MAY 1984 90p

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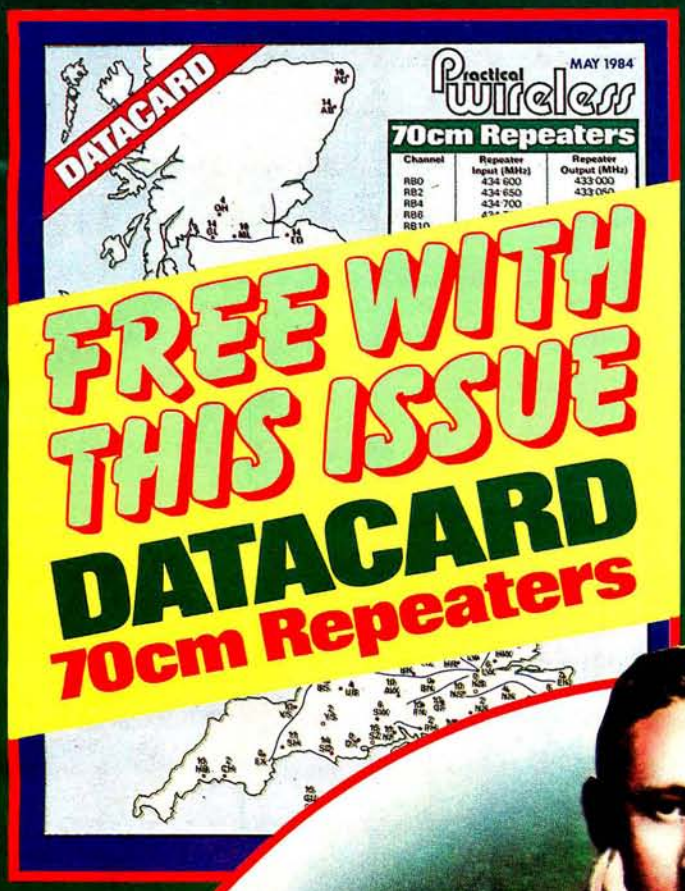
Practical Wireless

THE RADIO MAGAZINE



FREE WITH THIS ISSUE
DATACARD
70cm Repeaters

Let's Build a Crystal Set (just like Grandad's)

"An HF Tune-up Aid"

Early Work of Marconi

THE NEW ANTEX TCSU-D

temperature control digital soldering unit

has joined the Antex range advancing the science of soldering

With the New Antex TCSU-D High-Value high-performance unit. Its simple design incorporates an LED display and a unique ULA integrated circuit, custom built for ANTEX by Ferranti.

Tight temperature control can be maintained by setting the station — then removing the knob, preventing any further alteration, for laboratory, for workshop, for production-line. Joins the most sophisticated range of soldering equipment. Irons, bits, kits, stands, units and accessories — each at the forefront of soldering technology. It's just one more advance from Antex.

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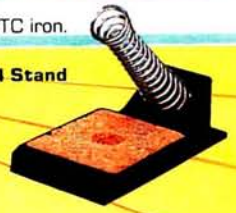
PW5

. . . and keep up to date with the science of soldering from ANTEX

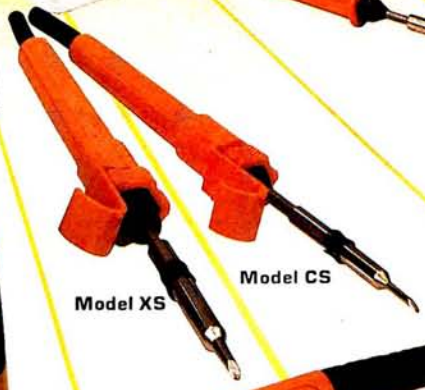
TCSU1 Soldering Station
For safe 24 volt temperature-controlled miniature soldering iron, variable tip temperature 65-430°C, antistatic earth connection, with XSTC or CSTC iron.



ST4 Stand

Model C
— 15 Watts
Stainless steel shaft only.
240 and 115 volts

50 and 24 volts



Model XS

Model CS

TCSU-D
temperature control digital

SK5 Soldering Kit
Contains model CS230 iron and the ST4 stand

SK6 Soldering Kit
Contains model XS230 iron and the ST4 stand

SK5-BP and **SK6-BP**
Soldering Kits
Fitted with safety plugs.
SK5-BP kit
SK6-BP kit

TCSU-D temperature control digital soldering unit.
● Temperature range — ambient to 495°C. ● Bit temperature maintained to ± 5°C. ● Zero crossing switching ● Detachable sponge-tray and includes the world-famous ANTEX Iron.

Model XS
— 25 Watts
Available for 240 and 115 volts

50, 24 and 12 volts

Model XS-BP
— 25 Watts
Fitted with safety plug 240 volts

Model CS
— 17 Watts
Available for 240 and 115 volts

50, 24 and 12 volts

Model CS-BP
— 17 Watts
Fitted with safety plug 240 volts

ANTEX

ANTEX (Electronics) Ltd.,
Mayflower House, Plymouth, Devon. Telephone: 0752 667377 Telex: 45296

Practical Wireless

FOR THE Radio ENTHUSIAST ...

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Regulars

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.

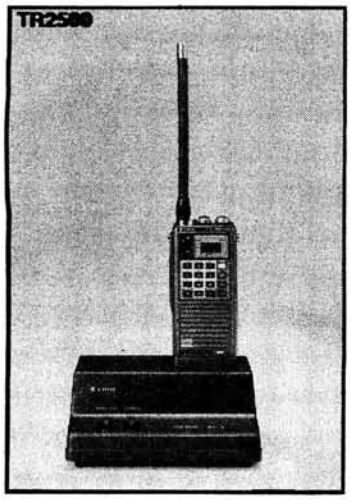
MC55 ..... **£38.64 inc VAT.** carriage £2.00
SW100A/B ..... **£37.26 inc VAT.** carriage £2.50

LOWE IN LONDON, Open monday to saturday, six days a week
lower sales floor, Hepworths, Pentonville Rd, London. telephone 01.837.6702
LOWE IN GLASGOW, Open tuesday to saturday
4,5 Queen Margarets Rd, Glasgow. telephone 041.945.2626

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 you have actually operated the rig with the optional VS1 voice synthesizer fitted, then you cannot really make a considered judgement. It is easy to say that such a feature is a gimmick but I, on my journeys up and down the country, have found that having the frequency, memory number etc announced in clear distinct voice is much better than stealing a glance at the display. A recent review in AMATEUR RADIO magazine (December 1983) tells more.

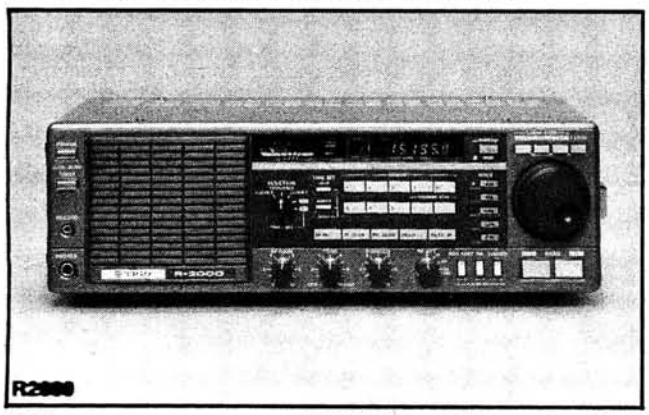
TW4000A ..... **£469.00 inc VAT.** carriage £6.00
VS1 ..... **£24.50 inc VAT.** carriage £0.75
(in fact the VS1 is not a voice synthesizer, it is the digitally recorded voice of a Japanese girl programmed into a dedicated chip, her Japanese diction can be had as an alternative by moving an internal switch on the VS1 board from position EN to JA.)

Don't let us forget the two handhelds from TRIO, the 2 metre TR2500 and the 70 centimetre TR3500. Both very popular pieces of equipment. Reliable and functional. Each having ten memories, memory scan, programmable scan, repeater and reverse repeater shift and a comprehensive range of accessories compatible to both models.



TR2500 ..... **£237.82 inc VAT.** carriage £6.00
TR3500 ..... **£256.45 inc VAT.** carriage £6.00

Two general coverage receivers are available from TRIO, the R600 and the R2000. The R600 is the basic model and covers continuously frequencies from 150 KHz to 30 MHz having AM, CW and SSB modes. The R2000 is more sophisticated having the same coverage but FM in addition to the usual modes found on a high quality general coverage receiver. Ten memories, memory scan, programmable band scan between user defined limits all add to the enjoyment to be had from a TRIO R2000. To create the perfect receiver an optional VHF converter covering again continuously 118 to 174 MHz and fitting inside the receiver is available. The nice thing about the VHF converter is that the frequency readout of the R2000 is also corrected so that if you are tuned to 145.600 then that is what the readout displays.



R600 ..... **£263.00 inc VAT.** carriage £6.00
R2000 ..... **£421.20 inc VAT.** carriage £6.00
VC10 ..... **£113.00 inc VAT.** carriage £6.00

HF equipment from TRIO provides you with a choice, solid state or valve. The NEW TS530SP from TRIO is the choice for those who require a rig that will give them world wide communication without frills. The TS830S has a receiver with variable band width and a transmitter having an RF speech processor. Both the TS530SP and the TS830S use a pair of the well known 6146B valves. There are also the four solid state rigs. The TS130 V and S amateur bands only, 25 watts and 200 watts PEP respectively, the TS430S covering the amateur bands and also being a general coverage receiver and the "FLAGSHIP" of the range, the incomparable TS930S, a piece of equipment whose specification and performance are well known.

TS530SP ..... **£638.00 inc VAT.** carriage £6.00
TS830S ..... **£731.40 inc VAT.** carriage £6.00
TS130S ..... **£555.45 inc VAT.** carriage £6.00
TS430S ..... **£752.10 inc VAT.** carriage £6.00
TS930S ..... **£1150.00 inc VAT.** carriage £6.00

So that a full amateur radio station can be set up, TRIO have a comprehensive range of microphones, headphones, separate VFO's, aerial tuning units, for the TS430S and TS930S, the ATU's can be automatic, etc.
The items are too numerous to list, full details and prices can be obtained from any LOWE ELECTRONICS shop.

★ ★
★ The **LOWE TX40 CB transceiver** is now well known on ★
★ the band. Many have bought other rigs, only to be dissatis- ★
★ fied. They have then heard about the **TX40** from their ★
★ friends, bought one and been delighted. The rig performs ★
★ as a well designed rig should. And for those who think ★
★ otherwise, the CB frequencies are now populated by opera- ★
★ tors having pleasant contacts. The band has come of age. ★
★ The **LOWE TX40** has been available for some time now for ★
★ the sum of £29.50 inc VAT, carriage £3.00. ★
★ For the discerning a deluxe version is available for an ★
★ additional £8.50. ★
★ This rig has an extra filter fitted to enhance listening when ★
★ the band is busy. Take this opportunity to buy at this special ★
★ price a LOWE TX40 CB transceiver. ★
★ ★

LOWE ELECTRONICS

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

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	79.00
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 amps	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	T.B.A.
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	T.B.A.
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	299.00
EX310	Voice synthesizer unit	39.00
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 4 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–O2E	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
T/L1	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
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 display	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, lw 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

Microphones

HM3	4 Pin hand microphone (IC240)	12.50
HM5	4 Pin hand microphone noise cancelling	20.00

IC-751, £1049.

The IC–751 now has an interesting and useful addition, a remote push-button frequency selector pad, so you can either twiddle knobs or press buttons.

The IC–751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options. The 751 is fully compatible with ICOM auto units such as the AT–500 and IC–2KL.

Standard features include: a speech processor, switchable choice of J–FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, direct feed mixer in the front end, full break-in on CW and AMTOR compatibility. First IF is 70.045 MHz. XIT and RIT adjustment is displayed. The transmitter features high reliability 2SC2904 transistors in a low IMD (–32dB @ 100W) full 100% duty cycle. Power is restricted to 40W on AM and adjustable from 10W on all modes. FM and the IC–FL44A crystal SSB filter are both fitted as standard.

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.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Than

perfection?

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 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	Comunications 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		
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		
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
Cue Dee Antennas:		
4144A	4 element 8dbd gain 2m VHF yagi,	£24.93
10144	10 element 11.4dbd gain 2m VHF yagi,	£45.16
15144	15 element 14dbd gain 2m VHF yagi,	£63.00
17432	17 element 14.5dbd gain 70cm. UHF yagi,	£48.00
Accessories:		
15L2	Matching cable to stack 2 x 15144's	£77.00
15S2	Clamps and boom to stack 2 x 15144's,	£72.00
10L2	Matching cable to stack 2 x 10144's	£75.50
10S2	Clamps and boom to stack 2 x 10144's,	£65.50

Prices include VAT at 15%
Items listed are subject to availability.
We reserve the right to change prices without giving prior notice.
As well as ICOM equipment, we also stock the following:– TONO & TELEREADER, CUE DEE, DATONG, MICROWAVE MODULES, MUTEK, LAR, WELTZ, YAESU, JAYBEAM, TAL, G-WHIP, DRAE, B.N.O.S., BEARCAT, TRIO and many other accessories.

IC-R71E, £649.

The best has just been made better! The ICOM IC–R70 receiver has had some important additions made to its specifications and this model is named the IC–R71E. Here are some details:–

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz 9MHz and 455 KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100 db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct entry keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

OPTIONS:– Synthesized voice readout, infra-red remote controller, 12 V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

The IC R70 will still be available at £549.00. Ask for a leaflet giving the full details of these two fine receivers.

Agent: Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900 – 2200 hrs.

