 00
FL44	455KHz SSB filter - 2 4KHz	79 00
FL45	9MHz CW filter - 500Hz	45 00
FM04	FM unit Tx & Rx	49 00
IC-720A	No longer available, Accs still available	
PS15	External power supply - 20 amps	119 00
PS20	External power supply with speaker 20 amp	176 00
CF1	Cooling fan for PS20	24 00
SM5	Desk microphone	34 50
FL32	CW narrow filter	39 00
FL34	AM xtal filter	34 00
BC10	Memory back up unit	5 95
FM03	FM unit Tx & Rx	89 00
IC-R70	General Coverage Receiver 0 1-30MHz	549 00
EX257	FM unit	32 50
FL63	CW narrow filter	39 00
FL44a	455KHz SSB filter	79 00
CK70	DC cable kit	5 75
7072	Interface unit to transceive with IC720A	97 50
IC-R71	All mode Gen Cov Rx, k pad entry, 32 memories	649 00
RC11	Remote control unit for above	49 00
IC-2KL	1KW PEP Linear, auto band switching, complete with -	
2KLPS	Power supply to run 2KL linear	1303 33
IC-AT100	100Watt Automatic antenna tuner	269 00
IC-AT500	500Watt Automatic antenna tuner	369 00
IC-PS30	Systems power supply, 25 amps continuous	229 00
IC-AH1	Mobile antenna, 3 5MHz-30MHz	199 00

VHF Equipment

IC-271E	Multimode base station, 25w, 32 memories	629 00
IC-271H/E	High power version of above, 100w	789 00
PS25	Internal switched mode power supply	89 00
EX310	Speech synthesizer unit	39 00
AG20	Internal receive pre-amp	49 00
SM6	Desk microphone	34 50
IC-290D	25W Multimode mobile, 5 memories, scanning mic	469 00
IC-27E	25W FM mobile, 9 memories, multi function display	319 00
UT16	Voice synthesizer unit	25 00
IC-25H	45W FM mobile, high power version of old IC25E	359 00
BU1	Memory back up unit for mobiles	24 50
	DC leads (flat pin or square 6 pin)	4 50
	DC Plugs (flat 4 pin)	30
	DC Sockets (flat 4 pin)	30
IC-2E	Synthesized hand portable, 1 5 watts	169 00
IC-02E	Synthesized hand held, keypad entry, LCD display	229 00
ML1	10 watt booster unit for 2E	69 00
BP3	Standard battery pack	25 00
BP2	Low volts high capacity (long life)	38 00
VP4	Empty battery pack, takes 6 x AA size cells	7 95
BP5	High volts high capacity (high power)	48 00
BP7	High volts high capacity (for use with O2E ONLY	59 00
BP8	Low volts high capacity	49 00
DC1	12v regulator pack (2E ONLY)	12 50
CP1	12v charger lead for cigar lighter	4 95
FA2	Helical antenna	7 50
LC1	Leatherette case (BP5)	5 00
LC2	Leatherette case (BP4)	5 00
LC3	Leatherette case (BP3)	5 00
LC11	Case for O2E (BP3)	5 00
TL1	Heavy duty leather case (all batt packs)	21 27
BC25E	240v wall charger for 2E	6 69
BC25U	110v wall charger for 2E (USA)	6 69
BC16E	240v wall charger for O2E (BP8/BP7)	9 95
BC30	Desk top drop in charger (fast and slow) old packs	56 35
BC35E	Desk charger all packs new & old (fast/slow)	56 35
HM9	Speaker microphone	16 50
IC-202S	SSB Portable, + CW, 3 watt output	199 00
BC15E	AC Charger 240v	41 80
BC20	DC Charger 13 8v	41 80
	DC lead	1 75
	Telescopic antenna	1 50
LC25	Leatherette carrying case	8 25
FA1	Helical screw in antenna	7 50

UHF Equipment

IC-471E	Multimode base station 25watts, 32 memories	699 00
IC-471H	High power version of above, 75watts	879 00
PS25	Internal switched mode power supply	89 00
EX310	Voice synthesizer unit	39 00
SM6	Desk microphone	34 50
IC-490E	Multimode mobile, 10 watts, 5 memories	495 00
IC-45E	FM mobile, 10 watts, 5 memories	329 00
BU1	Memory back up unit for mobiles	24 50
	Spare DC leads (flat 4 pin or square 6 pin)	4 50
	DC plugs & sockets (flat 4 pin)	30
AG1	Mast head pre amp for 471-451/490	49 00
IC-4E	Synthesized hand portable, 1 5 watts	219 00
IC-O4E	Synthesized hand held, k pad entry, LCD	T B A
FA3	Flexi 1/4 wave antenna	7 50
	Accessories same as IC2E/O2E	
IC-402	SSB portable + CW, 3 watts output	257 00
BC15E	AC charger 240v	41 80
BC20	DC charger 13 8v	41 80
	DC lead	1 75
LC25	Carrying case	8 25

1.2 GHz Equipment

IC-120	FM mobile 1 watt output 40MHz coverage mems	439 00
BT23E	Bit Zero 23e 1296MHz linear 1w in 7 8w out	179 00

50 MHz Equipment

IC-551	Multimode base station supplied SSB/CW only	379 00
EX106	FM unit	112 00
EX107	VOX unit	49 00
EX108	Pass band tune unit	97 50
IC-505	Multimode portable 3 10watt supplied SSB only	382 00
EX282	FM unit	28 50
BP10	Nicad pack	59 00
BC15	Charger unit	6 50
LC10	Carrying case	22 50

Mobile Mounting Brackets

MMB5	Mount for 251E 451E 720A 730	12 50
MMB6	Mount for 240	12 50
MMB7	Mount for 245E	12 50
MMB8	Mount for 255E 260E	12 50
MMB9	Mount for 290E 490E	12 50
MMB10	Mount for 25E 45E 120	12 50
MMB11	Mount for 22U 24G	12 50
MMB12	Mount for R70 740 271E 471E	12 50
MMB16	Mount for 2E 4E O2E O4E	6 95
MMB18	Mount for 751	T B A
SS1	Shoulder strap for handhelds	7 50

IC-27E, £319.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H × 144mm W × 177mm D. IT has all the features that you probably require included in this *microprocessor* controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:– 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5 Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price 299.00 and 39.00 for the optional speech synthesizer.

You can get what you want just by picking up the telephone. Our mail-order dept. offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Give it a visit, BCNU.

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perfection?

Microphones

HM3	4 Pin hand microphone (IC240)	12.50
HM5	4 Pin hand microphone noise cancelling	20.00
HM7	8 Pin hand microphone (IC-24G, 730, 720A)	14.95
HM9	Speaker microphone for hand helds	16.50
HM10	8 Pin microphone with up/down scanning	29.00
HM11E	8 Pin microphone with up/down scanning + tone call	22.50
HM12	Up/down scanning mic for new sets (271/471/751/745)	16.50
SM2	4 Pin base microphone	34.50
SM5	8 Pin base microphone	34.50
SM6	Base microphone for new sets (271/471/751/745)	34.50

Ext Speaker/Headphones/Headsets

SP3	Matching speaker for ICOM sets	45.00
SP4	Mobile speaker with magnetic mount	19.55
HP1	Good quality headphones	28.50
HS10	Headset and boom mic for ICOM hand helds	18.40
HS10SB	PTT switch box for HS10	18.40
HS10SA	VOX unit for HS10	20.70

ICOM Global digital clock
Attractive gold colour, gives time in cities all over the world. Pulsating red LED's, LCD readout with alarm. 195mm 59.00

TONO CW/RTTY/ASCII Terminals

9000E	Communications computer, RTTY, CW, ASCII, TX/RX	669.00
550	CW/RTTY decoder, inc CW practice, and CW transmit	299.00
5000E	Communications terminal & k board, inc AMTOR, VDU	799.00
9100E	As 9000E with amtor	699.00
CRT1200G	High quality video monitor with green display	136.00

TONO Linears

MR250W	144–146MHz, 10–15W drive, 180–200W out, RX pre-amp	325.00
MR150W	144–146MHz, 10–15W drive, 120–140W out, RX pre-amp	169.00
MR100W	144–146MHz, 10–15W drive, 80–90W out, RX pre-amp	99.00
2M50W	144–146MHz, 1–3W drive, 30–45W out, no pre-amp	59.00

NEW "G" Series

2M40G	144–146MHz, 1–3W drive, 20–35W out, RX pre-amp	79.00
2M90G	144–146MHz, 10–15W drive, 70–90W out, RX pre-amp	115.00
2M130G	144–146MHz, 10–15W drive, 110–130W out, RX pre-amp	160.00
4M60G	430MHZ, 3–15W drive, 40–60W out, RX pre-amp	159.00

TONO Pre-amps

RX144	2 metre mast head pre-amp & control box	65.00
RX430	70 cm mast head pre-amp & control box	70.00

TELEREADER Equipment

CWR685E	CW/RTTY/ASCII terminal & k board, with VDU, TX/RX	730.99
CWR675E	RX only version of 685E, with inbuilt printer/VDU	599.00
CWR670E	CW/RTTY/ASCII RX only, use with TV or VDU	349.00
	12 pin plug for 670/675/685	6.00
CWR610	CW/RTTY decoder, slow morse practice	159.00
CWR610E	As 610 with adjs baud rate from front panel (45–600)	175.00
	13 pin plug for 610/610E	4.75
CM40PS	40 character dot matrix printer, 11.5cm paper roll	199.00

ZENITH Monitors

123E	12 inch with green display, good quality	109.25
122E	12 inch with amber display, good quality	125.00

TAL, ASP Series System 6 antennas

ASP2016	138–512MHz 1/4 wave whip with threaded adaptor	2.56
ASP3976	66–138MHz 1/4 wave whip with threaded adaptor	5.21
ASP3936	130–174MHz 1/2 wave whip with barrel spring, 3dB	18.63

Mounts for above

K57	Fits 1.2 wave, 3/8 inch hole, snap-in type	3.10
K440	Fits 1/4 wave, 3/8 inch hole, snap-in type	1.55
K145	Fits 1/2 wave, 3/4 inch hole, snap-in with claw mount	5.43
K65	Fits 1/4 wave, 3/4 inch hole, deep claw with 17ft cable	9.31
K47	Fits 1/2 wave, 3/4 inch hole, wing mount	7.17
KR47	Fits 1/2 wave, 3/4 inch hole, narrow wing mount	12.42
K220	Fits 1/2 wave, magnetic mount with 17ft cable	12.10
K220A	Fits 1/4 wave, magnetic mount with 17ft cable	12.10
M161	Fits 1/2 wave, boot lip mount, needs K57	3.88
M161	Fits 1/4 wave, boot lip mount, needs K440	3.88
KR193	Fits 1/2 wave, swivel ball mount	4.03
K67	Ground plane kit for all whips	16.30

3000 Series System 6 antennas

TAP3006	60–110MHz, 1/4 wave whip with threaded hinge	7.76
TAP3016	110–512MHz, 1/4 wave whip with threaded hinge	7.76
TAP3026	144–174MHz, VHF 1/2 wave, 3dB gain, threaded hinge	10.86
TAP3676	144–174MHz, VHF 1/2 wave, 3dB gain, with spring	12.42
TAP3456	420–440MHz, UHF 3dB gain, with threaded adaptor	14.74
TAP3466	450–470MHz, UHF 3dB gain, with threaded adaptor	14.74
TAP3696	420–440MHz, UHF 5dB gain, with shock spring	18.63
TAP3666	450–470MHz, UHF 5dB gain, with shock spring	18.63

Mounts for above

K68	Snap in adaptor for 3/8 inch hole	2.32
K145	Snap in adaptor with claw fits 3/4 inch hole	5.43
K72	Wing mount with 17ft of cable, fits 3/4 inch hole	11.64
K66	Claw mount with 17ft of cable, fits 3/4 inch hole	7.76
K65	1/2 inch deep claw mount with 17ft cable, 3/4" hole	9.31
K220	Magnetic mount with 17ft of cable	12.10
ASPR332E	Gutter clip with 10ft of cable	11.79
M161	Boot lip mount needs K68	3.88
KR223	Duraflex noiseless spring	10.86
K67	Ground plane kit	16.30

Base station antennas

ASP655	130–174MHz economy base, 1/2 wave with g-plane	27.94
TAP4009	156–174MHz Colinear, 3dB gain	50.45
ASPD682	160–166MHz Colinear, 4.5dB gain	194.00
ASPE682UK	164–172MHz Colinear, 4.5dB gain	194.00
ASPD700	450–460MHz Colinear, 7dB gain	163.00
ASP2006	156.174MHz Unity gain	47.44

Low profile/Heavy-duty antennas

ASP2001	66–88MHz dome shape, –12db	55.89
ASP2000	105–108MHz TX – 138–141MHz RX dome shape, –4.5dB	73.74
ASP2002	162–174MHz dome shape, –3.5dB	55.89
ASP2021	162–173MHz fin shape, –1dB	55.89
ASP4005	450–470MHz dome shape, –0.5dB	31.05

Marine antennas 156–162MHz

ASM37E	1/2 wave unity gain, deck mount, with 20ft cable	26.90
ASM38E	Colinear 3dB gain, deck mount, with 20ft cable	39.32
ASM77E	1/2 wave unity gain, mast mount, with 3ft cable	19.67
ASM88E	As above with 60ft of cable	27.83
ASM98E	Dipole, with deck/bulkhead mount & 20ft of cable	24.21
TAM1001	1/2 wave unity gain, lightweight whip style	24.84
TAM1003	Emergency antenna, (CH16) c/w special bracket	23.28

Mounts/Accessories for above:

ASM42	Heavy duty rachet mount all angles	25.88
ASM91	Vertical deck mount, fold over	10.35
K509	Stand off bracket (13cm) for 1001, 1005, 1006, 88E	5.74
TAM108	Antenna extension rod (1.5m)	31.05
ASM93	Antenna support bracket	5.16
CS100	Good quality extension speaker	11.37

Antenna matching units

AMU100	1.5–99MHz 200 watts pep	99.00
AMU400	1.5–60MHz 400 watts pep	116.43

Prices include VAT at 15%.
We reserve the right to change prices without giving prior notice.
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IC-02E, £229

ICOM introduces the new top-of-the-line IC-02E to compliment its existing line of popular handheld transceivers and accessories. The new direct entry microprocessor controlled IC-02E is a 2 meter handheld packed with excellent features. Some of these features include: scanning, 10 memories, duplex offset storage in memory & odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:– HS10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay.

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10W/1W
FM mobile
Now only
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Dual VFO's | 10 memories

FT-708R
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10 memories
Keyboard entry
A must at only
£179

FT-790R 1W/200mw multimode
All the features of the FT-290R on 70cms
Incredible value at
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The world famous SHURE 444D dual impedance magnetic desk microphone. Features tailored frequency response for optimum speech intelligibility. This is the mike with the pedigree.

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SOUTH-WEST
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Our product range now exceeds **50 Individual items** in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become **the largest** and **most successful** designer and manufacturer of R F Products, such as **Linear Amplifiers** and transverters, but also designers and manufacturers of **innovative** microprocessor and digital products such as **The Morsetalker,** MMSI, and the RTTY to TV decoder, MM2001.

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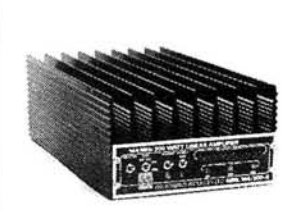
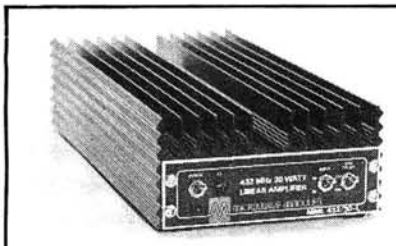


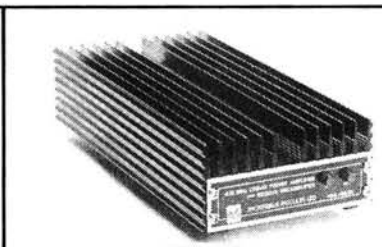
MML144/200-S

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER GAIN	PRE AMPLIFIER NF	POWER REQUIREMENTS	RF* VOX	PRICE INC VAT
MML144/30-LS	**1 or 3W**	30W	SSB. FM. AM. CW.	12dB	<1.5dB	13.8V @ 4A	√	£75 (p&p inc £3)
MML144/50-S	10W	50W				13.8V @ 6A	√	£92 (p&p £3)
MML144/100-S	10W	100W				13.8V @ 12A	√	£149.95 (p&p £3.50)
MML144/100-HS	25W	100W				13.8V @ 12A	√	£149.95 (p&p £3.50)
MML144/100-LS	**1 or 3W**	100W				13.8V @ 14A	√	£169.95 (p&p £3.50)
MML144/200-S	**3, 10 or 25W**	200W				13.8V @ 30A	√	£245 (p&p £4.50)

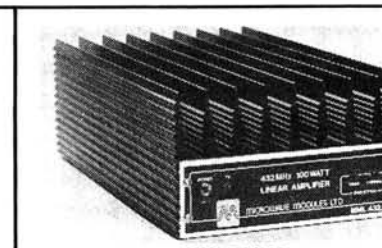
* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED



MML432/30-L



MML432/50



MML432/100

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER GAIN	PRE AMPLIFIER NF	POWER REQUIREMENTS	RF* VOX	PRICE INC VAT
MML432/30-L	1 or 3W	30W	SSB. FM, AM, ATV. CW.	12dB	2dB	13.8V @ 6A	√	£139.95 (p&p £3.50)
MML432/50	10W	50W		12dB	2dB	13.8V @ 8A	√	£129.95 (p&p £3.50)
MML432/100	10W	100W		—	—	13.8V @ 20A	√	£245 (p&p £4.50)

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ICOM IC271E
2m base station for the eighties, 25w O/P, 32 memories, scanning, 10/100Hz auto shift tuning rates + (as options) voice frequency synthesiser, internal 12V psu, GaAS FET preamp.

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Multiband base station transceiver. Just compare the following features:

£739 INCL. MUTEK PRE-AMP

FEATURES	FT 726R	TS780
Choice of bands	yes	no
450 MHz capability	yes	no
IF Shift	yes	yes
IF Width	yes	no
CW Filter	option	no
X-band Full Duplex	option	no
Squelch	all modes	FM only
Memory Channels	11	10

FEATURES	FT 726R	TS780
Limited Band Scan	yes	yes
Mode Memory	yes	no
Memory Backup	lithium	AA cell
RX Tone Control	yes	no
RF PWR Control	continuous	Hi/Low
Speech Processor	AF	none
VOX	no	yes
CW Semi break-in	yes	yes

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FT726R WITH 70cm CARD FITTED £989–WITH DUPLEXER/SATELLITE MODULE WORTH £95!!

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YAESU FT290R
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A2087	11.50	ECC85	0.60	EM81	0.70	PL84	0.78	6AN5	3.95	12AT7WA	2.50
A2134	14.95	ECC88	0.85	EM84	1.65	PL500	0.95	6AQ5	1.50	12AU6	1.50
A2293	6.50	ECC91	2.00	EM85	3.95	PL504	0.95	6AS5	1.50	12AU7	0.55
A2900	11.50	ECC804	0.60	EM87	2.50	PL508	1.95	6AS7G	7.50	12AV6	0.80
C1148A	115.00	ECC807	2.50	EN91	1.10	PL509	4.85	6AT6	0.75	12AX7	0.65
DAF91	0.70	ECF80	0.85	EN92	4.50	PL519	4.95	6AU6	0.95	12AX7WA	2.50
DAF96	0.65	ECF82	0.85	EY84	5.95	PL802	6.95	6AV6	0.75	12AY7	4.00
DET23	39.00	ECF86	1.70	EY86/87	0.50	PY88	0.65	6AW8A	2.95	12AZ7A	1.95
DET24	35.00	ECH3	2.50	EY88	0.55	PY500A	1.95	6BA6	0.95	12BA6	1.50
DF91	0.70	ECH3	2.15	EZ80	0.60	PY800	0.79	6BA7	4.50	12BE6	1.05
DF92	0.60	ECH42	1.00	EZ81	0.60	PY801	0.79	6BA8A	3.50	12BH7	2.50
DF96	0.65	ECH81	0.65	EZ90	1.35	QQV02-6	12.75	6BE6	0.72	12BL6	1.75
DK91	0.90	ECH84	0.69	GZ32	1.00	QQV03-10	5.50	6BD6	1.00	12BY7A	2.75
DK92	1.20	ECL80	0.60	GZ33	4.50	QQV03-20A	18.50	6BH6	1.95	12E1	17.95
DK96	2.50	ECL82	0.65	GZ34	2.15	QS150/45	7.00	6BJ6	1.20	12GN7	4.50
DL92	1.50	ECL84	0.74	GZ37	4.50	QV03-12	4.95	6BN7	4.50	12SG7	4.50
DL96	2.50	ECL86	0.80	KT61	4.00	S11E-12	38.00	6BN8	2.75	12SQ7GT	1.50
DLS10	13.50	EF37A	2.00	KT66 USA	7.15	TD03-10E	28.00	6BR7	4.95	30FL2	1.35
DLS16	10.00	EF39	1.10	KT66 UK	14.95	TD03-10F	28.00	6BR8A	2.15	40KD6	5.50
DM160	2.75	EF42	3.50	KT77 Gold Lion		U19 M.O.V.	12.00	6BS7	5.50	38HE7	4.50
DY86/87	0.65	EF55	4.95	Special	9.50	UCH81	0.65	6BW6	5.35	85A1	6.50
DY802	0.72	EF80	0.55	KT88 USA	8.00	UF80	0.80	6BZ6	2.50	85A2	1.50
E80CC	8.50	EF83	3.50	KT88 Gold Lion		UL84	0.85	6C4	1.10	90CG	13.15
E80CF	11.00	EF85	0.50	Special	15.95	UU8	9.00	6CB6A	1.95	92AV	12.50
E80F	13.50	EF86	1.25	KTW61	2.50	UY41	3.50	6CD6GA	4.50	150C4	2.15
E80L	11.50	EF89	0.85	M8083	3.25	V235A/1K	250.00	6CH6	8.50	807	1.60
E81CC	3.50	EF91	1.50	M8137	5.50	YL1020	29.00	6CL6	3.50	811A	12.95
E82CC	3.50	EF92	2.50	M8162	5.50	ZM1001	5.00	6CW4	7.25	813	18.50
E83CC	3.50	EF93	0.95	N78	8.50	2D21	0.95	6DK6	2.50	833A	115.00
E83F	5.50	EF94	0.95	OA2	0.85	2K25	24.95	6DQ5	3.35	866A	3.95
E86C	9.50	EF183	0.65	OB2	0.85	2K26	95.00	6DQ6B	2.50	5642	9.50
E88C	7.95	EF184	0.65	PC97	1.10	4CX250B	37.50	6EA8	2.50	5651	2.50
E88CC	3.50	EF804S	11.50	PC900	1.25	4CX350A	71.50	6F6G	2.00	5670	3.50
E130L	19.95	EF806S	14.50	PCF80	0.65	4X150A	25.00	6F28	1.25	5687	4.50
E180F	6.50	EH90	0.72	PCF82	0.60	5AM8	2.15	6GH8A	0.80	5696	3.50
E182CC	9.00	EK90	0.72	PCF86	1.20	5U4G	1.95	6GK6	2.00	5749	2.50
e810F	18.50	EL34	Philips 3.50	PCF200	1.80	5U4GB	2.50	6H6	1.35	5751	3.50
EA76	1.95	EL34	2.25	PCF201	1.80	5V4G	1.25	6J4	1.10	5763	4.95
EABC80	0.70	EL36	1.50	PCF801	1.35	5Z4GT	0.85	6J5	1.95	5814A	3.25
EAF42	1.20	EL38	6.00	PCF802	0.60	6AB8	0.66	6J5GT	1.50	5842	11.00
EB91	0.60	EL41	3.50	PCF805	1.25	6AC7	2.00	6J6	0.65	5965	2.25
EBC81	1.50	EL82	0.58	PCF808	1.25	6AF4A	2.50	6J7	4.15	6060	2.25
EBC91	0.75	EL84	0.75	PCH200	1.50	6AG7	1.95	6JB6	3.95	6080	4.75
EBF80	0.65	EL85	4.50	PCL82	0.85	6AH6	1.50	6JS6C	4.95	6146B	7.50
EC90	1.10	EL86	0.85	PCL83	2.50	6AJ7	2.00	6KD6	5.50	6550A	8.00
ECC81	1.15	EL90	1.50	PCL84	0.85	6AK6	2.00	6L6GC	2.95	6883B	9.95
ECC82	0.55	EL360	7.95	PCL85	0.90	6AL5	0.60	6L6GT	1.15	6973	3.75
ECC82	Philips/ Mullard 1.35	EL519	6.95	PCL805	1.25	6AM4	3.25	6LF6	4.50	7025	2.50
ECC83	0.65	EL821	8.50	PFL200	1.25	6AM5	6.00	6LQ6	4.95	7027A	4.65
ECC83	Brimar Made in UK 1.35	EL822	12.95	PL36	0.95	6AN8	1.50	6U8	0.85	7199	5.95
		EM80	0.70	PL81A	0.72	6BE6	1.00	6V6GT	0.85	7247	2.00
						6BH8	1.95	6X5GT	0.55	7360	9.50
						6BL7	4.50	7V7	4.15	7475	5.00
						6BQ7A	2.50	11E2	16.50	7551	5.75
						6BR8A	2.15	12AT6	0.65	7591A	5.50
						6BW6	5.35	12AT7	1.15		

INTEGRATED CIRCUITS

AN214Q	2.50						
AN240	2.80						
LA4400	4.15						
LA4422	2.50						
LC7120	3.25						
LC7130	3.50						
LC7131	5.50						
LC7137	5.50						
MB3712	2.00						
M51513L	2.30						
PLL02AG	5.75						
SL901B	5.50						
SL917B	6.65						
SN76003N	1.95						
SN76013N	1.95						
SN76023N	1.95						
SN76033N	1.95						
SN76131N	1.30						
SN76544N	1.95						
STK015	7.95						
STK435	7.95						
STK437	7.95						
TAA661B	1.20						
TA7061AP	3.95						
TA7120	1.65						
TA7130	1.50						
TA7204	2.15						
TA7205AP	1.50						
TA7222	1.80						
TA7310	1.80						
TBA120S	0.70						
TBA530	1.10						
TBA641A12	2.50						
TBA800	0.89						
TBA810S	1.65						
TBA920Q	1.65						
TDA1004A	2.20						
TDA1170	1.95						
TDA1190	2.15						
TDA1327	1.70						
TDA2020	2.45						
TDA2030	2.80						
TDA2532	1.95						
TDA2590/3	2.95						
TDA2611A	1.95						
UPC566H	2.95						
UPC575C2	2.75						
UPC1025	2.50						
UPC1028H	1.95						
UPC1156H	2.75						
UPC1181H	1.25						
UPC1182H	2.95						
UPC1185H	3.95						
UPC2002H	1.95						

SEMICONDUCTORS

AC127	0.20	BC170B	0.15	BF183	0.29	TIP42C	0.47
AC128	0.28	BC171	0.09	BF194	0.11	TIP47	0.65
AC141K	0.34	BC172	0.10	BF196	0.11	TIP146	2.75
AC176	0.22	BC173B	0.10	BF197	0.11	TIP2955	0.80
AC176K	0.31	BC182	0.10	BF198	0.16	TIP3055	0.55
AC187	0.25	BC183	0.10	BF199	0.14	TIS91	0.20
AC187K	0.28	BC184LA	0.09	BF200	0.40	2N3054	0.59
AC188	0.25	BC212	0.09	BF258	0.28	2N3055	0.52
AD142	0.79	BC212L	0.09	BF259	0.28	2N3702	0.12
AD149	0.70	BC213	0.09	BF336	0.34	2N3704	0.12
AD161	0.39	BC213L	0.09	BFX86	0.30	2N3705	0.12
AD162	0.39	BC237	0.10	BFX88	0.25	2N3708	0.12
AF124	0.34	BC238	0.09	BFY50	0.21	2N3773	2.50
AF125	0.35	BC307	0.09	BFY51	0.21	2N5294	0.42
AF126	0.32	BC327	0.10	BFY52	0.25	2N5296	0.48
AF127	0.40	BC461	0.35	BFY90	0.77	2N5496	0.65
AF139	0.40	BC478	0.20	BT106	1.49	2SA715	0.95
AF239	0.42	BC547	0.10	BT116	1.20	2SC495	0.80
AU106	2.00	BC548	0.10	BU105	1.22	2SC496	0.80
AU107	1.75	BC549A	0.08	BU108	1.69	2SC1096	0.80
AU110	2.00	BC557	0.08	BU124	1.25	2SC1106	2.50
AU113	2.95	BC558	0.10	BU126	1.60	2SC1173	1.15
BC107	0.11	BD131	0.32	BU205	1.30	2SC1306	1.00
BC108	0.10	BD132	0.35	BU208	1.39	2SC1307	1.50
BC109B	0.12	BD133	0.40	BU208A	1.52	2SC1449	0.80
BC139	0.20	BD135	0.30	BU326A	1.42	2SC1678	1.25
BC140	0.31	BD136	0.30	MRF450	13.50	2SC1909	1.95
BC141	0.25	BD137	0.32	MRF450A	12.50	2SC1945	2.10
BC142	0.21	BD138	0.30	MRF453	17.50	2SC1953	0.95
BC143	0.24	BD139	0.32	MRF454	23.50	2SC1957	0.80
BC147	0.09	BD140	0.30	MRF475	2.50	2SC1969	1.95
BC148	0.09	BD508	0.40	MRF477	10.00	2SC2028	1.15
BC149	0.09	BD538	0.65	R2008B	1.70	2SC2029	1.95
BC157	0.12	BD597	0.75	R2010B	1.70	2SC2078	1.45
BC158	0.09	BDX32	1.50	R2540	2.48	2SC2091	0.85
BC159	0.09	BDY57	1.65	TIP29C	0.42	2SC2098	2.50
BC160	0.28	BF179	0.34	TIP31C	0.42	2SC2166	1.95
		BF180	0.29	TIP32C	0.42	2SC2314	0.80
				TIP41C	0.45	3N211	1.95
						3SD234	0.50

Many other items available
Please phone send list for quote
Goods normally despatched within 24 hours

CALLERS WELCOME

★ Entrance on A227 50yds South of Meopham Green
Export enquiries welcome

★ Hours
Mon.-Fri. 9.30-5.30

P. & P. 50p. Please add V.A.T. at 15%
★ 24-HOUR ANSAPHONE SERVICE ★

BI-PAK BARGAINS

MINIATURE TOOLS FOR HOBBYISTS

Miniature round nose side cutters – insulated handles 4½inch length. Order No: Y043.

Miniature long nose pliers – insulated handles 5½inch length. Order No: Y044.

Miniature bend nose pliers – insulated handles 5½inch length. Order No: Y045.

Miniature end nippers – insulated handles 4½inch length. Order No: Y046.

Miniature snipe nose pliers with side cutter and serrated jaws – insulated handles 5inch length. Order No: Y042.

ALL AT **£1.25** each

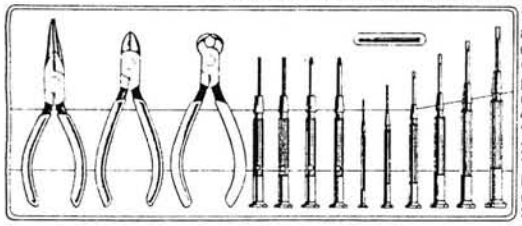
FLEXEY DRIVER

A flexible shaft screwdriver for those awkward to get at screws. Overall length 8 3inch. Order No: FS-1 Flat blade 4mm FS-2 Cross point no. 1 **£1.75 each.**

GRIP-DRIVER

8inch long screwdriver with spring loaded grip on end to hold screws in position while reaching into those difficult places. Order No: SD-1 Flat blade 4mm SD-2 Cross point no.0. **£95p each.**

13 PIECE TOOL KIT AND CASE



13-piece tool set housed in attractive moulded plastic case with clear sliding cover ● 1 off 5" snipe nose "radio" pliers with side cutters ● 1 off 4½" side cutters ● 1 off 4½" end cutters ● 2 off hex. "Allen" key drivers 2mm and 2.5mm; 2 off cross-point "Phillips" drivers No. 0 and No. 1 (with tommy bar) ● 6 off precision screwdrivers. Sizes from 1mm to 3.5mm ●

ONLY £7.50 ORDER No. VP102

PRECISION JEWELLERS' TOOLS

Rustproof, Tempered Handles and Blades. Chrome Plated Handles. Swivel Heads for use on Precision Work.

5T21 SCREWDRIVER SET
6 precision screwdrivers in hinged plastic case. Sizes – 0.8, 1.4, 2, 2.4, 2.9 and 3.8mm **£1.75**

5T31 NUT DRIVER SET
5 precision nut drivers in hinged plastic case. With turning rod. Sizes – 3, 3.5, 4, 4.5 and 5mm **£1.75**

5T41 TOOL SET
5 precision instruments in hinged plastic case. Crosspoint (Philips) screwdrivers – H0 and H1 Hex key wrenches. Sizes – 1.5, 2 and 2.5mm **£1.75**

5T51 WRENCH SET
5 precision wrenches in hinged plastic case. Sizes – 4, 4.5, 5, 5.5 and 6mm **£1.75**

MULTITESTER

1,000 opv including test leads & Battery
AC volts - 0-15-150-500-1,000
DC volts - 0-15-150-500-1,000
DC currents - 0 ·1ma-150ma
Resistance - 0 ·25 K ohms 100 K ohms
Dims - 90 × 61 × 30mm.
O/No. 1322 OUR PRICE £6.50 ONLY

BRAND NEW LCD DISPLAY MULTITESTER

RE 188m
LCD 10 MEGOHM INPUT IMPEDANCE
*3½ digit *16 ranges plus hFE test facility for PNP and NPN transistors *Auto zero, auto polarity *Single-handed, pushbutton operation *Over range indication *12.5mm (½-inch) large LCD readout *Diode check *Fast circuit protection *Test leads, battery and instructions included.

Max indication	1999 or −1999
Polarity indication	Negative only Positive readings appear without + sign
Input Impedance	10 Megohms
Zero adjust	Automatic
Sampling time	250 milliseconds
Temperature range	−5°C to 50°C
Power Supply	1 x PP3 or equivalent 9V battery
Consumption	20mW
Size	155x88x31mm

RANGES
DC Voltage 0-200mV
0-2-20-200-1000V. Acc. 0.8%
AC Voltage 0-200-1000V
Acc. 1.2% DC Current 0-200uA
0-2-20-200mA, 0-10A. Acc. 1.2%
Resistance 0-2-20-200K ohms
0-2 Megohms. Acc. 1%
BI-PAK VERY LOWEST PRICE
£45.00 each

Leather Case for 188m **£2.50 EACH**

SIGNAL INJECTOR

Simple push button operation. Oscillates at 700 – 1k Hz with harmonics to 30MHz. 1.4V p/p output. Impedance 10kΩ. Ideal for trouble shooting with audio equipment. One "AA" penlight battery supplied. **O/No VP96 £2.50**

LOGIC PROBE

Automatic levelling. White LED indication. Minimum width of measuring pulse 30 millisecs.Maximum input frequency 10M Hz.
Input impedance: 100kΩ
Power consumption: 40mA maximum
Power supply: 4.5 – 18 V d.c.
ORDER No. VP97 **£10.50**

CURRENT/POL CHECKER

Heavy duty test prods with built-in indicators for testing polarity: indicates whether a.c. or d.c. 3.5V to 400V. O/No. VP98 **£2.50**

TESTER

Universal tester with ceramic buzzer. Tests diodes, transistors, resistors, capacitors and continuity. One "AA" penlight battery included.

Test current:	Max 2μA
Test voltage:	1.2V
Response range:	100MΩ
Max voltage:	500V
Internal resistance:	390kΩ
Length:	135mm

£5.00 O/No. VP99

CIRCUIT TESTER

D.C. continuity tester for circuit checking on all low voltage equipment and components. Diode checking also possible. Takes two AA batteries. 90cm lead has crocodile clip. Body length 145mm. O/No. VP100 **75p**

ELECTRONIC SIREN 12v DC

Red plastic case with adjustable fixing bracket. Emits high-pitched wailing note of varying pitch - 100 cycles per minute. Dims - 90mm (dia.) 60mm (depth). Power - 12v DC. O/P 90dBA 1m type.
Our Price: £5.50 O/No. VP79

TAPE RECORDER SWITCH

Unit to control motor of tape recorder. 1.8m cord and 2.5mm plug attached. On/Off switch. Dims: 55 × 20 × 20mm.
O/No. VP 127 **£1.00**

POWER SUPPLY OUR PRICE £4.25

Power supply fits directly into 13 amp socket Fused for safety. Polarity reversing socket. Voltage switch. Lead with multi plug Input – 240V AC 50HZ, Output – 3, 4, 5, 6, 7.5, 9 & 12V DC Rating – 300 ma VP109.

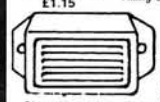
RATCHET SCREWDRIVER KIT

Comprises 2 standard screwdriver blades 5 & 7mm size, 2 cross point size 4 & 6. 1 Ratchet handle. 5-in-1 Kit. **£1.45 each.** O/No 329B

ELECT & PIEZO BUZZERS

PIEZO
Miniature round piezo-electronic buzzer. White plastic. Low consumption.
Frequency: 4kHz approx.
Output: 70dB (A) @ 1, typ.
Power: 12Vd.c. 4mA.
Dims: 22 (dia.) × 11.5mm.
Fixing Centres: 26.5mm
O/No. VP 107 **95p**

PIEZO
Piezo buzzer. White plastic. 90mm leads. For use on a.c mains.
Frequency: 3.5kHz approx.
Output: 85dB (A) @ 1m typ.
Power: 240Va.c. 5mA.
Dims: 32 (dia.) × 14mm.
Fixing centres: 38mm
O/No. VP 108 **£1.15**



ELECTRONIC
Miniature electronic buzzers. Solid state. Ivory plastic. 150 leads. Frequency 500 Hz approx.
Dims: 22 × 16 × 15mm.
Output: 82dB (A) @ 1m typ.
Fixing centres: 26mm.
3V 25mA: O/No. VP 82 6V 25mA: VP 83
9V 25mA: O/No. VP 84 12V 25mA: VP 86
80p each

SUB-BOX

A neat swivelling disc provides close tolerance substitution resistors of 36 preferred values from 5ohms to 1Kohm. Simply fix clips into circuit and swivel until optimum result is achieved.
O/No. VP 112 **£4.75**

MINIATURE VICE

Miniature plastic and metal vice with strong suction base for portability. Single action to secure or release suction. Plastic jaws with rubber pads 20mm wide, open out to 40mm. Dims: 85 × 65 × 60mm approx.
FANTASTIC VALUE
O/No. VP 95 **ONLY £1.60**

LEARN A LINGO!
PILLOW SPEAKER

Slim under pillow unit. 8ohms 2" speaker. 1.5m lead with 3.5mm mono jack plug. Black. Dims: 65 (dia.) ×17mm.
O/No. VP 88 **£1.25**

METRIC & BRITISH MEASURES

Steel tapes in sturdy ABs plastic case. Silk wrist strap. These yellow coated convex tapes have inch and metric graduations. Automatic push-button return.
2m long × 13mm wide. O/No. VP 89 **£1.00**
3m long × 13mm wide. O/No. VP 90 **£1.50**
5m long × 16mm wide. O/No. VP 91 **£2.00**

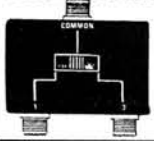
BATTERY TESTER

Tests all types of battery including standard, NICAD, Alkaline etc. Takes all standard sizes including 6V lantern batteries and watch/hearing aid cells. Also tests fuses and lamps by means of internal 9V (PP3) battery. Can also be used to recharge NICAD battenes by means of external 3-12Vd.c. power supply (not included).
Full instructions provided. Dims: 185 × 103 × 30mm
O/No. VP 101 **£7.00** (approx.).

SPEAKER PROTECTOR

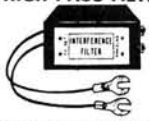
Limits voltage to speaker or to the permissible max., by automatically introducing a resistor in series with speakers. When excessive voltage is reduced the unit resets itself. Electronic voltage-sensing relay circuit. Spring terminals. Cut-off level adjustable from 10W-120W. Full instructions included. Dims: 85 × 74 × 25mm.
O/No. VP 118 **£9.95**

ANTENNA SWITCH 2 and 3 WAY



Co-axial switch for one transceiver to two antennae or one antenna to two transceivers. Dims: 86 × 55 × 32mm (Body).
O/No. VP 113 **£4.50**
As above but 3-way.
O.No. VP 114 **£4.75**

HIGH PASS FILTER/SUPRESSOR



CB/TV. High pass filter. Reduces unwanted signals picked up by antenna. Dims: 45 × 25 × 17mm
O/No. VP 115 **45p**

LOW PASS FILTER

Designed to reduce harmonics on the VHS and TV band. Cut-off frequency: 30MHz. V.S.W.R.: Less than 1.2 to 1. Insertion loss: −0.2dB @ 27MHz. Impedance: 50 ohms. Dims: 80 × 55 × 40mm.
O/No. VP116 **£2.75**

DC-DC POWER SUPPLY

DC to DC adaptor. Plugs into car cigar lighter aperture. Output 3, 4.5, 6, 7.5, 9, 12V @ 800mA. Has universal output spider plug, also 9V battery snap and polarity reversing facility. O/No. VP 119 **£2.45**

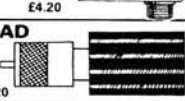
ANTENNA COUPLER

Transceiver/car radio antenna coupler. With co-axial cables. One co-axial terminates in antenna plug and the other in PL259 plug. Dims: 67 × 46 × 30mm.
O/No. VP 117 **£2.00**

FM MONITOR

FM monitor for 2 metre band. All metal. Attached earphone. PL259/SO239 connectors. 144MHz 10W maximum. Dims: (Body) 55 × 30 × 23mm.
O/No. VP 120 **£4.20**

DUMMY LOAD



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Where Next?

IN A RECENT ISSUE of *Popular Communications,* an American magazine devoted entirely to radio monitoring, Editor Tom Kneitel K2AES wrote about an interesting development in the fight for radio spectrum space.

One of his readers, a short-wave listener in Albany, New York, was listening to Radio France International on 17·865MHz in the 16m broadcast band when some other signals appeared on top of RFI. The intruder was a two-way transmission which "consisted mostly of childish arguing and bumbled messages". The s.w.l. contacted his local FCC monitoring station, which investigated the signals and told him that they were part of a training programme in radio communications at a military base in Virginia!

A few months later, the reader heard the same network operating on 11·933MHz in the 25m band. This time he wrote direct to the Department of Defence, pointing out that the short-wave broadcast bands were overcrowded enough without other services butting in, and anyway, surely part of the training ought to be about using the proper frequencies. His query was passed on to the Military Communications–Electronics Board, which deals with military frequency management matters, and their answer was a real eye-opener.

It seems that US military services are authorised to use certain frequency bands, including those allocated to international broadcasting, at low power within the United States and possessions.

The reply went on to explain that the military, too, are operating in a band which is overcrowded. With US forces deployed throughout the world, there is an ever-increasing demand for long-distance communications which must take place in internationally agreed bands. The result is that the government services band is entirely filled with operational traffic, and advantage is being taken of the authorisation to use international broadcast frequencies at low power to meet training requirements.

The authorities agreed to monitor the training more closely to ensure that only low power is utilised, and that communications discipline is observed. The letter concluded "We regret that some interference may result".

So, if you hear two-way communications on top of your favourite DX broadcast station, this could be the cause. Despite the many satellite links now in use, it seems that pressure on the spectrum from h.f. to u.h.f. is unlikely to ease.

★ ★ ★ ★ ★ ★

If you're a 144MHz QRP enthusiast, don't forget the *PW* QRP Contest 1984, which takes place on Sunday 17 June between 0900 and 1700 GMT (10am to 6pm British Summer Time). Full details appeared in our June issue—we hope you'll enjoy the event even more than last year.

Geoff Arnold

QUERIES

While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

INSURANCE

Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

CONSTRUCTION RATING

Each constructional project will in future be 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. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate
A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

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. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS

Subscriptions are available at £13 per annum to UK addresses and £14 overseas, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.50 to UK addresses, £5.75 overseas, including post and packing) each accommodating one volume of *PW.* Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

PW RADIO USERS INSURANCE SCHEME

Practical Wireless Radio Users Insurance Scheme was devised by Registered Insurance Brokers B. A. LAYMOND & PARTNERS LIMITED following consultation with PRACTICAL WIRELESS to formulate an exclusive scheme designed to meet the needs and requirements of: Amateur Radio Enthusiasts ● CB Radio Users ● Taxi Companies and Fleet Users with Radio Telephones. A copy of the Policy can be inspected at the offices of B. A. Laymond & Partners Ltd., or of Practical Wireless in Poole.

SPECIAL FEATURES

● All Risks Cover ● "New Lamps for Old" Cover (as defined in policy) ● Index Linked Cover to combat inflation ● Includes Personal Liability cover against damages payments of up to £500000 to members of the public ● Licence protection—covers legal costs arising from any breach of your licence conditions ● Equipment covered anywhere in the UK, Channel Islands and Isle of Man, but not Northern Ireland and Eire ● Fixed Antennas (Aerials) covered ● Frequency, Power and SWR Meters and similar radio-related test equipment covered ● 30 days cover on Western Europe included Free of Charge ● Absolute Security as this scheme is underwritten by a leading member of the British Insurance Association on the London Insurance Market ● Practical Wireless radio receiver and transmitter projects covered (when stated in feature) ● Available to Clubs and Organisationst ● Available to Companiest

†Write directly to B. A. LAYMOND & PARTNERS LTD, for a special application form and full details enclosing the coupon below.

B. A. Laymond & Partners Ltd., Practical Wireless and the Underwriters wish to make it clear that it is an offence to instal or use a radio transmitter in the UK except under the authority of a licence granted by the Secretary of State and it is not their intention to provide cover for or to encourage or condone the illegal use of CB and/or other communications equipment.

Cover for property contained in vehicles is subject to a Limit of Liability of £250, increased to £750 where the vehicle is protected by a reputable audible alarm, correctly set and operational.

When the vehicle is unattended, mobile equipment secured so that tools or a key are required to remove it must be disguised or concealed from view. Portable and mobile equipment not so secured must be removed and placed in a locked boot (or removed and adequately concealed from view if the vehicle has no boot), or removed from the vehicle entirely. Equipment not in a secure building or vehicle must not be left unattended.

How Much Will It Cost?

Sum to Insure	£1000	£3000	£5000
Annual Premium	£20	£35	£45

The premium is charged on sums insured in pre-selected bands. Thus equipment totalling £3750 would be in the band up to £5000, and the premium would be £45. Quotations for larger sums available on application.

Claims will be settled after deduction of an excess in the following manner:

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From estate cars, vans and hatchbacks without concealed luggage compartments	25% of claim (minimum £25)
All others: Sums insured up to £3000	£25
Sums insured up to £5000	£50

How To Insure

Complete the application form below to obtain immediate insurance cover. Photocopies will not be accepted

APPLICATION FOR PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME PW7/84

Name in full (State Mr, Mrs, Miss or Title)

Address

Post Code

Occupation Age Phone No. (Home) (Work)

I/We hereby apply to insure the equipment detailed below

BLOCK LETTERS

	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary

TOTAL SUM TO INSURE £

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by *Laymond's and* the premium paid in full and a Certificate issued.

* If you have, please give details on a separate sheet.

Date Signed

Rush us details of PW Club Insurance ☐
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DELAY IN ARRANGING COVER COULD COST YOU A GREAT DEAL OF MONEY. COMPLETE THIS APPLICATION AND POST WITH YOUR PREMIUM MADE PAYABLE TO "LAYMOND'S" NOW. ADDRESS TO: PRACTICAL WIRELESS (INSURANCE), B. A. LAYMOND & PARTNERS LTD., 562 NORTH CIRCULAR ROAD, LONDON NW2 7QZ. TELEPHONE: 01-452 6611.

Repeater News

UHF: The DTI has now issued all outstanding licences within UHF phase 7. These include: GB3CY at York on RB13 (info G8KAH); GB3KB, Biggin Hill, RB0 (info G4STA); GB3LA, Leeds, RB11 (G3KKP); GB3SZ, Bournemouth, RB15 (G8MCP); GB3AH, Swaffham, RB11 (G8VHW — this unit is now operational and had the proposed channel changed just prior to going on air); GB3DS, Worksop, RB13 (G3XXN); GB3YS, Yeovil, RB2 (G4JBH). Not licensed but should be by the time you read this is GB3GD, the Leicester RTTY/DATA repeater on RB12 (G4MQS).

Also agreed is a site change for GB3ND (Ilfracombe, RB14) which should become operational shortly. The Wisbech repeater GB3WI, RB15 was due on 16 April — reports to G4NPH. A *proposal* is being studied by the RMG to microwave link two u.h.f. repeaters in the South West with a view to improving coverage.

VHF: World Amateur Radio Day, 18.4.84, marked the first day of operation for GB3SF, the Sheffield experimental pilot tone s.s.b. repeater — reports please to G3RKL. The Lakeland repeater GB3LD is now operational from a new site and offering improved coverage. Sussex Coast repeaters GB3ES and GB3SR have undergone a channel swap to reduce co-channel interference problems between GB3ES and GB3NL; GB3ES is now on R3 and GB3SR on R7. The Inverness repeater GB3BI R5 (Black Isle) became operational 6.4.84, reports please to GM4OIJ. *Proposals* for 144MHz repeaters have been submitted for Weymouth (Dorset) and the Isle of Man (Snae Fell). Due to the non-availability of vacant channels in both areas these units, if accepted by RMG, may well herald the introduction of a 12·5kHz channel system within the UK. A request has been made to the DTI to change the callsign of the Horsham repeater from GB3BP to GB3WS. GB3KS currently located at Dover, has applied for a site change, which would locate it between Dover and Folkestone, providing an improved coverage.

As a final note on v.h.f. devices the original equipment forming GB3WL (West London) which was stolen in 1980, was recently "unearthed" by the Thames Valley Police. This re-emergence occurred during investigations into suspected terrorist activities — fortunately someone must have recognised that they had not dug up an explosive device and contacted the RSGB who managed to avert any "exploratory" demolition!

Microwave: GB3BW, the Bedford 1·3GHz repeater/beacon, became operational recently on RM6 (reports to G8ELA). The unit, which obtained its licence and became operational in record time, features an interesting antenna system. This comprises four sets of four $\lambda/2$ horizontal stacked dipoles mounted in front of a 300mm square mesh reflector. The array is formed into a square "box", radiating in each principal direction; a similar system, mounted 230mm below this, is used for the receiving antenna. By adopting this vertically separated structure the repeater is able to operate without the use of cavities and does not apparently experience any de-sensitisation problems.

Miscellaneous: We are always interested to hear from repeater/beacon constructors and will be pleased to assist these hard-working members of the amateur community by publicising details of their efforts in these columns. To this end we have recently received a letter from the Leicester Repeater Group who provided and maintain GB3CF on 144MHz and GB3LE on 430MHz, together with beacons for 1·3, 2·3 and 10GHz. Other "state of the art" projects include a 1·3GHz ATV repeater and 430MHz RTTY/DATA unit. Like all other repeater/beacon projects in the UK, they are not a "national provision" — they exist only because groups like LRG are dedicated enough to provide and pay for them. The *continued* viability and means to future improvement lies in the hands of their supporters i.e. **all those who use and benefit** from the facilities. Please help by joining your local group and contributing towards the service. The LRG treasurer is G4MGG (565 Uppingham Road, Leicester) who will in return for your annual subscription of £5 provide you with copies of the group's quarterly magazine LENS together with the venues of social and technical meetings held throughout the year.

Please Note

In the u.h.f. section of "Repeater News" on page 20 of the May 1984 issue, GB3BE was incorrectly quoted as being on RB15. It is in fact on RB6.

However, the nearby installation GB3WI is on RB15 and hopefully came on-air on 16 April 1984.

Vintage Components

Readers of the *Let's Build a Crystal Set* feature on page 23 of the May 1984 issue, may be interested to know that The Vintage Wireless Company have stocks of Galena Crystals, in their original cartons, for 90p each plus 85p p&p; they also have suitable headphones for £4.00 plus 85p p&p.

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

Mobile Rally

The West Manchester Radio Club has managed to secure what they think will prove to be the ideal site for their mobile rally, to be held on Sunday 8 July, 1984,

The venue is the Burtonwood Motorway Service Area, situated on the M62 motorway one mile west of its junction with the M6 (Junction 21a), which lies to the north-west of Warrington New Town in North Cheshire.

The club have use of the whole East-bound side of the service area with sites for both inside and outside exhibitors. All the usual attractions of a mobile rally will be there including talk-in via the rally station using the callsign GB2THF.

For further details contact: *Alan Nixon, 14 Carlton Road, Lowton St Luke's, Warrington WA3 2EP.*

The Essex Federation of Radio Societies

A new and possibly unique organisation has been set up in the County of Essex to serve the interest of amateurs in the County. Called the Essex Federation of Radio Societies, so far member clubs include: Southend and District Amateur Radio Club, Braintree and District Amateur Radio Society and Dengie Hundred Amateur Radio Club, with Colchester Amateur Radio Club expressing an interest in joining.

Close liaison between the Federation and the RSGB is envisaged and amateur radio clubs within the County of Essex are invited to apply for further details to: *The Secretary, Dick Simons G8YEZ, QTHR.*

More on pages 20 & 30

Vintage Shack

A vintage shack, representing the contribution made by the old timers to amateur radio, has been installed in the radio building at the Chalk Pits Museum, Amberley, Sussex and was officially opened on April 1st by Geoff Arnold, the Editor of *Practical Wireless*.

Inside the shack, designed by Ron Ham and built by museum volunteers, are two life-sized silhouettes (made by Joan Ham) representing the late Nell Corry G2YL and Gerald Marcuse G2NM, standing at a bench and apparently discussing a 2-valve receiver used by the late Barbara Dunn G6YL in 1930. On the operating bench is one of G6YL's early transmitters, a 1915 Muirhead Morse key pounded by Nell when she worked all continents on 28MHz in 6 hours and 20 minutes in 1935, an Empire Super Five kit shortwave receiver and the 1927 RSGB log book which belonged to G2NM.

The shack emphasises, with photographs and certificates, the work of Gerald Marcuse, past president of RSGB, one of the founders of RAOTA and the RSGB journal *T and R Bulletin* (now *Radio Communication*) and pioneer of empire broadcasting, Barbara Dunn the first YL, licensed in 1927, who made some 17 000 contacts on the key in 55 years and Nell Corry, the second YL, licensed in 1932 and 28MHz columnist for the RSGB journal. On display inside the shack are the now silent Morse keys used by Bill Corsham G2UV, Eric Cosh G2DDD and Ralph Cathles G3NDF along with Nell's HRO, built in 1937, and Barbara's bug key. Almost 3 sides of the shack are lined with contemporary QSL cards patiently glued into position by Gerry and Margaret Brownlow G3WMU and G4LCU who now have the job of explaining the significance of this display to the museum's Sunday visitors.

Two past presidents of RSGB, Len Newnham G6NZ and Geoff Stone G3FZL, Eric Godsmark G5CO secretary of IARU Region 1, Eric Dowdeswell G4AR from *Practical Wireless,* Mike Rowe G8JVE and Chris Bryan G4EHG, President and Secretary of the Chichester and District ARC, Stan Williams G3LQI and Eric Sandaver G4KIT, Chairman and Secretary of the Worthing and District ARC, Bob Hodge G4MMI of the Mid-Sussex ARC, old timers Ted Owen from Maldon and Richard Hill from Tunbridge Wells, many of their XYLs and local amateurs, the Brownlows, Ron Allen G2DSP and Les Sawford G6APD and John Warren Chairman of the museum's trustees, joined Irene and David, widow and son of G2NM, to see Geoff Arnold perform the opening ceremony.

Special Event Station 7SK0AC

The Swedish Telecommunications Administration has given permission to the Swedish Radio Amateur Radio Club to use the special event prefix "7SK" in connection with operations from the club station SK0AC during the annual conference of the European DX Council in Stockholm between 8 and 10 June, 1984.

The 1984 conference is being hosted by Radio Sweden International and the Swedish DX Federation, at the studios of RSI in Stockholm. 7SK0AC will be on the air during the conference, operated by members of the club and licensed amateurs among the conference participants.

7SK0AC is expected to go on the air at about 1500 GMT on 8 June, and will continue at various times throughout the conference. Frequencies to be used are: during daylight hours—14060kHz (c.w.), 14320kHz (s.s.b.), 21060kHz (c.w.) and 21350kHz (s.s.b.). During the hours of darkness—3550kHz (c.w.), 3700kHz (s.s.b.), and there will also be some operation on the 144MHz band.

New Catalogue

The latest product list from Barrie Electronics Ltd. is now available. The list is free of charge and can be obtained in return for an s.a.e. from: *Barrie Electronics Ltd., Unit 211, Stratford Workshops, Burford Road, London E15 2SP. Tel: 01-555 0228.*

934MHz Club UK

A group of 934MHz band users and enthusiasts have got together to form the 934MHz Club UK, in an effort to encourage and further the use of 934MHz throughout the country, and to represent their members in connection with representations to the various government bodies concerned with radio communications.

Another aim of the club is to keep members informed of news and events by means of a quarterly magazine. The magazine will also include details of new equipment and products available for the band, readers' letter page, and technical queries and answers.

Annual subscription is £5.00 (single), £6.00 (joint) and further details are available from: *Hon Sec, Mrs Glenys Anthony, PO Box 424, Chelmsford, Essex CM6 3UR.*

Special Event Station

The Wordsley Radio Club, based at Stourbridge in the West Midlands, will be operating a special event station at the 65th Anniversary of the Wordsley Carnival, which is one of the largest of such events in the Midlands.

Look out on the h.f., v.h.f. and u.h.f. bands (including ATV) for GB2WRA, which will be operational from 1700 hrs on 22 June to 1200 on 24 June. A special QSL card will be issued to all stations contacted.

For further info contact: *Andy Sherratt G4TGM on Kingswindford 295082.*

Name Change

In order to unify corporate identity in the future, National Panasonic (UK) Ltd. will, as from 1 April, 1984, change its name to Panasonic UK Ltd.

Consequently in Europe, all products presently marketed under the "National" brandname will be gradually phased out within the first half of this year and changed to Panasonic.

Panasonic UK Ltd., 300/318 Bath Road, Slough, Berkshire SL1 6JB.

Special Event from XR10B

In aid of the Highland Scanner Appeal, a group of radio and keen CB operators will be taking to the Sutherland Hills on 2 and 3 June 1984.

The amateur radio group will be operational on 14MHz (20m), 7MHz (40m), 3·5MHz (80m) and on 144MHz (2m) s.s.b. The CBers will be using the 27MHz CB service frequencies and are hoping to work many CB enthusiasts, far and wide.

Using the callsign GB2DOS, which stands for Duke of Sutherland (subject to approval by the authorities), the station will be located on the summit of Beinn A'Bhragaidh at 349m a.s.l. and 2·5km North West of Golspie.

Special QSL cards, from both CB and Amateur Radio Stations, will be sent to all confirmed contacts.

For further information, contact: *P. Gane GM4SUF, The Studios, Ardmore Lodge, Edderton, Ross & Cromarty, Scotland.*

Mods

No.29 Roger Hall G4TNT(Sam)

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

BEARCAT 100

As promised in May, here is a way that those of you who are fortunate enough to own a **Bearcat 100** can trick it into receiving outside its pre-programmed band edges. This was passed on to me by Terry Edwards at the Radio Shack, the importer of the Bearcat range of receivers.

First press MANUAL to stop the set scanning, which it does when it is first switched on. Then press 8 7 then LIMIT. Then press 8 8 and then LIMIT again. Then press SEARCH, then HOLD and then MANUAL. Now press 1 3 8 and then LIMIT. Press 1 3 7 then LIMIT and the display will then read ERROR. Ignore this and press SEARCH, then HOLD and then LIMIT. The display will now read 138.000 and by repeatedly pressing the LIMIT button, the set can be made to step all the way down to 88MHz. This is a very tedious process, so instead of pressing LIMIT, press SEARCH and the set will automatically search from 88MHz all the way up to 138MHz. Some broadcast stations can be received but, as the Bearcat 100 was designed to receive narrow band f.m., it does not handle wideband broadcast signals very well. It is also quite deaf in this portion of the band, but this can probably be cured by a quick twiddle inside—BUT ONLY TRY THIS IF YOU KNOW WHAT YOU ARE DOING!

Substituting 6 6 and 6 7 for 8 7 and 8 8 in the above procedure will make the set cover from 67MHz up to 138MHz.

Once you have entered the 88–138MHz loop, it is then possible to trick the set once again. Press DECIMAL, then ENTER and the display will then read ERROR. Press the SEARCH button and the receiver will start searching upwards from 318MHz. It carries on doing this until it reaches approximately 327MHz and then it reverts back to 88MHz.

Another useful trick is to substitute 4 0 6 and 4 0 5 for 1 3 8 and 1 3 7 in the above routine. The display will again read ERROR but pressing the SEARCH button will then make the set search upwards from 88 to approximately 142MHz when it will revert to 88MHz. To make it go down from 406MHz it is necessary to manually step down using the LIMIT key. This seems to take forever but it is worth it if there is a specific frequency that you want to reach.

Unfortunately there does not appear to be a way of entering out of band frequencies into a memory channel. I would be very pleased to hear from anyone who can figure out a way of doing this and if I do find out, I will pass it on in a future issue.

WANTED

Once again the Wanted file is starting to bulge, so it must be time to publish a few more.

James Jarrett wrote in from Penge to ask why there was no Mods column in our October issue and also to ask if it would be possible to publish a list of scanners that can be modified and references to previous issues of *PW* that contain details. Well James, we do publish a list of all the mods that have appeared in *PW*. Every twelve columns or so, I publish a cumulative index of all the mods that have appeared to date. I do not differentiate between scanner mods and others but as the index usually only covers one page, it is very easy to find the ones that you want. The non-appearance of the Mods columm is due to various factors. Sometimes the magazine is so full that there is just no room for it, sometimes there are some quite complicated circuit diagrams to be drawn and I underestimate the amount of time that it takes our artist to draw them so the copy is too late for that issue and sometimes I just don't write one—once in a while I do take a holiday.

I received a very nice letter from Indra YC0BQZ. He wrote in some time ago asking about mods for his Yaesu **FT-227R.** It appears that he has now obtained a copy of the workshop manual and he has now modified his set to cover 142–149·995MHz but there is still one small segment that it will not cover. This is between 142·800 and 143MHz. He says that his set will not work at all in this section and the display goes totally blank. I wonder if anyone else has experienced this problem. If you have and you know how to cure it, please write to me and I will pass it on to Indra.

Juul PE0GJG, wrote to me from Holland. He noticed that I often mention The International Users Radio Club who publish an Icom and a Trio newsletter, both of which are full of mods. Juul would like to be able to subscribe to these, but when he looked up the address for the editor, Rob Pohorence, N8RT, in the international callbook, he found that it was out of date. This is because Rob has recently moved so if you want to write to him Juul, his new address is—International Radio Inc., 364 Kilpatrick Avenue, Port St. Lucie, Florida 33452, USA.

Gordon GM4FEO, wrote to me from Dunbartonshire to ask if it is possible to extend the range of his Realistic **PRO-2001** scanner. I think not Gordon, but if any of our readers know otherwise and would care to write to me, I will certainly pass on any information that I receive.

That's all for this month. As the last two columns seem to have been dominated by scanners, next month it will be back to poking about inside a transceiver with a soldering iron.

Pass it on...

If you have a mod that you would like to pass on or if you have a request for a mod that you would like to carry out, please write to me at this address: R. S. Hall, Practical Wireless, Room 204B, Hatfield House, Stamford Street, London SE1 9LS.

HOME MADE ANTENNA ROTATOR

by C. A. Heaviside G4RWU

Faced with the need for an antenna rotator for a v.h.f. beam, and no cash to buy one, a little improvisation seemed to be called for.

Problem number one was the need for a powerful motor with a slow output, costing virtually nothing! A visit to the local car breaker's yard during a lunchbreak from the office produced a whole host of possibilities including starter motors, windscreen wiper motors, antenna operating motors and window winding motors. It also produced a ruined suit and shoes but these are not accountable in the cost calculations.

Reduction Gearing

Anybody who has tried to stop an electrically-operated window will know that such a motor has tremendous possibilities. I purchased a second-hand one for six pounds having first spent an hour ensuring that I didn't have to bring a Jaguar car door home with me.

The motor has a 90 degree reduction drive with an output speed at 12 volts of approximately 60 r.p.m. This is obviously more suitable for a helicopter than an antenna rotator and so some further reduction was needed.

Being totally ill-equipped to work in metal and lazy by nature, I investigated all sorts of ways to bodge up a pulley system to turn a 25mm mast mounted in the top of a 50mm pole.

A small lathe attachment for an electric drill produced some teak bearings to mount the 25mm aluminium post inside the 50mm section, but pulley arrangements were difficult to achieve and tended to slip when wet. When it was windy and raining antenna direction would be in the lap of the gods.

Saw Blade Gears

A problem shared usually becomes a problem that doesn't exist and it was so in this case. A bright friend suggested that a Black & Decker circular saw blade had similar sized teeth to the motor output gear and might do. How right he was—just file off the points to reduce the risk of ending up with two output gears instead of one and lo and behold I was in business.

The motor mounting plate, from the car door, was cut so that the 25mm tube passed through it at such a distance from the motor that the saw blade engaged smoothly with the output gear. A washer was inserted between the sawblade and the mounting plate. Cutting a 25mm hole in the sawblade entailed heating it with a blowlamp to remove the temper and then paying a social call on a friend known to have a cone cutter! His tool is not quite as good now as it used to be but he took it in good heart and so it hasn't been costed in the calculations.

The output shaft of the motor gear passes through a bush in the mounting plate and this shaft was filed to engage with a key in the 10-turn potentiometer used to provide the direction indication information.

Another lump of teak was "chucked" on the lathe and this secured the saw blade to the 25mm tube.

Inspired by my sheer inventive genius I dashed ahead at a rate of knots and screwed the motor mounting plate to the wooden top of the 50mm pole, inserted the 25mm pole, sawblade etc., and powered up the motor.

It was almost as good a feeling as passing the RAE (another recent experience) and everything worked as intended—well almost.

The rotation looked all right until I attached a broom handle in substitute for a v.h.f. beam, yet to be acquired. It was still too fast and of course it didn't stop after one rotation. The speed could be reduced by lowering the volts and still retain plenty of power, but the stopping problem would either have to be resolved or the cable left about 10m overlength to allow it to happily wrap around the pole until I remembered to switch the thing off.

By now, there was no limit to my inventive spirit and a couple of microswitches mounted side by side on a box on the mounting plate were operated by a lever contacting a pin on the rotating teak ring.

The lever operates one or other of the microswitches depending on the direction of rotation and cuts off the power.

Position Indication

Since the motor goes round some six times for a single revolution of the beam, a ten-turn pot was fitted on the underside of the mounting plate, engaged with the motor shaft.

Before completing the mechanical details, I added a couple of struts between the mounting plate and the 50mm pole to give it belt and braces and the whole assembly was well greased—including the teak bearings and all moving parts. A marine ply box was made to drop down over the 25mm shaft with a greased rubber sealing ring around the hole to enclose all the works and was bolted to tabs on the mounting plate. A bottom for the box was slid up the 50mm pole and screwed to the remainder.

Now to tackle the electrical circuits. Six-core cable (or two 3-cores) is needed to run from the rotator to the shack or operating position. Three cores provide the d.c. switching of the motor and the remaining three connect the potentiometer to the direction-indicating meter. The motor draws 4 amps and so the cable and switches need to be fairly heavy, but the current-indicating circuit would work with bellwire.

Control Circuits

Following the usual "theory not working in practice" bit, the electrical circuits shown in Fig. 1 were evolved. They are easily modified to suit a different value of masthead potentiometer or meter movement.

The control box size depends on the size of the meter and should preferably be of aluminium in order to heat sink the power resistor which drops the motor voltage to about 4V.

The unit has been in use for some time now at a height of 10m and has withstood gale force winds. At times when other amateurs have been heard recalibrating their indicators, mine has not moved. It is obviously a precaution at such times to turn the beam head-on to the wind to prevent possible damage.

Calibration is simple, requiring two people. The meter is first electrically adjusted at both ends to coincide with the microswitch cut-off points. The motor is then operated until the meter indication is centralised, and the decision is then made whether to call this north or south.

The beam is then clamped to the 25mm pole pointing in the required direction. The motor is rotated until the beam is pointing to the next required compass heading, and the meter marked accordingly.

The rotator has proved reliable in practice, and although larger in size than is usual, it seems just as efficient. At a net expenditure of six pounds, plus items from the bits box—mine and other people's!—it shows a considerable saving over commercial equivalents. There is also the tremendous feeling of achievement which comes from producing a useful item from scrap bits. ●

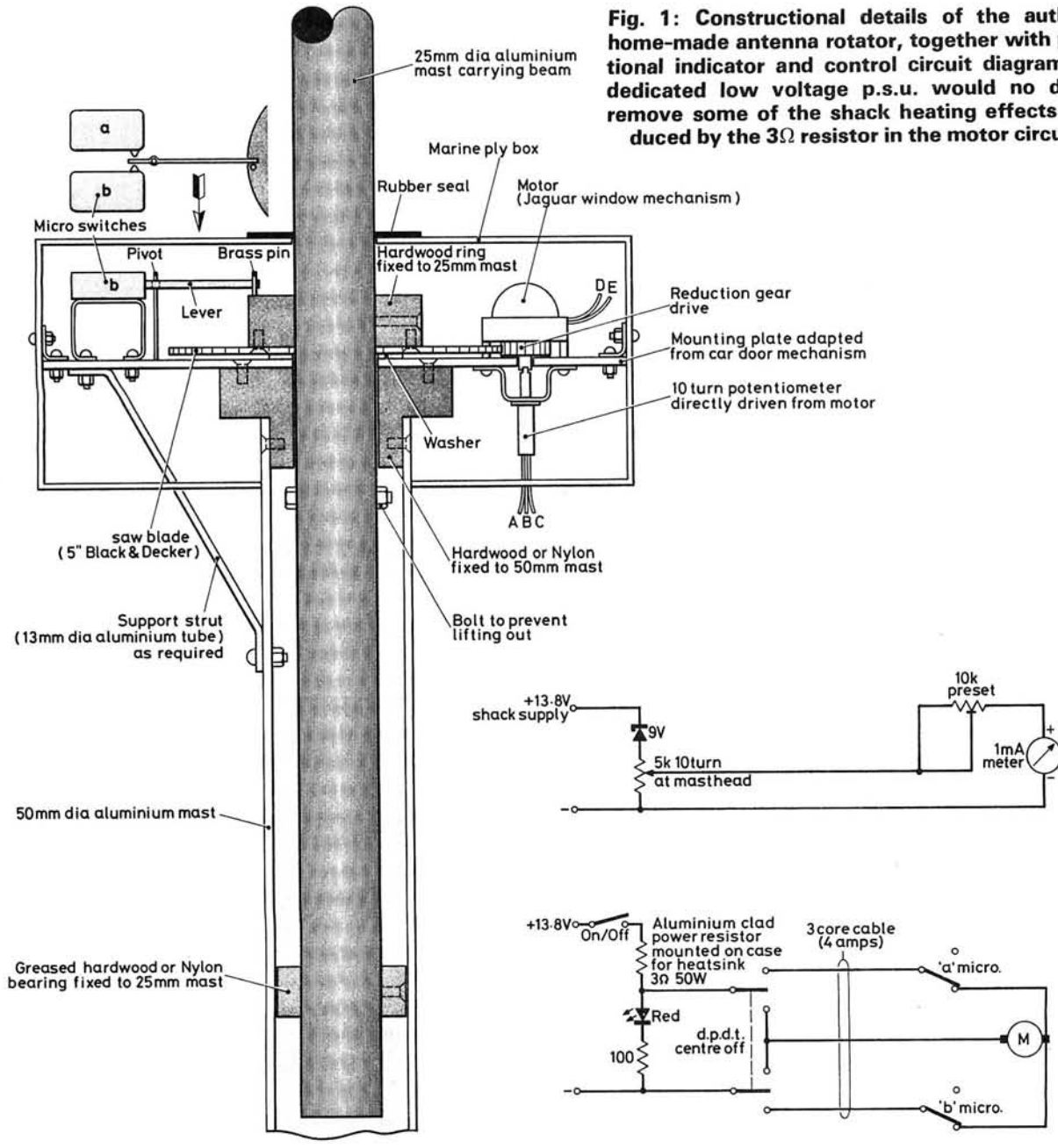

Fig. 1: Constructional details of the author's home-made antenna rotator, together with positional indicator and control circuit diagrams. A dedicated low voltage p.s.u. would no doubt remove some of the shack heating effects produced by the 3Ω resistor in the motor circuit

WRM179

Swap Spot

Have Bell and Howell 631 Film-o-Sound 16mm projector with 110V transformer plus 2·5m screen in good condition. Also have Realistic 5-channel stereo equaliser and 25W audio amp in very good condition. Would exchange for Ex-Army C42 set or any h.f. TX/RX, w.h.y. Stephen D. Shaw, 14 Rhudal Cottages, Drumlemble, by Campbeltown, Argyll. *V031*

Have Eddystone 640 communications receiver. Would exchange for an oscilloscope in good working order and in reasonable condition. Any enquiries should be in writing to Mr S. Speight, 42 Spottan Road, Parkgate, Rotherham, South Yorkshire. *V032*

Have KW77 amateur bands receiver, SX27 27–143MHz receiver, Hammarlund SP600JX receiver and Racal diversity unit. Would exchange for Racal RA63 s.s.b. adaptor, Ex WD receivers—HRO, AR88 etc. Also spare HRO coils. Tel: 0908 314095 after 3pm (Milton Keynes). *V033*

Have FT-290, 144MHz multimode with accessories, good condition. Would exchange for Trio R-600, R-1000 or Yaesu FRG-7700. Steve G6SXO. Tel: Chelmsford 59425 (after 6pm). *V034*

Have Amstrad 901 CB, 3 amp p.s.u., power reducer, s.w.r./power meter, antenna, antenna matcher, 3m pole, wall brackets, genuine Silver Eagle mic, 3-way antenna switch, RG58 coaxial cable, 5 patch leads, mag-mount and two antennas. Would exchange for good condition FRG-7700. Varney. Tel: 01-883 5488 after 6pm (Finchley). *V043*