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10 memories,
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- NC-7 - Standard charger
- NC-8 - Standard/quick charger/DC Power supply
- NC-9C - Compact charger (220-234V)
- PA-3 - Car adapter
- YM-24A - Speaker/microphone
- FL-2010 - 10 watt power amplifier for FT-208R
- FL-7010 - 10 watt power amplifier for FT-708R

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Open: 9.15 am - 5.15 pm
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SOUTH-WEST

Amateur Electronics UK/ Uppington,
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Open: 9 am - 6 pm.
Sat: 9 am - 1 pm

YORKSHIRE

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ARE *more on your wavelength*

AMT-1

The ultimate text communication machine

AMT-1 Specification Summary
Modes: AMTOR (ARQ mode) — RTTY (1-99 Bauds)
AMTOR (FEC mode) — ASCII (110 Bauds)
AMTOR (mode L) – ARQ listen — CW (1-99 w.p.m.) [Transmit only]
Tones: 170Hz shift (IARU tone frequencies)
Computer/Terminal interface: 75 or 110 Bauds, serial ASCII at RS232 levels. Full of half duplex.
Tuning indicator: 16 LED "panadaptor" type gated display.
Electronics: Microprocessor based; 4 pole input filter to discriminator/limiter; crystal controlled transmit tones via programmable sinewave function generator.
Equipment compatibilities: Almost all modern transceivers will operate on Amtor with little or no modification (except FT102). Any KSR or VDU terminal with serial ASCII interface of the correct Baud rate will work with the AMT-1, as will any personal computer with a suitable serial interface. Programs of varying complexity are available from ICS for the most popular micros.
Mode control: Via ESCAPE or CONTROL commands from the terminal or computer. Mode status is displayed on the AMT-1 front panel.
Options: CW receive board.
USA high tone frequencies available to special order.

The I.C.S. AMT-1 AMTOR/RTTY/ASCII/CW Terminal Unit is extremely powerful in its own right, but combine it with a Commodore 64 computer and our new split screen program and it forms probably the ultimate amateur radio data communication system.

Designed to get any home computer or ASCII terminal on the air with error-correcting data transmission with minimal difficulty, the AMT-1 is leading strong worldwide build-up in AMTOR activity.

EVEN W1AW IS NOW SENDING NEWS BULLETINS ON AN AMT-1!

This is what an independent test laboratory in America said of its AMTOR performance:- "I have a rather expensive commercial SITOR/FEC system, actually two of them (Philips and RCA) and your AMT-1 tends to maintain as much as 10 per cent less repeat exchanges, which is quite significant. I have compared your system with HAL's new entry, a prototype of same, and with the Microlog software for the 6800, and as far as I am concerned, there is no comparison, as your unit far outperforms them. I use baud optimised terminal units and under adverse conditions with injected noise transients, I have yet to see more than five per cent additional hits with your system compared to the standard I am using. Mind you, this is comparing it with a $2000 plus terminal unit."

Copies of the unsolicited letter from which this is extracted are available on request. On normal RTTY, the AMT-1 has been described as being "as good as HAL." G3PLX (who coined the term AMTOR), took three years to write and prove the software in the AMT-1 and to the best of our knowledge, no company has written comparable software which is bug free. For the moment therefore the AMT-1 is the **definitive** implementation of AMTOR. Others are trying to emulate it, but still have a long way to go!

To make using the AMT-1 even easier, I.C.S. have recently commissioned a really professional software package for the COMMODORE 64. At present this computer is probably the best value for money for use with the AMT-1. Among the features the program offers are: Split Screen with transmit buffer; Message Editing; Multiple Message Storage; CW Ident; RY; CQ; QBF; USOS and Automatic Operation. The system can even store and acknowledge messages whilst you are getting on with other things in the shack, with no human intervention! SIMILAR SOFTWARE IS AVAILABLE FOR THE BBC MODEL B MICRO (on E-PROM).

For **£55.00** including VAT, you get a manual, the software in a cartridge, an interface cable with built-in RS232 drivers (for RFI immunity) and labelled keyboard overlays. You can use your computer for other applications simply by unplugging the software cartridge.

The price of the **AMT-1** is unchanged at **£269.00** inc VAT, and with it's built-in tuning and status indicators; four section audio filter/discriminator and crystal controlled tone generator, offer superb value for money. Incidentally, the AMT-1 will work with *any* computer or terminal which has a 110 or 75 Baud serial RS232 interface.

For those still unfamiliar with AMTOR, it is a unique, error correcting data communications system which gives perfect copy through Noise, QRM and fading. It is on the way to replacing RTTY in Amateur applications, just as it already has done in marine ship-to-shore applications (termed SITOR in this instance.) **Once you try it, RTTY will never be the same again!**

PRICES:

AMT-1 Amtor/RTTY/ASCII/CW Terminal Unit	**£269.00** P & P £2.50
CW Receive option	**£25.00** P & P £1.00
Commodore 64 Software, interface	**£55.00** P & P £1.00
BBC Model B software, interface	**£55.00** P & P £1.00
IBM PC software, interface	**£25.00** P &P £1.00

Other products available from ICS
See (*) for special price reductions

Model	*Description*	*Price (inc. VAT)*	*P & P & Ins.*
CP-1 "COMPUTER PATCH"			
CP-1	Computer Patch	**£179.00**	£2.50
	Commodore 64 RTTY/CW/ASCII software, interface kit for CP-1	**£39.00**	£1.00
	VIC-20 RTTY/CW/ASCII software, interface kit	**£39.00**	£1.00
	BBC Model B RTTY software, interface kit	**£25.00**	£1.00
	Commodore 64 Amtor software, interface kit	**£69.00**	£1.00

The AEA "Computer Patch" is an excellent modulator/demodulator requiring code conversion in the host computer. Our software is some of the best in the business. USA manufacture.

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A new low cost method of getting the VIC-20 or Commodore 64 on the air with RTTY. Uses the same excellent software as the "Computer Patch". One hardware/software module does it all! USA made.

Model	*Description*	*Price (inc. VAT)*	*P & P & Ins.*
	Commodore 64 "Micropatch"	**£129.00**	£1.50
	VIC-20 "Micropatch"	**£129.00**	£1.50
LOW COST AMTOR			
	Mk II AMTOR P.C. board, assembled kit	**£135.00**	£1.00
	Commodore Pet Amtor software	**£45.00**	£1.00
	Commodore 64 Amtor software	**£69.00**	£1.00
MORSE KEYERS			
	MM-2 Morsematic Keyer. The ultimate keyer	**£149.00**	£1.50
	CK-2 Contester memory keyer	**£119.00**	£1.50
	KT-2 Keyer/Trainer	**£95.00**	£1.50

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S.E.M. IMABIC KEYER. We have replaced its plastic box, with an attractive plated steel case. No better fully auto keyer anywhere. Uses Curtis chip. R.F. proof. **£38.** A first class twin paddle key **£15 Ex stock.**

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Because no similar unit is made, it's usefulness is not appreciated until you have used one. Eliminates need for S.W.R. bridge.

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Feature either POWER AMP alone or PRE-AMP alone or both POWER AND PRE-AMP or STRAIGHT THROU when OFF. Plus a gain control on the PRE-AMP from 0 to 20dB. N.F. around 1dB with a *neutralised* strip line BF981.

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PA5 Same specification as the Auto including 240V P.S.U. **£33.00***

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This module is based on our popular 70LIN3/10E pcb which incorporates not only a well designed linear amplifier stage but also a temperature compensated bias network and full r.f. changeover facility. The pin diode circuitry allows a straight through path during receive periods or when the power supply is disconnected making the unit failsafe to accidental damage.
If you wish to use it for SSB transmissions the internal 'hang-time' will be advantageous as will the hard switching capability. Just apply 1.5W of drive for 10W output or 1W for typically 7W output!
The board is available as a pcb kit or assembled tested module without external hardware although boxes and heatsinks are available if desired.
INTRODUCTORY PRICE **Kit: £32.50** **Assembled: £44.25**

Have you seen our package offers?

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1.	500mW TV Transmit (70FM05T4+TVM1+BPF433)	30.00
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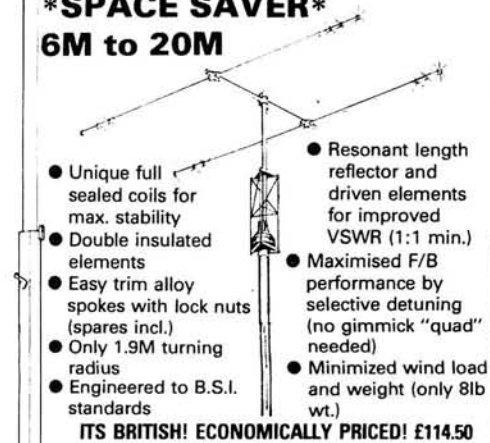

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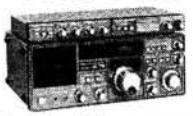

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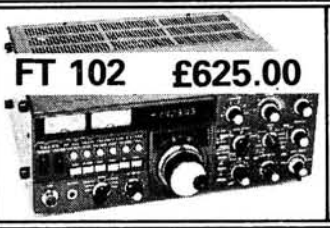

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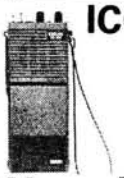

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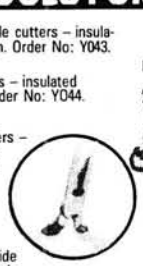

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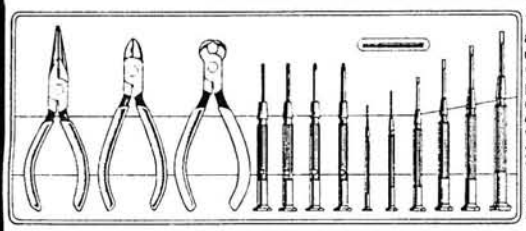

13-piece tool set housed in attractive moulded plastic case with clear sliding cover ● 1 off 5" snipe nose "radio" pliers with side cutters ● 1 off 4½" side cutters ● 1 off 4½" end cutters ● 2 off hex. "Allen" key drivers 2mm and 2.5mm; 2 off cross-point "Phillips" drivers No. 0 and No. 1 (with tommy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

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

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Dims - 90 × 61 × 30mm.

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Max voltage:	500V
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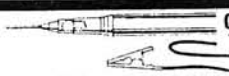

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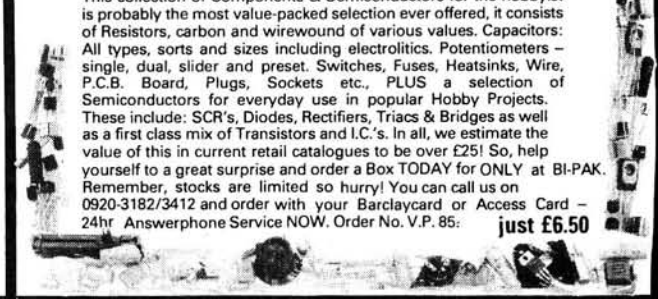

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IFs and Buts

MANY READERS will have heard the recent GB2RS News Bulletin broadcast which voiced concern over proposals for the choice of intermediate frequencies for domestic satellite TV (DBS) receiving systems to operate at 12GHz.

The choice of intermediate frequencies in any radio system is, of course, always a compromise, particularly in domestic equipment which must be mass-produced at reasonable cost. The avoidance of i.f. breakthrough and image interference are only the beginning of the designers' problems, but even here decisions have been made in the past on the basis of "it's not perfect, but interference is only likely to affect listeners in certain fairly limited areas".

Take, for example, i.f.s in the range 450–470kHz which are the norm for domestic long- and medium-wave receivers. Anyone who has ever lived in coastal regions will know about i.f. breakthrough from telegraphy transmitters in ships and marine coast stations, many of them running at kilowatt-plus levels. Receivers with the antenna feeding straight into the frequency changer stage don't have very good i.f. rejection, and often an i.f. trap at the input is the only way to kill the background "chirping".

The avoidance of image or second-channel interference is something which affects the selection of frequencies for Band II f.m. transmitters. Band II runs from 88 to 108MHz (though the top end is currently used for other services in the UK). This means that with the local oscillator running *above* the signal frequency and an i.f. of 10·7MHz, image interference can come from aeronautical stations in the range 109·4 to 129·4MHz. The broadcast frequency planners work with a map showing aeronautical assignments, and try to select channels that aren't 21·4MHz lower than anything on that map in the same area. They don't always get it quite right, though. For instance, there's an area north of Bournemouth where transmissions from aircraft passing a navigational beacon break into local radio programmes.

Getting back to those satellite TV i.f.s, the potential for interference is far more widespread than in either of these examples. The receiver system will be dual-conversion, with a proposed first i.f. in the range 950–1350MHz, and a second i.f. of 134MHz with a bandwidth of 27MHz, spanning the amateur 1·3GHz and 144MHz bands and other frequencies too, notably those used by airport radar systems, but not too many people live close to these. The chance of a satellite TV receiver and an amateur radio station being close together will be far higher though—in the UK the proportion of licensed radio amateurs to the general population is approaching 1 in every 1000, some other countries already far exceed that figure.

The RSGB is involved in discussions on the problem with the UK authorities and is liaising with all amateur radio societies in Region 1. Let us hope that common sense will prevail, and that a whole new range of interference problems is not unnecessarily to be thrust upon us.

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.

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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.

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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.

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Mods

No.28 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.

More and more people are using scanners, or so it would seem from the number of letters that I get on the subject. It could be that scanner owners tend to write more than other amateurs, but I am inclined to believe that scanning has become a very popular part of the hobby. Whenever I talk to the importers of scanners, their sales figures always amaze me. Admittedly a large number are bought by the various authorities who need to be able to check on several frequencies, but there are still many thousands being used by private individuals.

The legality of their use is not entirely clear, so instead of trying to define the situation I must rely on your knowing the various Wireless Telegraphy Acts and not making use of any mods that I may pass on in a way that could be construed as contravening these Acts.

Most scanners cover a large portion of the radio spectrum in five or six bands and the mod that is usually requested is extending the coverage to fill in the gaps between the bands. With some makes this is quite easy and I am indebted to Liam in Ireland for first telling me about it. He wrote in some time ago to tell me that pushing the buttons on a **Bearcat 250FB** in a very strange order would make it receive outside its pre-programmed ranges. I first mentioned this in our March '82 issue but as the program is so short I will pass it on again.