Have Microwave Modules 2001 RTTY and ASCII to TV converter, suitable for UOSAT. Would exchange for Spectrum, Commodore 64, Vic 20 or Dragon. R. Williams. Tel: 0376 23604 after 6pm (Braintree, Essex). *V044*

Have ZX81 plus 16K. Also have R107 Mk 1/1 receiver (1950s). Would exchange for 144MHz linear amplifier or any radio offers. Tel: 061-969 1681 evenings (Sale, Cheshire). *V045*

Have Yaesu FT-708R 430MHz portable TX/RX, NC-9C charger plus Datong D70 Morse tutor. All as new, in original packing. Would exchange for FRG-7700, FT-101, R-1000, R-600 or w.h.y.? B. Aspinall G6CJL. Tel: Halifax 54635. *V050*

Have Hallicrafters SX27 receiver. Would exchange for National HRO or similar. Also have crystals 7012 to 7050kHz. Would exchange for crystals 1760 to 1810kHz. G3HVI. QTHR. Tel: 0782 393349 (Stoke-on-Trent). *V066*

Have York 3CB863 f.m. CB rig, two base antennas, s.w.r. meter, etc. Also have Realistic DX160 communications receiver (all boxed). Would exchange for 430MHz rig, 144MHz linear, computer, RTTY gear or w.h.y. Tel: Driffield 89283. *V067*

Have Lunar 144MHz linear 10W input 80W+ output. 2 x 3m sections Alumast lattice tower. 2kV x 1 amp power supply for valve linear. Would exchange for 430MHz high power linear and KR500 elevation rotator, must be working and good condition. Tel: 01-864 8261 (South Harrow). *V069*

Have brand-new SR9 144MHz f.m. receiver with antenna and magnetic mount. Would exchange for Trio 9R59DS or similar short-wave receiver. Garlick, 135 Rookhill Road, Pontefract, Yorkshire. Tel: 795821. *V079*

Have Kimball Temptation electronic organ. Would exchange for h.f. amateur transceiver and accessories. Tel: Brixham 7988. *V085*

Have 48K Sharp MZ80K computer. Would exchange for Trio R2000, Icom R70, Yaesu FRG-7700, AR2001, Trio TW-4000A, Trio TR-9500 or Icom IC490. B. Armstrong G6SRW. Tel: Horsham 54526. *V098*

Have Rotel RVC230 f.m. CB rig plus Harrier s.w.r. meter and mobile antenna plus patch lead, in mint condition. Would exchange for Heathkit RAI amateur bands only receiver or Marconi Atalanta type 2207C. Tel: Bristol 642101 anytime. *V103*

Have Yaesu FT480R, 5MHz coverage, 8 months old and hardly used. Would exchange for Yaesu FT208R, FT290R or very similar hand-held or portable plus accessories. Jeff. Tel: 0278 69799 (Weston Zoyland). *V123*

Have Asahi-Pentax MV-1 camera and Aiwa HS-JO2 personal stereo cassette (a.m., f.m., mic, auto-reverse). Both items mint, original boxes and instructions. Would exchange for FT-290 or similar w.h.y. Kemp. Tel: Swindon 783461. *V124*

Have Microwave Modules 144MHz transverter for h.f. rig, 4-element Yagi, 430MHz transverter for 144MHz rig, attenuator and 18-element parabeam. Would exchange the lot for h.f. rig, receiver or w.h.y. Peter Lewis G4VFG. Tel: Ivybridge 4030 (evenings) or Plymouth 775851 (weekdays daytime). *V129*

Have Commodore 64 computer, excellent working order. Would exchange for FRG-7700 R-600 or similar. Also Vic 20 computer. Would exchange for telescope, s.l.r. camera, airband scanner, DX-302 or w.h.y. John. Tel: 0763 61222 ext 448 (days). *V150*

Have Trio S-100 speaker (for R-1000 RX), as new. Valradio transverter e.g. 6V–240V at 20 watts. Phonic 5 channel mixer plus p.s.u. (model SM3000). National ½-track stereo O/R Tape/recorder (upright model) working well, plus 5 tapes. Also 5 x 807. Would exchange for 4 metre converter and/or TVDX gear. Mike Evans. Tel: 01-251 4950. *V170*

Have AR88 (not D) in good working order. Would exchange for a Realistic DX160 or an all-band communications receiver of similar size also in good working order. Tel: Medway 43540. *V187*

Have Olympus OM2N f1.8 as new, new o.t. 80/200 zoom plus 2X teleconverter plus numerous other items. Would exchange for FRG-7700 receiver or would consider R-600 or FT-290. Mr Rowlands. Tel: Market Rasen 843127 (after 4pm). *V193*

Have Redifon GR470B radio telephone in good condition. Would exchange for RCA77, B40D or 1155N, w.h.y.? G. Campbell, 23 Ladeside Crescent, Stenhousemuir, Stirlingshire FK5 3DG. *V194*

Have 4m ski boat. Would exchange for FT-101 or similar. J. A. Cushen, 42 Wallace Road, Bodmin, Cornwall PL31 2ES. *U088*

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BC 184L	8p	MPF 102	44p
BC 212L	11p	3SK 88	90p
BC 213L	11p	2N 697	23p
BC 214L	9p	2N 2222A	22p
BC 307	10p	2N 2646	49p
BC 237	9p	2N 2905	23p
BC 327	15p	2N 2905A	24p
BC 337	15p	2N 3053	25p
BC 441	38p	2N 3054	60p
BC 477	33p	2N 3055	48p
BC 478	33p	2N 6027	32p
BC 183L	11p	2N 3703	10p
BD 115	61p	2N 3705	10p
BD 131	39p	2N 3706	10p
BD 135	44p	2N 3773	214p
BD 136	33p	2N 3819	22p
BD 244B	30p	2N 3820	44p
BF 259	39p	2N 3904	11p
BU 205	176p	2N 3906	11p
BU 208	187p	2N 5457	39p

Capacitors
Electrolytic suitable PCB
16v Radial. 10, 22mf **7p**, 47, 100mf **9p**. 470mf **13p**. 1000mf **31p**. 2200mf **41p**. 35v Radial. 4.7mf **10p**. 10mf **10p**. 22mf **12p**. 100 mf **18p**. 220mf **23p**. 470mf **33p**. 100mf **50p**. 2200mf **82p**. 63v Range. 2.2mf **9p**. 4.7mf **9p**. 10mf **9p**. 22mf **10p**. 33mf **11p**. 47mf **12p**. 100mf **20p**. 220mf **26p**. 470mf **35p**. 63v Range Axial. 0.47mf, 1, 2.2, 4.7mf **9p**. 10mf **10p**. 22mf **17p**. 1000mf **85p**. 2200mf **169p**. 470mf 40v **32p**. 1000mf 25v axial **30p**. 4700mf 63v tag can **263p**. Clip for above **10p**.

Mains Transformers
9-0-9 1Amp **297p**. 12-0-12 1Amp **352p**. 0-18, 0-18 10VA **170p**.

Antex Soldering Irons
CS 17 Watt **544p**. XS 25 Watt **575p**. C 15 Watt **535p**.
Spare tips **85p**. IC Desolder bit XS **270p**. ST4 iron stand with sponge **190p**. Desoldering Pump **525p**. Spare nozzle **77p**. **PP3 Batt. Snaps** + Wire Lead **6p**.

Switches (More in stock)
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Plugs and Sockets
PL 259 **39p**. Reducer, large or small **14p**. BNC plug **110p**. BNC socket round hole **110p**. BNC socket square hole **130p**. 4mm plugs/sockets **22p** (banana type). 2mm croc clips **7p**. Red/Black 35mm croc clips **9p**. Insulated Dalo Etch resist pen **95p**. Assorted PCB transfers **65p**. Ferric chloride crystals ½lb **115p**. Verroboard 0.1 Pitch Size 95.25×127mm **99p**. Neon mains tester 500v max. **60p**.

Toko Fixed Inductors
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Bridge Rectifiers

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RG 58 50ohms 7/0.3mm Conductor OD 5mm **22p**/yd.
Jackson variable capacitors. Type 0 Dual gang 10-365pf **625p**. Type 0 Single gang 100-365pf **440p**.

C804 Type
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DILECON Variable capacitors, etc.
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1N 4002	5p	1N 4006	7p
1N 4003	5p	1N 4007	7p
1N 4004	6p	1N 4148	3p

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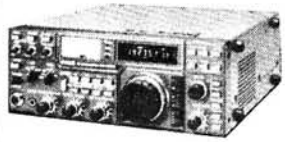

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BASIC QSOs in ITALIAN

Part 1

by G.W. Roberts GW4JXN and Paolo Pellegrineschi I5IJP

It is almost impossible to scan certain of the h.f. bands without meeting a friendly Italian station, as Italians seem to be a very active nation in the radio field. They are usually recognised by their high powered transmitters and their cheerful "cao" (tshaw) i.e. "hello" or "goodbye". For those who cannot differentiate between Spanish and Italian on the air most Italian verbs and nouns end in vowels, whereas in Spanish they end in "s".

Italian is spoken not only in Italy but also in parts of Switzerland and known by others in former Italian colonies e.g. Tunisia and in neighbouring countries e.g. Yugoslavia. There are also a large number of Americans and Argentinians of Italian origin, some of whom still speak Italian, and most Italian amateurs seem to be very interested in beaming over the UK to the United States.

Many Italian amateurs, like the Italian co-author, have good knowledge of English and revel in using it in trans-atlantic conversations. On the other hand others have a very minimal knowledge of English.

It is claimed that Italian is particularly easy to learn a little of and easy to pronounce and thus the authors hope that British and other English-speaking amateurs will start to try out their Italian on the air, albeit the very basic radio Italian taught in this article.

The Italian language (as did French and Spanish) developed from the spoken Latin of 2000 years ago and seems to have kept many of its features. Its grammar is very much like that of French. The pronunciation is fairly easy and the writing system is consistent. The pronunciation guide is a useful indication.

The type of Italian spoken here is standard spoken Italian and based on "Tuscan". This is the Italian spoken by Italians with foreigners and formally amongst themselves. The Italian custom of saying "tu"—thou to each other on the air is the one followed in this article. There is a great deal of dialectal variation in Italy so that there is no guarantee that if you heard two Italians speaking with each other that you would be able to follow their conversation. Aim to listen for Italians speaking Italian to non-Italians or to strangers rather than ragchewing with friends.

The Italian QTH system consists of a fairly lengthy system of regional prefixes with either a letter or a number or sometimes a combination of both after the initial "I" for Italy. This means that you can place your contact fairly precisely in Italy, e.g. "I5" (the regional prefix of the co-author) is that of Tuscany—the area around Florence where reputedly the best Italian is spoken. "I3" is the area around Venice, "I0" is the area around Rome. For more detailed information please consult the excellent *Amateur Radio Operating Manual*. If you are quick the QTH can be checked as it is spelt out over the air by looking at the index of a good European road map, e.g. the *AA/Marks and Spencer's Road Atlas of Europe*.

Final Comments

As this is the last in this short series "Basic QSOs in . . ." may we again remind the reader that all people appreciate being addressed in their native language, it has a good psychological effect. Furthermore foreigners' mistakes are freely forgiven and there is no need to be self-conscious when you speak a foreign language. Deal with short phrases first and then build up as you gain confidence. As no-one can see you on the radio you can read from a script. It is easier to read something than to recall it from memory. To beat the QRM you can give your report, name, location in the foreign language. Do not be put off by an Italian coming back at break-neck speed, repeat "parla piu lentamente, non dimentica che non sono Italiano"—"speak more slowly, don't forget that I am not Italian". This quick reply is because it is almost unknown for British hams to speak anything other than English. After this series, however, there is no excuse for anybody not trying a little French, German, Spanish or Italian! If foreigners were so shy of speaking English there would be very few international phone contacts indeed. We hope that this series has given you the confidence to try and return the courtesy shown us by foreign amateurs.

I have a friend in the shack!

Making a Call

CQ Italy, Switzerland, Corsica, Sardinia or an Italian speaking country. This is (own callsign) calling CQ and standing by.	CQ Italia, Svizzera, Corsica, Sardegna od un payse di lingua Italiana. Qui chiama (own callsign) e resta in attesa.	Tscheecoo Eetaleea, sveetsayra, Korseeka, Sardaynia od oon paeezay dee leengwa eesaleeana. Kwi kiama (own call) ay resta in attayza.

Replying to a Call

(Other callsign phonetically) this is the British/English/Welsh/Scottish/Irish/Australian/American/Canadian/New Zealand South African station (own callsign) calling you/returning your call. The Italian speaking station this is . . .	(Other callsign phonetically) questa é la stazione Britannica/Inglese/Gallese/Scozzese/Irlandese/Australiana/Americana/Canadese/Neo-Zelandese/Sud Africana (own callsign) che ti chiama/risponde alla tua chiamata. La stazione di lingua italiana é . . .	(Other call) kwaysta ay la statseeonay Britaneeca/Inglaysay/Galaysay/Skotsayzay/Irlandaysay/Awstraleeana/Amayricana/Canadayzay/Nayo-saylandayzay/Swd Africana (own call) kay tee keeama/risponday allah twa keeamata. La statsionay dee lingwa italiana ay . . .

After Someone has Replied to Your Call

I heard more than one station replying. Go ahead (XYZ). Try again (XYZ). Please wait. This is (own callsign). Good morning/afternoon/evening old man. Thank you for returning my call.	Ho udito rispondere piu di una stazione. Vai avanti (XYZ). Prova ancora (XYZ). Per favore attendi. Qui é (own callsign). Buon giorno/buon pomeriggio/buona sera OM. Grazie per aver risposto alla mia chiamata.	Ow wdeeto rispondayray piw dee wna statseeonay vay avantee (XYZ). Prova ancora (XYZ) per favoray atendee. Kwee ay (own call) Bwon djeorno/bwon pomayreedjeeo/bwona sayra. OM. Gratseeay per aver reesposto alla meea keeamata.
I think this is the first time we have worked each other. I think we have worked before. The name is . . . I'll spell it for you phonetically. I repeat.	Penso che questo sia il nostro primo collegamento. Penso ci siamo gia collegati. Il nome é . . . Te lo sillabo. Ripeto.	Pensow kay kwesto seea il nostro preemo kollegamento. Penso tshee seeamo djeea collagatee. Il nomay ay . . . Tay low sillabow. Reepayto.

Location

The location is . . . I'll spell it for you, in the county/state of . . . in North/South/West/East England/Wales/Scotland/Ireland/Canada/USA etc. The location is in the centre of . . ./on the island of . . ./in the small/big town/city of . . ./in the seaside town of . . .	La località é . . . Te la sillabo, nella contea/nello stato di . . . nel Nord/Sud/Ovest/Est della Inghilterra/del Galles/della Scozia/dell'Irlanda/del Canada/degli USA etc. La mia località é situata nel centro di/sulla isola di/nella piccola/grande cittadina/città di nella cittadina balneare di . . .	La lokaleeta ay . . . Tay la sillabow, nela kontaya/nello statow dee . . . nel Nord/Swd/ovest/est dayla Ingilterra/del Gales/della Skotsia/del Irlanda/del Canada/daylee WSA. La meea localeeta ay sitwata nel tshentro dee . . . swlla eezola dee nella pikola/granday tshitadeena/tsheta di nella tshitadeena balnayaray dee.
About . . . kilometres from . . . The longitude and the latitude is . . . degrees—minutes North/South, degrees—minutes East/West. The QTH locator is . . .	A circa . . . chilometri da . . . La longitudine e la latitudine sono . . . gradi-minuti Nord/Sud, gradi-minuti Est/Ovest. Il mio QTH locator é . . .	A tshirka . . . kilometree da . . . La longitwdeenay ay la latitwdinay sono gradi-minwti Nord/Swd gradi-Minwti Est/ovest. Il meeo Cw Tay Ha Lokaytor ay.

Signal Report

You are five and nine in . . . Your signal is variable/very weak/weak/strong/very strong/excellent. There is no interference. There is a lot of local interference.	Tu sei cinque-nove in . . . Il tuo segnale é variabile/molto debole/debole/forte/molto forte/eccellente. Non esiste alcuna interferenza. Esiste una forte interferenza locale.	Tw say tshinqway-novay in . . . Il two saynialay ay variabilay/molto daybolay/daybolay fortay/molto fortay/etshelentay. Non esistay alkwna interferentsa. Esistay wna fortay interferentsa lokalay.
Your signals are fading. Your modulation is good/bad. I can understand you very easily. I can understand you only with great difficulty.	I tuoi segnali sono evanescenti. La tua modulazione é buona/cattiva. Ti capisco molto facilmente. Ti capisco con molta difficoltà.	Ee twoi seniali sono evaneshentee. La twa modwlatsionay ay bwona/cateeva. Tee capisco molto fatshilmente. Tee capisco con molta difficolta.

Asking for Information and Commands

Please state your name/your location/your callsign.	Per favore indicami il tuo nome/la tua località/il tuo nominativo.	Per favoray indikamee il two nomay/la twa lokalita/il two nominateevo.
What is your country?	Quale é il tuo paese?	Kwalay ay il two payayzay?

Please spell your name/location/callsign phonetically.	Per favore sillaba il tuo nome/la tua località/il tuo nominativo.	Per favoray sealaba il two nomay/la twa locolita /il two nominateevo.
Please can you give me a report.	Per favore passami il mio rapporto.	Per favoray passame il meeo raporto.
Please repeat.	Per favore ripeti.	Per favoray repeatee.
Please speak more slowly.	Per favore parla più lentamente.	Per favoray parla piw lentamentay.
Do you have a lot of interference?	Hai molte interferenze?	Ay moltay interferentsay?
Are my signals fading?	Il mio segnale é evanescente?	Il meeo senialay ay evaneshentay?
Have we worked each other before—on this band, on 10, 15, 20 metres?	Ci siamo collegati prima su quests banda sui dieci, quindici, venti metri?	Tshee seeamo colegatee preema sw kwesta banda swee deeaytshe, kwindeetshee, ventee metree.
I'm sorry, I do not understand you.	Mi dispiace, non ti capisco.	Mee dishpeeatshay, non tee capisco.
I do not understand/speak Italian very well.	Non capisco/parlo molto bene la lingua italiana.	Non capisco/parlo molto benay la lingwa italiana.
Please speak more slowly.	Per favore parla più lentamente.	Per favoray parla piw lentamentay.
Please stand by.	Per favore resta in attesa.	Per favoray resta in atayza.
Please go again.	Per favore vai ancora avanti.	Per favoray vai ankora avantee.
Do you copy?	Mi copii?	Mee copee-ee?
How do you copy?	Come mi copii?	Comay me copee-ee?
Is this frequency free/occupied?	Questa frequenza é libera/occupata?	Kwesta frekventsa ay libera/occupata?
This frequency is in use old man, I'm sorry.	Questa frequenza é occupata OM, mi dispiace.	Kwesta frekventsa ay occupata Old Man, mee dispeeatshay.
I have a sked.	Ho chiesto.	Ow key-esto.
Can we change frequency? How about 10kHz up/down if the frequency is free?	Possiamo cambiare frequenza? Proviamo circa 10kHz in alto/basso se la frequenza é libera.	Posseeamow cambeearay frekventsa? Proveeamo tshirka deeaytshi kiloerts in alto/baso say la frekventsa ay libera.
How about S19?	Proviamo a circa S dicianove.	Proveeamo a tserka Es deetshianovay.
Can we go simplex?	Possiamo andare in simplex?	Poseeamo andaray in simplex?
I shall see you on the . . . repeater.	Ci risentiremo sul ripetitore . . .	Tshee risentiraymo swl repetitoray . . .
Shall we try on sideband.	Proviamo in banda laterale.	Proveeamo in banda lateralay.
How about Morse?	Proviamo in Morse.	Proveeamo in Morse.
I'll give you a report on the next over.	Ti darò un rapporto nel prossimo cambio.	Tea darow wn raporto nel prosimo cambeeo.

Net Working

I think it is X's turn.	Penso che sia il turno di X.	Penso kay seea il twrno dee X.
I've forgottten whose turn it is.	Ho dimenticato a chi spetta il turno.	Ow dimenteekatow a key shpeta il twrno.
Over to . . . with the group.	Il cambio a . . . con il gruppo.	Il kambeeo a . . . con il grwpo.
Break.	Break.	Break.
Over.	Cambio.	Kambeeo.

Rig and Antenna

The rig here is . . .	Qui l'equipaggiamento é . . .	Kwee lekipadjeeamento ay . . .
I'm using a . . . transceiver.	Sto usando un ricetrasmettitore . . .	Shto wzando wn reetshetrasmeteetowray . . .
I have here a . . . receiver and . . . transmitter with transverter/with a linear amplifier.	Ho qui un ricevitore . . . ed un trasmettitore con transverter/con un amplificatore lineare.	Ow kwi wn ritsheveetowray . . . ed wn trasmetitoray con transverter/con wn amplifikatoray linayaray.
I am putting out 10, 20, 50, 100 watts.	Esco con dieci, venti, cinquanta, cento watts.	Esho con deeaytshee, ventee, tshinkwanta, tshentow wats.
The rig is home brew with modification.	L'equipaggiamento é stato construito da me con modifiche.	Lekipadjeeamento ay statow kostrweeto da me con modifeekay.
My antenna is a dipole/is a trap dipole/a beam with three elements/a Yagi with 10 elements.	La mia antenna é un dipolo/un dipolo trappolato/una direttiva di tre elementi/una Yagi di dieci elementi.	La meea antenna ay wn deepolo/wn deepole trapolato/wna direteeva di tray elementee/wna yagi dee deeaytshee elementee.

Continued next month

More Holes Than A Gruyere Cheese?

by J. O. Brown LLB FCA G3DVV

Answer: The Amateur Licence

Even the name is wrong! It should be called the Amateur Radio Licence. Not just Amateur Licence. But there's a lot more that is wrong, which is a pity, seeing how helpful the authorities try to be.

Either the licence was written by an old be-whiskered lawyer who was left wondering how a food found its way into ham radio or, and this seems more likely, a retired army officer, with experience of amateur radio, drew up the regulations thinking he was writing the regimental standing orders. Seeing that 14 000 candidates take the exams every year and remembering that a quarter of the exam is a quiz on the licence, a reasonable request to the authorities would be for them to put the regulations in order.

Now, bear with me—just one tiny legal point. When interpreting i.e. finding out the meaning of, an Act of Parliament, or our amateur licence in just the same way, the legal rule says the plain meaning of the words is taken. It is not a case of what the draftsman, or Parliament for that matter, meant to say, or something which is obviously implied—it is a case of what is actually said. So, it is just too bad if there is a boo-boo in the Act, Licence, Agreement, etc., because the meaning is just taken from the actual words. OK?

Do you know how to operate in a dock or harbour? Simple. You operate as a pedestrian. The licence says (Section 1) that the operator *is hereby licensed subject to the terms etc., herein contained (v) as a pedestrian.* There are no restrictions. The restrictions only apply if you are in a vehicle or vessel as clearly stated in the previous subsection. Even the restriction about operating on the open sea does not apply if you walk on the waters—it has been done—because you are a pedestrian. Of course, what the authorities should have done would have been to put the bit about docks, harbours, estuaries and open seas in the limitations section along with the wording about aircraft and public transport, but they haven't.

What is this pedestrian nonsense anyway? Many of us have worked, usually on 144MHz, an operator on a bicycle. So he is /M—the hill is a bit steep and he dismounts becoming /P, gets back on again /M, changes his mind and back we are again with /P. All during the same QSO. Makes you feel dizzy, doesn't it. However, more seriously, what about operating as equestrian, or swimming or running. We are not licensed to do that.

Next point. You have moved to "alternative premises" and forgotten to give the required seven days notice. No problem. You simply operate from the "temporary premises" (not forgetting to sign '/A') under subsection (a) (ii) which says you can operate from any *premises for separate periods none of which shall exceed four consecutive weeks,* and then at the end of the third week you give the required seven days notice. They really have got their knickers in a twist on that one, haven't they?

Now here's one for the AND/NAND OR/NOR buffs. Section 6 (g) says that *a separate log book may be maintained for mobile or pedestrian use.* You can either say "separate log books (note the s) for mobile or pedestrian use" or "A separate log book for mobile and pedestrian use" but not the way it is put at present.

The non-interference section is a bit naughty. Tests shall be made, it says, to ensure that the *radiation of harmonics and other spurious emissions shall be suppressed . . . and details of those tests shall be recorded in the Log.* Surely that is bad practice? All the best amateurs make their tests on dummy loads. Making an entry in the log suggests that the test is "done on the air". More clarification needed here.

Do you know that every time the Secretary of State publishes your callsign he is breaking the law? Section (k) of the Notes says that *the Secretary of State regards himself as free to publish the licensee's name and address . . .* OK, but this does not give him authority to publish the callsign. He can only do what is written there—your name and address; and only that.

Have you done, I can hear you saying. Well really, but why does the schedule talk about antennas and not the English word "aerial"? ●

News

Series of Advanced Monolithic f.m. i.f. Systems Announced

The LM1865, LM1965 and LM2065 are a series of 20-pin dual-in-line devices specifically designed for use in f.m. receivers as i.f. units with a minimum of additional external components. Announced by National Semiconductors, California, on 7 March, 1984, they will doubtless be appearing on this side of the Atlantic within a reasonable time.

The LM1865 and LM2065 incorporate a stop detector for electronic tuning, whereas the LM1965 provides a deviation and a signal level mute function in addition to a mute disable facility for use in manually tuned receivers. All versions provide a low distortion output (0.1 per cent total harmonic distortion typical at 100 per cent modulation with a single tuned quadrature coil) and have a broad off-frequency distortion characteristic. If the radio receiver or the quadrature coil is mis-tuned, the total harmonic distortion is not adversely affected in circuits using only one of these devices.

The only difference between the LM1865 and the LM2065 is the direction of the automatic gain control (a.g.c.) signals. The forward direction of the a.g.c. from the LM2065 increases the control voltage which reduces the r.f. gain of the front end. All three devices have a dual threshold a.g.c. and eliminate the local/distance switch found in some circuits.

A low a.g.c. threshold is achieved with these devices whenever there are strong out-of-band signals which might generate an interfering third-order intermodulation (IM3) product, and a high a.g.c. threshold is achieved if there are no strong out-of-band signals. The high a.g.c. threshold allows the receiver to provide its best signal-to-noise performance when there is no possibility of an IM3 product.

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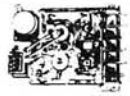

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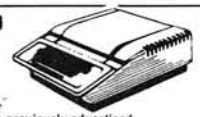

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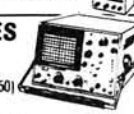

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Morse Sending Trainer

by Tony Smith G4FAI

Most methods of learning the Morse code concentrate on the acquisition of receiving skills and usually deal with sending by advising the student not to try it until he can actually read the code at some reasonable speed. In itself this is good advice since it is necessary to be quite familiar with the sound and rhythm of good Morse before attempting to send it.

Just how to acquire a good sending technique is, however, not always made clear. What follows, therefore, is a project and a system which takes over where the others leave off!

It is basically a Morse practice oscillator with adjustable volume and frequency controls having an additional input taken from a cassette player or recorder providing good-quality Morse at the desired speed. The oscillator is keyed repeatedly against this until the student can send with the same speed and rhythm with confidence. Full instructions are given later.

Additional Uses

As shown, the unit can also be used for class instruction in learning the code, and can also link up with a sub-station to provide realistic two-way practice for those building up their confidence to go on the air for the first time with their newly acquired Class A amateur licences.

In its full version it is a useful project for an amateur radio club, or other organisation, seeking to encourage its members to learn Morse, which should prove its worth over the years. A more modest version, perhaps without a loudspeaker and enclosed in a less expensive case, may well meet the needs of others.

The author's prototype Morse sending trainer together with peripheral components of the tutorial system

The Circuit

The oscillator is an NE555 integrated circuit in the astable mode with R1 controlling the frequency of oscillation. A high resistance results in a low frequency and a low resistance the reverse. The total value of R1 and R2 therefore, sets the lower frequency limit. Resistor R2 alone sets the higher limit and this can be changed to another value if required.

The oscillator is keyed to earth and the output goes to gain control R5, feeding the non-inverting input of an LM380N amplifier. In fact, the NE555 will provide sufficient output itself to drive a small loudspeaker, but the amplifier is included here to enable the external signal to be mixed with the oscillator signal and both fed to a common output. This is an unusual use for the LM380N but it works well in this application.

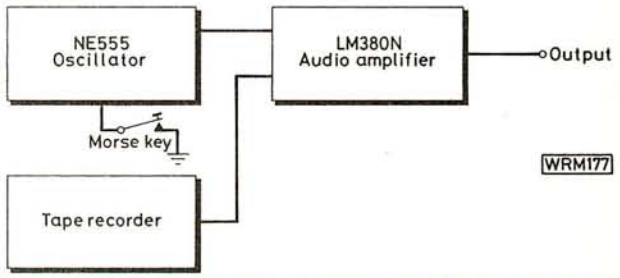


Fig. 1: Schematic block diagram of the training aid. The aim is to key the oscillator in time with the pre-recorded input to develop correct style by direct comparison

The external signal is fed to the inverting input of the amplifier via C3 and gain control R6, and the output can be taken by either a loudspeaker or headphones, the speaker being muted when the phones are in use. A low value is specified for C4, the output capacitor, to reduce the output slightly for use with low impedance headphones.

In the prototype, a standard stereo jack socket was used and wired to enable ordinary 8 ohm stereo headphones to be used without any modification. Other headphones, of virtually any impedance, can be used if desired, and the socket and wiring can be changed to suit the particular requirement.

Construction

The majority of components are mounted on a single-sided p.c.b. as shown in Fig. 3. To avoid the necessity of soldering directly to the pins of the i.c.s, sockets should be used, and the board should be mounted on spacers. The

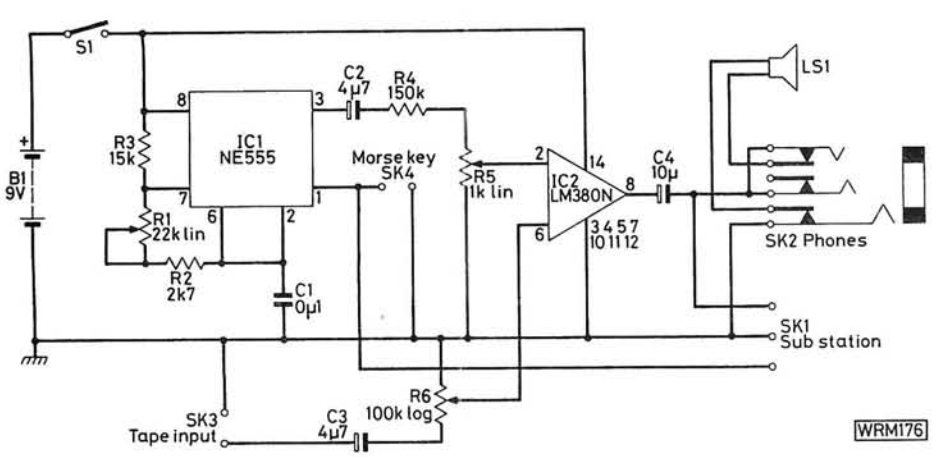
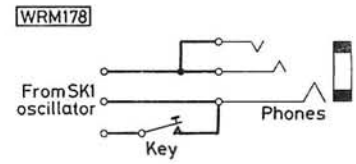


Fig. 2: Circuit diagram of the trainer together with details of the optional external sub-station. Pins 4 and 5 of IC1 are not terminated



general layout of the various controls and sockets is given in Fig. 3. As the speaker is base-mounted the case needs to have a series of holes drilled in it to provide an unmuffled output. The front panel is marked using rub-on lettering (Letraset or similar).

All wiring connections are as shown in Fig. 3. Power is supplied by a battery but if the unit is intended for regular use, e.g. in classes, an external power supply could be used. Alternatively, a larger case could be used to include the power supply. The battery is held in place by three plastics spacers fitted to the floor of the case, and by two lengths of adhesive foam strip (e.g. draught excluder) on the inside of the cover. With the gain control at minimum for headphone output the current requirement is about 1–2mA. With full speaker output this increases to about 40mA.

The various socket connections used are quite arbitrary and can be varied to suit individual requirements. The lead between the output of the cassette recorder and the input of the unit will require a connector to suit the recorder used. The input to the unit will take a wide range of impedances and it should be possible to match in other sources if required such as record players or reel-to-reel recorders.

Brief details are given for an optional sub-station. As there are only three components the layout and case are left to the choice of the constructor.

BUYING GUIDE

All items required for the construction of this project are readily available from regular suppliers. A type A Verobox enclosure (order Code 75-1238D) provides a rugged but lightweight housing

Approximate Cost £14

Construction Rating INTERMEDIATE

The Learning Process

Many learners will have been using a Morse cassette or record course. Alternatively, they may have access to practice tapes from their clubs or will, perhaps, have made their own recordings from "on-the-air" practice transmissions put out on the amateur bands by the Radio Society of Great Britain.

Although these are intended to assist in learning to read Morse, they can also be used to develop accurate sending

★ components

Resistors

Carbon film ¼W 5%

2·7kΩ	1	R2
15kΩ	1	R3
150kΩ	1	R4

Potentiometers

Carbon track

1kΩ (lin)	1	R5
22kΩ (lin)	1	R1
100kΩ (log)	1	R6

Capacitors

Electrolytic 16V single ended

4·7μF	2	C2,3
10μF	1	C4

Polyester

0·1μF	1	C1

Semiconductors

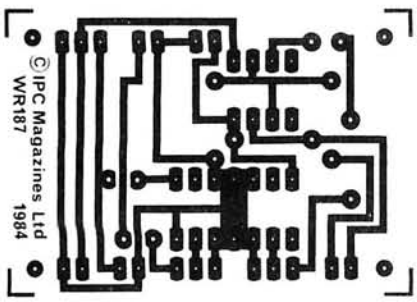
Integrated circuits

LM380N	1	IC2
NE555	1	IC1

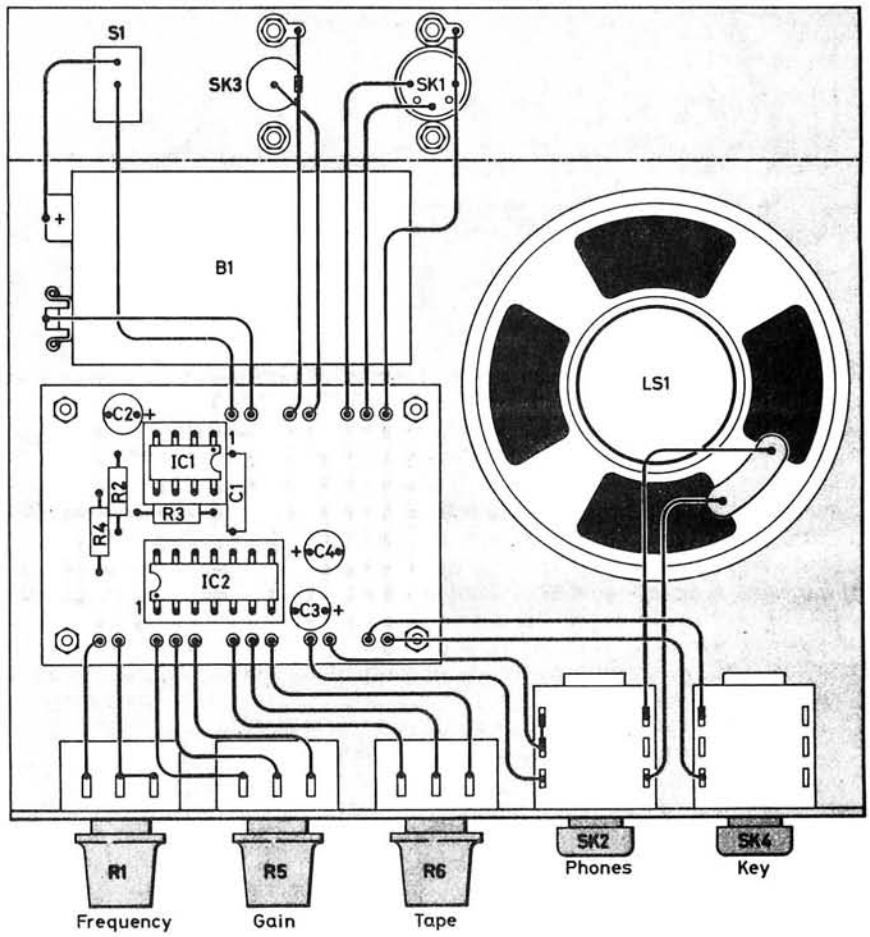
Miscellaneous

Miniature toggle s.p.s.t. switch (1); standard ¼in stereo jack socket with break contacts (1); standard ¼in mono jack socket (1); 2-pin DIN plug and socket (1); 3-pin DIN plug and socket (1); speaker, 8Ω (1); 8-pin i.c. socket (1); 14-pin i.c. socket (1); knobs (3); connecting lead to cassette recorder; connector to recorder (see text); 6F90 (PP7) battery; p.c.b.; Verobox.

Fig. 3: Component layout and p.c.b. track pattern of the Morse sending trainer, shown full size



WRM182



skills provided they are of good quality and are at the speed required for the test to be taken.

Unlike the process of learning to read the code, where it is essential the learner does not know what is coming, it is necessary now to know what is on the tape and have it written down in front of the operator. By the time a learner is ready to practice sending he should be able to read Morse at the desired speed and it should not be too difficult for him to prepare a transcript from the tape!

All that is required then is for the tape to be played through the mixing unit and for the written sheet to be followed and keyed in time with the recording. This will not be as easy as it sounds and, at first, the result may be rather discordant. As progress is made, however, there will be great satisfaction in working through the tape exactly in time with it, and the odd mistake can be noticed instantly and efforts made to correct it.

When recordings are used for learning Morse initially, it is a disadvantage that, with repetition, the student remembers what is coming and their value soon diminishes. In the application described here this is not a disadvantage at all. It doesn't really matter if the content of the tape can be remembered or not—what is important is that the recording used should contain a good mix of all the symbols required so that they can all be mastered.

When the tape is fed into the mixer initially the oscillator should be keyed and the frequency adjusted so that both signals can be clearly and separately identified in the headphones. If the tape is purpose-made, for example by a club, it would be helpful to have a continuous note for about 20 seconds at the beginning to assist with this adjustment. Of course, the entire learning process described can be simply carried out by running a separate tape recorder and Morse oscillator and listening to their loudspeaker outputs. This unit has been developed, however, to provide controlled mixing and a headphone facility in the interest of domestic peace!

Two-Way Practice

Good two-way results have been obtained over a wire 6 metres long, suitable for adjacent room operation, and the system will undoubtedly work well over much greater distances. There is no switching necessary between overs, either key will activate the oscillator and the signals are heard at both stations. This reproduces actual radio signalling conditions when the operator can hear his own signals, by means of a side-tone, whilst they are being received by the other operator.

Receiving Tuition

With its loudspeaker facility the unit will also assist a tutor in providing class-room practice in receiving Morse, although for larger groups it may be necessary to increase the output of the amplifier. This can be done by substituting a higher value capacitor for C4, a suitable value being 220μF.

Keep on Practising

The most important thing in learning Morse is regular practice. Use of this unit daily in its primary function will greatly assist in the acquisition of a good sending style which can last a lifetime. There can be few projects which offer such a long term benefit! ●

Your Life In Your Hands!

by E. A. Rule

Over the years there has been a large number of very interesting and well designed projects in the pages of *Practical Wireless* and these have ranged from simple add-on goodies to full size projects such as the PW Winton Tuner and Amplifier. In all of these articles the main interest has been in the construction and operation with little attention given to the safety aspect. Now let's be honest about this, our hobby can be dangerous and over the years there have been a number of fatal accidents from one cause or another. In this article it is intended to take a look at some of the things that can be a danger under certain conditions but which we are perhaps all guilty of taking for granted.

How many readers would go outside in a severe electric storm and fly a metal kite attached to a copper wire? Of course no-one would in their right senses, yet many radio operators have a metal object high in the sky attached to a solid copper conductor which is in turn connected to a metal box which they sit holding, **even** when there is an electric storm about! This is in fact the antenna, feeder and rig. It's a wonder to the author that the bands are not extra quiet after a storm due to a reduction in the number of operators! However, joking apart, it could be very serious, resulting in perhaps only a burnt out r.f. section of a receiver at one end of the scale but in a horrible death at the other. There is NO protection from a direct lightning strike because of the millions of volts and amperes involved (it takes about 4000 volts to jump a 6mm gap, some lightning flashes are many kilometres long, you work out the voltage!). In any case the direct strike is something you just don't worry about because you won't know anything about it!

Perhaps surprisingly, lightning goes from ground to sky, not (as many believe) from sky to ground. What happens is that an electric charge starts to build up until it is strong enough to break down the insulation of the surrounding air (through a process of ionisation), once this insulation has broken down a discharge takes place. Now electricity is very lazy and will **always** take the shortest route, so it will always start off from the **highest** point. The word "point" is important here because a sharp point helps to create the initial discharge and is one of the reasons why a good lightning conductor has several "points" at the top; these are to encourage the discharge to take place from the "proper" place. A discharge is far less likely from a smooth surface and this is why most vertical antenna designs have a small metal ball at the top, it's not just to make it look nice, it serves a real purpose.

An electric charge need not be strong enough to cause an actual lightning discharge but sometimes is strong enough to cause a repetitive crackling sound to appear in the receiver as smaller discharges take place. This sound is often heard just before or after a storm and sometimes can be caused by charged particles of rain. The point is, however, that if you hear this noise, you just might be sitting at the end of a potential lightning strike, in which case you should seriously consider improving your lightning protection! There are a number of simple things that can be done. First remove any sharp points near the top of the antenna system, provide a leakage path to ground so that the static charge can leak away before it builds up enough potential to initiate a lightning strike. With long wire antennas the best action is still the use of a good old-fashioned outdoor lightning switch; this disconnects the antenna from the equipment and grounds it to a suitable earth rod. Some years ago the author was on his way to a radio shack at one of the RAF stations as a storm was developing in the area, so it was decided to earth the top-band full-wave antenna. When the shack was entered it was in time to see sparks about 600mm in length leap from the end of the antenna to the cabinet of the transmitter; needless to say, yours truly decided it was too late to earth the antenna system and went back to the NAAFI! The sparks in this case were caused by currents induced into the long wire by nearby lightning discharges (still several km away, by the way). Even these levels of induced charge can be lethal so it is always wise to ground an antenna if there is a storm forecast.

In practice of course this may not be possible at the time so precautions should be taken as a matter of course. A method of providing a leakage path to ground which will not affect the performance of the system is shown in Fig. 1. The coaxial feeder is looped as shown and some of the insulation removed from the braiding; a metal clamp is then attached to the braiding and connected via a thick wire to a ground rod which should be at least one metre long buried in moist soil. The ground rod should be of copper. By using this simple method of grounding your antenna (which can be used with any coaxial system) any electric charge will leak to ground and not build up enough potential to start a discharge. It also makes sure that any induced currents from nearby lightning are discharged to ground. Another advantage of earthing in this way is that it often reduces the risk of TVI. Sometimes, with v.h.f. antennas for example, the actual vertical element is not provided with a direct electrical contact to the outer braid and it is important that there should be one, otherwise a charge could build up between the inner and outer conductors to a level where it could "blow out" semiconductors used in the r.f. section of a receiver. Two examples of this are shown in Fig. 2, in "A" the centre is grounded via the loading coil, but in "B" it is not. Two ways of providing a leakage path with such a system are shown in Fig. 3. One method uses an r.f. choke and the other uses a 1000 ohm resistor. The choke provides better protection *but may in* some cases cause an increase in s.w.r., the details given are a suggestion for a suitable choke but the number of turns, etc., can be varied. Not all antennas are suitable for this treatment.

There are other more elaborate methods of protection but we are only concerned here with things that the average person can do; if you want more advice on the subject a good textbook may help, or get the services of a

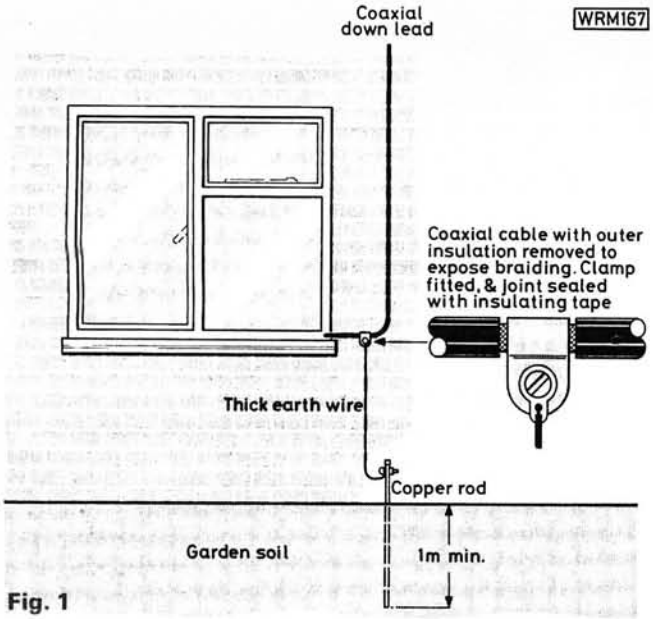


Fig. 1

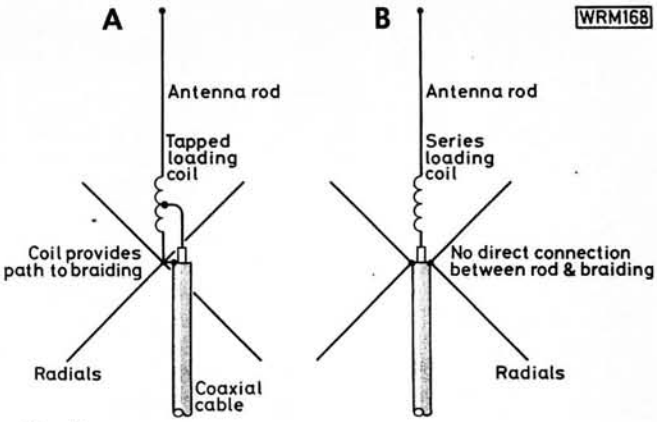


Fig. 2

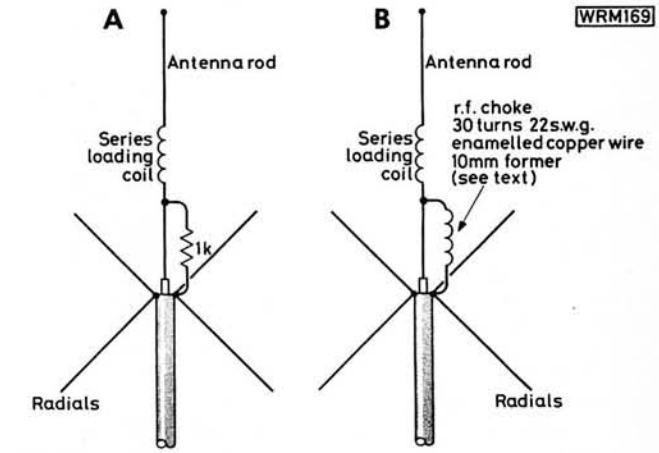


Fig. 3

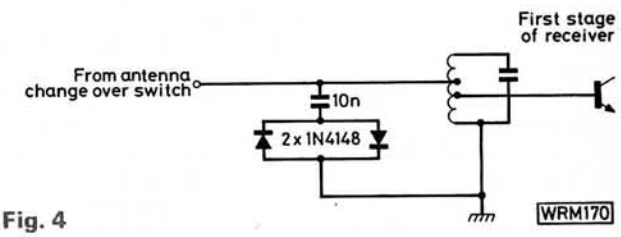


Fig. 4

professional engineer who specialises in such work. But remember, complete protection is impossible, by far the best thing to do is to disconnect and ground your antenna **before** the storm arrives.

The most common damage after a storm as far as receivers are concerned is due to the high induced voltages that can reach the first stage. These voltages can be strong enough to "burn out" the r.f. transistor or f.e.t. and the effect is a greatly reduced receiver sensitivity. Even storms many kilometres away can cause this type of damage as only a few volts are needed to damage some of the modern devices. The use of two silicon diodes "back to back" in the input circuit of the r.f. stage will give a high degree of protection and is recommended (many of the latest receivers already have these fitted). The basic arrangement is shown in Fig. 4, but they must be fitted after the antenna change-over relay and before the r.f. stage. This aspect of lightning is not of course a safety factor but mentioned in passing as a possible cause of damage to your equipment during a storm.

Turning now to other aspects of safety, the most common one is the use of "un-earthed" equipment, or incorrectly wired mains plugs (or for that matter sockets). Plugs and sockets have been known to be wired incorrectly by d.i.y. "experts" and the author recently received a nasty shock when testing a boiler installation because the system had been installed with the yellow/green earth lead wired to the neutral pin of the mains plug. For the sake of safety we will repeat here that: the brown lead is "live" and goes to the terminal marked "L", the blue lead is "neutral" and goes to the pin marked "N", the yellow/green lead is "earth" and goes to the pin marked "E". It is now illegal to supply equipment with cables having the old red, black and green colours. Regarding sockets, if you have any doubt about the wiring of these, get your local Electricity Board to carry out a check for you, their fee will be a lot less than the value you put on your life.

Equipment that is used without an "earth" (unless it is the double insulated type) is asking for trouble. If a fault develops internally, the equipment itself could become lethal and this fact may go unnoticed until such time as you happen to be touching your rig and (say) reached over to switch on a tape recorder which was earthed. You would then get the full mains voltage (which is 340 volts peak) between one hand and the other and with your heart in-between, need we say more! The same thing could be said if you are operating in a garden shed perhaps with a damp cement floor, except that this time the current will pass out through your feet—the effect is just the same! Electricity is **dangerous** and we can become far too complacent about using it. Right now, switch off your equipment and double check all the connections in all the plugs connecting mains to your various rigs, etc. Measure the continuity between metal chassis and the earth pins of plugs with a meter, MAKE SURE it is really earthed, it may be your last chance. While doing this, check and make sure that the correct fuse is fitted.

It's a pity that the standard 13 amp plug comes with a fuse already fitted because this is almost always a 13 amp one and far too large a rating for most equipment. These 13 amp fuses are only required for electric fires, kettles, irons, etc., very seldom is such a high rating required for **legal** power amateur radio rigs. A typical mains-powered rig would only need a 1 amp fuse and this would be suitable for up to about 250 watts. A 3 amp fuse would suit rigs up to about 750 watts (the wattage figures are total consumption, not transmitter power output). An average rig only consumes about 50 watts, in theory a 0·2 amp fuse would do, but if the rig has a **mains** fuse fitted then a 3 amp fuse in the wall plug is all right. Not all power supplies have a mains fuse, some only have secon-

dary circuit fuses fitted and although these will protect the equipment in the event of a fault, they will not protect you if a fault develops that puts mains supply voltages onto the chassis or cabinet. Providing you have a correctly rated fuse somewhere in the **mains supply circuit** you will have maximum protection providing your equipment **is correctly earthed,** otherwise it would still be possible to receive a fatal electric shock **even if the mains fuse had blown.** One very important fact is that the fuse must always be fitted in the "live" mains supply lead, NEVER, NEVER in the neutral. The same statement also applies to mains on/off switches, this is why it is so important to wire the brown and blue leads to the correct terminals in the plug, because if they are reversed, the equipment fuse is placed in the neutral lead instead of the live. If the leads are reversed **and** a fault occurs, then Fig. 5 shows what can happen.

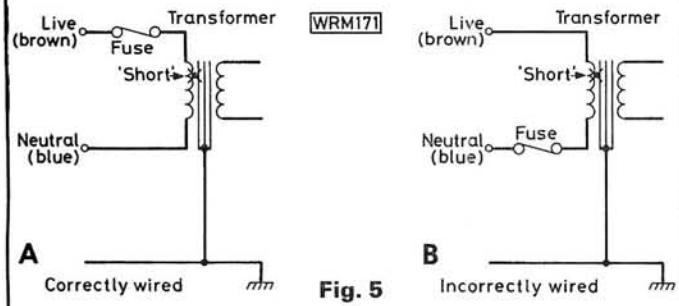


Fig. 5

Quite a lot of imported equipment only has a twin mains lead fitted for the mains input, and unless this is of the double insulated class of equipment it is illegal to sell. Double insulation here does not refer to a mains transformer with separated primary and secondary windings but to a special form of insulation which prevents the user touching any live parts, **or parts that may become live under fault conditions.** Equipment with only a twin mains lead rarely states which is "live" and "neutral" and it is very easy to get the mains switch and/or fuse into the neutral lead instead of the live, which is potentially dangerous. More so, because no earth is fitted. Unless you really know what you are doing, don't buy equipment with a two-core mains lead unless it has the British Standards label attached stating that it meets the relevant standards. Statements by manufacturers or importers that "it is designed to meet such and such a 'standard' " **DO NOT MEAN** that it has passed that standard, and such statements are designed to mislead. If the equipment HAS passed a BSI standard test **IT WILL CARRY A LABEL SAYING SO.**

After all this you could be excused for thinking about a safer hobby! But after all is said and done, this is a serious subject and one that is not often mentioned so do consider all the points raised carefully, as your life is in your hands.

The comments so far refer of course mainly to base station installations but there are a few points to consider concerning mobiles. As mobile rigs obtain their power from the vehicle battery it is very important that a suitable fuse is fitted as close as possible to the actual battery terminal. The reason for this is that if no fuse is fitted and a short occurs along the power supply lead to the vehicle chassis a very large current could flow causing the wire to become "red hot" and this could cause a fire. A suitable fuse would "blow" long before a fire risk was likely, but it must be fitted close to the battery terminal because the length of wire between the terminal and fuse is NOT protected. The best method is to use an "in-line" fuse holder close to the battery terminal. A fuse rating of about 5 amps should give maximum protection. Any hash filters, etc., should be fitted after the fuse and not between the fuse and battery connection.

Another danger comes from "free" microphone leads. Many operators hold the microphone in one hand and steer with the other, the idea being that they will "drop" the microphone if anything happens. Trouble is, it is very easy for it to fall under a foot pedal or get entangled with the steering wheel. By far the safest method is to use a microphone fitted to a boom which is attached to the vehicle; this leaves both hands free for driving, etc. An extension switch for transmit-receive could be fitted in a similar way to the "dip" switch or perhaps use could be made of a "voice operated switch" (idea for a project for *PW*, don't all rush). Using single ear-piece headsets is another much safer way of transmitting whilst mobile, but remember they must only have one ear-piece. Some of the types on the market have a VOX unit incorporated in them.

One final point. Rigs should always be firmly fixed in position and this includes loudspeakers, etc. The author was once in a car which had the speaker just lying on the rear parcel shelf; now if that car had made a sudden stop in an emergency, that speaker could become a lethal object capable of delivering a fatal blow to the back of the neck of anyone sitting in front of it. All equipment should be fixed down, there should be NO exceptions.

So there we are, some of the nastier sides of a hobby, next time I will try to be more cheerful! ●

Safety and The Law

Obviously, what you do in your own home is not regulated by the same laws that govern health and safety at work, but it is a good idea to take similar precautions. It's mostly a case of using common sense, though some people seem to be sadly lacking in that!

When you're out in the car, you are subject to legal restraints, notably the Motor Vehicles (Construction and Use) Regulations 1978, where Reg. 97, paragraph (2) says:

The load carried by a motor vehicle or trailer shall at all times be so secured, if necessary by physical restraint other than its own weight, and be in such a position that neither danger nor nuisance is likely to be caused to any person or property by reason of the load or any part thereof falling or being blown from the vehicle or by reason of any other movement of the load or any part thereof in relation to the vehicle.

The offence of having an "insecure load" applies not just to a lorry with packing cases falling off the back, but also to cars with rigs, loudspeakers, fire-extinguishers or first-aid boxes sliding around on the shelf behind the back seat (or anywhere else where they could be turned into a fast-moving projectile by an emergency stop). Being hit in the back of the neck by a 60 mph first-aid tin wouldn't be very funny!

If you get involved in repairing domestic radio and TV, you should be warned that there are certain components in most modern mains-powered equipment that are critical from a safety point of view. These will be identified on the manufacturer's circuit diagram with the international danger symbol:

If you have to replace such a component you must use an identical part or one approved by the manufacturer as an equivalent. Otherwise you will invalidate the equipment's safety approval, as well as very likely making it less safe for its owners and users.

+BATTERIES−

by Tony Smith

Constructors, and users of commercially made equipment, are confronted by a wide range of readily available batteries, and it is not always clear which is the best type to use. This article has been prepared, from information provided by various manufacturers, to help the user make the best choice for his particular purpose. It will be seen that the most expensive is not necessarily the most appropriate.

Zinc Carbon Types

Those having a limited life, and not intended to be recharged, are known as primary batteries. The least expensive to buy, but having the smallest capacity, are the traditional zinc carbon types, of which there are several versions. The basic cylindrical cell (U2 etc.) has been discontinued by most makers, but its successors (R20–SP2, HP2, etc.) have improved constructional features and greater capacity, utilising variations of mix in the electrolyte, anode and cathode materials to provide characteristics suitable for particular purposes.

The nominal voltage of a zinc carbon cell is 1·5V, which declines steadily in use, recovering slightly after rest periods, to an end voltage of 0·8V, when it should be discarded. The off-load voltage can provide a useful indication of its condition. This ranges from about 1·6V for a fresh cell, to about 1·2V for one which is fully discharged. They are designed for optimum use at a temperature of about 20°C. High temperatures reduce storage life, and very low temperatures result in decreased chemical activity and a reduced service life. They are of leak-resistant construction but, nevertheless, could leak corrosive electrolyte if left in equipment fully discharged for a prolonged period of time.

Some circuits have been published, and some units marketed, which recharge primary batteries to a limited extent using a system known as "dirty d.c.", i.e. a charging current with a strong ripple content. Battery manufacturers stress that primary cells are not designed for recharging and that there is always a risk of explosion from excessive gassing caused by too high a charging current.

The capacity of a zinc carbon battery varies significantly with load, duty cycle, and end voltage. The highest capacity is obtained when low current is drawn, there is intermittent use with long rest periods between discharges, and the circuit functions satisfactorily down to the specified end voltage. In these circumstances lower capacity batteries can often give a more cost-effective performance than higher capacity versions.

Flat-cell power pack batteries, such as the 6–F22 (PP3), 6–F50–2 (PP6), etc., specially designed for electronic equipment, are another type of zinc carbon battery. Leak-resistant, and having non-reversible contacts, their principal attraction is their compact construction where space is at a premium. Apart from the stand versions, the 6–F22 and 6–F50–2 are also available in higher power versions.

Alkaline Manganese

These batteries provide a much improved performance compared to their zinc carbon equivalents, especially at high current drains, but their purchase price is considerably higher. The voltage range is similar to zinc carbon, but when six or more cells are used in series the recommended end voltage per cell is 1·0V.

There is no distinct upper load limit and they could, typically, supply intermittent loads up to 2A at room temperature. Life to the specified end voltage depends on load and temperature, but nominal capacities for each size are provided by the makers, permitting some estimate of the service life of a particular battery for a given current drain.

Alkalines are leakproof under all normal conditions but leakage could possibly occur through cell insertion with wrong polarity, short circuit, reverse drive of series cells, or recharging. They perform better than zinc carbon at low temperatures and, subject to load and duty cycle, will operate over the range −20/30°C to +55/70°C. A storage life of 2½ years at 20°C would give, typically, capacity retention of more than 85 per cent. Long term storage at high temperature, however, results in deterioration of both capacity and high discharge rate properties. Available in the main international sizes, they may be used as straightforward replacements for similar size zinc carbon batteries.

Mercury

The main advantages of mercury batteries are their almost constant voltage over their effective life, high energy density, and good storage characteristics, making them particularly suitable where voltage stability or space are important factors.

There are two variants, having nominal cell voltages of 1·35V and 1·4V, and the recommended end voltage in each case is 0·9V. They work well at high temperatures, but only low current can be obtained below 0°C. Voltage stability and capacity will be affected by loads in excess of the 20 hour rate, although intermittent use may not have such a detrimental effect. Storage over 1½ years can retain up to 95 per cent of initial life at mid-range loads, and the recommended maximum storage period is 2½ years.

Silver Oxide

These button cells have a nominal voltage of 1·5V. Low temperature performance is good, and they can be stored for up to 2 years at room temperature, retaining up to 90 per cent of initial life after one year. Typical uses include watches, calculators and photographic applications.

Whilst they look very similar to mercury cells from the outside, the performance of each type varies considerably.

Individual cells are manufactured for different applications, and care should be taken to identify the characteristics of a particular battery before making a final choice.

Lithium (Sulphur Dioxide) Batteries

These lightweight, high energy batteries have a higher capacity performance than other primary sources over a wide temperature range, including the ability to operate well below −18°C when other batteries fall off substantially, and their projected storage life at room temperature is 5–10 years.

Nominal voltage is 3·0V, with an end voltage of 2·0V, and they can be discharged over a wide range of current levels from as high as the two-hour rate to low drain continuous discharge in memory systems for up to 10 years. Having a higher voltage they cannot, of course, replace other battery systems on a size for size basis.

Under normal use, the makers say, hermetically sealed lithium batteries will not leak, vent or explode. However, they contain toxic materials and care should be taken to ensure they are not recharged, over-heated, incinerated, punctured, or otherwise mutilated. Having a low internal resistance they are capable of a very high current output, and built-in devices such as fuses and safety vents are provided to minimise or prevent abuse.

At present lithium batteries are very expensive and are used mainly for military, commercial, or other specialist applications. As development proceeds it seems likely their costs will become lower than other high energy types, and they may then represent a reasonably cost-effective source of primary battery power.

Other Lithium Batteries

The lithium manganese dioxide battery with 3·0V nominal cell voltage is used in watches, cameras, calculators etc., requiring moderate or low discharge rates, and higher capacity batteries are under development.

Lithium solid electrolyte batteries having a nominal cell voltage of 2·0V are intended for low power long service life in the order of a few microamps. Typical applications are semiconductor memory and sensor circuits.

Rechargeable Batteries

Nickel cadmium rechargeable batteries (NiCads) are now widely available through retail outlets. They are supplied uncharged and require constant current chargers specially designed for the task. These can be easily obtained commercially to suit different sizes and numbers of batteries, and many suitable designs for constructors have also been published. NiCads have a reasonably stable voltage dropping from an initial 1·2V per cell when fully charged to an end voltage of 1·0V, and they will deliver high current if required. The voltage range is normally quite adequate to replace that of an equivalent size primary battery giving 1·5 to 0·8V, but some circuits intended to operate with NiCads at, say, 12V utilise an extra cell to compensate for the lower nominal voltage. They require no maintenance and can be recharged hundreds of times, depending on the use they are put to. The optimum temperature for charging and discharging is about 25–30°C, but they will operate at reduced levels over the range −40°C to +60°C. They are fully sealed, although the cylindrical cells have a safety vent to release gas under conditions of abuse, such as excessively high charge rates, which re-seals automatically after use. They are shock and vibration resistant and can be charged, discharged, or stored in any position. They can be stored indefinitely in any state of charge without permanent deterioration, the only effect being a slow self-discharge from a fully charged condition which can be restored by recharging.

Whilst the ability to recharge standard size batteries makes NiCads very economical in the long term, the high initial cost of batteries plus charger is a disadvantage. Another, in operational terms, is the limited capacity of NiCads compared with alkaline manganese batteries, something which many users of low-power transceivers will have experienced. The need for fairly frequent recharging in these circumstances really calls for a spare set of fully charged NiCads to be available when the set in use becomes depleted.

Unfortunately it is not possible to identify the state of charge of a NiCad at any given time in order to determine the amount of charging necessary to bring it back to full charge. The makers recommend using a battery until it is fully discharged and then recharging it for a specified period of time. This may not always be convenient, and there will be occasions when it is desired to recharge a battery before it is fully discharged. In this case it is necessary to estimate the average current taken in mAh, add about 20 per cent and recharge for a period of time equal to the estimated recharge desired divided by the known charging rate in mA of the charger to be used.

With this practice care must be taken not to overcharge excessively, as this can result in early battery failure. Additionally, the recommended full discharge-recharge procedure should be undertaken periodically to prevent the cells acquiring a "memory" for the limited recharging cycle, which could restrict their ability to take a full charge.

The nominal capacity of NiCad cells is that obtainable when fully charged cells are discharged at a rate bringing them to an endpoint of 1·0V in five hours, i.e. when the cell is effectively exhausted. This is known as the five-hour rate, and is expressed as C/5. Slightly higher capacities are obtained from a reduced discharge rate, e.g. C/20, and reduced capacities from a higher discharge rate, e.g. 2C (half-hour rate).

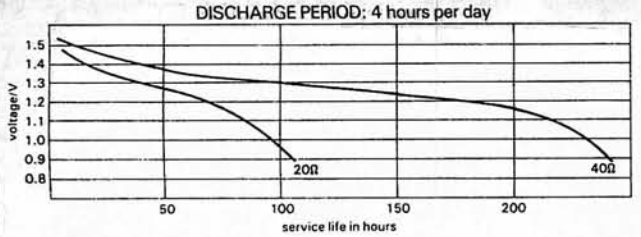
Fully discharged cells can be recharged after 14–16 hours, and left on charge for up to 24 hours, at the recommended C/10 charging rate, but care should be taken with the 6–F22 (PP3) equivalent size which can be adversely affected by overcharging. The recommended charging rate for NiCad button cells is C/50.

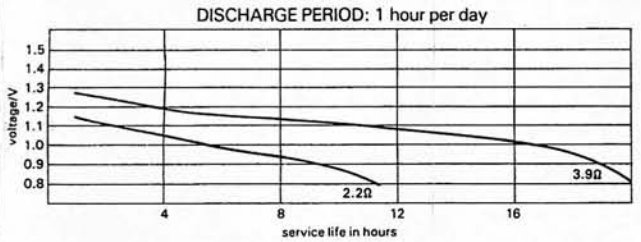
Where cells are maintained fully charged for standby emergency purposes, the recommended charge rate is C/30 which allows for normal self-discharge, but this needs to be increased following major withdrawal of charge to bring the cells back to full charge as quickly as possible.

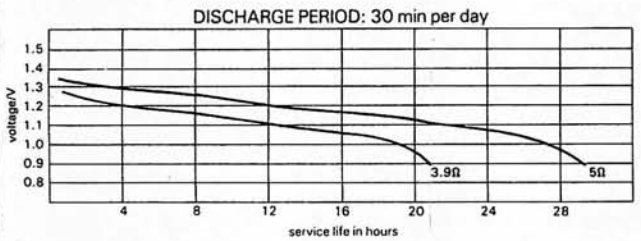
Making the Right Choice

For existing equipment the choice of battery probably revolves around the simple question—which type of a given size is the most economical for this application? Constructors can take into account other factors and, ideally, it would be better to decide on the battery first and then design the project and its circuitry to take account of the battery's voltage, capacity, physical, and other characteristics. This may not always be possible, but either way most, or all, of the following factors will be of significance:

Voltage Required: including the end voltage to which the battery drops at the end of its useful life. A circuit which will function satisfactorily to the end voltage will help maximise the life of a battery. When a circuit will not

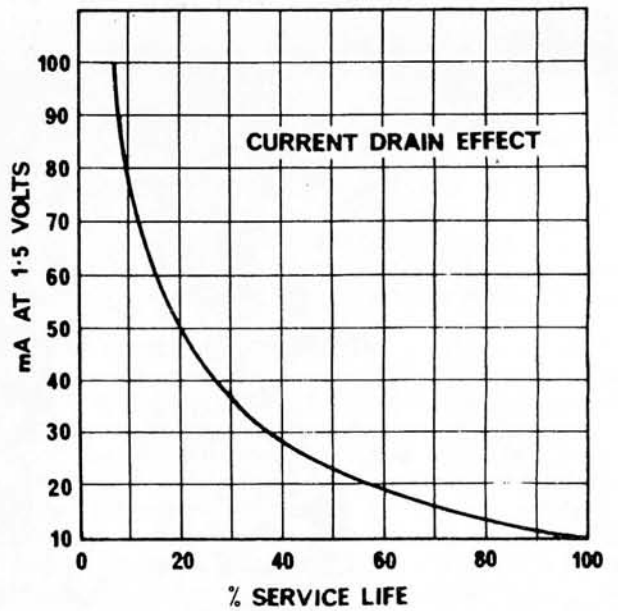






The voltage shown is plotted from the on-load voltage obtained at the end of each day's discharge (R20PP, power plus battery)

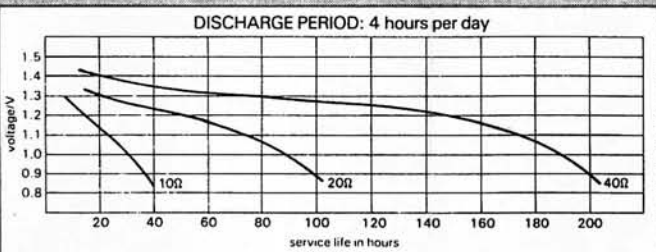
Ever Ready Co. Ltd.

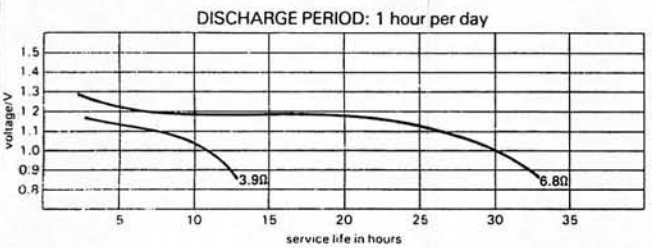


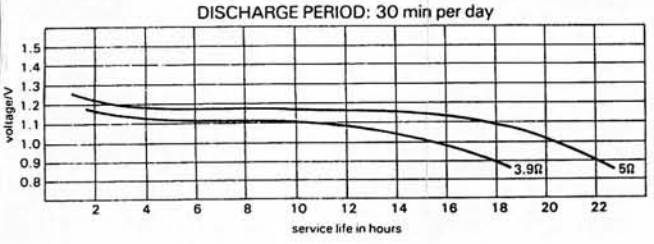
The current drain effect for an SP2 battery

Ever Ready Co. Ltd.

Grateful acknowledgements are given to Ever Ready Company (Great Britain) Ltd., Duracell UK, and Vidor Crompton Parkinson Ltd., for providing material used in this article

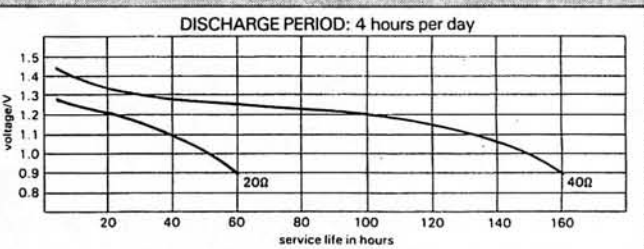


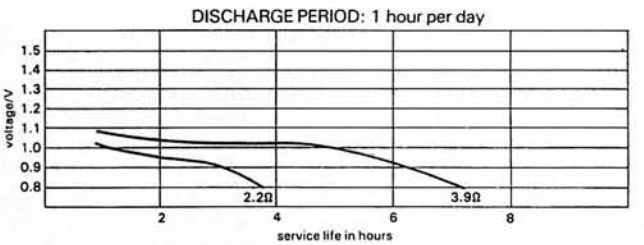


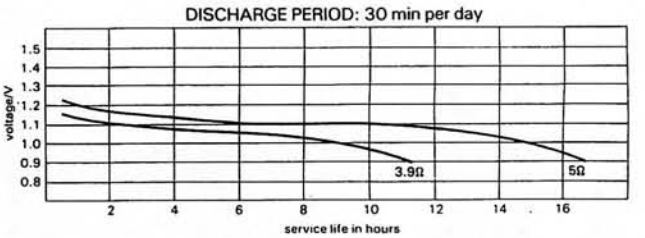


The voltage shown is plotted from the on-load voltage obtained at the end of each day's discharge (HP2 battery)

Ever Ready Co. Ltd.

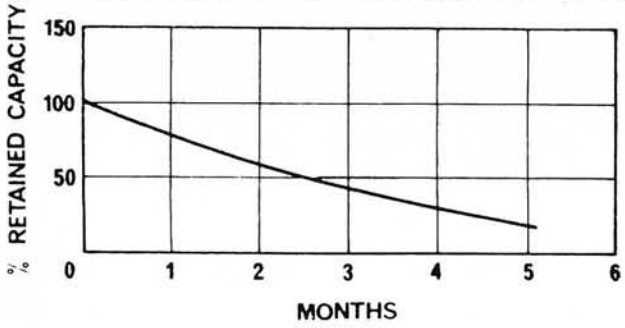






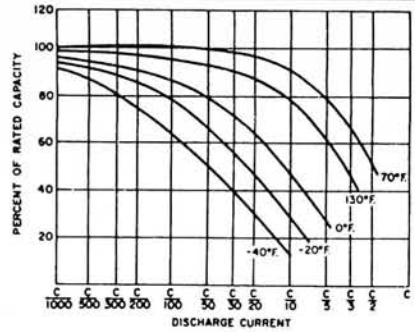
The voltage shown is plotted from the on-load voltage obtained at the end of each day's discharge (SP2 battery)

Ever Ready Co. Ltd.



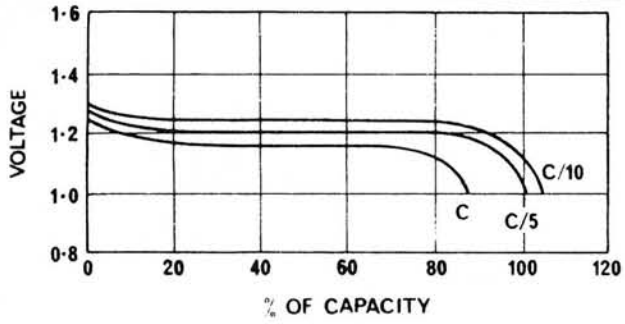
Charge retention with time for nickel-cadmium cells

Ever Ready Co. Ltd.