First press MANUAL to stop the set scanning. Then press 1 4 6, then LIMIT. Punch in 1 4 6 again and then press LIMIT again. Now press STORE, then open and close the SQUELCH and then press MANUAL.

Now press 1 7 4 followed by LIMIT, then 1 7 4 again followed by LIMIT again. Now press SEARCH and then RECALL. Press SEARCH again and the set will then search down from 146 to 133MHz.

The above procedure can be varied by substituting 5 1 2 for 1 4 6 and the set will then search from 512MHz all the way up to 999MHz. Of course this is well outside the design specifications for this model so the sensitivity figures quoted in the handbook do not apply.

To enter one of these "new" frequencies in one of the memories requires another strange operation. First use one of the above procedures to reach the frequency that you want. Then open the SQUELCH, switch the set off and then on again and the frequency will then be entered in the memory.

The Bearcat 220FB can also be persuaded to receive out of band and in the same issue I showed how this is done. First press 8 8 then ENTER. Then press LIMIT followed by 1 4 4. Press LIMIT again and then press SEARCH and then LIMIT again. Press SEARCH again and the set will then receive between 88 and 108MHz. In fact it can be made to cover its entire range without any gaps.

I have now found yet another way of receiving out-of-band signals with a scanner. This method is applicable to those models that cannot be persuaded to operate outside the pre-set limits, such as the SX-200. It's called Image Reception and it involves listening not to the main signal but its image, which is a product of the main frequency and the intermediate frequency inside the set. Most scanners use 10·7MHz as an i.f. but some use 10·8 or 10·85MHz so you must first find out which one your model uses.

Sometimes this is written in the handbook but if it is not, there is another way to find out. First tune around the 144 to 146MHz band until you find a very strong signal and make a note of the exact frequency. Then listen around 166MHz until you can hear the same signal. Make a note of this frequency and then subtract the first one from it. Divide the answer by two and that is the intermediate frequency of your radio. Armed with this knowledge you can now listen to signals that would otherwise be outside the range of your receiver. For instance, if your radio will cover 405 to 465MHz but you want to listen to a signal around 390MHz, simply add double your i.f. to the frequency of the signal that you want to hear and then tune to the new frequency. If the signal is reasonably strong, you should then be able to hear its image at around 410MHz. This method is not as flexible as the previous ones as it only allows you to tune to signals that are within 20MHz or so of the band edges of your receiver, but it does allow those of you with sets that cannot be modified to hear just that little bit extra.

Lots of people have written in with the a.m. mod for the Bearcat 220FB. This set covers the aircraft band, which is a.m., but it does not provide facilities for listening to any other bands in that mode. It is possible to hardwire a switch on the back to give a.m. whenever it is needed and I will probably publish details in a future issue but for now, here is a way to make the set switch itself to a.m. whenever you want it to. If you are tuned to say, the lower end of 144MHz and you happen to hear someone using a.m. (yes, some people do still use it), it is possible to trick the set into switching to a.m. Simply punch in any frequency in the aircraft band and then press LIMIT. The set will not change frequency but it will change to a.m. The peculiarity of this model is that while you are setting up the band edges that you want it to search between, it carries on listening to the last frequency that was entered in that channel. If it thinks that you are about to search a portion of the aircraft band, it changes to a.m. while it is waiting for further instructions. Therefore when you entered a frequency in the aircraft band, it thought that you were going to follow that up by entering another one and then search between them. The only disadvantage of this method is that you cannot see the frequency that you are on once the new one has been entered, but I prefer to do it this way as it saves having to delve inside with a soldering iron.

I have just been told of a "button juggling" way of making the Bearcat 100 operate out-of-band, but you will have to wait until next month for that as I have now run out of space. If you know of any interesting tricks that can be done with scanners, any models, please write to me and I will be happy to pass them on—and probably make use of them myself on one of my own machines.

Repeater News

The DTI has issued licences for the following voice repeaters on 16 February 1984.

VHF: GB3BB at Brecon, Powys on R4 (probably on air by the time you read this), GB3PA at Paisley, Scotland on R1 (operational 18-2-84), GB3OC at Kirkwall, Orkney Isles on R2 (operational 17-2-84), GB3LU at Shetland Isles on R3 (operational 17-2-84), and GB3BI at Inverness on R5 (should be on air in a few weeks).

UHF: GB3HK at Hawick, Borders on RB14 (operational 18-2-84), GB3KR at Kidderminster on RB4 (operational 18-2-84), GB3BE at Bury St. Edmunds on RB15 (could be on air by the time you read this), GB3CA at Carlisle on RB13 (probably on air by the time you read this), GB3GU at Guernsey on RB13 (probably on air by the time you read this), GB3OM at Omagh, Northern Ireland on RB15 (on air in few months), and GB3PP at Preston on RB15 (date not known).

Eight other u.h.f. repeaters submitted in this batch have yet to be approved by the DTI. It is believed the delay is due to the proposed operating frequencies.

Microwave ATV: The UK's first batch of 1·3GHz (24cm) ATV repeaters were also given the go-ahead on 16 February 1984.

GB3GV at Leicester became the first operational ATV repeater on 19 February 1984. This device has its input on 1276·5MHz, output on 1311·5MHz with sound channel +6MHz and uses a.m. video.

Following the release of the licence, the big switch-on day for the Worthing TV repeater GB3VR was 4 March. Situated just north of Worthing, the repeater is expected to give good coverage along the south coast from Brighton to Chichester.

Two horizontally polarised Alford slot antennas are used for the input on 1249MHz and output on 1318·5MHz. Frequency modulation is used for both sound and vision channels, with a +6MHz separation. The callsign is transmitted every 10 minutes in vision and sound (Morse). Further details from G6AIW QTHR.

GB3TV at Luton is due on air in about a month, followed by GB3UD at Stoke in about two months. No date is available for GB3UT at Bath.

Further proposals for 1·3GHz ATV repeaters will be considered by the RMG after six months of operational evaluation of the new units.

Miscellaneous: With three out of the ten licensed UK 1·3MHz f.m. voice repeater/beacons now operational and the remainder progressing well, the RMG will be considering a second batch of submissions to the DTI in late 1984.

A proposal to establish a single channel store and forward 256 byte packet data repeater in the Bedford area is under consideration by the RMG.

Letters of intent to establish 430MHz f.m. repeaters have been received for Sunderland, Scunthorpe and West London.

The u.h.f. RTTY/Data repeater GB3MT is due on air by August 1984.

The v.h.f. repeater GB3YJ on R7, is due for a site change to Edge Hill and a new callsign GB3WK (Warwick).

An RMG open meeting is to be held in the Hull area this Autumn and in the Borders in Spring 1985. Anyone who is happy/unhappy with any repeater/proposal should write to the RMG via RSGB HQ. All user feedback is appreciated and will be considered in future planning.

OSCAR-10

OSCAR-10 continues to provide excellent worldwide coverage via its 144/430MHz mode-B transponder. Activity on the twice weekly activated mode-L transponder is progressively increasing, with many well known e.m.e. stations setting up skeds. Graham Taylor G8HVY recently sent in a list, compiled by K0RZ of Boulder, Colorado, of 55 stations known to be active on mode-L.

Of these Graham has worked (as of February 1984) 19 stations in 14 countries including ZS, VE, K6, W0, OE and I5. Equipment used by G8HVY for the 1296MHz uplink provides 100W into 4 x 25 element Yagis and appears to be "middle of the road" with listed stations between QRP at 2W into a single Yagi (PA0SSB) and at the other end of the scale 400W into 16 x 23 element Yagis (DJ5BV). It has been noted that 430MHz band downlink signals are often modulated by the c.w. beacon, an effect that can be virtually removed by biasing the transponder with a strong off-frequency carrier—not a recommended technique!

The main conclusion reached and the key to successful mode-L operation is that the downlink antenna and subsequent receiving system must be of the highest quality, usually involving a high gain beam—or beams—and low noise GaAsf.e.t. preamplifier first stage.

OSCAR News, the official journal of AMSAT-UK, now contains day-by-day predictions for all currently active amateur transponders/experimental space vehicles. It is planned to make these 10-page, A5 format inserts available to non-members, at nominal cost, from the AMSAT-UK stand at most of the major rallies during the coming season.

Microwave Society

The Microwave Society looks after the interests of all those interested in, or operating on, frequencies above 10GHz.

The society's newsletter *Waveguide* keeps members up to date with society affairs and also includes updates for their *Datapack,* a publication which provides sufficient information for the reader to build a complete system for under £40. Many elements of *Datapack* are based on the highly successful *PW Exe* project.

Some indication of the growth of microwave operating is the fact that nearly 200 new members joined the society during 1983.

The society looks forward to meeting as many microwave enthusiasts as possible on its stand at the RSGB National Amateur Radio Exhibition on 28/29 April 1984 at the NEC, Birmingham.

Further details from: *The Microwave Society, 81 Ringwood Highway, Coventry CV2 2GT.*

Radio Rally

Kelso, which sits right on the Anglo-Scottish Border and is easily accessible via several major roads, will be the venue of the 1984 Anglo-Scottish Rally to be held on Sunday 6 May.

Organised by the Kelso Amateur Radio Society and supported by all three major border radio clubs, the event is expected to attract radio enthusiasts from the North-East and North-West of England, from Dumfries and Galloway, as well as hardened rally-goers from farther afield.

In addition to all the traditional rally exhibits and stalls, full catering facilities and licensed bar will be available.

For further details, contact either: *Bruce Cavers GM4UIB, Chairman KARS, c/o Community Centre, Kelso, Scotland, tel: (0573) 24654, or Andre Saunders GM3VLB/ex 5Z4KL, Secretary KARS, c/o Community Centre, Kelso, Scotland, tel: (0573) 24664.*

News

New Catalogues

Bi-Pak Semiconductors, the Ware, Hertfordshire, component suppliers, have their new 1984 catalogue available. The catalogue is jam-packed solid with information on the vast stocks of components, tools, etc. that Bi-Pak carry, and is designed for use with their 24-hour "ansaphone" service and the Visa/Access credit cards, which they accept over the telephone.

To obtain a copy, send 75p plus 25p postage, to: *Bi-Pak Semiconductors, PO Box 6, Ware, Herts.*

Electrovalue announce the availability of their latest catalogue entitled *A–Z Product List.*

As the title suggests, its pages are crammed with information on the Electrovalue product range, from Adhesives to Zener diodes.

The *A–Z Product List* is available, free, on request from: *Electrovalue Ltd., 28 St. Judes Road, Englefield Green, Surrey TW20 0HB. Tel: Egham (0784) 33603. Or from their Northern Branch at: Burnage Lane, Manchester M19 1NA. Tel: 061-432 4945.*

Greenweld's latest catalogue has been increased to 84 pages and includes many new product lines. Also supplied with the catalogue is their latest Bargain List, Bulk Buyers List and Wholesale Discount List, as well as pounds worth of discount vouchers.

The catalogue will appeal not only to the home constructor, but also to schools, colleges, universities and small manufacturers, is priced at £1, which includes postage, and is available from: *Greenweld Electronics Ltd., 443 Millbrook Road, Southampton SO1 0HX. Tel: (0703) 772501.*

Can You Help?

The Intermediate Technology Development Group, the charity founded by Mr. E. F. Schumacher, author of *Small is Beautiful,* is seeking the help of a creative person whose personal interests closely conform to the subject material of this magazine.

Ideally the group is seeking someone with the skills and facilities required for the construction of the self-build articles who is willing to spend a few hours each week researching through back numbers. Later, several models will need to be constructed at low cost for demonstration purposes.

It would be helpful, though not essential, for such a person to be located within easy access of Waterloo Station in London. Please write to: *Mr. B. Padgett, Head of ITDG UK Unit, 6 Avonmouth Street, London SE1 6NX.*

Amateur Radio Courses

Think you would like to know more about amateur radio, or perhaps you have just passed the RAE? If you fall into either of these categories and live within striking distance of Nottingham, you will probably be interested to know of two short courses organised by Alan Lake G4DVW.

A four-week introductory course for beginners will start on Wednesday 6 June, between 7.00 and 9.00pm. Entitled *An Introduction to Amateur Radio & SW Listening,* the syllabus will include an outline of the RAE, some basic theory, receiver operation plus practical points concerning construction techniques and antennas. In short, a useful preliminary for the aspiring RAE candidate.

After the RAE is the title of the other course and will run for five weeks starting Thursday 17 May, between 7.00 and 9.00pm. Designed principally for the licensed amateur, s.w.l. and technically competent CBer, the course will deal with the hobby in general and include many aspects barely touched on in the RAE, such as, valves and their use, antennas, power, v.s.w.r. measurements, and interference—or how to come to terms with your paranoia of men in yellow vans.

For enrolment and further details, apply direct to *Arnold and Carlton CFE, Digby Avenue, Mapperley, Nottingham. Tel: (0602) 876503.*

Can I Help You!

Are you the secretary, organiser or general dog's body of your local radio club or any other group whose functions may interest readers of *PW*? If so, let me know and I will endeavour to publicise your rally, get-together whatever, through this column.

RAIBC Anniversary

February this year saw the Radio Amateur Invalid and Blind Club celebrating its 30th Anniversary, having been founded in 1954.

The object of the RAIBC is to help those with a genuine interest in amateur radio to help themselves in pursuing their hobby. The success can be seen in that almost 100 members obtained licences last year.

The club has been running nets for the last 27 years on 3750kHz, on Tuesdays at 10.00am and Wednesdays at 2.00pm. These nets boast an ever-increasing audience.

There is still a need for representatives who can assist and encourage members, and the areas most in need are London, Birmingham, Liverpool and Manchester. Anyone who is able to devote some of their time to this work is asked to contact the RAIBC's Hon. Sec.: *Mrs Frances Wooley, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey KT9 4TE.*

EDXC Conference 1984

The European DX Council is an umbrella organisation of the shortwave radio listening clubs of Europe. During the past 17 years the annual EDXC conference has developed from an informal meeting of DX club leaders into **the** forum for DX clubs and international broadcasters to discuss questions of mutual interest. Attending the conference will be representatives of the listener clubs which can now boast more than 30000 members.