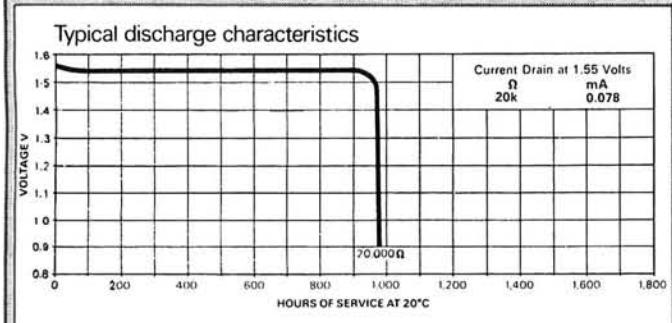
Performance as a function of temperature and load (Lithium/SO_2 battery)

Duracell UK



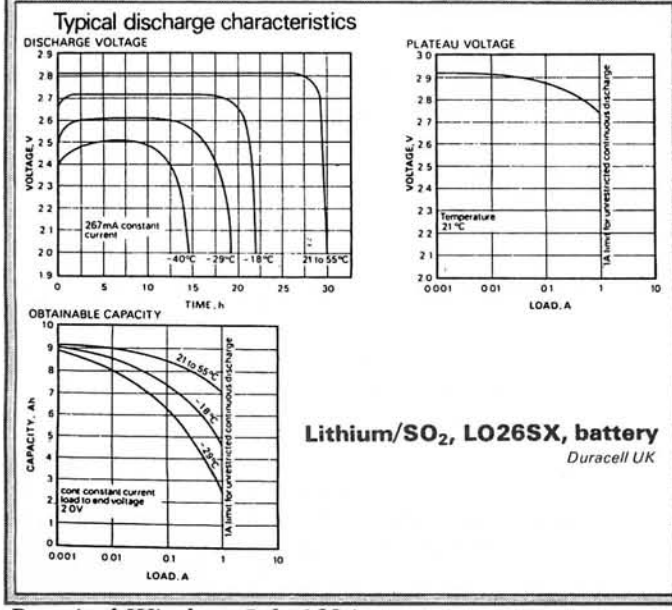
Capacity variation with discharge rate for nickel-cadmium cells

Ever Ready Co. Ltd.



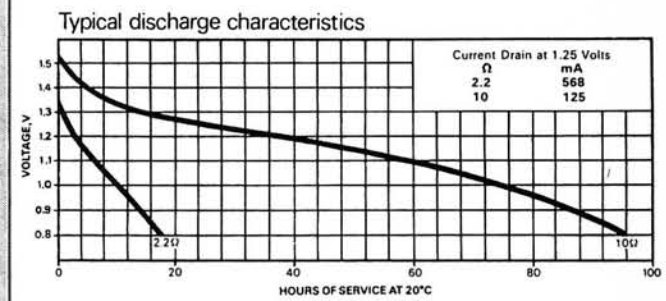
Silver Oxide, D393, battery

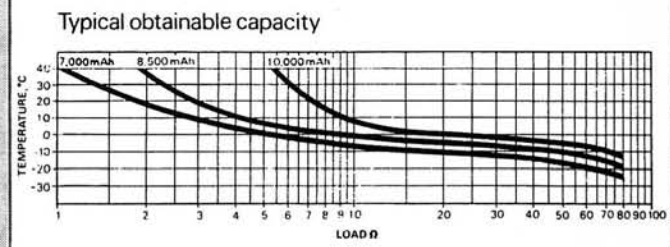
Duracell UK



Lithium/SO_2, LO26SX, battery

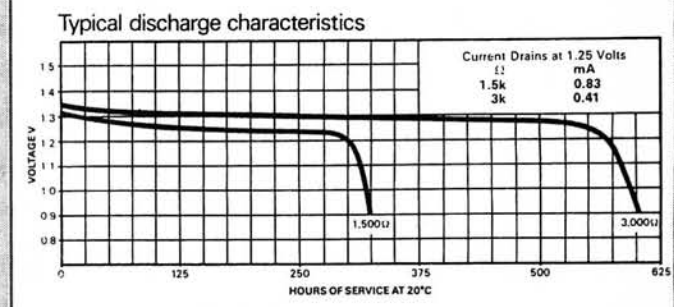
Duracell UK

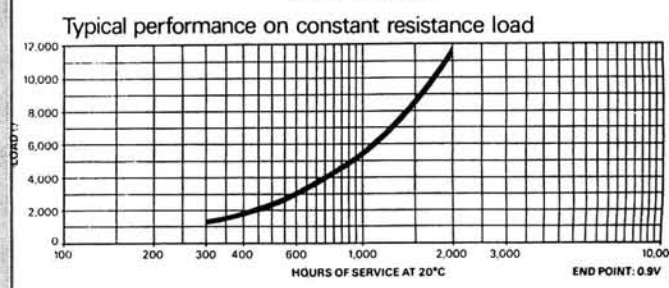




Alkaline manganese, MN1300, battery

Duracell UK





Mercury, PX625, battery

Duracell UK

work well at the lower voltage it would be helpful to add an extra cell to raise the value of the end voltage, provided the new maximum voltage is not detrimental to the circuit.

Duty Cycle: i.e. whether continuous or intermittent, will help determine the suitability of different types of battery.

Average Current: likely to be drawn will help determine the system or size to be used.

Size: of battery can affect the dimensions of the finished project.

Weight: of battery may be of significance if a lightweight portable unit is required.

Storage Life: will be particularly important if a very low current is required, sometimes making the service life virtually the same as the shelf life.

Temperature Storage: and operation outside defined temperature ranges can result in serious battery deterioration.

Cost: Careful choice can result in lowest running costs.

Availability: The type chosen should be readily available to ensure easy replacement.

Type	Equivalent	Nominal capacity	Nominal voltage
MN1300	R20 (HP2) etc.	10000mAh	1·5
MN1400	R14 (HP11) etc.	5500mAh	1·5
MN1500	R7 (HP7) etc.	1800mAh	1·5
MN1604	6–F22 (PP3) etc.	500mAh	9·0

Typical alkaline manganese batteries (Duracell UK)

Type	Equivalent	Nominal Capacity	Nominal Voltage	Standard Charge Current	Standard Charge Time
RX20	R20 (HP2) etc.	1·5Ah	1·2	120mA	14–16 hr.
RX14	R14 (HP11) etc.	1·2Ah		120mA	
RX6	R7 (HP7) etc.	0·5Ah		45mA	
RX22	6–F22 (PP3) etc.	110mAh	8·4	11mA	

Nickel cadmium batteries—technical details (Ever Ready Co. Ltd.)

Test conditions		Typical service life of fresh cell (hours) SP2	HP2	R20PP	LR20 (Alk)
(a) 40 ohms for 4 h/d	to 0·9V	160	200	243	420
(b) 5 ohms for 30 min/d	to 0·9V	16·5	22	29	34
(c) 3·9 ohms for 1 h/d	to 1·0V	5	11	16·2	21
(d) 2·2 ohms for 1 h/d	to 0·8V	3·7	4·9	11·4	14
(e) 2·2 ohms for 5 min/d	to 0·9V	7·9	9·5	12·1	13

Typical service life of "D" cells (Ever Ready Co. Ltd.)

Type of cell	%
Alkaline	100
Power Plus	48·1
High Power (HP)	42·7
Standard Power (SP)	33·51

Percentage comparison of costs of "D" cells (based on Ever Ready price list 3.5.83)

Test	SP	HP	PP	Alk	
(a)	38·1	47·6	57·9	100	Relative life (%)
	33·5	42·7	48·1	100	Relative cost (%)
	113·7	111·5	120·4	100	Relative value for money (%)
(c)	23·8	52·4	77·1	100	Relative value for money (%)
	33·5	42·7	48·1	100	
	71·0	122·7	160·3	100	
(e)	60·8	73·1	93·1	100	Relative value for money (%)
	33·5	42·7	48·1	100	
	181·5	171·2	193·6	100	

Cost-effectiveness of "D" cells
Extrapolated from data provided by Ever Ready Co. Ltd.

Type	Capacity	Rated Load	Equivalent physical size
G6	1·0Ah	44mA	R6 (AA, HP7) etc.
G52	3·2Ah	135mA	R14 (C, HP11) etc.
G20	7·7Ah	323mA	R20 (D, HP2) etc.
G22	16·5Ah	680mA	2D
G62	30·0Ah	1250mA	

Examples from the range of 3V lithium cells made by Vidor Crompton Parkinson Ltd.

The various tables and illustrations given should provide some assistance in assessing these factors and making the best choice. Grateful acknowledgements are given to Ever Ready Company (Great Britain) Ltd., Duracell UK, and Vidor Crompton Parkinson Ltd., for providing material used in this article.

Did You Know...

That Germany's radio industry boomed because Marconi refused to handle a wireless message for the Kaiser?

Early this century Marconi found he was losing his monopoly of supplying wireless apparatus to ships and shore stations. He therefore forbade Marconi operators, who were hired out along with the apparatus, to handle messages passed by rivals, except in an emergency. A great radio war then ensued, with Marconi operators and their rivals jamming each other's transmissions and being in every way obstructive. When, in 1903, the German Emperor's yacht *Hohenzollern* sailed within range of the Marconi station at Borkum, Germany, and Kaiser Wilhelm II ordered wireless greetings to be sent to his Empress, the Marconi operator at Borkum followed instructions and refused to accept the message, since the *Hohenzollern* was not equipped with Marconi apparatus. Enraged by the insult, the Kaiser ordered the infant German wireless industry to be boosted, whereupon it quickly assumed a position of world importance.

Eric Westman

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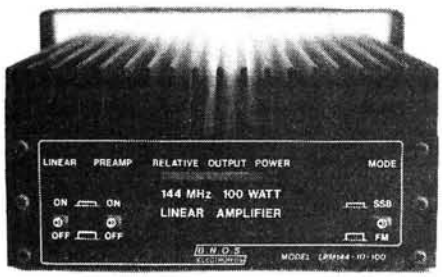

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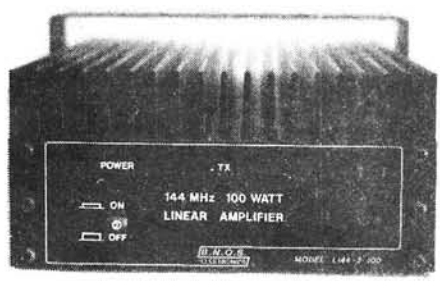

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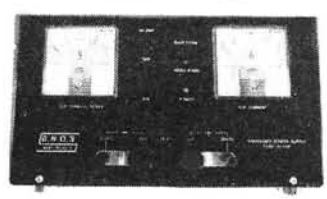

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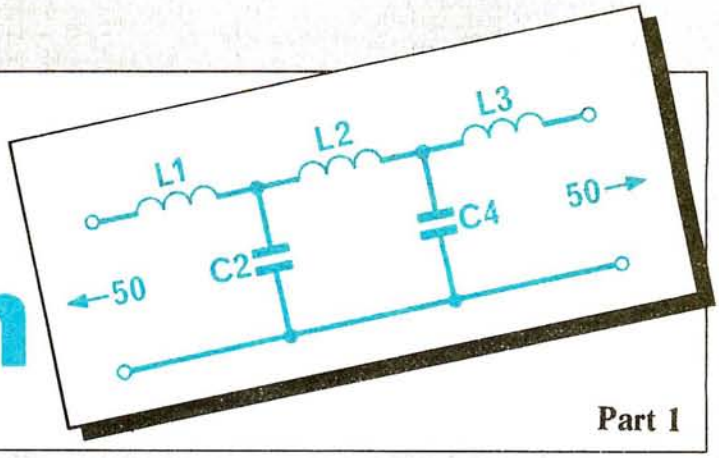
Practical LC Filter Design



by Edward Wetherhold W3NQN

Part 1

Although the passive inductor-capacitor (*LC*) filter was developed more than sixty years ago, a simple and practical design procedure still is not widely available to the radio amateur. Because this filter type has many applications in radio communications—transmitter harmonic reduction being the most common and familiar—a simplified design procedure for the amateur would be of considerable use. Modern network synthesis provides the professional filter designer with the necessary tools for designing sophisticated filters, but these procedures are unfamiliar and too inconvenient for use by the radio amateur. This article introduces a new passive *LC* filter design procedure in which one simply scans a table of precalculated designs to find a filter that is suitable for a particular application.

This new design procedure makes use of several tables of precalculated designs in which a large number of the most commonly used lowpass and highpass filters are tabulated over one decade of frequency (1–10MHz). Because of the large number of designs, the increment in cutoff frequency from one design to the next is small enough, so virtually any cutoff frequency can be selected from the table. To simplify construction, all capacitor values used in the designs are standard. By shifting the decimal points in the tabulated data, designs for other frequency decades can be obtained by inspection.

The procedures currently used by the amateur and professional filter designer involve several calculations to obtain a final design, but invariably the calculated capacitor values are not standard. Because of this, the design is more difficult to realise than it should be. In comparison, the standard-value capacitor (SVC) designs are easy to realise, because only standard-value capacitors are needed. Finding a filter using this new design technique consists of scanning the tables for a suitable design and reading out the component values. Although the designs are based on equal input and output terminations of 50 ohms, SVC designs for any equal-impedance terminations can be found using a simple scaling procedure in combination with the "scan mode" selection process. Before proceeding any further in explaining this new SVC filter design technique, a brief review of filter design and development will be presented so you can better appreciate the convenience and power of the SVC filter design tables.

History of Filter Design

The development of the first *LC* filter, independently discovered in 1915 by George Campbell in America and Karl Wagner in Germany, was based on transmission line theory [1]. A more comprehensive design procedure was published in 1923 by Otto Zobel of Bell Telephone [2]. He developed the m-derived matching sections to solve the problem of matching the filter image impedance (which varied with frequency) to a fixed resistive source and load. Zobel's image parameter filter design procedure was adequate to satisfy the filtering requirements of the electronics industry for the next thirty years. The image parameter design procedure was the only known method until about 1940 and the only practical method until the mid-1950s. The familiar terms such as "cutoff frequency", "characteristic impedance", "constant-k prototype sections", and "m-derived sections", are examples of how Zobel's invention affected the vocabulary and terminology of the communications field.

Between 1940 and 1950, a more theoretically correct design procedure was developed in which networks were synthesised to produce a desired response. Some of the people involved were Norton, Bennett, Dishall and Darlington in the US, Cauer in Germany and Cocci in Italy. This new design procedure, known as "modern filter design" or the "insertion-loss" design procedure, gradually superseded Zobel's less exact image parameter procedure. Modern filter design was found to be more versatile than Zobel's procedure and it was possible to produce networks having many different desired response characteristics with a minimum of components. Continuing application of modern filter design resulted in the development of its own unique terminology, such as "Butterworth", "Chebyshev", "Cauer" and "Bessel", to indicate a specific response type, and "passband ripple", "ripple cutoff frequency", and "minimum stopband attenuation" to describe certain characteristics of a modern filter response. In passing, it should be noted that the term "characteristic impedance" is associated solely with Zobel's image parameter design procedure, and it is not applicable when discussing modern design filters.

During the 1940s and 50s, modern filter design remained primarily in the realm of the network theorist because of the lengthy and complex mathematics required to calculate a design; however, after the development of the digital computer, it became possible to calculate and publish tables of normalised design values for the more popular filter configurations. For example, the 1958 publication of normalised Cauer-parameter (also known as elliptic function) designs by Saal and Ulrich in the *IRE Transactions on Circuit Theory* [3] gave the professional filter designer the capability to quickly and conveniently design this type of filter. In addition, Telefunken published Saal's normalised tables of Chebyshev and Cauer designs with an explanation of the design procedure in German accompanied by an English translation. This attractively bound 381-page book soon became the authoritative reference source of the professional filter designer [4]. In 1963, Philip Geffe's now classic book *Simplified Modern Filter Design* [5], also known as the "little blue book", was

the first publication to simply and clearly explain modern filter design in a manner understandable to the amateur. Since then, many other books have been published. The most recent authoritative books in English are Zverev's *Handbook of Filter Synthesis* [6] and *Filtering in the Time and Frequency Domains* by Zverev and Blinchikoff [7]. A more recent and less theoretical publication on modern filter design is *Electronic Filter Design Handbook*, by A. Williams[8]. From this brief history of passive *LC* filter design, you can appreciate the many years of effort by many different individuals that were required to reach the present state of the art.

In the following paragraphs, several of the modern filter response types and configurations will be reviewed, and those most suitable for amateur radio applications will be explored in greater detail.

Modern Filter Types

Listed in order of increasing selectivity, the most frequently used modern filter types are the Bessel, Butterworth, Chebyshev and Cauer (also known as the "elliptic"). These filters are named after the mathematicians who developed the polynomials upon which the filter responses are based. The lowpass attenuation responses of these four filters are shown in Fig. 1.1. The 3dB attenuation level has been taken as a common cutoff frequency (designated *F3* in Fig. 1.1) so the relative selectivity of the responses can be properly compared. The highpass response is the mirror image of the lowpass response.

Bessel Response—This response is characterised by a very gradual rise in attenuation that starts well within the passband with a gradually continuing attenuation rise (also called a "monotonic response") in the stopband. As you can see from the response shown in Fig. 1.1, the Bessel is not well suited for applications where an abrupt rise in attenuation is desired after the cutoff frequency. However, the Bessel provides good phase and delay characteristics to minimise waveform distortion, such as overshoot and ringing, when filtering pulse or digital waveforms. Since most amateur filtering applications are concerned with sinusoidal waveforms, such as audio or r.f. signals, the Bessel response is seldom used because of its poor amplitude response.

Butterworth—This response is similar to the Bessel in that it is monotonic in passband and stopband, and even though its attenuation rise (6dB per octave, per element) is more abrupt than the Bessel, it is not abrupt enough to be of major importance. The Butterworth response is sometimes used when a compromise is wanted between equally poor phase and amplitude performance. By coincidence, the 3-element Butterworth is identical in response and component values to the 3-element image parameter constant-k filter, but this similarity does not extend beyond three elements.

Chebyshev—This response has attenuation ripples in the passband and is monotonic in the stopband. The Chebyshev filter has the best amplitude response of the modern designs in which each branch consists of a single element. The number of ripple peaks in the passband is related to the number of branches. The 5 and 7-branch designs have 2 and 3 attenuation peaks, respectively, of the same maximum amplitude (*Ap*). This parameter directly affects the stopband attenuation slope in the first octave above the cutoff frequency. That is, the higher the value of *Ap*, the steeper the slope of stopband attenuation. After the first octave, the attenuation slope approaches 6dB per octave, per element. The cutoff frequency (*F-Ap*) for the Chebyshev and Cauer responses is that frequency where the attenuation first exceeds the *Ap* level.

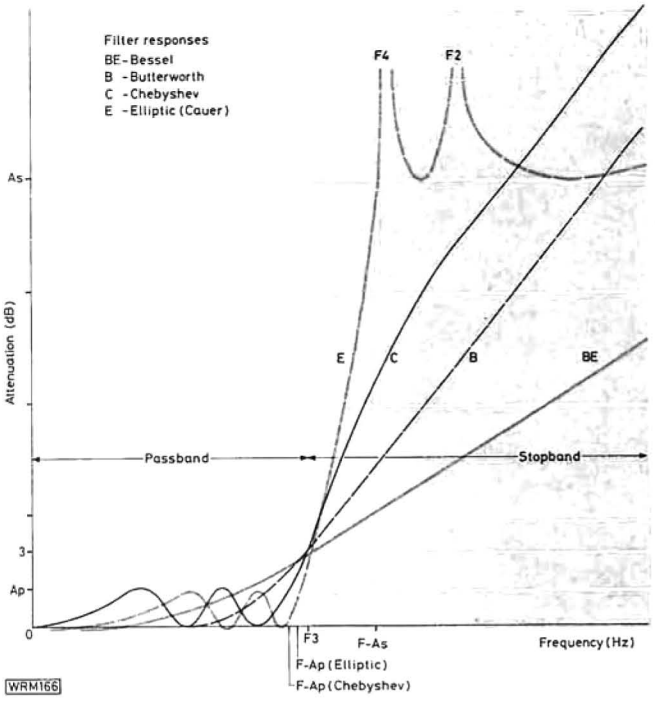


Fig. 1.1: Modern filter responses for typical 5-branch lowpass designs

The ripple amplitude in Fig. 1.1 is exaggerated for clarity. Usually, it is small enough that it is ignored because it is difficult to measure. Nevertheless, the passband amplitude is important because it is mathematically related to the v.s.w.r. and reflection coefficient of the filter. Appendix A (which appears in Part 2) gives the equations relating *Ap*, v.s.w.r. and percentage of reflection coefficient (*rc*). Because we are interested in filters with low v.s.w.r. only those Chebyshev designs having a maximum v.s.w.r. less than 1·3:1 (corresponding $Ap = 0{\cdot}074$dB and $rc = 13$ per cent) will be considered. The lowest maximum v.s.w.r. of interest is 1·020, and this corresponds to a maximum attenuation amplitude of 0·000434dB and a *rc* of 1·00 per cent. Usually, it is not necessary to know the exact v.s.w.r. at all frequencies within the passband. Instead, it is sufficient to know that the v.s.w.r. will never exceed a certain maximum value related to the passband attenuation peaks. Values of v.s.w.r. lower than 1·020 are possible, but these responses are of little interest because they are very similar to that of the Butterworth with its poor selectivity. Because the v.s.w.r. and *Ap* parameters have awkward numbers, the *rc* parameter will be used instead to define a particular design. This is the defining parameter used in most filter catalogues published today.

At this time, it is appropriate to include a brief explanation of the correct spelling of the great Russian mathematician, Pafnuti Lvovich Chebyshev (1821–1894), whose name is used to identify this filter response. Because the Russian and English alphabets are different, Russian names must be transliterated (changing letters of one alphabet into corresponding characters of another alphabet having a similar pronunciation). The correct Russian–to–English transliteration is "Chebyshev". Because many of his papers were published in French scientific journals, the French transliteration "Tchebycheff" was used. Many years later, English and American authors on network theory discovered that Chebyshev's polynomials (originally applied in calculating steam tables) were also applicable to the synthesis of elec-

DEFINITIONS

Like experts in most specialised fields, filter designers rely on a special jargon of their own. *Practical Wireless* readers unfamiliar with this subject may become confused when reading filter articles simply because they do not understand a few key words. The following is a list of some of the filter terms used in this article with a brief explanation.

Passive filter—a frequency selective network composed of passive elements (for example, inductors and capacitors) and generally classified by its filtering function (lowpass, highpass, bandpass or stopband) and response shape (for example, Butterworth, Chebyshev, etc.).

Lowpass filter—a filter that passes signal frequencies from zero frequency (d.c.) to some specified cutoff frequency, above which the signal frequencies are increasingly attenuated.

Highpass filter—a filter that passes signal frequencies above a specified cutoff frequency, below which the signal frequencies are increasingly attenuated.

Passband—the frequency range where a filter passes signal frequencies with little attenuation; that is, for a lowpass filter, from d.c. to the cutoff frequency. In the passband, the filter appears as a window between the signal source and the load, and practically all of the power is transmitted to and received by the load.

Stopband—the frequency range outside of the passband; that is, the region where signal frequencies are significantly attenuated. In the stopband, the filter appears as a mirror between the signal source and the load. Practically all of the power is reflected back to the source, and almost no power reaches the load.

Image parameter filter—a filter design based on image parameters that are related to transmission line theory. The image parameter design procedure has been largely replaced by the more convenient and efficient modern design procedure.

Constant-k prototype section—an image parameter filter section in which the series and shunt arms are inverse impedances, and the product of these impedances is independent of frequency: that is, $Z1_k) \times (Z2_k) = L1_k/C2_k = (R_k)^2$. R_k is a constant and is known as the "characteristic impedance" of the prototype section. This section is the "prototype" upon which the design of other image-parameter filter sections are based.

m-derived sections—a special image-parameter filter section invented by Otto Zobel having unusual impedance characteristics which allow a half section to be used to match the image impedance of the constant-k section to a fixed resistive termination. A full m-derived section can be inserted between two constant-k sections to produce increased stopband attenuation.

Cutoff frequency—the frequency that separates the filter passband from the stopband. For the image parameter and some modern designs, the cutoff frequency occurs at the 3dB attenuation level. For modern filter designs having passband attenuation ripple, the cutoff frequency is commonly taken at the frequency where the filter passband attenuation first exceeds the maximum ripple attenuation (*Ap*) level. The modern filter cutoff frequency is also called the "ripple cutoff frequency", and is designated "*F-Ap*".

Passband ripple—a passband attenuation characteristic of some modern filter types in which the passband attenuation ripples between zero and a maximum level. The maximum level of passband ripple amplitude is designated "*Ap*".

Modern filter—a filter designed by the application of network synthesis to produce a circuit having a desired performance. The procedure used to calculate design tables of modern filters is highly mathematical and is practical only with the aid of a digital computer. Fortunately, many computer-calculated normalised design tables of various filter types have been published, and this makes it practical for the experienced radio amateur to conveniently design modern filters.

tric wave filters, and incorrectly assumed the French transliteration could be copied directly into English. In 1955, the confusion concerning the English spelling of Chebyshev was resolved when a response to this question was received from a spokesman from the Russian Embassy and published in the correspondence section of the *IRE Transactions*. This same spelling, "Chebyshev", is used by the Russian-born and educated A. Zverev in his English publications.

Cauer—The most selective and versatile of the modern responses is the Cauer, named after the German network theorist who developed the mathematics associated with this response. Most English and American writers prefer to use the name "elliptic" to describe this response, as this is the mathematical function on which the response is based; however, since the three previous responses were named after those men credited with developing the associated mathematics, it seems consistent and appropriate to name the fourth response in the same manner.

The Cauer filter is the modern equivalent (in a more elegant form) of Zobel's constant-k prototype with m-derived intermediate and end-matching sections. The Cauer response is characterised by attenuation ripple in both the passband and stopband; however, as can be seen from Fig. 1.1, the shapes of the ripple waveforms are distinctly different. In addition to being able to select any maximum level of passband ripple, it is also possible to select any level of minimum stopband attenuation. This is an important characteristic because usually the filter stopband will be adequate as long as the attenuation is always greater than some minimum value, such as 45dB, for example. If you recall, the Chebyshev attenuation continued to rise with increasing frequency up to infinity, even though attenuation levels in excess of 60dB are of no practical use. In the Cauer response, the designer can specify the minimum stopband attenuation (*As*-min) actually needed for a particular application. Also, by properly selecting *Ap* and *As*-min, the attenuation peaks at *F4* and *F2* in Fig. 1.1 can be positioned near frequencies equal to two and three times the ripple cutoff frequency. This is useful when the second and third harmonics of an r.f. amplifier must be highly attenuated.

The abrupt attenuation rise in the Cauer response shown in Fig. 1.1 is due to resonant branches in the filter configuration, and this is one of the disadvantages of this filter type—careful tuning of the resonant circuits is required to obtain the expected response. The Cauer design is used whenever the transition band (the region between the end of the passband (*F-Ap*) and the start of the stopband (*F-As*)) must be minimised. Ratios of *F-As*/*F-Ap* for a minimum stopband attenuation of 40dB can vary from 1·1 for very selective filters to 1·8 or more for less selective filters.

TO BE CONTINUED

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1·3GHz ATV Converter

ATV activity on the 1·3GHz (24cm) band is increasing rapidly. Several repeaters have recently become operational allowing area coverage. As a "first-step" introduction to microwave ATV, the CQ Centre have available a receive converter which will down-convert signals in the range 1·24–1·32GHz, allowing a.m. reception on an unmodified u.h.f. TV set.

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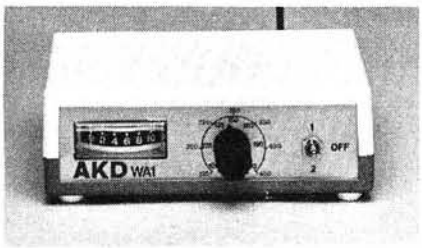
In order to comply fully with the terms of the amateur licence in respect of frequency measurement you should be able to provide equipment "capable of verifying that the sending apparatus comprised in the station is operating with emissions within the authorised frequency bands". There is also a stated need to suppress the radiation of harmonics and other spurious emissions to such a level that they cause no undue interference.

For operations on the 144MHz band this requirement can generally be met by the use of a calibrated absorption wavemeter. AKD now produce the model WA1 VHF absorption wavemeter which covers the range



120–450MHz, providing a meter readout of relative signal strength. The unit is fully portable, using a 6–F22 (PP3) 9 volt battery supply and is supplied complete with external antenna. Being a sensitive device it can also be used as a field strength meter for comparative measurements over its frequency range.

Also recently introduced by AKD is their Radio Transmissions Detector (RTD) which is designed to alert the user to the presence of close proximity radio transmissions. This unit has already found its way into the control desk area of many petrol filling stations to assist in the detection of fraudulent pump operation/explosive hazard. A development of this basic wideband (3–500MHz) detector is the model RTD–S1 which is capable of switching mains powered equipment. Suggested uses include the facility for a shop owner to arrange for internal lights to be activated by a patrolling Police officer, briefly transmitting on his personal handset.

For further details of all AKD products contact: *Armstrong Kirkwood Developments, 62 Marcourt Road, Stokechurch, High Wycombe, Bucks, HP14 3QU. Tel: (02426) 2360.*

Antenna Tuner Kit

Cambridge Kits announce the availability of their new antenna tuner kit that is a bandpass unit designed to improve reception within the frequency range 100kHz to 30MHz.

The device has switched series or parallel tuning to suit both long and short end-fed antennas, and receivers having the usual low impedance input; it is claimed to be particularly effective with indoor antennas.

Other features include a detector output to drive a meter to provide a sensitive wavemeter/field strength meter function. Alternatively, when used with headphones modulation monitoring or general coverage crystal set operation is possible. Although designed principally for receiving, the tuner will handle transmitter powers up to 10 watts.

This easy-to-build kit comes complete with ready-wound inductors, instructions, calibration chart, 140 × 70 × 40mm metal case and costs £25.20, which includes VAT and UK postage.

The Antenna Tuner Kit is available from: *Cambridge Kits, 45 Old School Lane, Milton, Cambridge CB4 4BS. Tel: (0223) 860150.*

144MHz Antenna

Ever since the introduction of the "Slim Jim" antenna, designed by G2BCX and first published in the pages of *Practical Wireless,* the popularity of the design has gone from strength to strength, so that nowadays it must be one of the most popular 144MHz vertical antennas of all time.

Gamma Aerial Products have recently introduced their "Gamma Twin," a design based on the original "Slim Jim" that has an adjustable length radiating element and produces the very low angle of radiation that this type of antenna is famous for.

Other features include a completely weatherproof connecting box and the mounting system has been adapted to allow the "Gamma Twin" to be vertically fitted directly to the mast top.

The "Gamma Twin," which comes complete with a pair of mast clamps and U-bolts, costs £7.95 (inclusive of VAT) plus £1.15 p&p and is available direct from the manufacturer: *Gamma Aerial Products, Balds Lane, Lye, Stourbridge, West Midlands. Tel: Lye (0384) 891132/891474.*

Portable Communications Receiver

Spring 1984 saw the introduction into the UK of the Panasonic RF-B600LBE portable communications receiver.

Powered by either battery or a.c. mains, the receiver covers the l.w., m.w., s.w. and v.h.f. (f.m.) bands with frequency control derived from a microprocessor controlled p.l.l. (phase-locked loop) synthesiser.

Frequency selection can be made in several ways, which include direct keyboard entry, pre-programmed scan or manual override. Nine memory channels are available that can be programmed for any frequency within the frequency range, which in turn may be scanned.

The receiver is equipped for reception of u.s.b./l.s.b., c.w., a.m. on the s.w. section and f.m. only at v.h.f. Also a switch selectable bandwidth facility, together with variable a.m. r.f. gain, is included.

Received frequency is displayed on a large fluorescent digital readout with a resolution of 100Hz in conjunction with the manual tuning option.

Elegantly styled in a silver and grey finish, the RF-B600LBE has a recommended retail price of £444.50 and is available complete with instruction manual through Panasonic's authorised dealer network.

Panasonic UK Ltd., 300–318 Bath Road, Slough, Berks. SL1 6JB. Tel: (0753) 34522.

PW REVIEW

muTek TLNA 432u u.h.f. pre-amplifier

As advances occur in semiconductor material and manufacturing methods it becomes easier and cheaper to achieve increased sensitivity v.h.f., u.h.f. and microwave equipment.

The TLNA 432u 430MHz band pre-amp from muTek is a good example of a modern front-end device for a u.h.f. transceiver and is a very good way of updating existing 430MHz equipment, which is all too often not as sensitive as it could be. For an explanation of the effects of pre-amplifiers on equipment performance you are recommended to read the G3YGF article in the November and December 1981 editions of *Radio Communication*.

The review sample supplied was the u model which is an unswitched version housed in a 100 × 50 × 25mm diecast box with BNC socket connectors. The active device used in the pre-amp is a BFQ69, which is a modern silicon *npn* bipolar transistor producing, in this design, a typical gain of 16dB at 13·8V d.c. with a quoted noise figure of 1·4dB.

The pre-amp was incorporated into the author's system at the masthead using two separate feeders and a masthead changeover relay arrangement, as shown in Fig. 1. This layout reduces the number of relays in the system and ensures that the full output of the transmitter cannot accidentally be applied to the pre-amp output. A substantial improvement in signal-to-noise ratio resulted on f.m., s.s.b. and amateur TV signals. This was due in part of course to the elimination of the feeder loss (approximately 1·8dB in the 30m run of Heliax) but was mainly due to the pre-amp input being more sensitive than all the author's receivers (an IC4E for f.m., a Modular Electronics transverter for s.s.b. and a modified domestic TV for ATV).

Having tried it out from home it was decided to give the pre-amp a severe test over the weekend of the 1983 Greenbank Observatory e.m.e. tests when it was used as part of the Flight Refuelling Amateur Radio Society station, G4RFR. The antennas used were two 24 element G3JVL design quad loop Yagis spaced 1·5m apart at 5m a.g.l.—the pre-amp and relay were placed directly at the antenna power combiner. Using this receiving system c.w. signals were heard from K8HUH throughout the weekend peaking at about 4dB above the noise in a 200Hz bandwidth and culminated in a c.w. contact with the American team.

Following this event the pre-amp was given a practical test of strong signal handling performance on VHFNFD where it was used in conjunction with a Trio TS780 on the FRARS 430MHz station, G4RAM/P. It passed this test with flying colours despite the presence of another high power contest station 8km away that could be seen with binoculars!

Throughout all these events, regardless of what receiver was being used in the station, the pre-amp never failed to produce a significant improvement in the signal-to-noise ratio of incoming signals, often lifting *inaudible* signals up to copyable strength.

Subsequent lab tests on the pre-amp confirmed the gain figure to be 16dB at 13·8V falling to 12dB at 11V. The bandwidth at the −3dB from peak gain point was found to be 12MHz (428–440MHz); at 0dB gain, 420–451MHz. With a supply of 13·8V the input signal 1dB compression point, measured at 433MHz, occurred at 90dBμV (30mV), reducing to 80dBμV (10mV) at 11V.

In practical terms these results show a good bandpass characteristic, centred on the narrowband working seg-

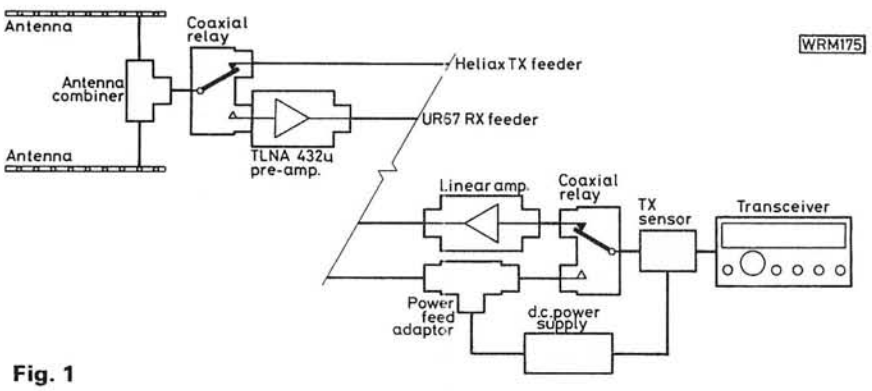


Fig. 1

ment of the band, but wide enough for ATV use. Fall off to unity gain occurs at a point below u.h.f. TV channel 21, ensuring problems are not introduced from that service. The gain figure is enough to overcome normal feeder run losses leaving sufficient gain to overcome front end noise of most oriental "black boxes". Overloading effects that occur with the pre-amp in operation will almost certainly be due to the receiver as the 1dB compression point (which gives a rough indication of the strong signal handling performance) is very good at 30mV at the input to the pre-amp.

The TLNA 432u is built to the high standard expected from this manufacturer and will make a very useful sensitivity improvement to the majority of current 430MHz equipment, especially if it can be mounted at the masthead.