The 1984 EDXC conference is to be held in Stockholm between the 8 and 11 June 1984, and will be organised by Radio Sweden International and the Swedish DX Federation. It will be a meeting for everyone who enjoys listening to shortwave radio, and not just for the specialists or club leaders (although there will be plenty for them as well). The programme includes a variety of speeches, workshops, films, exhibits and tours.

Special Event Station—GB4GWR

Members of the Vale of the White Horse Amateur Radio Society will be establishing a special event station at Didcot Railway Centre in Oxfordshire from 15 to 23 April 1984. The special callsign GB4GWR will be used during this period.

The radio station will be established in a former Great Western Railway Saloon, carriage No. 9005, built in 1930. It is hoped to make contact with other radio amateurs throughout the UK and, if conditions permit, the world. Activity will be in both the v.h.f. and h.f. bands.

Special QSL cards, provided by the Railway Centre, will be sent to all contacts, and visitors will be able to collect their cards personally.

For further information, contact: *John O'Hagan G4PFY, Tel: Didcot (0235) 812565.*

Products

New CB Dual Bander

In the vanguard of a series of products dedicated to the CB market, comes the "Minster" an up-market dual bander that provides full transceiver operation on both the 27MHz and 934MHz allocations.

Uniden (UK) Ltd. are the makers, and Cravenminster Ltd., who are the marketing organisation for Uniace Telecommunications products in the UK, are handling the Minster home base unit that should be available shortly.

Housed in a stylish black and instrument grey cabinet, measuring 340 x 234 x 120mm, Uniace will present a second generation 27MHz set-up featuring crystal filtering in the receiver section to enhance selectivity. The receiver section will also be very sensitive at 0·5μV for 20dB of quietening. On the u.h.f. side the Minster has an ultra low-noise GaAsf.e.t. receiver front end together with twin cavity antenna filter for really low spurious presentation. A single loop synthesiser system is provided.

The Minster will operate on the original UK CB frequencies of 934·025 to 934·975MHz—until May 1984—and on the new frequencies of 934·0125 to 934·9625MHz which come into effect after May.

On 934MHz the maximum permitted r.f. output of 8 watts is available, as is the 4 watts maximum on 27MHz. A 10dB attenuator for 27MHz is selectable via a push button on the front panel.

Other functions controlled from the front panel are power on/off and volume, squelch, mic gain, r.f. gain, tone Hi/Lo, and attenuator. Also on the front panel are mic and phone sockets, channel select switch, S/RF meter, channel in use indicator and TX/RX l.e.d. On the rear panel provision is made for external speaker, external d.c. supply, a.c./d.c. switch and antenna connectors.

Overall specifications fully comply with the requirements of MPT1320 and MPT1321, whilst spurious emission control on both bands are claimed to exceed these requirements.

The Minster 27/934MHz f.m. dual bander CB transceiver will have a recommended retail price of £329.95.

As mentioned earlier, the Uniace Telecommunications range, manufactured by Uniden (UK) Ltd., is intended to include a dual band mobile transceiver entitled the Uniace Britannia 201, and an economy 934MHz only, mobile transceiver called the Cavalier 101. Prices, along with detailed specifications, remain to be announced.

For details of your nearest Uniace stockist, contact: *Cravenminster Ltd., Unit 8, Industrial Estate, Glan Conwy Corner, Llandudno Junction, Gwynedd, North Wales. Tel: (0492) 61 3232.*

Flexible Slim Jim

A recently introduced antenna product from the CQ Centre will be of interest to all 144MHz/P amateurs. Following on a long line of Slim Jim folded half-wave variants, this latest device is constructed from durable 300Ω ribbon feed and comes ready terminated with 3m of UR43 coaxial cable/UHF PL259 plug. The quarter-wave matching stub is formed from a section of p.c.b. allowing ready adjustment (if required) of the input tapping points. A plugged plastics tube cover is fitted over the matching section to weatherproof and protect the feed cable junction. When out portable the antenna is tied to a handy "sky hook" by means of a nylon cord inserted through the top of the radiator—when not in use the whole assembly can literally be wrapped up and stowed in a pocket/handbag.

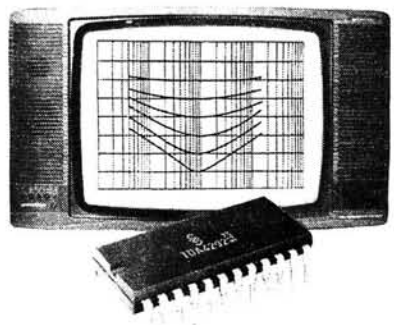
Called the "Travelling Jim", the VAT inclusive price is £8.99 plus £1.00 for p&p, and is available from: *R. Withers Communications, The CQ Centre, 584 Hagley Road West, Oldbury, Birmingham B68 0BS. Tel: 021-421 8201/2.*

Stereo "Stretch" IC

The TDA4292 24-pin d.i.l. integrated circuit has been introduced by Siemens mainly for use as a tone control device for stereophonic TV receivers with built-in loudspeakers that cannot physically be widely separated.

It is claimed that this device not only makes allowances for the peculiarities of the human ear, but also produces a stereo image which would otherwise be obtainable only when the speakers are placed well apart on either side of the receiver. Equally, the i.c. is suitable for use in stereo radio receivers where, similarly, the speakers are fixed fairly close to one another.

Each stereo channel of the TDA4292 comprises five operational amplifiers and their associated electronic potentiometers and switches manufactured in bipolar technology. The "wider" stereo effect is achieved by deliberately reproducing part of the two signals on both speakers; the "crosstalk" amounts to some two-thirds of the actual channel level (expressed in terms of voltage), but is phase-shifted by 180 degrees.



Siemens have implemented an additional network of internal resistors and capacitors on the chip for loudness control, these being in the two amplifier path outputs. These resistor-capacitor networks ensure that the treble and the bass can be adjusted when the loudness control is set at a high level.

The TDA4292 requires a supply of between 8V and 15V. All the setting and switching functions (treble, bass, volume, loudness, balance and stereo "width") are controlled by d.c. voltages, so the control leads are not affected by hum pick up and no external switches are needed.

Let's Build a Crystal Set (just like Grandad's)

by Old Timer

One of the best-known personalities of the early days of broadcasting was John Scott-Taggart. ST, as he liked to be known, edited several magazines for hopeful enthusiasts of the new hobby and the sets he designed for home construction were designated progressively ST100, ST200 and so on.

The crystal set to be described was one of his early designs—so early and so primitive that it didn't even get an ST number! Instructions were given in the first issue of an S-T magazine that appeared in February 1923 and also in an S-T booklet of the same period. The crystal set could be built in either of two versions: one rudimentary called Broadcast Receiver No. 1, and the other, which might humorously be described as "de luxe", designated Broadcast Receiver No. 2. They would cover wavelengths from 300 to 600 metres, which included all the BBC stations then operating, 2LO, 5IT and 2ZY.

We'll start with the rudimentary version, a diagram of which is given in Fig. 1. In the top left corner of the diagram appear the symbol and word "aerial". This bore no resemblance to the TV or CB antenna of today; in 1923, aerial meant the official Post Office aerial consisting of a copper wire up to 100 feet long including the down-lead. Thus, if the aerial was 25 feet high, it could be 75 feet long; 50 feet high (and some were), it could be only 50 feet long. That's more than most of us can manage today, but don't worry, the little set will work off a TV antenna, using the outer braiding of its coaxial feeder to be precise, connected via a length of flex to the "aerial" terminal of the crystal set.

Similarly with the earth connection: you don't have to drive a metre length of 25mm diameter copper tube into the ground as the old-timers did; connect another piece of flex to the large central earth pin of a 13-amp mains plug inserted into the nearest mains socket. **If you are not familiar with 13-amp plugs, or are in any doubt, get someone who knows what he is doing to make the connection for you.** In most cases these arrangements for "aerial" and earth will work fine.

Next in the diagram appears item A which, together with item B, forms a rudimentary variometer—the tuning device. To make item A, take a cardboard tube 50mm in diameter by 150mm long and bore two small holes about 10mm apart and 20mm from one end of the tube. From a small reel of 36 s.w.g. double-cotton-covered copper wire, thread about 300mm through the two little holes you have just bored; thread it through a couple of times as though sewing on an invisible button, to anchor the wire firmly, leaving the 300mm end dangling loose. Now wind the wire from the reel around the tube—it doesn't matter in which direction—making sure that the wire grips the tube tightly and that the turns of wire lie side-by-side, each turn touching its neighbour. Continue until you have wound on 33 turns, covering about 18mm along the tube. If you have only been able to get enamelled or plastics-coated wire, this overall measurement will be reduced. Leave 300mm of wire for connection purposes and snip the wire from the reel. Holding the tube so that the turns you have just wound on don't unravel (and they will if you give them half a chance), bore two small holes in the tube at the end of the winding, just as you did at the beginning, and weave the 300mm tail of wire through them to anchor it.

Now for item B, the second part of the variometer. Obtain a cardboard tube 28mm long and 64mm outside diameter; this has to be able to slide freely over item A. About 6mm from one end of the second tube make the two holes as before, anchor the 36 s.w.g. wire leaving 300mm spare for connecting purposes, and wind on 31 turns in the same direction as before. Once again, bore two small holes and anchor the end of the wire leaving 300mm as with item A.

Now to make the crystal detector. This requires a thimble which, ideally, should be of brass or even silver, although a plastics one will do. Sixty years ago grandfather would now have filled the thimble with molten solder and dropped a "crystal" of lead ore called Galena into it, but we'll go about the matter a little less drastically.

Obtain a piece of Galena about the size of a pea from a firm of mineralogists (Lapidary equipment and supplies in *Yellow Pages*); you'll probably have to buy a minimum of several ounces of it but it is very cheap. Select a nice shiny lump, lay it on a hard surface and hit it **gently** with a hammer. Since natural Galena is very brittle and you will almost certainly hit it too hard, there will probably be nothing but a heap of grey powder on your hard surface, and such crystals as survived will have flown to the far

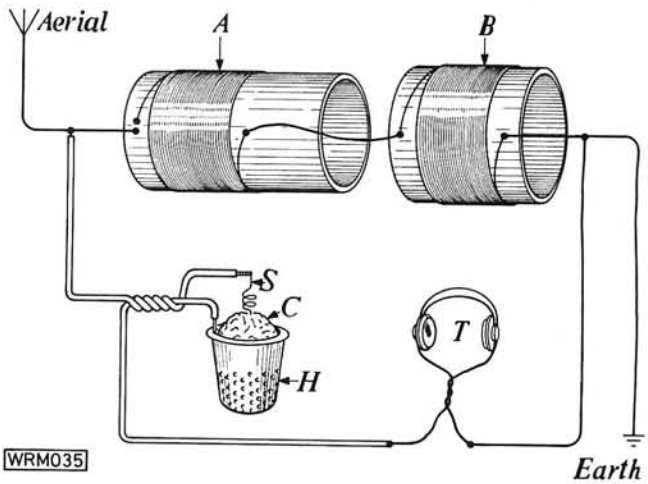


Fig. 1: The very simple Broadcast receiver No. 1. A, fixed winding of variometer; B, movable winding; C, Galena crystal; H, thimble; S, spiral catswhisker; T, high resistance headphones

recesses of your workshop. If so, try again, wrapping the specimen in a piece of cloth, not your handkerchief if you value it, to prevent the pieces from flying and becoming lost. With any luck, you'll have at least one usable crystal this time. **Don't** handle it with your fingers—they'll leave a film of grease sufficient to prevent it from working; instead, use a pair of tweezers. If you do happen to handle any, wash it in methylated spirits before using it.

Jam the crystal into the thimble by packing bits of screwed-up kitchen foil around it; at the same time, insert into the thimble the bared end of a 150mm length of insulated 20 s.w.g. wire. With your crystal thus mounted in its cup, that's half of the crystal detector made.

To make the second part, take a further 150mm of the insulated 20 s.w.g. wire and twist it for a few turns around the wire sticking out of the crystal cup, as shown in Fig. 1. Bare about 3mm of the end of it that overhangs the crystal. For the catswhisker, which has to contact the exposed surface of the crystal, snip 50mm of 36 s.w.g. wire from the reel and remove the insulation. Wind this into a short spiral about 3mm in diameter and twist one end of it around the bared end of 20 s.w.g. wire that overhangs the crystal. That's the complete crystal detector made.

To listen to the little set you will need a pair of high-resistance headphones. The standard value in Grandad's day was 2000 ohms; perfectionists with money to spare aspired to 4000 ohms. You may come across a genuine vintage pair of high-resistance headphones secondhand. New ones are available from R.T. & I. (see Buying Guide). Alternatively you can use a cheap high-impedance crystal earpiece.

All that is left is to wire up the set as shown in Fig. 1. It doesn't matter which way round the crystal detector is connected: one wire from it goes to the antenna, the other to the headphones. When you have made the few connections, using more of the 20 s.w.g. wire (don't forget to bare the ends of wires that you twist together, such as those connecting the two windings of the variometer), put on your headphones and gently touch the end of the 36 s.w.g. catswhisker against the crystal. You should hear a scratching noise, but be warned that this is the most difficult operation of all. Not all of the crystal's surface effects rectification of the signal, so you will have to search the surface gently with the catswhisker until you find a "sensitive spot" when, if the variometer is tuned to a station, you will hear a programme. This procedure was known humorously as "tickling the crystal". The catswhisker also has to bear against the crystal with the required light amount of pressure, and when the crystal and catswhisker have been correctly set, the slightest vibration is likely to disturb the setting, and you must start again. It is a decidedly tricky business, and conducive to a very frayed temper. Once you have obtained a sensitive setting, slip the short variometer tube over the long one if you haven't already done so—it doesn't matter which way round—and gently move it along until you hear a programme in your headphones. If you don't tune in anything at all, remove the outer tube of the variometer, reverse it, slip it back over the thin one and move it gently along again. If you still don't tune in anything, it is more than likely that the movement has disturbed the crystal setting. When we follow in the footsteps of the pioneers, we must expect the same setbacks that they had!

For those with limited patience and time, it is a good idea to lift the catswhisker from the crystal and to connect a modern germanium diode such as an OA90 across the whole detector. With such a stable rectifier tuning becomes easy, and when you have adjusted the variometer so that a station is heard, disconnect the diode and search with the catswhisker until you hear the station again.

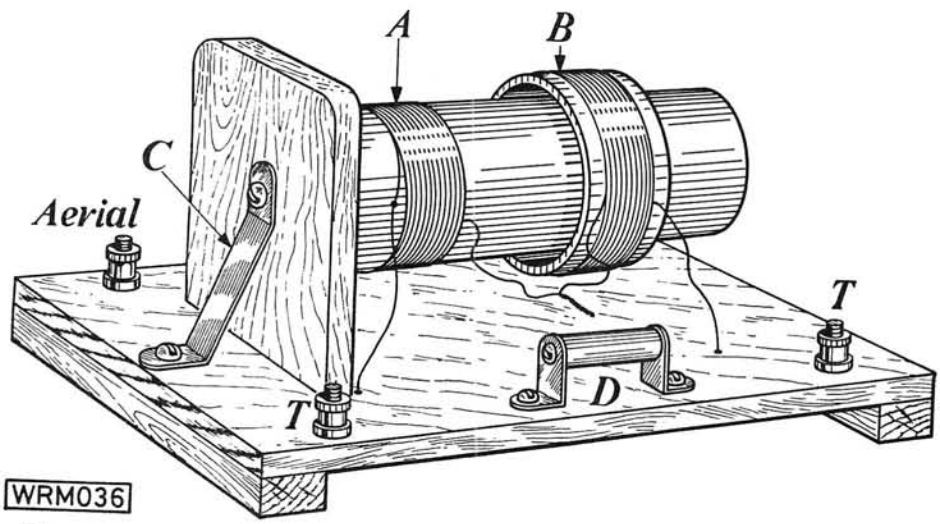
That's the performance that thousands of experimenters like Grandad happily underwent night after night 60 years ago, sometimes without hearing a station for days. Now we'll adapt the little set to a more permanent form rather easier to operate, S-T's No. 2 Broadcast Receiver.

BUYING GUIDE

There should be no problems obtaining the component parts for this project. The cost quoted is based on the use of a high impedance crystal earpiece. Browns Type F headphones (2 & 4kΩ) are available from R.T.I. Electronics Ltd., Ashville Old Hall, Ashville Road, London E11 4DX. Tel: 01-539 4986.

Approximate Cost £2·50

Construction Rating Beginner



WRM036

***Fig. 2*: The completed Broadcast receiver No. 2. A, fixed winding of variometer; B, movable winding; C, optional brass stay; D, diode detector; T, headphone terminals**

The "de luxe" receiver is mounted onto an 8mm plywood base measuring 210 × 120mm with supporting battens at each end as shown in Fig. 2. The inner variometer tube, item A, has one end plugged and is then screwed to a wooden upright. The centre of the tube should be about 65mm above the baseboard and parallel with it. For additional rigidity a brass strip bracket can be fitted to the wooden upright. Assembly is completed by fitting four brass terminals to the baseboard.

To keep to the spirit of this little enterprise, we should make ourselves another crystal detector a little less rudimentary than the thimble version but still necessitating the nerve-wracking procedure of tickling the crystal with the catswhisker. Now, the author owns a so-called "permanent" crystal detector from the same era as this set, needing no adjustment whatsoever. As a matter of fact, it lives up to its name and works as well now as it must have done 60 years ago. So to make matters easier for ourselves we'll employ a copy of it in our de luxe receiver; after all, it was available in 1923.

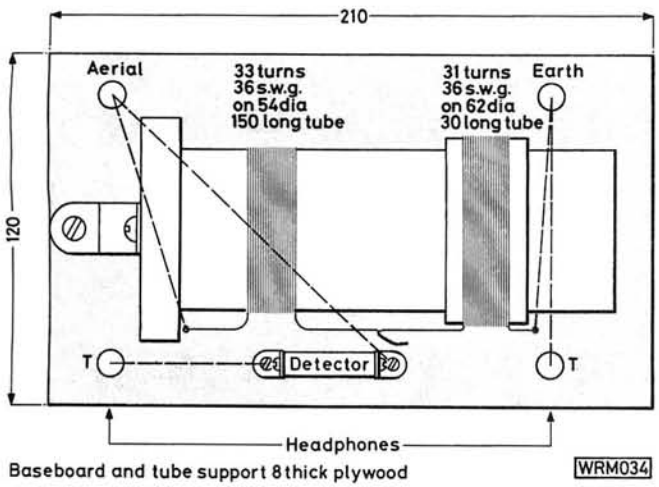


Fig. 3: Wiring diagram of the Broadcast receiver No. 2

Take the cylindrical casing of a ballpoint or felt-tipped pen about 10mm in diameter and coloured black to resemble ebonite, and cut off a piece 30mm long. Inside it place a modern crystal diode such as an OA90, with one wire sticking out of each end of the short cylinder. You now have to make some means of connection at each end of the cylinder; the original employs a plain brass, roundheaded 6BA screw. A domed brass upholstery nail soldered closely at each end and held in position with superglue would make a version that could be held between two L-shaped clips on the baseboard, after the style, for those who know about such things, of an old-fashioned "grid leak".

Finally wire up your Broadcast Receiver No. 2 as shown in Fig. 3, using 20 s.w.g. wire. Make sure that all wires are bright and clean where they connect with others, and drill 3mm diameter holes in the baseboard wherever necessary to allow the wires to run under it. The currents that flow in a crystal set are so feeble that a dirty connection could reduce the volume noticeably. Connect your antenna, earth and headphones to the set and start tuning with the variometer. You won't receive 2LO unless you encounter a time-warp for it no longer exists, but you should tune in at least your local m.w. station with far less difficulty than did the many pioneers who built the originals of this set at the birth of British broadcasting over sixty years ago. ●

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AH2511	90 00	NL760	99 20	5R4	6 00	6SN7GTB	2 85	5876A	27 60
AH2532	31 50	NL760L	103 50	5R4GYA B	3 75	6SR7	3 80	5879	3 80
AJ2256	7 50	NL840	17 35	5R4WGB	17 90	6U4	1 50	5886	10 00
BD512A	31 50	NL843	17 70	5SR6	6 00	6U8A	2 00	5894A	41 25
BK66	90 00	NL1022A	300 00	5U4GB	2 50	6V4	1 95	5894B	45 00
BK448	110 00	NL1036	150 00	5UPI	40.00	6V6GT	1 95	5920	8 50
BK482	485 00	NL1052A	144 00	5V4GA	2 75	6X4	2 00	5963	1 80
BK484	144 00	NL1052D	144 00	5Z4GT	1 95	6X5GT	1 65	5965	2 20
BK486	375 00	NL1053A	485 00	6AH6	3 50	6X8A	3 00	5991	3 00
BK488A	525 00	NL1082S	244 00	6AJ8	2 50	6Y9	2 95	6005	1 90
BK7703	250 00	NL2923	525 00	6AK5	3 90	7F7	9 50	6011	29 90
BLT119	320 00	NL5440	19 20	6AK5W	2 90	7K7	10 85	6012	9 90
BT5	51 50	NL5440A	23 90	6AK6	1 95	8CG7	2 00	6014	20.00
BT5B	51 50	NL5441	21 50	6AL5	1 95	8FQ7	2 00	6021	3 70
BT17	142.00	NL5550	90 00	6AL5W	1 80	9SP4	88 00	6058	10 50
BT17A	142 00	NL5553B	375.00	6AM5	9 10	12AT6	1 70	6063	3.70
BT19	36 00	NL5750 (NIXIE)	23 80	6AM6	2 95	12AT7	1 60	6065	7 25
BT69	295 00	NL6844A	28 50	6AN8A	2 70	12AU6	2 00	6073	5 50
BT95	129 90	NT2	2 50	6AQ5A	1 95	12AU7A	1 60	6080	9 20
BT125	72 50	PC1805	1 85	6AQ5W	1 90	12AV6	2 00	6083	72 00
BT127	95 00	PL509	5 50	6AQ8	2 20	12AX7	1 60	6084	13.10
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C3J	22 50	QQV02-6	19 50	6AS6	5 50	12BA6	2 90	6094A	420 00
C3JA	28 80	QQV03-10	5 50	6AS7G	7 20	12BA6	2 00	6101	2 20
C3JL	30 00	QQV07-50	12 00	6AU5GT	4 50	12BA7	3 00	6130	24 50
C16J	120 00	QV03-12	4 50	6AU6A	1 80	12BE6	1 90	6146A	7 50
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DX555	96 00	RR3-250	15 00	6BL6	68 50	12SL7GT	3 95	6426	1690 00
DY51	1 85	RR3-1250	34 50	6BL7GTA	3.80	13E1	155 00	6442	18.00
E55L	44 00	S866A	12.00	6BL8	1 45	20PE11	25 00	6484	42 00
E80CC	8 60	S4075	195 00	6BM6	93 95	20PE13A	21 00	6528	48.00
E80F	13 10	S4076	225 00	6BM8	1 50	20PE14	25 00	6550A	7 25
E80L	12 95	S4092	195 00	6BN8	2 45	20PE15	220 00	6688	8 50
E81CC	3 20	S4102	240 00	6BQ5	1 60	20PE19	25 00	6888	9 25
E88CC	3 90	S4113	220.00	6BR8A	2 95	20PE20	27 50	6893	90.00
E89F	9 25	SC1-400	5 00	6BX6	1 35	21JZ6	3 40	6779	19 50
E90CC	8 50	SK410	28 50	6BZ6	2 50	30KD6	5 00	6856	52 50
E92CC	6 50	SK600	46 50	6C4	1 85	40KG6	5 50	6857	66 80
E130L	23 50	SK600A	49 50	6CA4	1 65	40KG6A	5 75	6858	99 20
E180F	8 50	SK606	7 50	6CA7	3 50	42EC4	4 00	6859	103 50
E188CC	7 50	SK650	32 00	6CB6A	1 90	75C1	2 80	6883B	14 20
E5070	27 50	SP41	3.80	6CF6	1 90	83A1	12 00	6922	3 90
EB91	1 95	SSR-13	12 00	6CG7	2 25	90C1	3 50	6939	19 50
EBC91	1 30	T160L	29 50	6CH6	9 95	90CG	12 00	6973	3 70
EBF89	1 50	T2688HDG	589 00	6CJ3	2 30	90CV	14 20	6975	66.00
EC90	1 85	TH2-5-300	112 00	6CJ6	10 95	150B2	6 50	7014	44 50
ECC32	2 50	TY5-500	225 00	6CK6	6.00	150C2	3 10	7015	50 00
ECC40	2 95	UU5	25.00	6CL6	3 30	150C3	4 95	7017	66 50
ECC70	3 70	VLS631	14 50	6CM5	2 30	150C4	4 50	7018	18 50
ECC81	1 60	VR75	5 45	6CN6	4 95	212E	170 00	7022	66 80
ECC82	1 60	VR150	4 95	6CQ6	2 20	290A	1150 00	7023	103.50
ECC83	1 60	XC12	1 30	6CW4	6 50	350A	22 50	7025	2 50
ECC85	2 20	XG1-2500	51 50	6CW5	1 95	350B	22 50	7027	4 60
ECC88	1 70	XG2-500	36.00	6CY5	3.80	404A	12 00	7034	42 50
ECC91	3.00	XG2-6400	152 00	6CY7	3 00	572B	29 50	7056	2 50
ECC189	2 10	XG5-500	24 50	6CZ5	3 15	575A	35.00	7136	175.00
ECF80	1 45	XQ1275	237.00	6DA6	2 30	615	18 50	7189A	2.40
ECF86	2 50	XQ1276	269 00	6DC6	2 45	710	29 90	7199	4 20
ECF801	1 85	XR1-1600A	29 50	6DC8	1 50	740L	66 80	7203 (NAT)	39 50
ECH81	2 50	XR1-3200	72 50	6DJ8	1 70	750P	103 50	7203 (EIM)	49.00
ECL82	1 50	XR1-6400	95.00	6DK6	3.95	805	42 00	7233	6.75
ECL83	2 50	Y602B	69 40	6DT5	2 30	807	2 90	7234	72 50
ECL86	1 70	Z803U	19 50	6DW4B	2 30	810	50 00	7247	3 20
EF40	8 50	ZT1011	29 50	6ES	4 20	811A	14 90	7262A	26.00
EF80	1 35	ZD100551	13 50	6EA8	2 45	812A	19 90	7289	39.00
EF85	1 65	ZM1000	18 15	6EH5	1 65	813 (NAT)	28 50	7308	7 50
EF86	1 75	ZM1001	18 15	6EH7	2.00	813 (RCA)	65 00	7322	604 00
EF89	2 30	ZM1020	15 65	6EJ7	2 00	829B	17 20	7360	9 00
EF91	2 95	OA2	3 10	6EL4A	4 15	B33A	61 50	7486AL	80 00
EF92	2 20	OA2WA	5 50	6ES8	2 10	843	10 00	7527	73 30
EF93	1 60	OA3	5 45	6EV7	2 85	845	48 30	7527A	140.00
EF94	1 80	OB2	3 95	6EW6	1 50	857B	708 00	7534	23.50
EF95	3 90	OB2WA	5 95	6FG6	2 00	866A	15 50	7543	2.00
EF183	2 00	OB3	2 50	6FH8	16.50	868	24 00	7551	5 50
EF184	2 00	OC3	3 50	6FQ7	2 25	872A	19.00	7558	9 50
EFL200	2 95	OD3	4 95	6FS5	2 25	922	12 50	7581A	18 25
EK90	1 90	1B24A	100 00	6GB5	2 80	927	17 80	7586	11 50
EL34	3 50	1B35A	38.00	6GE5	2 90	930	14 70	7587	19 00
EL36	2 30	1B63A	62 00	6GF5	2 10	931A	18 50	7591A	5.00
EL38	4 95	1B63B	58.00	6GH8A	1 80	931B	25.00	7723NE	28 65
EL81	10.95	1P21	104 50	6GJ5A	3.00	934	18 80	7735A	26.00
EL83	6.00	1P28	30 00	6GJ7	1.85	935	35 80	7815AL GE	48.00
EL84	1 60	2A515A	21 10	6GK6	1.95	1051D	110 00	7815RAL	48.00
EL86	1 95	2C39A	48 00	6GW8	1 70	1052S	144 00	7868	4 20
EL91	9 10	2C39WA	39 40	6GX6	3.00	2050	2 85	7903	115.00
EL360	7 95	2D21	2.80	6GY6	3 00	2050A	2 85	7905	13.50
EL500	2 80	2E26	7.50	6H6	3.00	4532U	250 00	7984	13 50
EL503	39 00	2J42	95 50	6HA6	3.05	4833U	215.00	8008	18.80
EL505	6.00	2J55	225.00	6HB6	3.05	4848	25.00	8020	35.00
EL519	6 75	2K25	114 00	6HE5	4.00	4875U	215.00	8032	14 20
EL803	9 95	3-400Z	82.00	6HF5	3.85	5517	14 50	8056	15.00
EL803S	9 95	3 500Z	79 50	6HG5	1 95	5544	72 50	8068	13.00
EL821	9 95	3B28	15.00	6HG8	2.50	5545	95.00	8072	69 20
EM84	2.00	3BS2A	3.00	6HS6	3.95	5551A	110.00	8117	165.00
EN32	16 25	3BW2	3.00	6HZ6	2.75	5552A	144.00	8121	90.00
EN91	2 80	3C23	23 75	6J5	3.15	5557	24.50	8122	90.00
EN92	3 30	3C45	24.50	6J5GT	2.95	5559	51.50	8163	82.00
EZ35	1 85	3CX100A5	39.00	6J6	2.20	5581	16.85	8164	298.00
EZ41	2 45	3CX1000A7	495.00	6J6A	3.00	5582	24.00	8233	44.00
EZ80	1 95	3CX1500A7	350.00	6J8S	4.00	5583	20.65	8278	39.00
EZ81	1 65	4-65A	52.50	6J86A	3.65	5632	22.50	8298A	7.50
EZ90	2.00	4-125A	57.00	6JC6A	3.50	5636	7.00	8321 (EIM)	70.00
FG17	24 50	4-250A	76.00	6JE6C	4.95	5642	8.20	8321 (AMP)	68.00
FG105	95.00	4-400A	80.00	6JG6A	3.85	5644	17.00	8416	15.70
GXU1	15.00	4-400B	73.30	6JH8	3.25	5651	2.85	8417	5.55
GXU4	37 50	4-400C	66.00	6JK6	2.20	5654	2.90	8422	20.00
GXU5	120.00	4B32	34.50	6JM6	3.95	5665	120.00	8438	80.00
GZ34	3.50	4C35A	85.00	6JS6C	3.95	5670	2.75	8541	33.00
KT66	6.90	4CX250B (EIM-AMP)		6K6GT	2.75	5684	28.85	8552	14.20
KT77	8.75		49.00	6K8	4.85	5684NE	39.50	8553	280.00
KT88	15.95	4CX250B (NAT)	39.50	6K11	2.55	5696	3.30	8608	27.50
KU72Z	280.00	4CX350A (EIM)	70.00	6KD6	5.90	5718	6.20	8643	66.70
L5047	890.00	4CX350A (AMP)	68.00	6KD8	2.00	5726	1.80	8754	17.35
MB223	5.50	4CX350F	72.00	6KE8	3.90	5727	2.00	8794	2330.00
MB224	5.95	4CX1500A	440.00	6KG6	6.00	5749	2.50	8844	23.00
MD1901	10.00	4CX1500B	370.00	6KM8	3.50	5750	1.90	8874	185.00
ML7815	96.00	4CX10000D	785.00	6KN8	5.50	5751	3.30	8906AL	55.00
ML8536	220.00	4D21	57.00	6KX8	8.00	5763	4.50	8908	10.50
ML8741	215.00	4D32	64.75	6L6GC	3.50	5796	29.50	8950	9.50
MU7235	66.00	4PR60C	250.00	6L6 METAL	15.00	5814	3.00	9001	6.00
NL604	44.50	4X150A	42.50	6LF8	4.95	5822A	300.00	9877M	31.00
NL604L	50.00	5-500A	225.00	6LN8	2.00	5847	12.00	9844A	420.00
NL606L	66 50	5AR4	3.50	6LQ6	4 95	5866A	112.00	9950	40.00
								16411	118.00