Thanks for the review sample TLNA 432u pre-amp, which is currently available at £30.50 including post, packing and VAT, go to **muTek Ltd., Bradworthy, Holsworthy, Devon EX22 7TU, Telephone 040924 543.**

Nick Foot

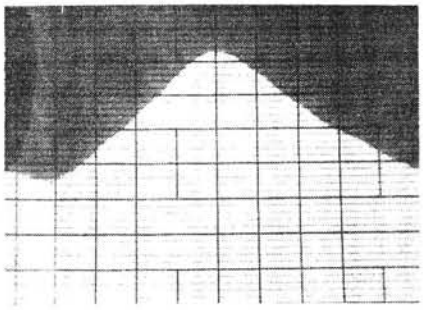
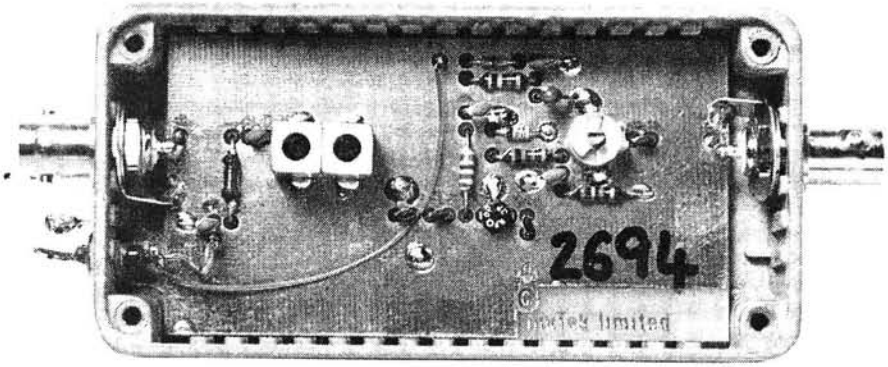


Fig. 2 (left): Frequency response plot of the TLNA 432u pre-amplifier, centred on 434MHz. Horizontal axis 10MHz/div; vertical 10dB/div, input −30dBm. An internal view of the pre-amplifier is shown below. The d.c. supply can be introduced via the de-coupling feedthrough capacitor or the coaxial output socket



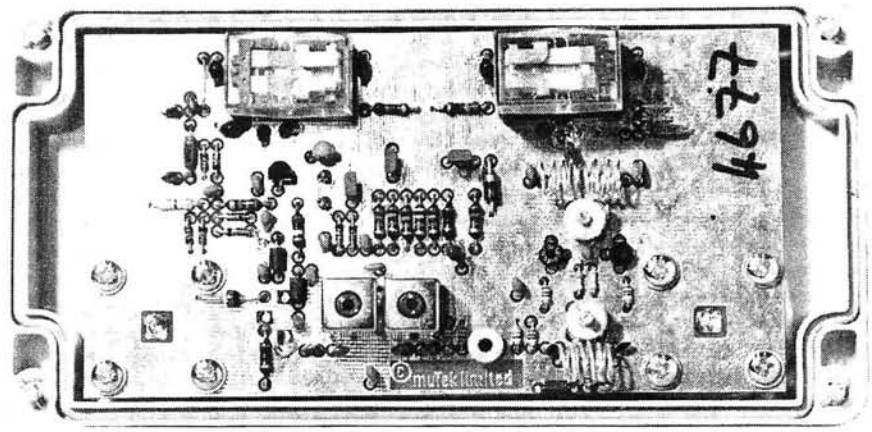
muTek SBLA 144e 144MHz v.h.f. pre-amplifier

In the August 1982 edition of *PW* the author reviewed muTek's SLNA 144s switched 144MHz pre-amplifier and concluded that it was a very effective means of improving the receive performance of the average v.h.f. station. The original device was used daily until February 1984, mainly for "moderate" power s.s.b. operation and, contrary to recommended practice, relying exclusively on r.f. VOX! Suffice to say that during this extended field trial the performance remained constant throughout. I was only persuaded to change the established system with the arrival of the SBLA 144e which was introduced in late 1983.

Unlike the SLNA 144s the SBLA 144e is supplied as a complete, *fully* weatherproofed masthead mounting assembly and is capable of handling power levels of 250W p.e.p.

With the rapid rise in 144MHz band occupancy that has occurred over the last couple of years design emphasis has been placed on strong signal handling performance together with bandwidth tailoring to suppress non-amateur transmissions. To this end the SLNA 144e features a balanced pair of BF981 dual gate m.o.s.f.e.t. semiconductors. Whilst the choice of a GaAs-f.e.t. device may appear to be more attractive in terms of ultimate noise figure, current dual-gate GaAs-f.e.t. devices cannot achieve the dynamic range of the m.o.s.f.e.t. devices. For *terrestrial* work the noise performance of this circuit places it at the point at which man-made QRN and ground noise contributions predominate, or in other words there is no point paying more money to make the ambient noise contribution louder! Microwave GaAs-f.e.t.s used at higher frequencies with correspondingly lower band noise levels or even e.m.e. systems at 144MHz, using narrow beamwidth *skyward facing* antennas, are of course a whole different ballgame. It may be a sobering fact but for terrestrial 144MHz work at least, we have reached a physical limit in terms of receiver sensitivity.

Meanwhile back to the circuit. Signals pass to the active amplification stage via a tuned input network arranged to simultaneously provide bandpass, impedance matching and balance-to-unbalance transformer characteristics. The use of silver-plated inductors and good layout result in minimal noise contribution at this critical point. Static discharge and excess power level protection devices



are included at the input to prolong the active life of the m.o.s.f.e.t.s.

The amplifier stage is terminated by a variable resistive pad allowing the user to optimise the gain on installation. This is accomplished by listening to a weak f.m. signal and adjusting the miniature on-board potentiometer until the background noise level just starts to rise. A further slight increase in gain from this point is made and will result in the best combination of sensitivity and large signal performance. Gain adjustment by alteration of the gate 2 bias has not been employed as this technique degrades the dynamic range. The final frequency response of the pre-amplifier is determined by a two-pole bandpass filter featuring screened inductive elements.

Signal routing within the pre-amplifier is controlled by a pair of "conventional" double-pole power relays, *cunningly* arranged in the circuit so that their self-inductance forms one of the elements of a low-pass filter. Control of the relays is accomplished by a variation of the circuit used in the SLNA 144s and as I mentioned at the start of this review to have operated in VOX mode (and survived) for two years must be a fair tribute to its effectiveness. Transmit r.f. is routed via low-pass filtering and rectified before being used to drive a switching transistor stage, the collector of which contains a time constant capacitor to allow "hang" during s.s.b. operations. The stage is buffered by an emitter follower which in turn drives the regenerative relay drive circuit. This later stage also switches the gate 2 bias to the pre-amplifier m.o.s.f.e.t.s. The s.s.b. time delay can be removed by cutting an on-board link, resulting in immediate reversion to receive mode when either the transmitted r.f. ceases or the hardwired control line option is in use. The r.f. VOX action overrides the transceiver control line option, which follows the ground-on-transmit standard. Details of a simple single stage inverter are supplied in the four-page instruction manual for transceivers using the alternative format.

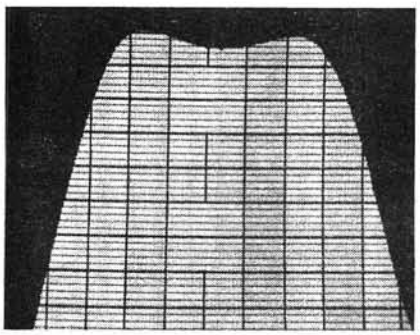


Fig. 3: Passband response plot of the SBLA 144e pre-amplifier, centred on 145MHz. Horizontal axis 1MHz/div, vertical 1dB/div, input −20dBm

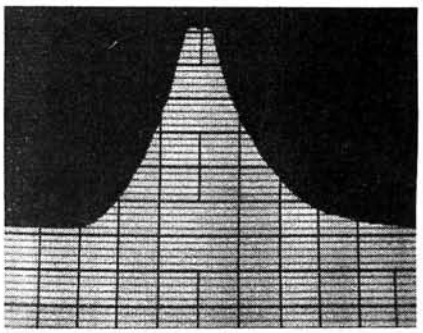


Fig. 4: Wideband response plot, centred on 145MHz, indicating the well-defined passband and excellent stopband characteristics. Horizontal axis 10MHz/div; vertical 10dB/div, input −20dBm

Apart from the complexity of the electronic side of the design, a fair part of the overall cost of manufacture may be attributed to the weatherproof enclosure. This takes the form of a substantial moulded plastics case fitted with integral O ring seal. Both r.f. connectors are N type with the d.c. input/control line using a captive plug. All three are sealed by flexible compound within the enclosure. Several so-called "weatherproof" masthead pre-amplifiers recently examined by the author have revealed assemblies that allow light to pass through (pop-rivetted socket flanges etc) let alone rainwater. Nevertheless, muTek do advocate mounting the pre-amplifier with the connectors facing downwards or in their words "you will be the proud possessor of a rather inefficient water-cooled amplifier!".

During the months since its installation the pre-amplifier has consistently performed to expectation *and can* be thoroughly recommended. Lab tests indicate the maximum gain to be 14dB, adjustable to below unity. At a supply of 13·8V d.c. (120mA on standby) gain compression occurs at −5dBm (122mV). Passband ripple over the UK band allocation was measured at 0·4dB, with the 3dB bandwidth being 7MHz, probably arranged to accommodate the wider US allocation. With the d.c. supply removed (TX condition) the through loss was approximately 0·4dB.

The SBLA masthead pre-amplifier is currently priced at £89.90 + £2.50 p&p inc. VAT, direct from muTek or their agents.

John M. Fell

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1197	SP-102P	External speaker & phone patch	69.00
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1199	FC-102	ATU	170.00
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1257	FRV-77000	Converter 118/130, 140/150, 70/80MHz	83.00
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1217	E-72L	Extension cable, 4m	14.50
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1367	RA-3	Telescoping Antenna	.
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1369	SP-40	Compact Mobile Speaker	15.75
1371	MC-46	Auto-patch Up-Down microphone	41.50
1313	MC-60A	Desk Top Mircophone, built-in pre-amp	50.00
1339	TR-9130	2m All Mode Transceiver, 25W	419.00
1372	BO-9A	System Base	45.00
1373	SP-120	External Speaker	34.00
1374	PS-30	DC Power Supply	114.00
1370	BC-1	AC Adaptor for memory back-up	6.43
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1313	MC-60A	Deluxe Desk Top Mic. + pre-amp.	52.00
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1373	SP-120	External Speaker	34.00
1307	PS-20	DC Power Supply	59.00
1370	BC-1	AC Adaptor for memory back-up	8.00
1313	MC-60A	De luxe Desk Top Mic. + pre-amp.	50.00
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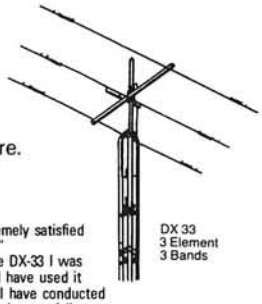

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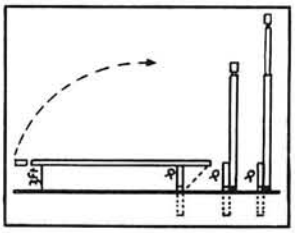

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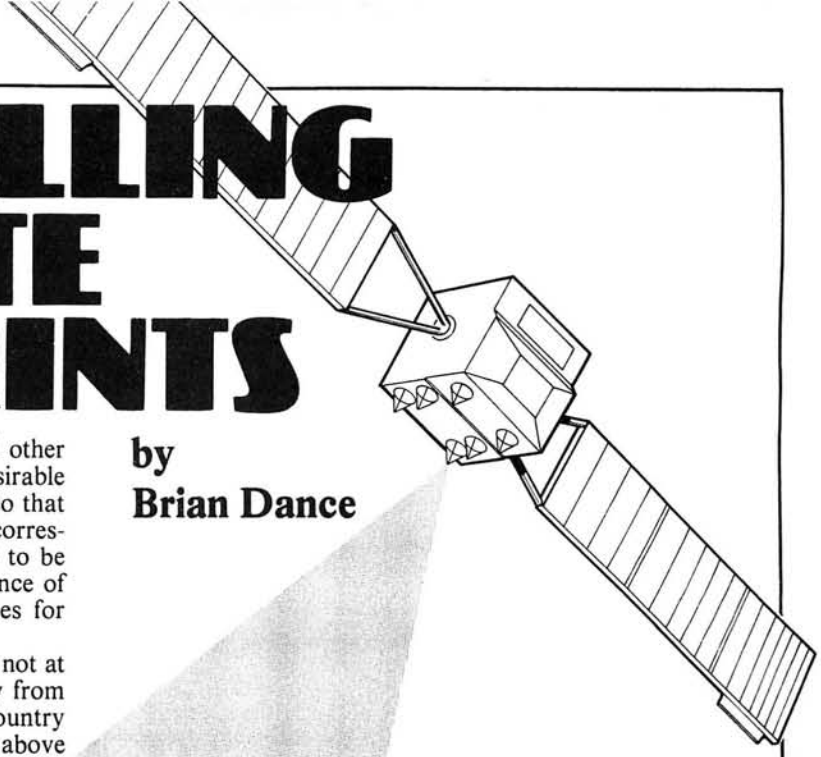

by Brian Dance

As the number of direct broadcasting (DBS) and other satellites increases in the future, it will be highly desirable to contour the beam transmitted from the satellite so that it produces a coverage area or "footprint" which corresponds fairly closely with the shape of the country to be covered. This will not only reduce mutual interference of the beams, but will also be desirable in some cases for political reasons.

The control of the footprint of a satellite beam is not at all easy, since the satellite is some 36 000km away from the surface of the earth and is not even above the country concerned, geosynchronous satellites being located above the equator. The problem is made still more difficult by the fact that the antenna system on the satellite must be relatively simple and normally only a single reflecting dish for a beam will be practically possible.

Electrical Research Association

About half a dozen teams are working on the contouring of satellite beam footprints, including Dr. Shiraz Adatia who is head of the Electrical Research Association's r.f. technology division at Leatherhead, where he is mainly concerned with the development of satellite antennas and tracking systems for commercial and military purposes. The Electrical Research Association has the largest team in Europe working on satellite footprint problems. The controlling of the shape of satellite footprints to match the boundaries of a country can be achieved by the overlapping of individual beams from a single reflector for both DBS TV and business communications. ERA has been developing extremely complex computer programs to predict the beam pattern that feeder arrays driving a single reflector will produce on the ground. Current satellites normally employ only a single beam for each reflector, but multiple beams from a single reflector dish call for extremely high precision engineering and will involve frequency re-use and TDMA (Time Division Multiple Access) in certain cases for maximum information carrying capacity.

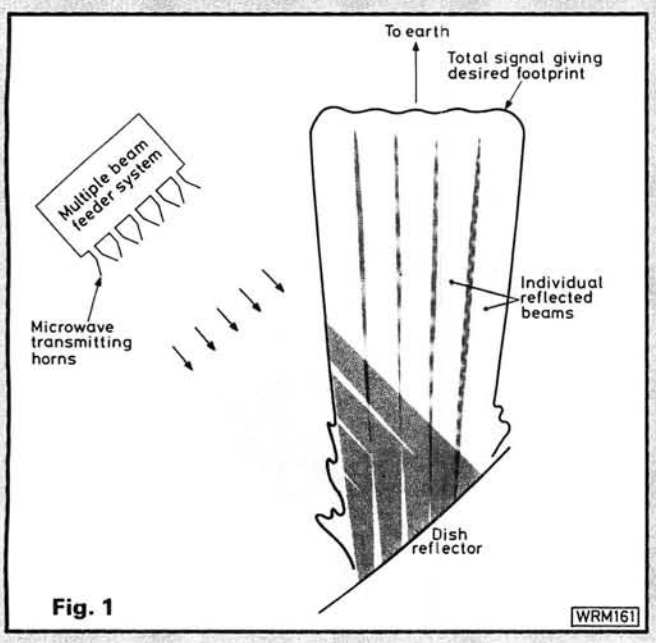

Fig. 1

As indicated in Fig. 1 several beams from a multiple-beam feeder system can be reflected to the earth using a single dish on-board the satellite to produce a very close approximation to the required footprint, yet if the system is sufficiently sophisticated the signal intensity in the region of the desired footprint area can be made fairly uniform.

Dr. Adatia has also been working on the development of extremely accurate satellite tracking systems and on economical antennas for satellite business applications.

British Aerospace is also very interested in being able to predict the footprints from satellite transmitters, since once a satellite is in geosynchronous orbit it is not a practical operation to make any adjustments to the antenna system if the footprint is not quite what is desired.

An anechoic chamber has been constructed by British Aerospace at its satellite plant at Stevenage, which is the largest facility of its kind in Europe. This can accommodate reflecting dishes of up to 5·5m in diameter and is lined with black foam rubber projections or "dragon's teeth" which are impregnated with carbon. The chamber is carefully insulated from stray electromagnetic radiation by a Faraday cage with special door contacts so that no radiation can enter through the gaps.

This facility can handle antennas weighing up to 9000kg if azimuth swinging only is needed, but another positioner can handle 1100kg dishes in both azimuth and elevation. The radiation profile of the antenna can thus be mapped out by feeding the data to a PDP-11/34 computer in a neighbouring room. The near field information can be expanded into a far field profile by computer programs using Fourier transforms.

The facility is being used to test the large spot beam antenna for the European Space Agency at the time of writing. This multibeam array model consists of 18 spot beams with a possible global beam in the centre if needed. A phased array was chosen for this application, since it offers the possibility of steering and shaping the individual beams together with better system characteristics. Transmission will be in the L band. ●

on the air

AMATEUR BANDS by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey, KT17 1NA.
Logs by bands in alphabetical order.

In the normal course of events the listener to the s.w. broadcast bands eventually comes across an amateur band mainly because he hears a station that he can't quite understand and on enquiry is told the station is using single-sideband, or s.s.b. A beat frequency oscillator is soon added, usually externally, and the amateurs can be resolved working each other across the world, a pastime much envied by the listener.

This can lead on to joining a radio club and studying for the Radio Amateurs' Examination. On passing, operation is permitted on telephony on the v.h.f. and u.h.f. bands. The wise candidate will go on at this stage to study for and pass the requisite Morse code test which allows operation on the h.f. bands as well. The situation now arises that the newly-licensed amateur has a receiver but no transmitter. Does he sell his receiver and get a transceiver, or buy or make a transmitter to go with the receiver? While the former solution is all very nice it is not a cheap way out and for many the separate transmitter is the only answer.

A fairly low-power c.w. transmitter can be a lot of fun to build and get on the air and need not cost a lot at all especially if cheap receiving-type transistors are used. The problem now arises of how to co-ordinate the operation of the transmitter with that of the receiver. Even a low-powered transmitter can grossly overload a nearby receiver and may even damage the front-end transistors, so what to do?

Basically a relay is used to transfer the antenna from the TX (transmitter) to the RX (receiver) and vice versa while the RX is muted on transmit, sufficiently to protect the set but not enough to entirely suppress the transmitted c.w. signal which can still be heard at any desired level as a sidetone for monitoring purposes. Additional protection can be added by fitting two diodes, preferably of the germanium type, back-to-back across the antenna terminals or socket at the receiver. All these functions are performed by a relay as shown in Fig. 1 which is for a valved receiver. A microswitch screwed to a thin piece of board or metal is used as a changeover footswitch thus keeping the hands free for tuning, logging and drinking tea!

Usually the r.f. and i.f. gain controls are a common potentiometer marked "RF gain" and it is necessary to lift the earth or chassis connection to add the pre-set potentiometer R2 which is adjusted on transmit for a satisfactory sidetone with the key down.

The relay itself should be for 12V d.c. operation rather than for mains operation, in the interests of safety, and the contacts for the antenna changeover should preferably be mounted on ceramic or ptfe insulation if the power output is more than a few watts. Every watt is precious! If low impedance feeder is being used to feed the antenna then no high voltages will be present on the relay.

The unit can be built into a metal box with domestic TV coaxial sockets for the antenna connections and twin flex out to the footswitch.

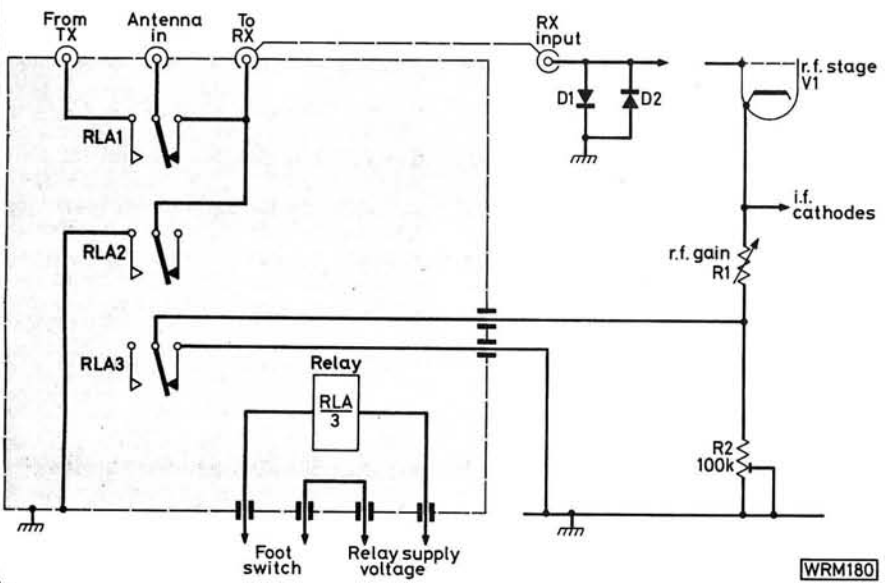

Fig. 1: Composite drawing showing the receive/transmit switching for separate transmitter and receiver. The cross-connected diodes D1, D2 should be connected by the shortest possible leads right across the receiver's antenna terminals or socket, preferably inside the set. The mod to the RF gain control is easily adapted for solid-state receivers. Note the relay contacts RLA2 which put a short circuit across the receiver's input circuit as additional protection

General

A letter from **Terry Underhill G4MWP** enclosed a cutting from a national daily newspaper in which an ad for a "portable radio and communications receiver" claimed to be able to pick up "radio hams" from all over the world. What with the rest of the extravagant claims it seems to me that the copywriter had little knowledge of the radio he was writing about. As Terry points out there is no b.f.o. provided which is a necessity if one is to copy the single-sideband signals which virtually all amateurs use today on the h.f. bands.

In addition, the s.w. bands provided only covered one amateur band, that on 7MHz, where reception of amateur signals is often extremely difficult due to interference from powerful broadcasting stations. There is also a socket on this radio for an outside antenna but I hate to think of the cross-modulation that will be produced, especially on 7MHz.

I have warned readers before now about buying such receivers if they want to undertake listening seriously on the h.f. amateur bands. Much better to spend a bit more money and buy a good secondhand set.

Keith Hamilton of Manchester has been through an assortment of receivers in his time, starting with a Sony ICF 5900 portable and ending with the new Icom R70 including the odd duff one on the way. Let us hope he has now settled down and will send in some logs!

I was pleased to get a copy of the *Bulletin* from the Ex-G Radio Club, run

for the benefit of amateurs born in the UK and domiciled abroad, the general secretary and treasurer being W3CTR/G3BSY Don Rayner. As a past member of the club, when I was ST2AR for some years, it is good to see the club going from strength to strength. A number of world-wide nets ensure that members keep in regular touch exchanging news and information.

Founder of the Ex-G Club (in 1959) Reg Cherrill W3HQO/G3XNV was awarded the Calcutta Cup by the RSGB last year, for the second time, for "outstanding service to international friendship".

Capital Venture Day Last year this event provided some three quarters of a million people with the opportunity of seeing and sometimes sampling activities laid on by over 140 different organisations. Organised by London's Capital Radio the show will be repeated this year on Sunday June 24 in Battersea Park. As you may have guessed amateur radio was NOT represented apparently and the Radio Society of Harrow has decided to do something about that sad deficiency this year.

GB4CVD will be run by the club from 10am to 5pm and it is hoped to cover all modes on bands from 1·8 to 1296MHz including fast and slow scan TV. A special QSL card will be available via the RSGB QSL Bureau. Amateurs are asked to make a special effort to QSO GB4CVD so as to keep the operators busy demonstrating AR to the public.

Two questions come into my mind. Why has such a big undertaking been left to a single society? Surely this is a prime venture ideal for organisation by the RSGB using as many local clubs as possible. And why go QRT on a midsummer's evening at 5pm? Congrats to the Harrow group for their initiative. Let's hope the hang gliders don't get mixed up with the masts!

From the RSGB's *Council Letter* it appears that the Chinese Radio Sports Association which represents radio amateurs in China has applied for membership of the IARU. To date amateurs are still operating only from clubs with no individual licensees. The three club stations for your notebook are BY1PK, near to CRSA HQ, and BY8AA at Sichuan, both Box 6106 Beijing, plus BY4AA in Shanghai, Box 205.

QRP Corner

Steve Ortmayer G4RAW was inspired to write in after reading of the QRP exploits of Bill Stevenson G4KKI in the May issue, so here goes with the first edition of QRP Corner, albeit a bit brief, but hopefully it will trigger other QRP enthusiasts to write to this column of their experiences in this exciting field.

Steve started with 1·5W and a direct conversion receiver which he does not find all that sensitive, and a single conversion superhet didn't seem much better but he has managed to work most of Europe so far. Steve enclosed a copy of an article from *QST* of August 1969 showing how a c.w. rig using just two valves, a 12BY7A and 6146, can be constructed from parts garnered from an old TV set. However this rig can run around 75W so hardly qualifies for QRP status but the important point is that one need spend hardly any money at all to get on the air on the h.f. bands on c.w.

The 10MHz band seems to Steve to be an ideal band for QRP c.w. especially for beginners "like me" he says. So let's hear of your activities in QRP and especially on 10MHz c.w.

Around the Bands

Owing to a very early deadline for copy this month, due to the Easter hols, the DX news may be a bit thin so don't blame it on conditions! Not that conditions have been too bright as far as my own DXing was concerned.

I always like the logs from **Marcus Walden** up in Harrogate as he usually makes a point of logging something worthwhile on most of the bands from 1·8 to 28MHz. There is always a tendency, especially with newcomers to the bands, to stick to 14MHz (20m) where there are easy pickings most of the time. One has to be more selective as far as time is concerned to get the best out of the other bands but it is worth making the effort. Marcus has a Realistic DX302 receiver plus a.t.u. used with a 20 metre-long wire in his attic, not exactly an ideal location.

Starting on or around 3·8MHz Marcus found PT7BZ, TF3KT and VO1FG, the last around midnight. Better things on 7MHz with A71AD, A92P, JY9CL and PJ7ACK. (I was pleased to work the JY9 myself during the visit of the Queen to Jordan). On to 14MHz and CE1COW, CP5AI, JW5SB, KL7Y, OX3SG (QSL LA5NM), T30DB on W. Kiribati, VP2VA, 8Q7AC, 9M2HB. A wonderful catch on 21MHz was BY1PK for one of the very rare Chinese calls, cards to VE7BC. On to DU7EY, FM7BH, PZ1AN (Box 1334, Paramaribo, Surinam), VP2MKS with cards to K5VZN, VS6DX, VU2DQP, YB0BWW, 8P6OV, 9K2BE, 9V1VP. On the few occasions that 28MHz came to life Marcus got A4XYS, HK0HEU on San Andres Island, VP9IJ, VS6DO, Z21GN (QSL NY4X), 5Z4DJ (QSL G4NJP) and 6Y5IC.

The Panasonic DR48 of **P. H. Cullen** in Saltburn-by-Sea, Cleveland, uses a random wire in the attic plus an a.t.u. which doesn't seem to be working too well yet but managed HH5CB, VS5GA (Brunei), VP5GT, XT2BR, DJ4IJ/XZ, Z22JE, 4S7NMR, 5H3GD, 5T5RD, 9M2BS and 9V1VP all on 14MHz which doesn't seem too bad to me! On 21MHz it was AP2ZA, C53EK, FR7BT, HK0HKU on San Andres, 5Z4WD and 9X5WP.

Goodies from **David Price** in Wellington, Somerset, copied on his FRG-7 plus 15m quad and a 20 metre-long wire included AP2ZA, PZ1CC, VU2GI, VP8AIB, VK6IV, and HK6DHS on 28MHz, JD1BBG (Ogasawara Island), TA1UA/2, TZ6FE, TU2NA, 8R1RBF, HP5FL, CO7RM, YC2DNT, 6V1A and DU7EV of Box 152, Dumaguete City, turned up on 21MHz. For 14MHz it was TU73 (QSL AK3F), HS1BV, TR8DR and 8R1RBF (QSL Box 10932, Georgetown). Later the same band produced VP8LP at Goose Green, VP9KA, YK3BCC, OD5AO and HI3EMS.

Paul Price (Merthyr-Tydfil) has a Sony ICF2001 at the moment but is thinking of something better, like an FRG-7700, but in the meantime logged OD5AO and PZ1BS on 14MHz on the whip antenna, and then on 21MHz HC2AIR, NC4U/PJ7, A71BJ, VP2KCA (QSL K0GU), ZS1LQ and CT2AK.

Another letter from **Chris Burger ZS6BCR** in Pretoria points out that the prefix H5 belongs to Boputhatswana and not Botswana and is an independent state within the RSA but is not recognised by the ARRL for DXCC purposes and counts as ZS. Chris anticipates regular DXpeditions to Botswana A22 including activity on c.w. Four-band DXCC has been achieved so far with 55 countries on 3·8MHz on which, as he points out, the nearest DX is in Europe!

The Swedish ARC club station SK0AC will be using special call 7SK0AC during the annual conference of the European DX Council in Stockholm between June 8 and 10. Apart from operations on 144MHz (2m) the station will use 14·060 and 21·060MHz on c.w. 14·320 and 21·350MHz during daylight hours and 3·550 and 3·700MHz for c.w. and s.s.b. respectively during hours of darkness.

David Palmer of Stowmarket, in Suffolk, writes in again after a very long break, having just acquired a Racal RA17L receiver which he is using with a 20 metre-long wire at 8 metres up. Welcome back OM. He logged FO8KS, J28DX, KC6IW, KL7U, OY2A, TR8DR and VK7GK on 14MHz and then AP2P, HL5QQ, JW6KY, J29BS, VS5HG (Brunei), ZD7BW, Z21GN, 4S7DA, 5H3BH, 9J2BO and 9L1YL on 21MHz. The few on 28MHz included A71BJ, CO2HQ, C53AL and VU2VIM.

Late night and early morning sessions have been out for **Graham Cunningham** (Paisley) because of work demands, so it's been daytime on 21MHz with his FR-100B and dipole catching 7Q7LW, VP8KF (Goose Green), VP2MKS, S83H, A82LC, 6Y5MJ, HR3JJR, J37AH, HP1XJL and 7X3ESQ said to be an expeditionary party across the Sahara.

Don't forget, logs, preferably in alphabetical and band order, to me direct by the 15th of the month. Photographs of the den or shack, suitably tidied up, most welcome and should be clear black and white or good colour pics.

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Club News

Abergavenny & Nevill Hall ARC Forthcoming special events include a mid-summer buffet at the Llanwenarth Arms, Crickhowell, on Saturday June 16 and operating GB2ABC at the Abergavenny & Border Counties Show on Saturday July 28. More mundane meetings at Pen-y-fal Hospital, Abergavenny, above Male Ward 2, every Thursday at 7.30. Sec D. H. Jones GW3SSY is on (0873) 78674 waiting to answer your questions.

Acton, Brentford & Chiswick ARC G3IIU A review of the May RAE papers is the subject on Tuesday June 19 at the Chiswick Town Hall, High Road, Chiswick, London W4. Could be very interesting especially to those who failed! New members and visitors most welcome, says sec W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

Axe Vale ARC G8CA Don't forget the visit to the IBA at Stockland Hill on Friday July 6 with a start from the club's usual venue at the Cavalier Hotel, West Street, Axminster, Devon. Normal meetings take place there on the first Friday of the month at 7.30pm, the August gathering going out in the field for a 144MHz fox hunt. The sec is R. W. Jones G3YMK on Upottery 468.

Aylesbury Vale RS G4VRS Briefly, Cathy Clark G1GQJ can tell you all about the club on (0844) 51461, with meetings on alternate Tuesdays, like June 12 and 26, at the Haydon Hill Community Hall, Dickens Way, Aylesbury.

Banbury ARS If you haven't been along to the club for a few months you'll want to know that it now meets on the last Thursday of the month, June 28 in this case, at St Pauls Church Hall, Banbury, says sec J. Burrell G8OZH available on (0280) 702900.

Bangor & District ARS Let's hope it is a fine day for the club's mobile rally on Sunday June 10 at the Mount Royal Hotel, Donaghadee, which is six miles from Bangor. Talk-in on S22 and opening time is noon with many traders, RSGB bookstall, bring-and-buy stalls and a display by the model Engineers Club of NI. Stewart Mackay GI4OCK, 11 Dellmount Park, Bangor, Co Down, will be glad to answer any queries about the rally or the club.

Barry College of FE RS GW3VKL GW4BRS GW6BRC Thursdays at 7.30 at the Annexe, Weycock Cross, Barry, with slow Morse lessons available. Margaret Beynon GW4GSH is the sec, Bungalow No. 1, Racal-Decca Transmitting Station, Llancarfan, Barry, S. Glam.

Bath & District ARC G4TMH PRO Colin Ashley G4UMN reckons he has all the answers on the club's activities on Frome (Somerset) 63939, meeting at the Englishcombe Inn, Englishcombe Lane, Bath, on alternate Wednesdays which I calculate is June 13 and 27 but I may be wrong.

Biggin Hill ARC G4RQT G6TBH Spring sale of surplus equipment takes place on Tuesday June 19 at 8.30pm at St Marks Church Hall, Church Road, Biggin Hill, Kent, which makes it the third Tuesday of the month in general. Expert G4BUE will deal with QRP operation in July, on the 17th. Your contact is Ian Mitchell G4NSD on (09598) 376.

Braintree ARS G4JXG G6BRH A jolly good idea garnered from the Club's fab mag *BARSCOM* is for "A" licensed members to take s.w.l.s and "B" licensees under their wings and to take them home and show them what the h.f. bands are all about. Other clubs please copy. Every first and third Monday at the Braintree Community Association Centre, Victoria Street, next to the main bus centre in Braintree at 8pm, with early arrivals not averse to a little selling/bartering of unwanted gear. The club net G6BRH is on 144MHz S15 on alternate Mondays at 8pm. So, sec is Pat Penny G6TAF, 13 Newnham Close, Braintree, Essex, otherwise (0376) 26487.

Bridgend & District RC Second Wednesday at the NCB HQ, Tondu, with full details of specific events from sec T. C. Morgan GW4SML, 4 Rhiw Tremaen, Brackla, Bridgend, Mid Glam, or it may be easier to buzz chairman Clive, call unknown, on (0656) 93 226198.

Bury RS Note the surplus equipment sale on Tuesday July 3 and a visit to the Emley Moor IBA TV site on July 10. Otherwise gatherings take place at the Mosses Community Centre, Cecil Street, Bury, Tuesday evenings at 8, the second of the month being treated as main meeting. Sec is Brian Tyldsley G4TBT, 4 Colne Road, Burnley, Lancs or Burnley 24254.

Cambridge & District ARC G2XV June 8 and 22 are informal evenings which means code classes and getting G2XV on the air and any other activity you feel like undertaking in the sphere of AR, all at the Visual Aids Room, Coleridge Community College, Radegund Road, which is off Coleridge Road, Cambridge, at 7.30. The other Fridays of the month have more formal meetings with lectures, demos and the like but David Wilcock G2FKS will give you details of these on (0954) 50597, being the club's PRO.

Carmarthen ARS The second Friday is a general meeting with an activity night on the fourth Friday, at the West Wales Hospital Social Club, The Quay, Carmarthen, says Milly Meredith, 50 Caecoed, Llandybie, Ammanford, Dyfed.

Cheltenham ARA G5BK First and third Fridays in the Stanton Room, Charlton Kings Library, Cheltenham. Can only tell you that June 15 is a natter-nite but watch for July 6 when G3KKN will hold forth on Communications in Africa. The only contact I have is Chairman John Holt G3GWW of The Old Rectory, Brimpsfield, Gloucester.

Chester & District RS G3GIZ G8GIZ First mention of this group that meets every Tuesday, except the first one of the month, at the Chester RU Football Club in Hare Lane, Vicars Cross, Chester, at 8pm although if you get there half an hour earlier you can join in the fun of the Morse code classes run by G4MOU. A surplus gear sale is promised for June 12 and an outside activity night is taking place near Helsby on the 19th. A club night on-the-air is linked to a barbeque on July 10. Try the chairman on (0244) 40055 name of Alan Warne or sec Dave Hewitt G8ZRE on 316673 otherwise 31 Broadmead, Vicars Cross, Chester.

Chichester & District ARC Club net on 144MHz S11 every Wednesday at 7pm, otherwise first Tuesday and third Thursday at 7.30 at the Fernleigh Centre, 40 North Street, Chichester, but note that it may be either the Long Room or the Green Room. Special event is the summer social evening on Thursday June 21. Your sec is C. Bryan G4EHG, Marmanet, Salthill Road, Fishbourne, Chichester, Sussex, likewise Chichester 789587.

The Cheltenham Amateur Radio Association's Constructor's Cup was won this year by Richard G4ERP, left, presented to him by the judge Reg G3GMN. Richard's entry was three superbly-engineered v.h.f. transverters with second place being taken by G4TLX for a 144MHz mobile rig and third place by G6CUN for a frequency counter

Colchester ARC All welcome on second and fourth Thursdays at 7.30, the Colchester Institute, Sheepen Road, Colchester, with "How the banks talk to each other" the subject for June 14, and "What next in space" on the 28th. Note the Anglian Mobile Rally at Stanway School on Sunday July 22. Further info from sec G3FIJ on (0206) 851189.

Cornish RAC The radio and computer sections of the club meet separately but at the same venue, namely the Church Hall, Treleigh, Cornwall. I can tell you about the computer feature on Monday June 18 which is G3CZZ holding a discussion on software transportability, with Boolean algebra the subject for July 16. Club PRO is S. Rodda G4PEM, Cliff Hotel, Penrose Terrace, Penzance or Penzance 3948.

Coulsdon ATS G4FUR Second Monday of the month at St Swithun's Church Hall, Grovelands Road, Purley, Surrey, at 7.30 for prompt start at 8. CATS PRO is Richard Goring G6VYT to be found on Downland 54319.

Crawley ARC David Hill G4IQM is on Crawley 882641 for club information but on Wednesday June 27 there is a lecture on RTTY and AMTOR matters including demos at the Trinity Church Hall, Ifield, Crawley, W. Sussex, at 8pm so that ought to attract a large audience. Classes in c.w. are held on Friday evenings with more details on that from G3KAU on Crawley 22428.