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2N3375	9 20	2SC1120	12 50	2SC2290	27 50	MRF428	57.00
2N3553	2 00	2SC1121	24 00	2SC2347	9 30	MRF428A	75.00
2N3632	10.00	2SC1122	18 00	2SC2369	2 00	MRF433	16 21
2N3733	13 20	2SC1162B	0 90	2SC2370A	18 00	MRF449A	14 95
2N3866	0 85	2SC1165	6 95	2SC2379	15 00	MRF450	11 90
2N3926	11 26	2SC1169	4 85	2SC2395	15.00	MRF453	11 90
2N3927	11 82	2SC1176	14 00	2SC2407	1 00	MRF453A	16 90
2N4416	0 75	2SC1177	17 25	2SC2420	18 00	MRF454	21 00
2N4427	0 75	2SC1178	18 00	2SC2494	16 00	MRF454A	24 00
2N5090	13 90	2SC1209D	0 64	2SC2509	6 00	MRF455	16 00
2N5109	2 00	2SC1213A	0 40	2SC2531	1 30	MRF455A	21 00
2N5160	4 80	2SC1213C	0 40	2SC2538	1 10	MRF458	19 95
2N5190	1 50	2SC1239	2 50	2SC2539	15.00	MRF466	24 50
2N5589	6 00	2SC1241	15 00	2SC2540	24 95	MRF472	4 40
2N5590	8 50	2SC1251	10.00	2SC2545E	0 29	MRF475	2 00
2N5591	8 90	2SC1260	1 11	BRF90	1 50	MRF475	2 25
2N5643	13 00	2SC1303	5 00	BRF91	2 00	MRF477	12 50
2N5913	2 50	2SC1306	1 00	BRF96	2 00	MRF492	27 50
2N5945	8 95	2SC1307	1 50	BFY90	1 50	MRF497	18 50
2N5946	15 63	2SC1311	0 40	BLW29	10.00	MRF515	3 90
2N6080	6 00	2SC1311E	0 32	BLW60C	15 00	MRF517	3 50
2N6081	8 75	2SC1314	25 00	BLW60CF	15.00	MRF620	18 00
2N6082	9 00	2SC1318	0 40	BLW64C3	65 00	MRF644	27 50
2N6083	12 00	2SC1368B	1 00	BLW78	61 80	MRF646	28.00
2N6084	13.20	2SC1383B	0 50	BLW80	10.25	MRF648	33.00
2N6094	8 00	2SC1424	1 35	BLW81	14 90	MRF750	6.50
2N6095	8 50	2SC1509	6 00	BLW90	13 00	MRF846	46.00
2N6255	3 45	2SC1546	0 45	BLW98	110 00	MRF901	2.75
2SC382	0 65	2SC1568	0 45	BLX39	13 75	MRF904	2.95
2SC458	0 22	2SC1589	5 00	BLX65	2 45	MRF911	2.50
2SC458B	0 36	2SC1622	0 33	BLX67C	9 50	MRF5175	22.50
2SC458C	0 22	2SC1623	0 30	BLX67CF	9 50	MRF5176	30.00
2SC460	0 25	2SC1688	19.80	BLX68C3	10 00	MRF5177	43.00
2SC460B	0 25	2SC1674	0 25	BLX68CF	10 50	MRF8004	2.00
2SC461B	0 25	2SC1675	0 20	BLX69A	20.00	PT3134A	1.50
2SC535	0 38	2SC1678	1 25	BLX94A	36.00	PT3134B	2.75
2SC535A	0 38	2SC1729	18.00	BLX98	132 00	PT3134C	12.00
2SC535B	0 38	2SC1730	0 25	BLY87C	7 50	PT3134D	12 50
2SC535C	0 35	2SC1740Q	0 20	BLY88C	11.00	PT3134E	30.00
2SC540	24 95	2SC1765	7 75	BLY88CF	11.00	PT3161A	1.75
2SC608	0 75	2SC1815Y	0 28	BLY89C	13.00	PT3161B	1.75
2SC644	0 25	2SC1906	0 33	BLY90	45.00	PT3161C	8.50
2SC684	0 28	2SC1907	0 30	BLY91CF	11.00	PT3161D	14.00
2SC703	36.00	2SC1945	2 10	BLY94	45.00	PT3161F	30.00
2SC710	0 45	2SC1946	19 75	MRF208	12.00	PT3503	6.95
2SC710D	0 28	2SC1946A	16.50	MRF212	12.00	PT4261A	16.00
2SC715D	0 40	2SC1947	9 88	MRF221	12.05	PT4261B	24.00
2SC715E	0 40	2SC1955	7 20	MRF229	3 50	PT4261C	60.00
2SC717P	0 38	2SC1966	11.00	MRF231	12 36	PT4316C	12.00
2SC730	4 10	2SC1967	15.00	MRF232	13 50	PT4316D	18.00
2SC731	3 95	2SC1968	17.50	MRF233	14.30	PT4316E	25.00
2SC732	0 25	2SC1968A	22.00	MRF234	16.00	PT4316F	30.00
2SC741	2 50	2SC1969	1 50	MRF237	2 40	PT5661C	14.00
2SC821	6 60	2SC1970	1 50	MRF238	12 60	PT8751	24.00
2SC828B	0 30	2SC1971	4 00	MRF239	20 00	PT8820	15.00
2SC829B	0 25	2SC1972	11.00	MRF240	24 50	PT8831	2.75
2SC890	8 50	2SC1978	7 50	MRF243	35 00	PT8837	10.00
2SC891	18.00	2SC2001	0 45	MRF245	30.00	PT8838	15.00
2SC900	0 18	2SC2026	0 75	MRF247	30 10	PT8854B	18.00
2SC900F	0 19	2SC2053	0 80	MRF260	5 00	PT8861A	15.00
2SC908	4 50	2SC2097	36.00	MRF264	11.00	PT8864A	30.00
2SC911A	18 00	2SC2099	15.00	MRF309	42 00	PT8874	18.00
2SC945	0 21	2SC2100	24.00	MRF316	55.00	PT9795	12.50
2SC945R	0 21	2SC2103	18.00	MRF317	73.00	PT9797	14.00
2SC952	0 60	2SC2105	15.00	MRF321	35.00	PT9841	16.00
2SC982	0 30	2SC2116	1 60	MRF323	35.00	PT9847	16.00
2SC994	2 50	2SC2118	9 00	MRF326	63.00	SD1005	8.20
2SC998	3 90	2SC2221	5 50	MRF327	70.00	SD1006	2.10
2SC1001	9 90	2SC2233	0 90	MRF329	58 06	SD1012-3	10.00
2SC1011	15.00	2SC2237	16.00	MRF412	18.51	SD1012-4	10.50
2SC1070	1 15	2SC2281	13.00	MRF421	36 85	SD1013	10.00
2SC1096L	0 90	2SC2283	9.00	MRF422	42.00	SD1014-6	10.50
2SC1096M	0 90	2SC2287	11.00	MRF426	23.00	SD1015	17.50
2SC1117	1 50	2SC2289	12.50	MRF427A	21.00	SD1018-6	13.00
						SD1019	24 70
						SD1019-5	24 70
						SD1020	1 50
						SD1074	16.10
						SD1076	18.50
						SD1077	1 60
						SD1078	26 50
						SD1080	1 55
						SD1080-6	7.50
						SD1080-7	7.50
						SD1088	26.00
						SD1089	28.50
						SD1089	40.10
						SD1115-2	7.50
						SD1115-7	2.10
						SD1127	2.50
						SD1131	3.25
						SD1133	9.50
						SD1133-1	10.00
						SD1134-1	2.50
						SD1134-2	10.00
						SD1134-8	10.00
						SD1134-STUD	7.60
						SD1135	10.25
						SD1135-3	12.00
						SD1136	12.50
						SD1143	9.45
						SD1143-1	10.00
						SD1144-1	2.50
						SD1158	7.95
						SD1201	7.35
						SD1202	7.50
						SD1212-4	6.00
						SD1212-7	4.00
						SD1214	8.70
						SD1216	11.00
						SD1219	18.00
						SD1219-4	18.00
						SD1220-1	9.50
						SD1222-5	11.00
						SD1222-STUD	11.00
						SD1224-2	13.00
						SD1229-F1	10.95
						SD1229-STUD	10.95
						SD1244-6	12.75
						SD1256	6.95
						SD1262	15.00
						SD1270	3.75
						SD1272	10.95
						SD1272-2	10.95
						SD1278	13.75
						SD1278-1	13.75
						SD1285	12.75
						SD1300	1.25
						SD1303	2.50
						SD1316	2.10
						SD1317	8.00
						SD1405	21.00
						SD1407	27.50
						SD1407MP	55.00
						SD1410	21.06
						SD1410-1	21.00
						SD1410-3	21.00
						SD1412	36.00
						SD1412-3	24.00
						SD1413	18.00
						SD1414	36.00
						SD1416	33.00
						SD1418	30.00
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Letters

Mobile?

Sir: I read your comment in March 1984 *PW* with interest. When I was licensed as G6GOQ I used to operate from my summerhouse in the hot weather with an IC–2E on 150mW with a Slim Jim using "G6GOQ/P".

Several amateurs queried this and I spoke to a senior official at the Home Office who said that I was correct, the criteria being the location of the power supply. If I had used the mains supply from the licensed premises I would not have been portable. He said that I could transmit from my car either *mobile* or static (including my own licensed premises) as "mobile", as the supplies were being taken from the vehicle.

In this case, however (on own premises) the log would need writing up in a mobile log book every 15 minutes. This suited me as a CQ call on 150mW using stroke portable often brought a quick response—I doubt that a quick reply would otherwise be forthcoming. This is probably insufficient evidence!

A. A. Butcher G4SIB
Newdigate, Surrey

More Third Party?

Sir: ARTAC (Amateur Radio Third Party Action Committee) International is a group of Australian Radio Amateurs who consider it is about time that a number of countries, especially Commonwealth countries, were encouraged to follow Australia's lead in allowing members of their Amateur Radio Service to use third-party operation, thereby removing a long-standing, most unnecessary and highly "political" strangle-hold on the Amateur Radio Service.

In some countries the third-party restrictions are so severe that it is illegal for members of the Amateur Radio Service who are operating within a legal radio network to relay messages, or even signal reports, to other amateur stations in the net who are having difficulties in receiving certain stations due to interference or poor conditions. It is therefore illegal for stations under these rules to become involved in international DX nets. Authorities in many countries are so "neurotic" about third-party, they insist that under no circumstances shall anyone's voice, except that of the licensed operator, be conveyed over the air. The restriction is so severe that the licensee of the station may expect to receive, from the authorities, an infringement notification for having his microphone gain set a little too high, thereby allowing so-called "unlicensed" background noises and voices to be transmitted over the air.

These restrictions are not only unnecessary but are a direct insult to the Amateur Radio Service which is, and always has been, one of the community's most responsible organisations. Members of the Amateur Radio Service are always ready and willing to provide their skills and equipment free of charge for the benefit of the whole community. Internationally the Amateur Radio Service provides one of the stabilising factors for world peace, by breaking the political, racial and prejudicial barriers.

ARTAC asks, "Why should the International Amateur Radio Service be treated like irresponsible children by authorities in so many countries, when in fact they are, in most cases, more responsible than many of those countries' leaders."

A. D. Tregale VK3QQ
ex. G3LMT, DL2AH, MP4BDN, 9L1AT
Secretary ARTAC

Any Ideas?

Sir: I would like to interface my BBC Microcomputer with a Creed 7B teletype machine that is terminated with a nine pin plug.

I would be most grateful if any *PW* readers can supply me with advice.

J. Mercer,
5 Bushey Road,
Sutton,
Surrey SM1 1QR.

Info Please!

Sir: I am writing a book on Home Computers and should like to hear from any of your readers who are using computers to control systems, and who are making practical use of computers in the field of radio and communications.

R. P. Graves,
Eleven Canonbury,
Shrewsbury, Shropshire SY3 7AH.

Can You Help?

We regularly receive letters from readers seeking information, circuit diagrams, sources of spares etc. for a variety of electronic equipment, and where possible we reply direct to them. However, in some instances our search will prove fruitless, so we would like to ask fellow enthusiasts if they can help. Brief details of some of the requests are listed below:

Siemens Bros. Communications Receivers Types G11 and G12. The separate power supply and audio amplifier are missing and the only information I have is that the power supply should provide 250V d.c. (HT), 6·3V (LT) and 100V stabilised. Require circuit diagrams or any pertinent information. *W. J. Smyth, 37 Severn Road, Woodfield, Dursley, Glos. GL11 6NG.*

Heathkit Oscilloscope Model 10–12U, require circuit diagram. *Basil Spencer G6VAN, 189 Oxbridge Lane, Stockton-on-Tees, Cleveland TS18 4JB. Tel: (0642) 676869.*

U.E.C. Lion v.h.f. 10 channel Transceiver, Type BM6B8FNP/10 Serial No. 1147, manufactured by Ultra Electronics Ltd., London W3. Require circuit diagram or service manual. *J. M. G. R. Martin, 2 Bowness Road, Morningside, Bulawayo, Zimbabwe.*

US Army Receiver Type BC-348-Q, manufactured by Wells Gardner and Company, Chicago, Illinois. Require circuit diagram. *Mark Jakes, 50 Charles Dart Crescent, Barnstaple, North Devon EX32 7ED.*

Strad Model 10B three waveband receiver, manufactured by RM Electrik Ltd., Gateshead. Require circuit diagram or service sheet. *G. Rodgers, 26 Wingfield Street, Peckham, London SE15 4LN.*

Eddystone 840, require information on where to obtain a new dial glass. *R. L. Natzke, PO Box 87, Te Awamu Tu, New Zealand.*

AVO Multimeter ACWEEC No. 3791-U-751—TMK Multimeter Model 5023—Taylor Model 65B All-Wave Signal Generator, Serial No. FS.100.057—Tech Model TE 20D Signal Generator. Require circuit or wiring diagrams for all four instruments. *Luke Smith, "Three Oaks", 104 Chase Road, Lindford, Bordon, Hants. GU35 0RR.*

Detailed information on Morse Code Training Courses, the Chairman of the Anjoman-e Radioamateuri-e Society of Iran would be most grateful to receive any information on Morse code training. *A. Sadjadian EP2FM, PO Box 64/837 Tehran, Iran.*

PW REVIEW

AOR AR-2001 Communications Receiver 25-550MHz

The AR-2001 scanning communications receiver has proved to be one of the most useful pieces of equipment in the shack for a long time. With its wide range of frequencies, 25MHz–550MHz continuous coverage, and compact size, it presents a very deceptive picture. Previously, if you wanted a receiver with this kind of coverage, you needed either two or three receivers or the size of the unit concerned left you very little room to move in the shack. The AR-2001 is likely to be the first in a new era of scanning receivers.

Before the AR-2001 was taken into the test facility it was given a thorough testing "on air"—and a most enjoyable time this was, too. The receiver comes complete with two power leads, one for 12V power supply connection and the other with a two-pin mains adaptor end. This two-pin adaptor needed to be used with a floor or horizontal socket before it made a really good connection—but that is fairly typical of this type of plug. Also included is a telescopic antenna (BNC connection) and a small handbook. The handbook is very easy to understand, and not written in the familiar "Japanese English", which helps. All the various programming steps are explained with worked examples—so not too many mistakes were made.

You certainly know when you have got something wrong! With correct entries the receiver gives a high "bleep"—make an illegal move and the tone changes. I think this is my major moan with the receiver—if you have an external speaker connected the volume of these tones is a bit much. I would like them to be either quieter or switchable, as it certainly made me jump on more than one occasion.

There is a BNC socket on the back of the receiver which makes it very convenient for connecting other antennas. The receiver sensitivity is good and even with its own telescopic antenna compared well with dedicated portable rigs on the 144MHz band. Various types of antenna were used over the review period, colinears, dual-band antennas, beams and even the traditional long wire. No antenna seemed to have adverse effects and, of course, when a 430MHz antenna was connected, for example, the performance on that band improved.

Having 20 memory channels is another good point, as it seemed about the right number of set frequencies I wanted to listen to. When looking for signals within a band the SEARCH facility did this job quickly, as there are two speeds of search. The three modes of operation, narrow band f.m., wide band f.m. and a.m., enables the user to listen to just about all signals the average user is licensed for.

During the review period I was able to monitor the f.m. 27MHz CB channels, the 28, 70, 144 and 430MHz amateur bands, the 50MHz trials—not to mention all the broadcast bands. Of course, those licensed for such bands as p.m.r., marine and aircraft bands will find most of their frequencies catered for.

Broadcast band listening is something I had never found much time for doing, but with a receiver like the AR-2001 I could easily change my way of thinking. From the Band II v.h.f. local radio right through to u.h.f. TV sound channels there was no problem with the audio from the receiver, but it usually had an external speaker connected to do justice to the "broadcast" transmissions.

Front Panel Controls

The front panel is angled so the liquid crystal display fascia doesn't reflect the light, and so is readable even in fairly strong daylight. With controls kept to a minimum it is very easy to operate all programming functions on the 20-section membrane keyboard.

Most of the keys have a double function, for example, the "decimal point" key is also the key that operates the delay function. There are options providing LOCKOUT on any of the 20 memory entries, make one frequency a PRIORITY channel, SCAN the channels, SEARCH between two points, even between 25 and 550MHz. Channel spacing is also selectable at 5, 12·5 or 25kHz, which should accommodate most channel spacing currently employed.

When such functions as LOCKOUT or DELAY have been selected, the l.c.d. indicates this fact above the numerals on the display. Each of these functions is cancelled or enabled by pushing the same button—nice and easy to remember.

Mobile

The AR-2001 was taken mobile during the testing time—not always a good idea with some of the earlier (modern) scanning receivers. Although it wasn't used with the mobile mounting bracket, it sat happily on the back seat working well. The receiver worked well connected to 144 and 430MHz band antennas and scanned through both bands with no apparent problems.

For those listeners who enjoy chasing DX on amateur or broadcast bands, the AR-2001 would suit that application well, bearing in mind the lack of s.s.b./c.w. modes.

Lab Tests

The bench tests on the AR-2001 didn't reveal any real problems; it is a shame, though, that the handbook doesn't contain even a block diagram.

The only problem (if it can be called that) that showed up was a harmonic

★ test measurements

Sensitivity: µV e.m.f.

Freq. (MHz)	Input signal for 12dB SINAD: n.b.f.m. (3kHz)	Input signal for 12dB SINAD: w.b.f.m. (45kHz)	Input signal for 10dB S + N/N: a.m. (30%)
25·000	0·45µV	—	1·6µV
28·000	0·37µV	—	1·4µV
50·000	0·54µV	—	1·65µV
70·000	0·39µV	—	1·36µV
88·000	—	0·8µV	1·32µV
108·000	—	0·78µV	1·32µV
145·000	0·35µV	—	1·41µV
220·000	0·32µV	—	1·18µV
435·000	0·43µV	—	1·45µV
470·000	0·43µV	3·4µV	1·38µV
550·000	0·36µV	0·8µV	1·21µV

Selectivity @ 145MHz

Mode	6dB	70dB
n.b.f.m.	13kHz	21kHz
w.b.f.m.	180kHz	446kHz
a.m.	13·5kHz	*

* Reciprocal mixing limited

AGC: Threshold 2µV
Output rises by 2·5dB for increase 90dB above threshold (70mV). Begins to limit @ 100mV

Audio response: (ref 1kHz)
n.b.f.m. −6dB 327–1900Hz

Supply: 12V d.c. @ 300mA Quiescent
400mA Full output

Squelch threshold: 0·5µV (−119dBm) min.
1·5µV (110dBm) max.

Audio output: 1W into 8Ω for 10% THD
125mW into 8Ω

n.b.f.m.	3% THD	(3kHz dev.)
w.b.f.m.	2·3%	(45kHz dev.)
a.m.	3·3%	(30% mod.)
	3·1%	(90% mod.)

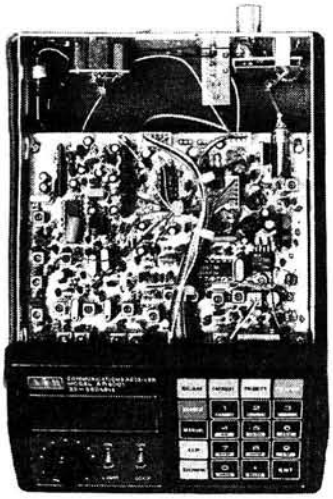
★ specification

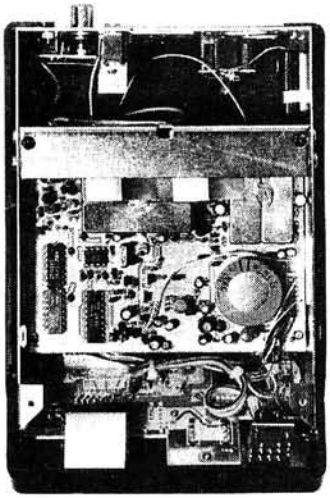
Receiving frequency: 25MHz–550MHz
Receiving sensitivity: n.b.f.m. 0·3µV (12dB SINAD)
w.b.f.m. 1·0µV (12dB SINAD)
a.m. 0·5µV (10dB S/N)
Receiving selectivity: n.b.f.m. ±7·5kHz @ 6dB
±20kHz @ 70dB
w.b.f.m. ±50kHz @ 6dB
±250kHz @ 60dB
a.m. ±5kHz @ 6dB
±10kHz @ 70dB
Image and spurious rejection: −50dB
No. of memory channels: 20 channels
Intermodulation: −50dB
Scanning rate: 5 channels/sec
Searching rate: 1MHz/6 sec
Audio output: 1W at 10% distortion
Dimensions: 138 × 80 × 200mm
Weight: 1·1kg
Receiver circuitry: p.l.l. synthesiser

of one of the i.f.s. This appeared around 470MHz and made that part of the band on w.b.f.m. unusable. As that is just about the start of a broadcast band it shouldn't really make a huge difference to the average user. None of the other harmonics proved anywhere near as troublesome. The test measurements show how our tests compare with the specification given in the handbook.

The interesting thing about the AR-2001 design is its choice of i.f. The first i.f. is at 750MHz instead of the far more familiar 10·7MHz. This is why image frequency problems have almost been removed.

The two photographs of the internal views of the AR-2001 show the high standard of construction that has been employed.





Price

The AR-2001 costs £325 including VAT, with carriage costing £6. Also available is a mobile mounting bracket at a cost of £7.95. The communications receiver was loaned by **Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel. 0629 2817,** to whom thanks are extended.

Elaine Howard G4LFM

Building an HF Linear Amplifier and ATU

Part 2

by I. Buffham
BSc CEng MIEE G3TMA

Antenna Tuning Unit

A matching antenna tuning unit is a very useful accessory for the amplifier and it is fairly simple to carry out both construction projects in parallel. Both projects involve a lengthy search for components and so a great deal of time can be saved in combining the two searches. Also, for matching pieces of equipment the metalwork required is virtually identical. The only difference between the amplifier and a.t.u. metalwork is that cooling cutouts are not required for the a.t.u.