Denby Dale & District ARS G4CDD G8KMK Last warning of the DD Mobile Rally at Shelley High School, Skelmanthorpe, near Huddersfield, on Sunday June 17 starting at 11am, entrance and car parking free. Talk-in will be provided on S22 and SU8 with more info on this event from G3FQH on (0484) 862390, who is also club sec for general information.

Dudley ARC G4DAR Don't forget the new venue and meeting time is first, second

and fourth Mondays at the Allied Centre, Greenman Alley, off Tower Street, Dudley. So for more up-to-date info contact sec Cheryl Wilding G4SQP on Codsall 5636.

Edgware & District RS G3ASR The Straight Key evening recently on 3·5MHz c.w. seems to have been a success yet again judging by the number of stations heard taking part. A demo of electronic music is featured for Thursday June 14 given by G4BZY, with a VHF FD briefing scheduled for the 28th. Meetings on second and fourth Thursdays at 8, at 145 Orange Hill Road, Burnt Oak, Edgware, Middx with club net on 1·875MHz Mondays at 10pm. Slow Morse sessions from G3ASR and at the club are run by John G3SJE. More from PRO Michael Harlock G4TOC, 91 Flamborough Road, Ruislip Manor, Middx or Ruislip 72855.

Exeter ARS G4ARE An interclub quiz is booked for June 11 says PRO Roger Tipper G4KXR of Exeter 68065 the club meeting second Mondays of the month at the Community Centre, St Davids Hill, Exeter, with informal meetings on the other Mondays at the Scout Hut, Emmanuel Hall, Okehampton Road, Exeter, for c.w. code practice and operating the club station G4ARE.

Fingal RC EI2FRC Every Monday at the Scout Hall, Ballygall Road East, Dublin, at 8pm with such as Morse code classes and on-the-air activity with the club station plus lectures and the like. Sec is David Tobin EI7BFB at 52 Clune Road, Finglas East, Dublin 11.

Flight Refuelling ARS meets every Sunday around 8pm. The lectures this month include G3VMO on System X on the 3rd, G3WNG on Falkland Comms, G6XM talking on Old Timers and their QSLs and finally G4WHO on 24th with Nicks Rambles. A date for everyone's diary is August 19, Hamfest'84—a day out for all the family. The club, with the local RAIBC, are holding their second rally which is "bigger and better" this year. Club details from Mike Owen on 0202 882271.

Greater Peterborough ARC It's arrived! the lecture by Rev G. C. Dobbs G3JRV on QRP Working on June 28 guaranteed to be a sell-out. That is at the Southfields Junior School, Stanground, Peterborough, at 7.30pm. It is normally the fourth Thursday when the school is in session, according to sec Frank Brisley G4NRJ of 27 Lady Lodge Drive, Orton Longueville, Peterborough.

Halifax & District RS G2UG The Running Man, Pellon Lane, Halifax, is the spot on third Tuesdays, except July please note, at 7.30pm, the June event on the 19th being a surplus gear sale. Assistant sec/PRO is Max Townend G4SDX at the other end of (0422) 248542.

Hastings Electronic & RC G6HH Third Wednesdays at 8pm, West Hill Community Centre, Hastings, with a talk on air traffic control down for June 20. Forthcoming talks are likely to cover DX TV, repeaters, h.f. antennas, and d.f. fox hunts. It seems that long-standing sec George North G2LL is stepping down to handclaps all round so you had better contact chairman Terry Ransom G4FET, 9 Lyndhurst Avenue, Hastings, East Sussex, in the meantime.

Horndean & District ARC G4FBS Club facilities include a quarterly newsletter, print-out of membership lists, special club QSL cards and the HDARS award. First Monday at Merchistoun Hall, London Road, Horndean, Hants, at 7.30 with demos, talks and lectures. Next event I can tell you about is G2DZT on getting on the air cheaply, on July 2 and it's worth making a note of a talk by a Lucas rep dealing with suppressing interference from car electronics, on August 6. PRO R. E. Tribe G3SAQ lives at 32 Sutton Road, Cowplain, Portsmouth, Hants.

Hornsea ARC Every Wednesday at 7.30 the Mill, Atwick Road, Hornsea, Yorks, according to sec Norman Bedford G4NJP located on (0262) 73635.

Horsham ARC First Thursdays at the Guide HQ, Denne Road, Horsham, Sussex, at 8 with the June 7 meeting likely to be a home-brewing session but check on this first from PRO Peter Head G4LKW on Horsham 64580.

Ipswich RC G4IRC GB2IRC As always the second and last Wednesdays at 8, in the club room of the Rose & Crown, 77 Norwich Road, Ipswich, the club room being detached from the public bars. A treasure hunt on June 13 will end at the club room but the start point was not known at going to press. On the 27th a rep from SMC will review the range of Yaesu equipment now available. Unusually the club journal QUA gives fixtures for some nine other clubs in the area. More on the Ipswich club from Jack Tootill G4IFF on (0473) 44047.

Leighton Linslade RC G4LLR G6LRC First and third Mondays at 7pm at the Vandyke Community College, Vandyke Road, Leighton Buzzard, Beds, in Room A64 to be precise. For June 18 G8ELA has chosen packet radio as his subject. On the July programme there is a rep from AB Engineering dealing with electrical and electronic tool aids for the AR enthusiast, on July 2. Try Pete Brazier G6JFN on Heath & Reach 270 for more info on the club's doings.

Lincoln SW Club G5FZ G6COL Gathers at the City Engineers Club, Central Depot, Waterside South, Lincoln, on Wednesdays with June 6 and 20 devoted to code classes and RAE tuition while the 13th concentrates on an activity night-on-the-air. The 27th will see a junk sale in progress. More from Pam G4STO at the club QTH.

Louth ARC G4LRC First Wednesdays at the King's Head Hotel, Louth, with occasional "specialist" gatherings on the third Wednesday. A computer section is now well under way at the club and newcomers in this field and in AR are very welcome. Try Paul Empringham G6GZS on North Somercotes 483 for the latest info.

Magherafelt ARS GI4MFT A varied programme of events is promised by the club, meeting on the first Tuesdays at 12 Garden Street, Magherafelt, with Morse and RAE classes taking place at the local tech college on Monday evenings. Jack Chapman GI4LVC is on (0648) 32096 if you'd like more details.

Medway AR & TS G5MW G8MWA On June 8 it's a junk sale and for the 22nd note that Adrian Keeble will deal with the WAB awards programme. So, it's every Friday at 7.30 at St Lukes Church Hall, King William Road, Gillingham, Kent. Try Andy Wallis G4TQS on (0634) 363960 for more details.

Newquay & District RS G4ADV Outside visits seem to predominate in June with a trip to a Royal Observer Corps station on Wednesday the 6th and off to see the studios of

It seems that guest judge G6XO had a difficult time deciding the winner of the Chesham & District ARS constructional contest this year but finally Robin G4IWS came through with his 14/3·5MHz transceiver seen here with G6XO

Radio Cornwall on the 20th, which makes it alternate Wednesdays. Visitors and anyone interested in AR in the area should contact Andy Grove G6ZWI on Newquay 4285.

North Devon RC For Barnstaple bods it's the Pilton Community College, Chaddiford Lane, Barnstaple on the fourth Wednesday of even months, like June, with Bideford bods to the Bideford Community College on the fourth Wednesdays of odd months but imagine both lots can go to both or either if you see what I mean! Perhaps George Hughes G4CG on (0271) 43683 can explain it better.

Oldham ARC Mondays at 8.30 at the Devonshire Arms, Elliot Street, Lees, near Oldham, with this relatively new group looking for visitors and potential members who will be assured a great welcome according to Fiona Butterworth G4SPX reachable on 061 652 8862.

Radio Society of Harrow G3EFX G8JMR Fridays from 8pm at the Harrow Arts Centre, High Road, Harrow Weald, Mddx, in either the Roxeth or Belmont Room. Secretary Alison Wilson G6NDJ is on (0923) 53642.

Rhyl & District ARC This should be in time to acquaint you with the talk to be given on June 4 on switch-mode p.s.u.s by G4KPY, with an activity night on the 18th. So, first and third Mondays at the 1st Rhyl Scout HQ (hope that is enough!) with more details from sec John McCann GW4PFC on St Asaph (0745) 583467.

Ripon & District ARS At 7pm it's RAE and code classes until 8 when it's on to a lecture, talk or demonstration, all every Thursday at the St John Ambulance Hall, Ripon. (0845) 24945 will get you Peter Fautley G6CUG who can fill in the gaps.

Robin Hood ARS A warm welcome awaits those going along to the White Hart Inn at Ollerton any Friday around 8pm. That's near to Newark, Notts, since a note to Pete Buckmaster G6VGN, POB 1, New Ollerton, Newark, Notts should get you all the latest

info on the club and its activities.

Rolls Royce ARC G3RR Monday evenings at 7.30 including a code class and Sundays at 3.30pm for constructional time and general nattering, all at the RR Sports & Social Club, Barnoldswick. L. Logan G4ILG is available on (0282) 812288.

Salisbury Radio & Electronics Society Gathers at Grosvenor House every Tuesday at 7.30. Programme promises fetes, talks, d.f. hunts, demos and competitions so get the latest gen from Bert Newman G2FIX on Salisbury 743837.

Salop ARS G3SRT Diane Parslow G4XBI (was G6UDB, so congrats!) says the club meets Thursdays 8pm at The Albert, Smithfield Road, Shrewsbury, with natter nights on June 14 and 28, a visit to Madley on the 7th and another outside trip, yet to be arranged, on the 21st. A summer social is scheduled for July 5. Current constructional project is a f.e.t. dip oscillator, or code classes may be more to your liking, run by G4UOQ at the Drill Hall, Coleham, every Wednesday pm. Diane's QTH is 1 Willington Close, Little Harlescott Lane, Shrewsbury, or ring (0743) 62737.

South Bristol ARC G4WAW The Whitchurch Folk House, East Dundry Road, Whitchurch, every Wednesday enjoying the facilities of the Folk House along with the some 70 members of the club. June 6 has G3OUK dealing with the Radio Interference Service while the 27th is "rig tweaking night" run by G4SDR. An RSGB lecture by G4FRG and G4ROX is planned for July 4. Len Baker G4RZY is on (0272) 834282 to answer your queries.

Southdown ARS G3WQK Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, first Mondays at 7.30pm, says sec T. Rawlance G4MVN, 18 Royal Sussex Crescent, Eastbourne, who has latest news on club events.

Southgate ARC G4AEZ will be dealing with receiver techniques on June 14 at St Thomas' Church Hall, Prince George Avenue, London N14, at 7.30 where the club meets on the second Thursday of the month. More from R. F. Snary G4OBE, 12 Borden Avenue, Enfield, Middx acting PRO.

South Lakeland ARS The Deaf Association at 153 Abbey Road, Barrow-in-Furness, at 8 on the first Tuesday and third Thursdays, hopefully back in use after a slight case of flooding! Ring Dave Warburton G6LKB on (0229) 54982 for details of forthcoming events or 23366 ext 4892 during the day.

South Manchester RC G3FVA G3UHF G8SMR Fridays at Sale Moor Community Centre, Norris Road, Sale, at 8, plus Mondays for a general chat on AR matters. G3WFT deals with the latest Top Band d.f. techniques on June 15 with the mid-summer d.f. contest on the 22nd followed by a barbeque at the Centre. On the 29th G4HON will introduce members to op-amps. It's Dave Holland G3WFT on 061-973 1837 who can supply further details.

Spalding & District ARS G4DSP Second Friday at the White Hart Hotel, Spalding, at 8 with d.f. techniques the subject for June 8 followed by a d.f. hunt on July 13. Get all your unwanted gear ready for the junk sale scheduled for August 10. Hon sec is Betty Whitley G6YBL on (0775) 2781.

Thames Valley ARTS New members are most welcome at this club says new chairman David Foster G3KQR available on 01-399 1289 or at 50 Elmbridge Avenue, Tolworth, Surrey, with suitable tuition for RAE and code available. First Tuesday at the Thames Ditton Library in Watts Road at 8pm. An invitation to lecturers is also made to visit the club.

Three Counties ARC Alternate Wednesdays which makes it June 6 and 20 when a rep from Radio Reading will reveal how a broadcast station works. HQ is the Railway Hotel, Liphook, Hants, and sec C. N. Tidwell can be found on (0730) 64821.

Todmorden & District ARS Main event in June is G8UVE telling all how to use amateur satellites, on the 4th, at the Queen Hotel, Todmorden. That makes it the first Monday of the month for this comparatively new group. More from Janet Gamble G6MDB, 282 Halifax Road, Todmorden, Lancs.

Torbay ARS G3NJA G8NJA Friday nights at 7.30 at Bath Lane, behind 94 Belgrave Road, Torquay, plus a more formal meeting on the last Saturday of the month. Sec Margaret Ryder resides at 7 Kingston Close, Kingskerswell, Newton Abbot, S. Devon or try chairman Derrick G3LHJ on Newton Abbot 4437.

University of Kent ARS With the shack located on the campus there are meetings every Tuesday at 7.30 with code classes and other interesting activities including an AR TV group. Look for talk-in station on S15 if you are mobile. Christine Coles G6RQV is sec and is to be found at Rutherford College, The University, Canterbury, Kent.

Watford RC First and third Wednesdays at the Tudor Arms, Bushey Mill Lane, North Watford, at 8pm with details from Gordon Clarke G8XXV on 01-950 3611.

Wimbledon & District RS It's club station activity night on June 8 with operation on 3·5 and 144MHz with the 29th concentrating on discussion of the summer camp programme, using the special call GB0WIM, at the end of July. Normally meetings at St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19, second and last Fridays at 8. Sec is Geoff Mellitt G4MVS on 01-644 8249.

Wisbech Radio & Electronics Club G4PQL G8NED New sec Ken G4UQN of 14 St Peter's Road, Wisbech, Cambs. informs that club meets at the Five Bells, Parson Drove, every other Thursday which seems to be June 7 and 21 et seq, at 7.30. Future plans call for d.f. hunts, a radio-controlled car rally, a barbeque, a family day out, not to mention a Christmas dance. Ken is also to be found on Wisbech 61029.

Yeovil ARC G3CMH G8YEO Expert G3MYM will deal with the ionosphere and radio waves, in two parts, on June 7 and 14. The 21st sees G3GC discussing the changing face of AR. Not me, you understand, but of amateur radio. Every Thursday at 7.30, the Recreation Centre, Chilton Grove, Yeovil. All that from sec G3GC, on (0935) 75533.

Would club chairmen and all those club officials above the rank of secretary or PRO please not shoot your sec/PRO if information on forthcoming events is not printed in this column at the appropriate time. Only a selection of all club information received can be given each month. The big clubs can be safely left to themselves although some get a mention from time to time. New and smaller groups tend to get preference as they have a greater need for new members. Bigger clubs also have better newsletters on the whole, making for better communication between members.

One final final: would all correspondents please note my correct QTH in the heading of this feature. Recent changes in QTH over the last few months have meant some delays in receiving correspondence.

MEDIUM WAVE BROADCAST BAND DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG.

"I wonder if it is possible to receive some North American DX on a portable radio with built-in ferrite rod antenna" is a question often asked by readers and one that is difficult to answer without being misleading. It really is piling the odds against yourself to use such a set-up but yes, it is possible. I have heard CJYQ St John's Newfoundland on 930kHz using my Vega portable, but it was on a good night, on the peak of the fading cycle and I knew where to look for it.

Perhaps a better answer would be to outline the desirable features that a receiver for m.w. DXing should have, and the type of antenna. The reader can then judge for himself how effective his DXing set up is likely to be. A few words about location and operating technique should also help.

Selectivity

A selective receiver is one that can separate stations that are close together. This property can be measured and is often quoted in receiver specifications as the bandwidth at the 6dB points. A set that has 4kHz bandwidth to the 6dB points is more selective than one which has 6dB bandwidth. 6dB means simply that the signal is half strength.

It is quite easy to check your receiver's selectivity. Tune to 918kHz after the Belgian station on 927kHz has gone off for the night, usually at 2140UTC. You should hear Yugoslavia and Spain. Now tune up to 936kHz which is dominated by Radio Bremen and then tune back between the two channels, searching for a point where the audio from 918 and 936 cannot be heard. If you can find such a quiet spot then your receiver is selective enough to pick up any DX lying around 927kHz, right down to the noise level. If

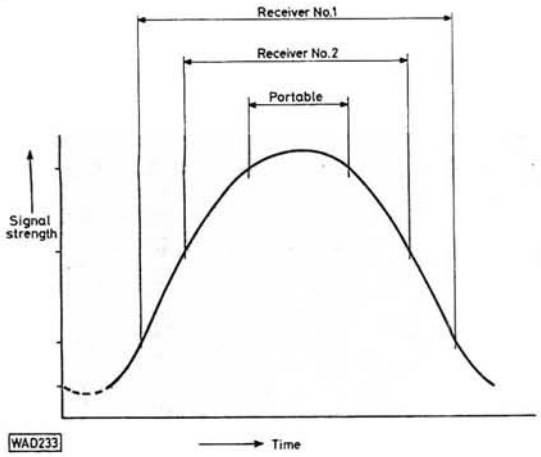
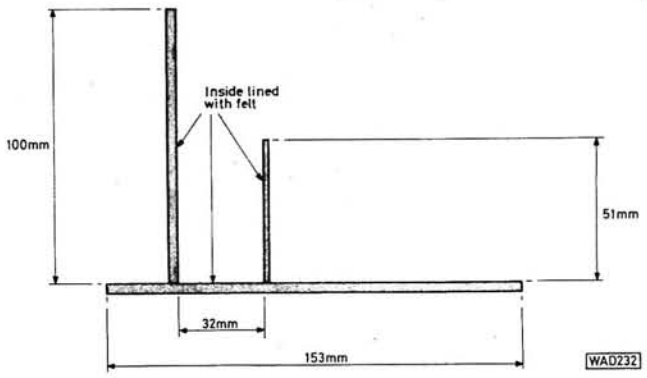


Fig. 1: Fading cycle



▲Fig. 2: Stand for the 7600D

you cannot find a spot clear of splash, then CJYQ on 930kHz will have to be at least as loud as the QRM before it can be heard.

Sensitivity

The ability of a receiver to hear weak stations is called sensitivity. It is measured in microvolts (μV) or even in millivolts (mV). A receiver with a sensitivity of 1μV for a signal-to-noise ratio of 10dB is more sensitive than one with 5μV, while a set with 1mV is insensitive. Receiver sensitivity varies from band to band and usually is none too good on the medium waves.

On the medium waves it is not just a question of being able to pick up weak stations. A sensitive set will hear strong ones for a greater part of the fading cycle. The waveform in Fig. 1 shows how this happens. Next time we will continue with antennas for m.w. DXing.

Portables and Antennas

"I have managed to hear some distant stations—CJYQ on 930kHz and WHN on 1050kHz but I would like to hear more" says reader **N. Pound** of Hull who uses a Grundig Satellit 1400SL which does not have a socket for an additional antenna for the medium waves. It is reasonable to assume that the set maker did not intend this set to be used with an additional antenna on the medium waves otherwise a socket would have been provided, so we had better go carefully and watch for overloading.

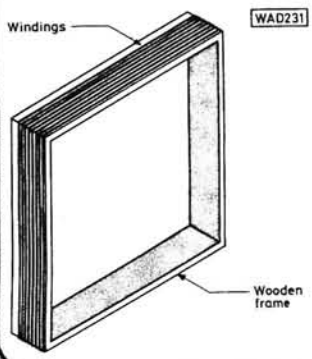


Fig. 3

Take the lead from an additional antenna, a short outdoor one is ideal and lay it across the top of the receiver. Check if there is an improvement. The internal antenna will pick up signal direct from the lead. Now try wrapping the lead round the set in a single turn and see what happens. If there is still no overloading then try two or three turns round the set and connect the end of the lead to earth. This is the way to experiment. Try something and if the results are favourable then continue. It is trial and error plus what you can get away with.

Sony ICF 7600D

"I recently got a Sony ICF 7600D. This great little receiver is very good on the medium waves" writes reader **Michael Evans** who goes on to say that he purchased a ready-made small loop complete with loop amplifier from a constructor in West Germany for DM125 which is about £35.

"If anyone wants the address of this constructor in West Germany just write to me with an s.a.e. and I'll give it to them." Michael's address is 41 Great Arthur House, Golden Lane, London EC1.

Michael has constructed a stand for his new receiver (Fig. 2) as he reckons it can fall over readily when the whip antenna is fully extended. "The front of the stand should be placed to the left of the Manual Tuning up and down buttons."

Radio Andorra

"Can you give some information if Radio Andorra is still on the air" asks Swedish reader **Ingvar Berggren** of Ljongbyhed. Currently it is on 702kHz apparently with reduced power as it is a poor signal at my QTH. So far as I know it has not re-started on the short waves.

The principality of Andorra, situated in the Pyrenees between Spain and France, is a separate DX country. For a long time there were two high-power medium wave stations in Andorra, which seemed to be used mainly for broadcasts to Spain and France. These were the 900kW Sud Radio on 810kHz (to France) and Radio Andorra with 300kW on 702kHz. Radio Andorra also broadcast from time to time at the h.f. end of the 6MHz (49m) band. Both stations were good verifiers, and since the transmitters were located high up in the mountains the signals covered a wide area, giving DXers the chance to add another "country" to their list. Sud Radio's location at Pic Blanc is the highest transmitter site in Europe!

As a result of disagreements between the broadcasters and the Andorran authorities both stations left the air in 1981 and the situation has been rather fluid since then. Sud Radio is now broadcasting in French on 819 again but it may close down permanently once the operators build a new transmitter in France. If you do pick up either of these stations it is worth sending them a report, in English, as Andorra may well cease to be a broadcaster before long. The address for Sud Radio is BP7, Andorre-la-Vieille, Andorra and for Radio Andorra, BP1 also in Andorre-la-Vieille.

Readers' Letters

"I have recently constructed my second 1 metre square loop antenna, as the wires on the first one became slack" reports **Peter Wade** from Biggin Hill. The new loop is wound round a square wooden frame (Fig. 3) and our reader wonders if the efficiency of the antenna would be affected by having solid wood between opposite sides of the winding. I doubt it. The radio waves have in any case to pass through the walls of the house so provided that insulated wire is used and the wood is not allowed to become damp, there should be no noticeable difference between the two methods of construction.

Some DXers prefer this box construction and it certainly holds the wires in place and appears to be less liable to damage than the open type. Convenience in use and ease of construction would seem to be the factors involved. The tuning capacitor can be fixed to the inside of the box with ease and it is not essential to use a stand if rubber feet on the bottom of the frame keep the windings clear of the floor.

M. G. Hayman (G8RDB) has been busy on the band using his Icom IC-R70,

FRT-7700 a.t.u. and a 20 metre random wire. He has been DXing local radio pulling in Newcastle on 603, York on 666kHz, Norfolk 855, King's Lynn 873 and several others, and writes: "I used to have an FRG-7700 and found it quite good on the medium waves also on 27MHz. I miss this on the R70 and am looking for a mod for the R70 to improve 27MHz. Any ideas would be appreciated." Our reader's address is 113 Tuam Road, Plumstead Common, Woolwich, London SE18. *(I think G8RDB's R70 may have a fault, as our review receiver was good on 27MHz—Ed.)*

SHORT WAVE BROADCAST BANDS

by Charles Molloy G8BUS

Reports: as for Medium Wave DX, but please keep separate.

"Radio Japan is expanding its overseas service to Europe and the Middle East by starting relay broadcasts on April 2, from a high-power transmitting station in Africa" writes the Programming Affairs Division of NHK. They go on to say that "listeners in these areas have so far found it difficult to receive clear broadcasts direct from Japan."

The relay is located at Moyabi some 500km south east of Libreville, the capital of Gabon, West Africa. The station is set in a compound where twenty curtain type antennas, one log periodic antenna and four short-wave 500kW transmitters are located. Radio Japan is leasing one of the 500kW transmitters for six hours a day for broadcasts in seven European languages. The English slots are from 0700 to 0800UTC on 21·575MHz and from 1500 to 1600 on 21·550, both frequencies being in the 13 metre band. Two QSL cards are being issued to commemorate the start of the Moyabi transmissions. Reception reports, which are requested, should go to the Overseas Broadcasting Dept, Nippon Hoso Kyokai, 2-2-1 Jinnan, Shibuyaka, Tokyo 150, Japan.

Radio Japan

Short-wave transmissions in Japan started in 1935 and I well remember the thrill of picking them up with my home-made one valver. Today, the General Service, beamed worldwide, alternates every hour between programmes in Japanese and English. The latter are 60 minutes in length and are on the air at 0500, 0700, 1300 and 1500 and this is the programme heard via the relay in Moyabi. Features include *Science Today, Viewpoints, Japan as I see it, Tokyo Pop-in, Midweek Focus,* plus *DX Corner* on a Sunday.

A programme schedule is obtainable from R. Japan while up-to-date information on frequencies and times of transmission direct from Japan can be found in the International Listening Guide.

Relay Stations

Radio Japan is an example of a country that is badly placed for broadcasting to the UK during the 24 hour period. It lies in the northern hemisphere in a time zone 9 hours ahead of GMT, so it is only during our morning that a path of daylight exists between transmitter and receiver. Reception is often very good on the long distance h.f. bands, typically on 21·610, 17·870 and 17·785MHz, so if you want to log Japan direct then the morning is the best time to do it. In the afternoon try 11·815 and 11·840MHz.

At the peak listening period in the evening the position is rather different. A mixed path of daylight and darkness will be found at most times of the year making it difficult to find suitable channels for reception at programme value, but try on 9·580MHz in the 31m band.

Short-wave propagation is by means of the sky wave. The way that radiation from a transmitter travels into the ionosphere and bounces back to earth is shown in Fig. 1. Waves go upwards at all angles. Those going up vertically come back to earth at the transmitter. As the angle decreases the distance travelled outwards increases, the maximum of 4000km occurring from low-angle radiation that is only a few degrees above the horizon. This is the greatest distance to be had from single-hop reception, so ideally a relay station should be within 4000km of the target area.

Reception beyond 4000km will be by multi-hop, where the radiation coming from the earth's surface back into the ionosphere is returned again at even more distant points. This multi-hop reception is less reliable than single-hop since the radio waves travel for greater distances through the ionosphere.

How does the programme reach the relay station? Sometimes it is a tape recording, sometimes it is by an s.s.b. point-to-point link. The current trend is by satellite. The Radio Japan programme for Moyabi travels from Tokyo via the INTELSAT link to Paris and again from Paris to Gabon. The slight delay introduced by the satellite link is unnoticeable unless you have two receivers and compare direct with relay, but there could be problems with time signals.

Relay Stations and DXing

Although relay stations offer improved reception to the s.w. programme listener, they can be a real menace to the DXer and QSL hunter. Alright if you know you are listening to a relay. The R. Japan programme on 21·550MHz at 1500 is really coming from Africa No. 1 in Gabon. It is not always that clear, though. The *World Radio and TV Handbook* lists relay stations. Sometimes they identify themselves over the air, usually as they close down. Programme schedules often help. Radio Canada International's evening programme in English on the 6MHz and 7MHz bands come from BBC transmitters at Daventry and this is clearly indicated in the schedule.

The *International Listening Guide* (see March *PW*) which covers programmes in English, has a subscript against frequencies used by a relay, whose identity can then be found from a list on the back page. This source lists 13 relays abroad for the Voice of America, 9 for the BBC, 6 for Deutsche Welle and lesser numbers for Afghanistan, Australia, Moscow, Japan, Netherlands, Spain, Cuba, Paris, VOCF Taipei, WYFR in the USA. We will have to live with relay stations as they are on the increase. The last word comes from Japan. "Radio Japan also plans to secure the use of facilities in South East Asia and Central America for relay broadcasts, so listeners in North and South America and in Asia can receive Radio Japan's transmission with ease and clarity."

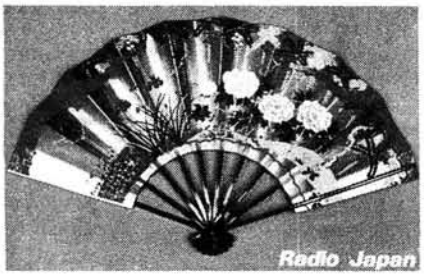
Time Signal Stations

Regular readers will know that there are broadcasting stations, WWV is one, whose programme consists of time signals, usually as clock pulses, though additional information such as ionospheric data is often included. The frequency of some of these stations is very accurate so they can be used as a frequency standard or even to drive a digital clock. It is not too difficult to pick up time signal stations from distant parts of the globe. Australia on 7·5MHz and 12MHz can be quite strong on occasion.

A new edition of the booklet *Time Signal Stations,* is now to hand. It has been extended to 82 pages, it is bi-lingual German and English and it lists stations in the range 20kHz to 170MHz. As well as a frequency list there is a countries list which gives details of transmission times, programmes, schedules, station addresses. There is also a section that explains the different time scales in use, such as ephemeris time, atomic time, sidereal time, UTC.

Time Signal Stations, written by Gerd Klawitter, is obtainable from Wolfgang Scheunemann Verlag, Bonnerstr 328, D-5000 Cologne 51, West Germany for DM9.80 or 4 US dollars.

Also of interest is a free Information Sheet called *Broadcast Time Signals and Greenwich Mean Time* which covers GMT, the mean solar day, the 6-pip time signal, leap seconds and the occasions when the number of pips may be 5 or 7. It



Radio Japan QSL Card sent in by Philip Hodgson

YVTO is a time signal station on 6·1MHz located in Venezuela, sent in by Philip Hodgson

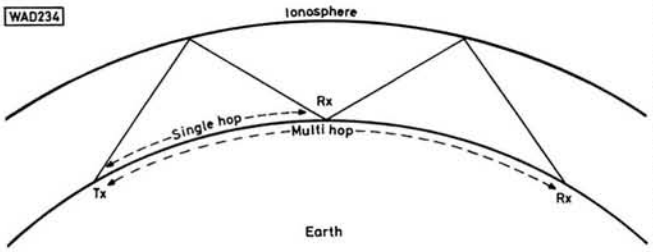
Yuka Nukina and Hiroshi Shioguchi present DX Corner

can be had from the BBC, Broadcasting House, London W1A 1AA or from the bookshop in Bush House.

Readers' Letters

A novel answer to the problem of reception inside a trailer caravan comes from reader **S. King** of Marlow who uses two coaxial sockets. One is connected to the inner metal wall of the caravan and the other to the external skin, the two being joined together. The external antenna is plugged into the external socket and the lead from the receiver goes into the internal socket. Clearly the external socket would require protection from the weather when not in use. On a similar subject, the BBC Engineering Information Sheet *Take Your Television Caravanning* gives information about TV reception and a suitable antenna for use by caravanners.

Fig. 1: Multi-hop Reception



The Voice of Hope and the Voice of Peace have confused reader **Dennis Starr** of Bletchley, not surprisingly perhaps, as the two stations are relatively close on the dial and geographically. The Voice of Hope, which is a gospel station, is on 6·215MHz while the non-religious Voicace, can, at the time of writing, be found on 6·240MHz.

VHF BANDS by Ron Ham BRS15744

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

Although, apart from a solar storm, nothing spectacular in the way of propagation occurred during the past month, there is still plenty to write about. BARTG launch their new magazine, observational techniques, contest results and the general, run of the mill, wireless operating that makes amateur radio that something extra special in the complex world of communications.

Solar

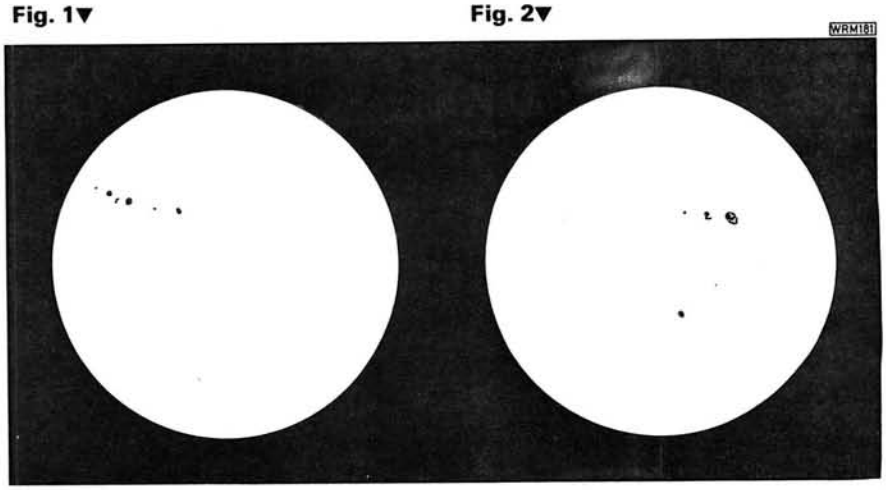
Both **Mike Bennett,** Slough and **Patrick Moore,** Selsey, observed some medium sized sunspots between March 10 and 19 which, most likely, caused the variety of bursts of solar radio noise which I recorded at 143MHz on several days during that period. Although the sun was very hazy on March 29, Patrick located a train of about 7 sunspots between the east solar limb and the central meridian, Fig. 1. One of these, 4th from left, stood out from the rest and was no doubt the main contributor to the severe noise storm which raged on the sun from April 1 to 6. This sent my pen recorder off scale for about 8 minutes on the 4th, Fig. 3, and for most of the midday observation on the 5th.

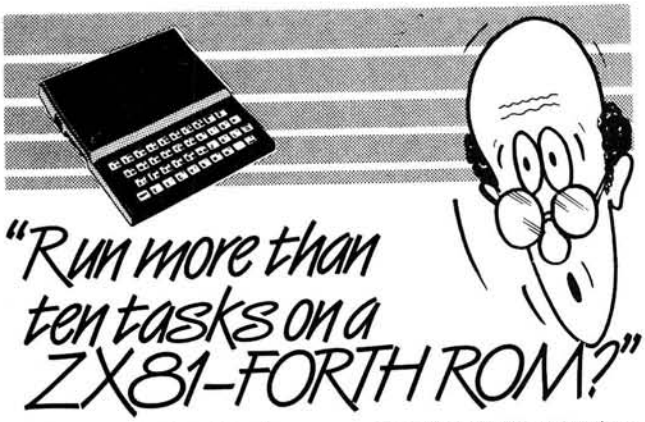
At 1020 on the 3rd, Patrick plotted the new position of the large spot, Fig. 2, when he projected the sun's image on to a white card. "Have you heard all the solar noise?" asked **John Fell** G8MCP, and although I received the noise on the dedicated antenna, Fig. 4, which I built in 1968, the noise was so strong that John could hear it on his normal 144MHz band equipment. Radio waves from the active sun can be detected from about 20 to 200MHz with a peak around 150MHz, but when solar noise is heard between 20 and 40MHz, I believe that previous solar activity must have destroyed part of the ionosphere, or else the waves would have been reflected back into space in the same way that terrestrial signals are deflected toward earth under normal ionospheric conditions.

Radio Astronomy is a complex subject and quite honestly, apart from the really dedicated astronomer, it is not an ideal

Fig. 1▼

Fig. 2▼





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9×2	0.33×2	2.41	.90
8,9×2	.5×2	3.36	1.20
8,9×2	1A×2	4.27	1.40
15×2	.2A×2	2.41	.90
12-0-12	.05	3.11	.90
20×2	.3×2	3.39	1.20
20,12,0,12,20	.9	4.13	1.20
15,20×2	1A×2	5.60	1.60
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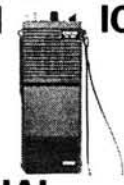

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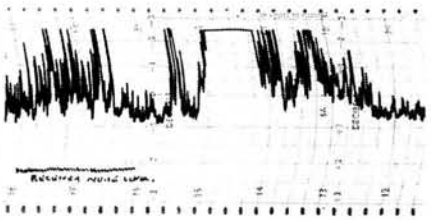

Fig. 3

project for the home constructor, especially if he is looking for immediate or short term results. However, the sun is a different proposition and although one can wait days or sometimes weeks for activity, when it happens, it is positive and exciting, because there is a strong possibility that one can record the beginning, middle and the end of an event, as was the case during the first week in April. One must remember that the radio waves from the sun, which is only 150 million kilometres away, reach earth in 8·3 minutes from their time of origin, whereas those from celestial sources, such as Cassiopeia, Cygnus and the Sagittarius arm of the Milky Way have travelled for millions of years. Solar activity can be detected with modest radio equipment but very large, mechanically rock stable and precisely aligned antennas, with super sensitive receivers and computer technology is required to carry out serious radio work in the greater astronomical field. I would of course be delighted to hear from any readers who have built or developed equipment for radio astronomy and what results have been achieved.

Ted Waring, Bristol, counted 12 sunspots on March 22 and 7 on April 12 and during the life of the solar storm his count changed from 34 to 7 in six days, showing just how variable and interesting routine solar observation can be. The April edition of *Solar News,* published by The London Solar Committee, contains a lot of information about sunspots and a quarterly report on solar activity, plus the plans to build an observatory with a slide off roof and a radio report, which to me is all good reading. All details available from Bert Chapman, 15 Homersham Road, Kingston-upon-Thames, Surrey, KT1 3PL.

Aurora

When your 144MHz band beam is facing north, a c.w. signal sounds raspy and s.s.b. like a ghostly voice, then the signals you are receiving are being reflected from an auroral display, known as Borealis in the northern hemisphere and Australis in the southern hemisphere. This phenomenon may last for any length of time from a few minutes to several hours depending upon the intensity of the temporary ionisation, caused by streams of solar particles, about 160km above the earth's polar regions. Reports of such events are welcome by Ron Livesey, 46 Paidmyre Crescent, Newton Mearns, Glasgow, G77 5AQ. Ron is the auroral co-ordinator for the British Astronomical Association and is looking for lists of dates when auroral reflected signals were heard during 1983. When reporting to Ron, the RSGB or to this column, don't forget to include the times of maximum and minimum signal strengths, beam headings and country of stations heard. Not everyone involved with radio is familiar with amateur prefixes and QTH squares. Aurora is a fascinating subject and when visible it is a wonderful sight, but when it manifests during the hours of daylight or when the skies are overcast it can be identified by the strange effect it has on terrestrial radio signals.

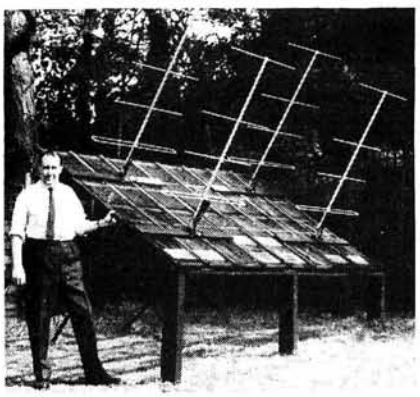

Fig. 4

28MHz Beacons

"It's nice to see the 28MHz band awakening after winter hibernation", writes **Bill Kelly** on April 3 and adds, "my report shows mainly the more distant beacons". Both Bill and Dave Coggins reported hearing signals from the Australian beacon VK2RSY on 28·260MHz and the return of an old friend, the Mauritius beacon 3B8MS on 28·210MHz. In late March, my *On The Air* colleague, Eric Dowdeswell G4AR reports hearing the beacons EA8AU 28·228MHz, LU1UG 28·254MHz, PY2AMI 28·299MHz and pointed out that TR8DX on the Ivory Coast and VK6RWA in Perth are both on 28·264MHz. Thanks for the gen Eric. John Coulter, Winchester, first heard the Perth beacon on March 18 and then around 1000 for a couple of days.

"It was interesting to note the late fade out of ZS6PW and ZS1CTB on March 12" writes Dave Coggins and adds, "I heard them as late as 1900 with watery type QSB signals and all I can suggest, is that the signals were arriving via scatter from the south west, because I noted an opening to South America at that particular time". Dave also received hollow and ghostly signals from the Cyprus beacon 5B4CY at 0742 on the 21st. The sun was active on both those days Dave so the ionosphere may well have been stirred up a bit.

Dave Coggins logged the two German beacons DK0TE and DL0IGI via sporadic-E on March 24 and 25 and heard two of the less frequent American beacons, KA1YE and W3VD on the 21st.

"Welcome back Mauritius, not heard by me since 1981", writes Ted Waring, who heard those strange dashes again at 10 second intervals on March 23, 26, 30, 31 and April 1 and 3rd.

"With ZS1STB pounding through here, I have difficulty in separating it from PY2AMI" writes **Norman Hyde** and he adds, "TR8DX seems to have disappeared after being on the air for a short time and VK6RWA was heard on a couple of occasions on the same frequency".

Information to compile the monthly beacons heard chart, Fig. 5, came from the logs of Dave Coggins, John Coulter, Bill Kelly, Ted Waring, **Cmdr Henry Hatfield,** Sevenoaks, Norman Hyde G2AIH, Epsom Downs, Ted Owen, Maldon and me.

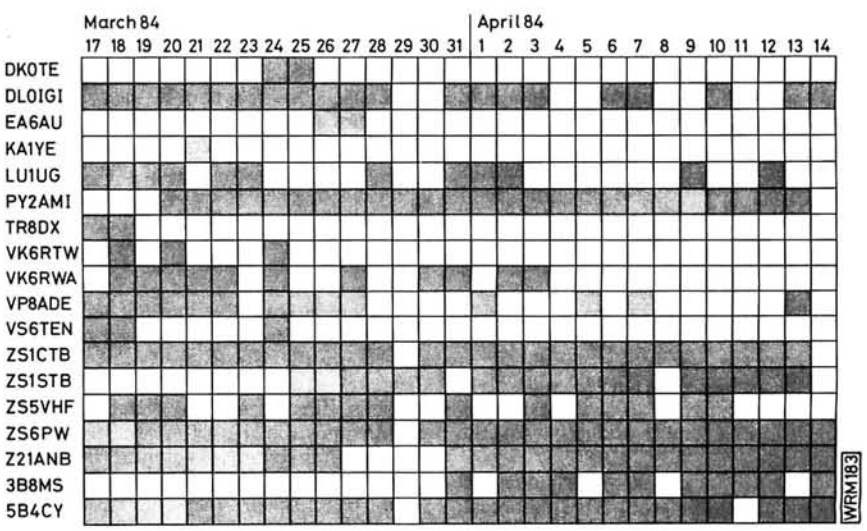

Fig. 5

28MHz Satellites

At 1015 on March 11, Bill Kelly heard European stations working through RadioSputnik 3 and orbital data from RS7 at 0815 on the 16th, RS8 at midday on the 20th and RS3 and RS5 around 1100 on the 22nd. **Michael Ray** G4XBF, Godalming, operates a FT-102, KW Z MATCH a.t.u. and W3DZZ antenna on the h.f. bands and is active on 28MHz when it is open. One of his many interests in radio is to listen to the signals from the OSCAR and RS6 and RS8 satellites.

While listening on April 5, John Coulter heard DJ3UH, G3EDD, G4IHZ, G8DJW, UK1AAA and UK3QBW, working through the satellites.

Tropospheric

The atmospheric pressure, measured at my QTH, began this period on March 17, steady at 30·0in (1015mb) where it hovered until 1300 on the 23rd when it fell to 29·4 (995) and remained at this low level while wind and rain passed over. By midnight on the 26th the pressure had risen to 29·5 (998) and stayed there until 0200 on the 29th. At this point the pressure rose to around 29·9 (1012) and did not cross the 30·0 line again until early on April 1. The barograph trace was steady for a while, rising to 30·3 (1026) at 1400 on the 7th and by noon on the 11th it was back to 30·0 and up again to 30·2 (1022) by 1000 on the 12th. The pressure can, of course, vary across the country.

Band II

"The Band II airwaves seem to have been very quiet in recent weeks" writes **Neil Pound** from Hull and tells me that test transmissions for Viking Radio began on 102·7MHz on April 5 and their address for reports is Viking Radio, Commercial Road, Hull, HU1 2SA. Although the band has been quiet Neil, down on the south coast, Harold Brodribb counted 23 French stations, including 7 editions of France Musique, some transmitting a German opera, between 0930 and 1000 on March 21, 15 on the 22nd and 10 on the 23rd. Harold, using a Bush VHF80 with a loft dipole and reflector, praises the French locals, especially Musique, for their good entertainment value. **Damien Read,** Newport, tells me that Dave Kenny uses 4-element and 7-element Yagis, horizontal and vertical, on a rotator to feed his JVC TZ-1L tuner and among the stations Dave can hear, most of the time, are Radios Kent and Sussex, Belgium BRTII and France Cultur and Inter. Well done Dave, it must be those big antennas, but spare a thought for Bill Kelly in Belfast, who writes, "I am poorly located for v.h.f. and u.h.f. reception" and although he has a Discone and a special f.m. antenna on his chimneys, 10m a.g.l., to supply his Grundig 600 Professional and Panasonic DR49 receivers with signals, he has a job to hear broadcast stations from the rest of the UK. He adds, "I think the trouble is screening from surrounding hills and trees". Could well be Bill, I have heard about many poor signal areas in the UK, I believe that parts of Scotland are bad, and not far from my QTH is a residential area where a few metres movement with a portable f.m. receiver means the difference between S1 and S9 signals.

There was a slight lift on April 13 and while in Kent, I used the f.m. radio section and telescopic antenna of my Plustron TVR5D and heard Dutch, German and French stations between 96 and 101MHz.

RTTY

The British Amateur Radio Teleprinter Group have launched their new quarterly magazine called *Datacom*, to replace their existing *News Letter* and it will be sent free of charge to members of the group. I have seen the Spring edition of *Datacom* and in my view it is a first class journal for all RTTY enthusiasts, mainly because its 106 pages are packed with useful gen about most aspects of this rapidly growing subject. Readers wishing to know more about BARTG and membership should write to John Beedie G6MOK, 161 Tudor Road, Hayes, Middlesex, UB3 2QG.

I always enjoy a look around the RTTY sections of the h.f. bands and between March 17 and April 11, I copied signals from 15 countries, DL, EA8, F, HC, I, LZ, OE, OK, OZ, SM, SP, UT, VK, YO and Y23 on the 14MHz band around 14·090MHz and 11 countries, DL, EL, I, KA1, KA3, LZ, OH, ON, Ws 1, 3, 4 and 5 all counted as USA, YB and 6W1 on the 21MHz band around 21·090MHz. One of the interesting periods was logging signals from 4 countries, Australia, Italy, Sweden and Poland, on 14MHz, in as many minutes at 0850 on the 24th and a new country for me was HC2SL, in Ecuador, about 0930 on April 1.

"I have received all the usual Europeans and on March 26, when 14MHz was open late, I copied signals from the Americas with two of special interest, XE3ABC who was working into Italy and PP7AKY calling CQ 110 baud ASCII," writes **Peter Lincoln** BRS42979 from Aldershot. Peter also logged CE3CBG, CX4AAU and YV8CQ on 14MHz and YB3AP on 21MHz.

TELEVISION *by Ron Ham BRS15744*

Reports: as for VHF Bands, but please keep separate.

"I do not know what is expected on v.h.f." says **Owen Jones,** Stoke-on-Trent, who is experimenting with antennas for his Vega 402 receiver. We expect and hope for a lot Owen and often get nothing, one has to wait until a suitable disturbance takes place, within the earth's atmosphere, to increase the range of television signals. Once such a natural event occurs, then we in the UK can receive pictures from transmitters a long distance away and then we call it DX. Basically the v.h.f. range on a dual purpose TV receiver is split up between Chs. 2 to 4, approximately 48 to 68MHz, a range affected by Sporadic-E and Chs. 5 to 12 approximately 175 to 230MHz, which is influenced by ducting in the troposphere.

During a Sporadic-E disturbance you should see pictures from Austria Fig. 1, Iceland Fig. 2 and Scandinavia Fig. 3, on Ch. E2 48·25MHz, Czechoslovakia, Poland and the USSR on Ch. R1 49·75MHz and Italy Chs. IA and IB 53·75 and 62·25MHz respectively. Because Chs. E2 and R1 are so close together in frequency, it is best to start by tuning around number 2 on your dial until you get the feel of your receiver. The pictures in Figs. 1, 2 and 3 were received by **Len Eastman** G8UUE in Bristol last July. DX depends upon the intensity and the predominant direction of the disturbance and during a tropo you may well see pictures from Belgium Fig. 4, received by **Keith Hamer** and **Garry Smith,** Germany Fig. 5—**Roger Wallis,** Holland Fig. 6—**Tony Palfreyman** and Radio Telefis Eireann seen by **Tim Anderson.** Sometimes the signals are so strong that antenna direction makes little difference but I suggest that you start by facing your beam toward the south east and adjust it from there. The television section of the *World Radio TV Handbook* and *Guide to World-Wide Television Test Cards* by Keith Hamer and Garry Smith would be of great assistance to the New DXer. ISBN: 0-902285-08-4 and ISBN 9504304-0-4-2 respectively.

Tropospheric

In India, **Major Rana Roy,** Fig. 8, uses a Crown receiver fed by an 8-element Yagi for Band I at 13m a.g.l., 3-element and 18-element Yagis at 20m a.g.l. for Band III, separate amplifiers, giving 40dB, are wired at the top of each mast and a selector switch is installed at the receiver position. Rana's interest in radio dates back to 1961 when he assembled a broadcast receiver kit and began DXing on the medium waveband. In 1975, when India had only 6 TV stations, he became interested in television and commenced TV DXing in 1980 after reading about it in an Indian magazine,

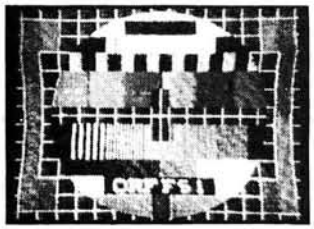
Fig. 1

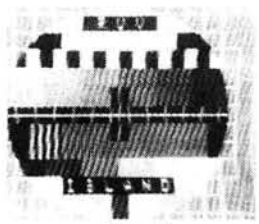
Fig. 2

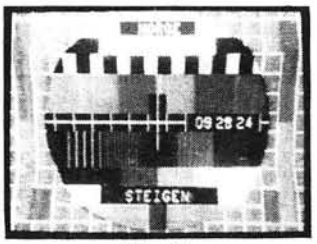

Fig. 3

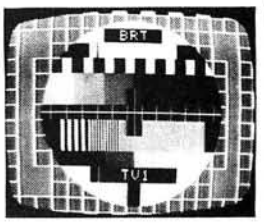

Fig. 4

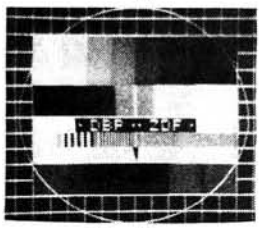
Fig. 5

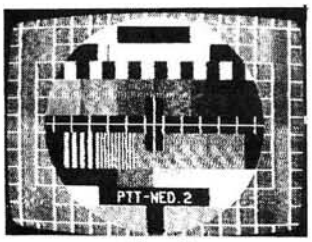

Fig. 6

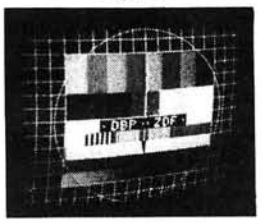
Fig. 7

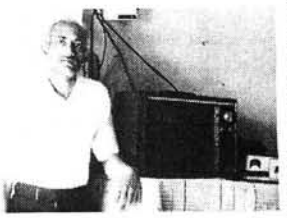
Fig. 8


Fig. 9

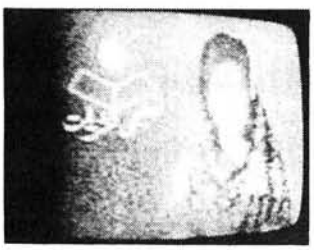
Fig. 10

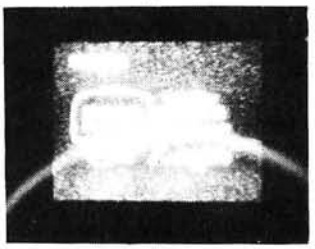
Fig. 11

Fig. 12

Electronics For You. The author of the article suggested that Rana should read the book, *Long Distance TV Reception*, by Roger Bunney and take *Practical Wireless*. His first success came in May 1982, when in Amritsar he received pictures from Calcutta, Madras and the USSR in Band I. Since then I have been pleased to use some of Rana's comprehensive reports in this column. "There has hardly been any tropospheric openings during the short winter that we have here," writes Rana and adds, "however, at 0957 on February 17 we saw Rawalpindi TV tuning call on Ch. 8 (Fig. 9) and at 1000 the announcer (Fig. 10) said that she was calling from Rawalpindi-Islamabad." During an excellent tropo opening on March 12, 13 and 14, Rana watched a cricket match between England and Pakistan on Ch. 5 Band III from Lahore. On the subject of propagation he writes, "My enquiries have revealed that the coastal areas of India have excellent tropospheric DX during October to March, while inland, especially desert areas, hardly have a tropo opening."

We also had some good conditions in March when **Harold Brodribb,** St Leonards-on-Sea, received pictures from France TF1 on Ch. 49 and Belgian teletext on Ch. 55 on the 21st and the French FR3 on about 5 u.h.f. channels around 1600 on the 22nd.

Band I

At 1715 on March 2, Rana Roy received pictures from a Russian station in Band I, followed by a map and a programme on Bulgaria, until 1740 when a number of stations started overlapping and it was difficult to identify one from the other. The signals fluctuated until 2215 when he watched a Russian feature film for about forty minutes. Rana also received weak signals on Ch. 2 on March 3, 4 and 5. From Slough, **Mike Bennett** reports seeing a test card, PTT NED 1, from Holland at the top end of the band, Ch. E4, during the afternoons of March 13, 15, 16 and 19, a children's programme on the 14th, puppets on the 15th and their clock, with YL announcer, at 1155 on the 19th.

SSTV

"Katsuhiko Kambara JG1DDT, SSTV editor of the Japanese *CQ Magazine*, welcomes reports on SSTV activities at his home QTH, 36–14 Higashi 2 chome, Kuki-city, Saitama, 346, Japan," writes **Richard Thurlow** G2WW, March. During the DL-SSTV contest of April 8, Richard had a two way QSO with LZ2WF and thus increasing his new stations worked score to 1990. Although there did not appear to be too many 14MHz band SSTV stations on during the event, Richard noted that LZ2OV was showing a serial number of 48 by late afternoon. At 1827 Richard was called by ZS6BTD on 14·231MHz with a 24 seconds colour caption and was asked to transmit a similar signal from G4NJI's tape so that shack visitors, a ZS6 and PY1DAB could see the system working. "The PY1 was so impressed with this colour that he called his wife into the room to see the amazing pictures frozen in the memories of ZS6BTD's WA7WOD modified Robot 400," said Richard. Since March 10, Richard's new 2-way SSTV QSOs include A92NH using the latest 450C Robot converter, F6DWP, LZ1KDP, PY4AJ and "at long last" VK4ZG.

"I have only copied the usual pictures from Europe," writes **Peter Lincoln** on April 13 and sadly adds, "I had three near misses at new countries, I copied an Italian calling 9K2, but either he didn't answer, or I couldn't copy him. The second was an A92 station, but he was trying out the receive side of his gear with the help of an Italian, so no copy there, and the last was when an east European, LZ I think, was working a VK. I could hear the VK, but the QRM was too much to make sense of the pictures." We all know the feeling Peter, it usually happens to me when I want to demonstrate the equipment to someone. However, Peter had a land line call from **Jack Darby** G8ZWM, Crawley, who arranged to send a CQ to Peter on 144MHz; all went well and Peter received Jack's SSTV pictures at Q5. Well done lads, amateur co-operation wins again.

Station Reports

George Garden has moved QTH from Bracknell to Kincardineshire and is setting up a DXTV station, but earlier in the year George made a trip to Sri Lanka. True to form, he took his JVC 610GB with him and on arrival, pressed the v.h.f. button and received the local 625 line

colour pictures which he recorded with a Kodak Retinette camera, as close as the focus would allow at 1/25th second and f2.8. "There are only two programmes receivable in Colombo, ITN Sri Lanka Ch. 12 and Rupavahini Ch. 5," said George. He travelled to Nuwara Eliya, 2500m a.s.l., to see the mast of the Rupavahini transmitter which overlooks a tea plantation. While in Sri Lanka, George saw a fair number of English programmes including *Miss World UK*, British news and *It's A Knock Out*. The ITN ident card, Fig. 11, is shown at the opening of transmissions.

A most interesting report George, which reminds me that it is high time I used the pictures of a test card from ZDF Germany, Fig. 7, and the advert for Pennine Radio, Fig. 12, from Yorkshire TV on u.h.f. from your old QTH whilst only using an indoor antenna.

Further to the test card scribed KRS3 in our April issue, **Brendan Gaffney,** Dublin, says that he saw this on Ulster Television last year and again on March 15. **Brian Ellis** G3NSU, Leeds, explains that it is a set of colour bars used on links between programme contractors with a code to identify the source. My thanks to you both, these points are always of interest.

Mike Bennett has installed a South West Aerials WB3, and a Jaybeam ABM8 on a Hirschmann Rotator, with alignment bearing, to feed the Redson 136M 14in colour receiver, which covers systems PAL B, G and I and SECAM L, v.h.f. Bands I and III and u.h.f., at his station in Slough. **Alan Newman,** Basildon, plans to buy a Plustron receiver for TVDXing in Bands I and III.

Griffith Rockwood G3JGR, Burgess Hill, has purchased a Sony video camera and recorder and hopes to join many of his Mid-Sussex Amateur Radio Society colleagues who are active in the field of Amateur Television.

Letters

Sir: Very heartily indeed I welcomed the RTTY-ZX81 articles in *PW* (June/July 1983). But, again, the conclusion of these (on the whole quite interesting) articles got me red hot with anger. Do you really expect me to pay some ten quid to get the project to work?

I don't know anything about your connections with Scarab, but I do think you should go all the way in a construction project. You know, I am quite able to make my own p.c.b. (for a fraction of the cost of the Scarab one). Also, I can very well press the ZX81 keys myself.

So, why don't you offer the listings for the programs mentioned? If you consider these too lengthy for publication you can always make some s.a.e. offer. But, I suspect you won't really like to do that, for in the August issue you're continuing this bad habit, even selling the cassettes yourself.

Also, I noticed the interface p.c.b. design is very cramped and difficult to reproduce, although I did manage to do so. Can't you stick to single-sided boards?

So, I would like you to make the listings available for the projects you offer. Otherwise I don't see much point in renewing my subscription.

I want you to consider the questions raised by me, and also consider the way your projects increasingly rely on ready made stuff, such as p.c.b.s and cassettes. I'd say this letter also deserves inclusion in the Readers' Letters column (if you dare). I always rated *PW* as a first class monthly, but now you're going the wrong way I think.

B. Hendriksen, Leuvenheim, Holland

One of our aims in PW *is to publish from time to time articles which will introduce readers to a new mode of communication. We look for a design which will not be too expensive to build, and which can be got working easily by someone with no previous experience in that mode and with a minimum of test equipment. It may well include some ready-built modules if that's going to make life easier.*

The finished unit won't give the ultimate in performance, but it will be good enough to let you find out if it's a mode that could interest you, without costing you an arm and a leg. If you become hooked then you move on to better (and more expensive) hardware. The PW *"Exe" microwave transceiver was one example of this sort of project, the RTTY terminal was another.*

As a radio magazine, we look on computing simply as a tool that can be used in the radio hobby, not as an end in itself. The software, we consider to be the equivalent of a complex component, part of what you need to buy or make to construct the unit.

Yes, of course you could enter any of our PW *Radio Programs from a listing via the keyboard of your computer. Some of them can take an awful long time though, for example "ORBITS" on our first ZX81 cassette takes around five hours for a not too expert typist. We may make listings available in the future, but our feeling is that most radio enthusiasts would prefer an easier way of loading programs, providing it's not too expensive.*

Editor

New Horizons

Sir: Having read your magazine for the last seven months I thought I ought to put pen to paper and compliment you on your excellent magazine. You are about the only magazine which does not restrict itself to amateur radio as many do. I spent many months with your magazine as a s.w. BC bands listener. I logged many stations worldwide using a black box. I have tried Band II DXing with varying degrees of success. I am now the proud owner of an AR88 so I am on h.f. after spending some time as a listener on 144MHz. I also own a Vega 342 and I have had a lot of fun during the lift logging the DX. I always wanted to do it and thought you needed expensive gear, but my TV DX station is worth just £50. During the lift on January 29 I logged BRT TV1 and TV2 at 211 miles using a 2-element indoor quad, proving just what can be done on simple gear.

I hear a lot of people moaning about how difficult the RAE is. Let's face it, even on the Class B licence you have worldwide capability via the OSCAR satellites so the RAE isn't, in my view, asking too much. I am appalled at the number of people who don't know how to operate correctly and where do you find them all?—on 144MHz of course, moaning about the RAE, or expecting sympathy via your *Letters* page. I don't expect to pass at the moment though I have been into radio for three years now. I am 16 years old and I hope soon to take the RAE and the Morse. When and if I pass that I will be off to h.f. to work the DX instead of listening to some new ham moaning about how hard the RAE was. These are the people who have probably never tried anything other than 144MHz. In three years I have tried CB listening, s.w. BC bands DXing, Band II DXing, h.f. DXing and u.h.f. TV DXing. I challenge anyone who moans about the RAE to beat that lot. I am still finding new ways to play with radio after three years. Anyway I'm QRT and off to swot up for the RAE and the Morse test so I can earn my callsign.

Simon Griggs
Great Chesterford

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FT77s	10w. version	425.00	(—)
FMU77	FM Board for FT77	27.20	(1.00)
FT757	HF Transceiver	685.00	(—)
FT480	2m M/Mode Transceiver	399.00	(—)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	269.00	(—)
FT290	With Mutek front end fitted	299.00	(—)
FL2010	Linear Amplifier	63.25	(1.00)
FT790	70cm M/Mode Port/Transceiver	299.00	(—)
FL7010	Linear Amplifier	91.00	(1.00)
MMB11	Mobile Bracket	26.55	(1.00)
NC11	Charger	9.95	(0.75)
CSC1	Carrying Case	4.20	(0.75)
YHA15	2m Helical	5.35	(0.75)
YHA44D	70cm ¼wave	9.00	(0.75)
YM49	Speaker Mike	18.40	(1.00)
FT230	2m 25w FM	259.00	(—)
FT730	70cm 10w. FM	259.00	(—)
MMB15	Mobile Bracket	13.95	(1.00)
FT208	2m H/Held	199.00	(—)
FT708	70cm H/Held	209.00	(—)
MMB10	Mobile Bracket	8.05	(0.75)
NC9C	Charger	8.80	(0.75)
NC8	Base/station Charger	54.05	(2.00)
PA3	Car Adaptor/Charger	15.35	(0.75)
FNB2	Spare Battery Pack	21.45	(0.75)
YM24A	Speaker Mike	21.50	(1.00)
FT726R	2m Base Station	739.00	(—)
430/726	70cm Module for above	250.00	(2.50)
FRG7700	HF Receiver 15-30MHz	369.00	(—)
FRG7700M	As above with memory	435.00	(—)
FRT7700	A.T.U. for above	46.00	(1.00)
MH1B8	Hand 600 8pin mic	14.95	(1.00)
MD1B8	Desk 600 8pin mic	53.60	(1.00)
YH77	Lightweight phones	11.75	(0.75)
YH55	Padded phones	11.75	(0.75)
YH1	L/weight Mobile H/set-Boom mic	14.95	(0.75)
SB1	PTT Switch Box 208/708	16.25	(0.75)
SB2	PTT Switch Box 290/790	13.80	(0.75)
QTR24D	World Time Clock	34.50	(0.75)
FF501DX	Low Pass Filter	27.60	(0.75)
YP150	Wattmeter/Dummy Load 150w	98.00	(1.00)

TRIO

TS930S	9 Band TX General Cov RX	1150.00	(—)
TS830S	160-10m Transceiver 9 Bands	731.00	(—)
AT230	All Band ATU/Power Meter	139.00	(2.00)
SP230	External Speaker Unit	42.09	(1.50)
TS530S	160m-10m Transceiver	638.00	(—)
TS430S	160m-10m Transceiver	752.00	(—)
PS430	Matching Power Supply	115.00	(3.00)
SP430	Matching Speaker	29.90	(1.50)
MB430	Mobile Mounting Bracket	11.50	(1.50)
FM430	FM Board for TS430	35.19	(1.00)
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SP120	Base Station External Speaker	27.14	(1.50)
AT130	100W Antenna Tuner	95.45	(1.50)
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MC30S	Fist Microphone 500 ohm IMP	14.95	(0.75)
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TR9130	2M Multimode	442.52	(—)
TW4000A	2M/70cm mobile	469.00	(—)
TM201A	2M 25W mobile	269.00	(—)
TR7930	2M 25W Transceiver	312.11	(—)
TR3500	70cm Handheld	256.45	(—)
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SMC25	Speaker Mike	16.56	(1.00)
PB25	Spare Battery Pack	25.53	(1.00)
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R600	Gen. Cov. Receiver	263.12	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	421.36	(—)
HC10	Digital Station World Time Clock	69.46	(1.50)
HS5	Deluxe Headphones	23.65	(1.00)
HS4	Economy Headphones	11.27	(1.00)
SP40	Mobile External Speaker	14.49	(1.00)

POWER SUPPLIES

DRAE			BNOS	
4 amp	30.75	(2.00)	6 amp	48.30 (2.50)
6 amp	49.00	(2.50)	12 amp	86.40 (3.00)
12 amp	74.00	(3.00)	25 amp	125.00 (4.00)
24 amp	105.00	(4.00)	40 amp	225.00 (4.00)

ICOM PRODUCTS

		£	c&p
IC751	HF Transceiver	1049.00	(—)
IC745	HF Transceiver	839.00	(—)
IC730	Mobile HF Transceiver	659.00	(—)
PS15	P.S. Unit	119.00	(4.00)
PS30	Systems p.s.u. 25A	229.00	(—)
SM6	Base microphone for 751/745	34.50	(1.00)
IC290D	2m 25w M/Mode	469.00	(—)
IC271E	2m 25w M/Mode Base Stn.	629.00	(—)
IC271H	100W version of above	P.O.A.	(—)
IC25H	2m 45w FM	359.00	(—)
IC27E	25W FM mobile	315.00	(—)
IC45E	70c 10w FM	P.O.A.	(—)
ICBU1	B/U Supply for 25/45/290	24.50	(1.00)
ICR70	General Coverage Receiver	549.00	(—)
ICR71	General Coverage Receiver	649.00	(—)
IC02E	2m H/Held	229.00	(—)
IC2E	2m H/Held	169.00	(—)
ML1	2m 10w Linear	69.00	(2.00)
ICO4E	70cm Handheld	P.O.A.	(—)
IC4E	70cm H/Held	219.00	(—)
BC30	Base Charger	56.35	(—)
HM9	Speaker mic	16.50	(0.75)
ICBP3	Std Battery Pack	25.00	(0.75)
BP5	High Power Battery Pack	48.00	(0.75)
CP1	Car Charging Lead	4.95	(0.75)
DC1	12v Adaptor	12.50	(0.75)

LINEAR AMPS

TOKYO HY POWER			
HL 82V	2m inc preamp (2-12W in 35-85 + out)	144.50	(2.00)
HL 160V	2m inc preamp (1-10W in 160W + out)	242.40	(2.00)
MICROWAVE MODULES			
MML144/30-LS	inc preamp (1/3 w i/p)	69.95	(2.00)
MML144/50-S	inc preamp, switchable	92.00	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	149.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML432/30L	inc preamp (1/3w i/p)	129.95	(2.00)
MML432/50	inc preamp (10w i/p)	129.95	(2.00)
MML432/100	linear (10w i/p)	245.00	(2.50)
B.N.O.S.			
LPM 144/1-100	(1 watt input) inc preamp	172.50	(2.00)
LPM 144/3-100	(3 watt input) inc preamp	172.50	(2.00)
LPM 144/10-100	(10 watt input) inc preamp	149.50	(2.00)
LPM 144/25-160	(25 watt input) inc preamp	207.00	(2.00)
LPM 144/10-180	(10 watt input) inc preamp	235.00	(2.50)
LPM 144/3-180	(3 watt input) inc preamp	235.00	(2.00)
TONO			
MR 100	2m (10w in 90w out) inc preamp	P.O.A.	(—)
MR 150	2m (10w in 120w out) inc preamp	P.O.A.	(—)

SWR/PWR METERS

HANSEN			
FS200	1.8-150MHz 20/200 Pep	55.95	(1.00)
FS210	1.8-150MHz 20/200 Auto SWR	59.80	(1.00)
FS5E	3.5-150MHz 20/200/1000W HF	41.00	(1.00)
FS500H	1.8-80MHz 20/200/2000W Pep	77.80	(1.00)
FS7	145 & 432MHz 5/20/200	44.85	(1.00)
FS710H	1.8-60MHz 15/150/1500W Pep	97.75	(1.00)
FS711U	430-440MHz 5/20W Head	41.00	(1.00)
FS711H	2-30MHz 20/200 W Head	41.00	(1.00)
WELZ			
SP15	1.8-160MHz PWR/SWR	41.00	(1.00)
SP45	130-470MHz PWR/SWR	59.75	(1.00)
SP10X	1.8-150MHz PWR/SWR	28.75	(1.00)
SP200	1.8-160MHz PWR/SWR	82.00	(1.00)
SP250	1.8-60MHz PWR/SWR	57.75	(1.00)
SP300	1.8-500MHz PWR/SWR	115.00	(1.00)
SP350	1.8-500MHz PWR/SWR	69.95	(1.00)
SP400	130-500MHz PWR/SWR	82.00	(1.00)
SP600	1.8-500MHz PWR/SWR	106.00	(1.00)
TOYO			
T430	144/432 120 W	39.49	(1.00)
T435	144/432 200 W	43.50	(1.00)
YAESU			
YS200	1.8 60MHz	52.90	(1.00)
YS2000	1.8 60MHz	69.79	(1.00)

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MUTEK PRODUCTS

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SLNA 50	50MHz Switched preamp	37.10	(1.20)
SLNA 144s	144MHz Low noise switched preamp	37.10	(1.20)
SLAN 145sb	Preamp intended for 290	27.40	(1.20)
TLNA 432s	70cm Switched preamp	74.90	(1.20)
RPCB 144ub	Front end FT221/225	71.00	(1.20)
RPCB 251ub	Front end IC251/211	76.90	(1.20)
BBA 500u	20-500MHz Preamp	29.00	(1.20)
GFBA 144e	2m Mast head preamp	129.90	(2.50)
SBLA 144e	2m Mast head preamp	79.90	(2.50)
RPCB 271ub	Front end for IC271	79.90	(1.20)

DATONG PRODUCTS

PC1	Gen. Cov. Con.	137.40	(1.00)
VLF	Very low frequency conv.	29.90	(1.00)
FL2	Multi-mode audio filter	89.70	(1.00)
FL3	Audio filter for receivers	129.00	(1.00)
ASP/B	r.f. speech clipper for Trio	82.80	(1.00)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.00)
ASP	As above with 8 pin conn	89.70	(1.00)
D75	Manual RF speech clipper	56.35	(1.00)
D70	Morse Tutor	56.35	(1.00)
MK	Keyboard morse sender	137.40	(1.00)
RFA	RF switched pre-amp	33.90	(1.00)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(2.00)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(2.00)
MPU	Mains power unit	6.90	(1.00)
DC144/28	2m converter	39.67	(1.00)
PTS1	Tone squelch unit	46.00	(1.00)
ANF	Automatic notch filter	67.85	(1.00)
SRB2	Auto Woodpecker blanker	86.25	(1.00)

CW/RTTY EQUIPMENT

Tono 550	CW/RTTY Decoder	299.00	(2.00)
Tono 9000E	Reader/Sender	P.O.A.	(—)
Telereader	CWR610E	189.00	(2.00)
MICROWAVE MODULES			
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MM4001	RTTY terminal	269.00	(1.25)
MM4001KB	RTTY term with keyboard	299.00	(2.00)
HI-MOUND MORSE KEYS			
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HK704	Up down keyer	19.25	(1.00)
HK705	Up down keyer	13.57	(1.00)
HK706	Up down keyer	15.90	(1.00)
HK708	Up down keyer	13.00	(1.00)
HK808	Up down keyer	39.95	(1.00)
MK 703	Twin paddle keyer	28.30	(1.00)
MK704	Twin paddle keyer	12.65	(1.00)
MK705	Twin paddle keyer marble base	24.65	(1.00)
KENPRO			
KP 100	Squeeze CMOS 230/13.8v	77.05	(2.00)
KP200	Memory 4096 Multi Channel	165.62	(2.50)

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AR40	5 core Medium Duty	98.90	(2.00)
KR400	Med/H Duty	99.94	(2.50)
KR500	6 core Elevation	126.50	(2.50)
KR400RC	6 core Medium Duty	118.45	(2.50)
CD45	8 core Heavy Duty	149.50	(2.50)
KR600RC	8 core Heavy Duty	167.90	(3.00)
HAM1V	8 core Heavier Duty	264.50	(4.00)
T2X	8 core Very Heavy Duty	332.35	(4.00)

SWITCHES

Sigma	2 way SO239	11.50	(0.75)
Sigma	2 way 'n' Skts	15.50	(0.75)
Welz	2 way SO239	20.75	(0.75)
Welz	2 way 'n' Skts	37.00	(0.75)
Drae	3 way SO239	15.40	(0.75)

MISCELLANEOUS

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	7.10	(0.50)
T100	100W Dummy load	28.00	(1.00)
T200	200W Dummy load	41.40	(1.50)
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Altai	Dip Meter	49.00	(1.00)

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2.	(2)	Modem	LW99H	£44.95	5 XA05F
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3.	(3)	Car Burglar Alarm	LW78K	£6.95	4 XA04E
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6.	(7)	Syntom Drum Synthesiser	LW86T	£11.95	Best of E&MM
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		Also required: LK30H £6.50; Case: XG35Q £4.95 — Total £39.95.			
		Also available complete ready-built: XG36P £44.95.			
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9.	(9)	8W Amp Module	LW36P	£4.45	Catalogue
10.	(11)	Logic Probe	LK13P	£9.95	8 XA08J
11.	(13)	Ultrasonic Intruder Detctor	LW83E	£10.95	4 XA04E
12.	(8)	VIC20/64 RS232 Interface	LK11M	£9.45	7 XA07H
13.	(10)	Harmony Generator	LW91Y	£17.95	Best of E&MM
14.	(14)	Spectrum RS232 Interface	LK21X	£17.95	8 XA08J
15.	(12)	Keyboard for ZX81	LW72P	£23.95	3 XA03D
		Case also available: XG17T £4.95. Complete ready-built: XG22Y £32.50			
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17.	(28)	Burglar Alarm	LW57M	£49.95	2 XA02C
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