Transmatch

It was decided to base the a.t.u. on the well known Transmatch Circuit and the circuit diagram is shown in Fig. 2.1. Two variable capacitors are required. C20 is a 300pF + 300pF split stator type and C21 is a 600pF variable, and these values should ensure coverage from 1·8–30MHz. L5 is a "roller coaster" of approximately 10μH inductance similar to the one used in the amplifier and L6 is a coil with an inductance of 30mH. By tapping L6 at 10μH intervals it is then possible to vary the combined inductance of L5 and L6 continuously between 0 and 40μH. It is not recommended to use a single fixed coil with many taps for the various bands since the inductance setting can be critical to within half a turn or so. Hence the use of "roller coaster" ensures that an accurate match can always be obtained.

A dual-meter v.s.w.r. bridge is built into the a.t.u. as an aid to rapidly obtaining the correct tuning settings. The use of a single-meter v.s.w.r. bridge is not recommended. The cir-

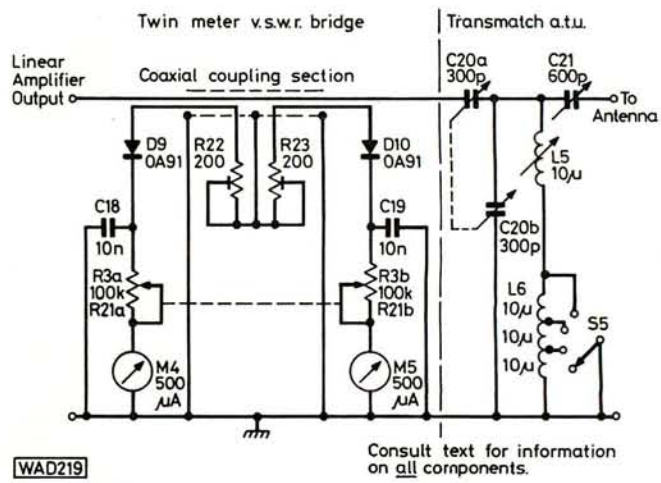


Fig. 2.1: Circuit of a.t.u. and v.s.w.r. meter

Most of the components used in this project will have to be painstakingly gathered together from amateur radio rallies. Only attempt this design if you have the ability to modify the construction and design to suit the components available. Please do not ask *Practical Wireless* or the author for information on how and where to obtain the components.

cuit of the v.s.w.r. meter is shown in Fig. 2.1. The coaxial coupling section consists of 1m of UR67 cable with the outer pvc sheath removed. A small hole is then made in the braid at the centre of the length of cable and two thin enamel covered wires are inserted between the braid and the inner insulation and brought out of the end of the cable. The meter is set up by alternately connecting a 50 ohm load and a transmitter tuned to 28MHz to either end of the coupling section. The presets R22 and R23 are then adjusted for minimum reflected power in each direction.

Band Changing

The front of the a.t.u. is shown in the photographs and it can be seen that a chart has been fitted to record control settings for the various bands. This is a useful aid to speedy band changing. The photographs also show the side view of the a.t.u. and the coaxial coupling section for the v.s.w.r. bridge can be seen at the far side. It can be seen that generously rated capacitors and coils have been used and this gives two advantages. The risk of flashover with high power operation is reduced and also the losses with low power operation are very small.

Improvements

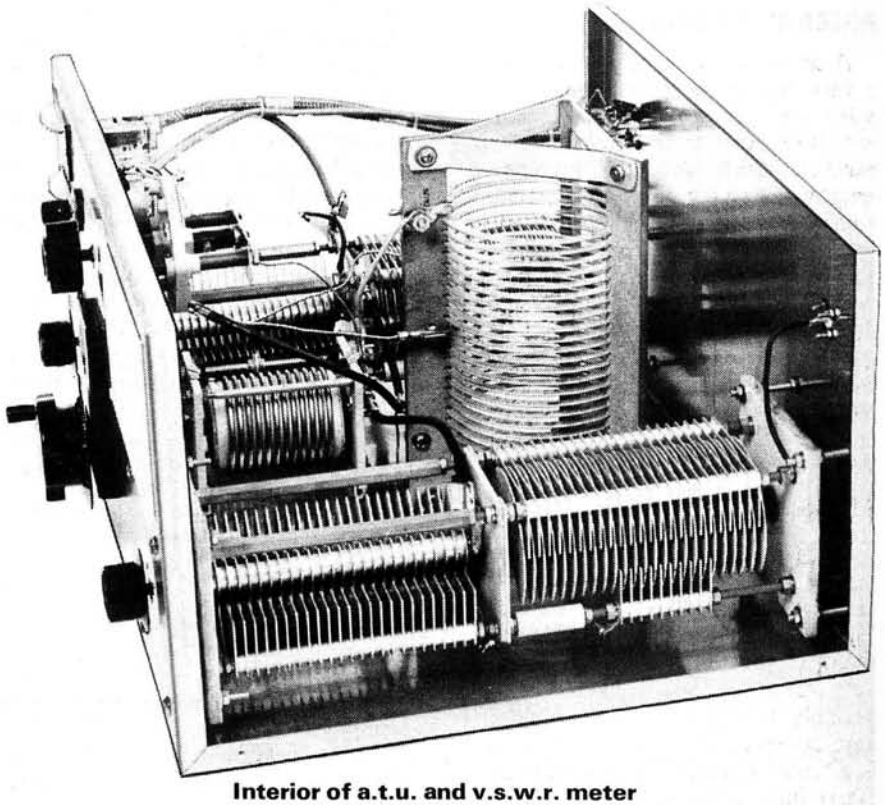
The tuner has proved to be very effective in use and will match most impedances to 50 ohms. Also, control settings are very broad even at the highest frequencies, and operating bandwidth is much greater than obtained with tuners which contain parallel tuned circuits. An "improvement" to the basic Transmatch is described in the 1982 edition of the *ARRL Amateur Radio Handbook* but the "improved" version throws away the advantages of non-critical control settings and broad operating bandwidth.

The only change to the circuit being considered by the author is to change the v.s.w.r. meter, the sensitivity of which is frequency conscious, to the ferrite ring type described in *H.F. Antennas for all Locations.*

Hopefully this article will inspire one or two amateurs to set aside their microphone and keys for a while in favour of drills, hacksaws and soldering irons! Best of luck with the component collecting!

References

(a) *Radio Amateurs Handbook,* 1982 p. 19-11
(b) *H.F. Antennas for all Locations,* L. Moxon, P. 234 ●



Interior of a.t.u. and v.s.w.r. meter
(Cyril Parrish G6HTW and Les Prudden)

Products

Band I TVDX

South West Aerials inform us that they have in stock a comprehensive selection of Band I antennas, which should prove suitable for the enthusiast who intends taking advantage of the forthcoming Sporadic-E season.

These Band I antennas design variations cover the frequency range 47 to 68MHz including a wideband dipole, four element Yagi, and omni/bi-directional switched options. Constructed of seamless hard drawn alloy tubing, the antennas' fittings are bright zinc plated, have all open ends plugged, and cost between £24.60 and £37.85.

Ever mindful of the end of Band I 405-line TV transmissions in the UK, and the potential increase of interference from other services within this segment of the spectrum, SWA has available ex-stock a range of Band I notch filters, designed specifically to ensure continuance of Ch. E2/R1 reception and allow the intrepid DXer to remain operational.

For further information, contact: *South West Aerials, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH. Tel: (0202) 738232.*

Jupiter Ace

Following the liquidation of Jupiter Cantab Ltd., manufacturers of the Jupiter Ace Home Computer (*News*, March 1984), Boldfield Limited Computing have announced that they have obtained the right to retail Jupiter stocks and that they intend to develop new software. Also they are prepared to act as selling agents for any company wishing to produce new peripherals.

The Jupiter Ace, which uses the FORTH programming language, is now back on sale by mail order only from: *Boldfield Limited Computing, Sussex House, Hobson Street, Cambridge. Tel: Ramsey (0487) 840740.* Existing owners will be pleased to hear that Jupiter 16K RAM packs and Jupiter software is also available, with further titles being added soon.

Prices have been reduced drastically, the Ace, with power supply, 182 page manual, demonstration cassette, leads and a 12 month guarantee costs only £26. The 16K RAM packs cost £20, and all the software packages are priced at £3 each (add VAT and £3 for carriage).

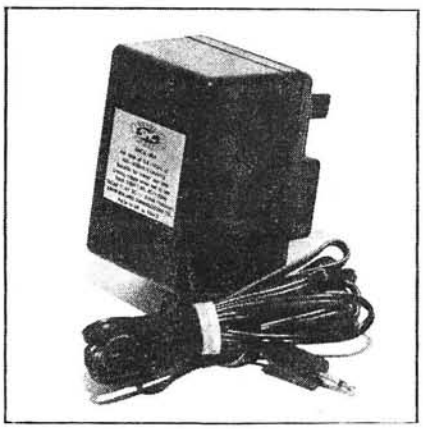
As a package deal, an ACE with 16K RAM pack is obtainable for only £44 plus VAT—previously £124.90!

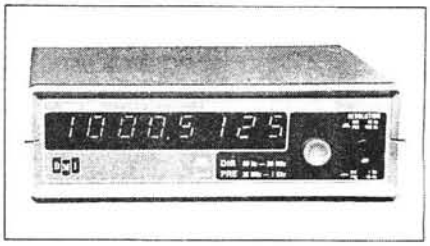
Mini Mains Charger

For equipment fitted with rechargeable NiCad batteries of between 9·6 and 10·8V and a corresponding capacity of 450 to 600mAh, South Midland Communications have available the SMC-8-9AA mains charger.

Contained within a moulded plastics enclosure, the unit is fitted with integral 13A plug and delivers 11·6V d.c. at a nominal 50mA, via a metre of twin-flex terminated with a moulded-on 2·5mm jack.

Manufactured in the UK, the unit complies with BS415 and is obtainable at a VAT and carriage inclusive price of £8.05 from: *South Midlands Communications Ltd., S.M. House, Rumbridge Street, Totton, Southampton SO4 4DP. Tel: (0703) 867333.*





Compact DFMs

The DigiMax 500 series digital frequency counters from Aspen Electronics Ltd. are compact, inexpensive instruments offering a relatively large 8-digit display and an accuracy of 1p.p.m.

Little more than pocket size, measuring 133 x 127 x 38mm, the model D-500 covers the frequency range 10Hz to 512MHz and the model D-510 covers 50Hz to 1GHz, with resolutions of 1Hz and 10Hz.

With sensitivity of 15 to 50mV and 50Ω inputs, the frequency counters are well suited to checking transmitter and receiver frequencies at base stations, in motor vehicles or on boats.

Powered by a rechargeable battery pack or a.c. mains adaptor, the model D-500 costs £159 and the model D-510 £189, VAT and carriage must be added. For further details contact: *Aspen Electronics Ltd., 2/3 Kildare Close, Eastcote, Ruislip, Middlesex HA4 9UR. Tel: 01-868 1188.*

Versatile Screwdriver

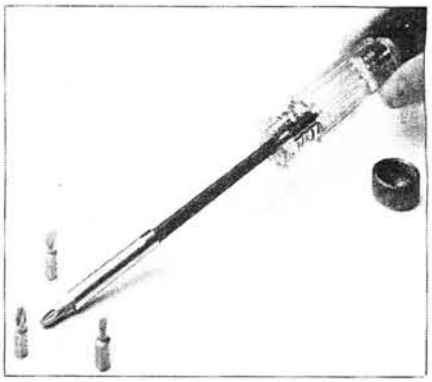
New from Britool is an extremely versatile screwdriver claimed to be capable of doing the jobs of at least four different screwdrivers—at much less cost.

The basic screwdriver comes complete with four interchangeable bits—two slotted blades and two Pozidriv. In use, the bits are simply slipped into a stainless steel hexagon sleeve on the 137mm long shaft, where they are retained by magnetic force. The magnet is strong enough to hold small steel screws when being positioned. All four bits can be stored in the screwdriver handle.

Apart from the convenience of only having to carry one screwdriver for most jobs, the multi-bit system is much cheaper than buying a number of conventional screwdrivers, also damaged bits are much cheaper to replace. The versatility of the tool can be extended, as it will accept up to 13 extra bits from the Britool Interchangeable Bit System, which includes Pozidriv, hexagon and extra-long slotted-screw bits in a range of sizes.

Designated the Britool B430, the basic screwdriver with the four interchangeable bits is available from most hardware stores or car accessory shops at a recommended retail price of £5.90 (excluding VAT).

Britool Ltd., Fourth Avenue, Bushbury, Wolverhampton WV10 9NB.



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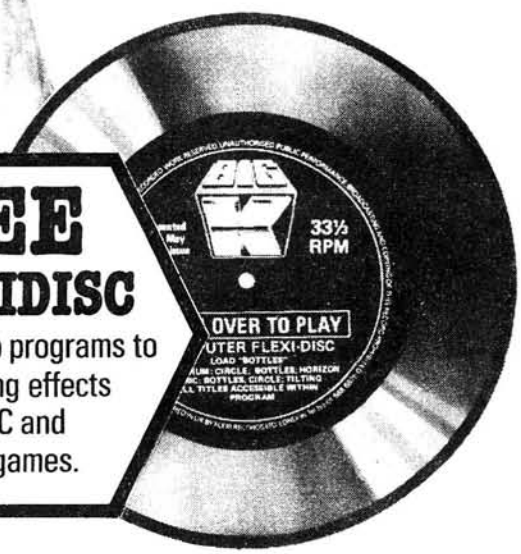

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The Early Work of Guglielmo Marconi

Part 1 by F. C. Judd G2BCX

This article is concerned with early experiments carried out by Guglielmo Marconi and in particular the types of antenna he used. At that time (circa 1895) the function of antennas was not fully understood so work in this direction was mostly on an empirical basis, although antennas were destined to play the most important role in the first long distance transmission of wireless waves some six years later.

The essential theoretical data concerned with radiating waves stemmed from the work of James Clerk-Maxwell (circa 1864); the actual existence of these waves remained unproved until 1888 when Professor Heinrich Hertz announced his discoveries, although again no practical applications were developed. At this time Marconi was about 12 years of age. It must be appreciated, however, that virtually all the earlier investigators, Michael Faraday, Joseph Henry, Dolbear, Sir W. H. Preece, Clerk-Maxwell and Hertz were no amateurs but respected and very eminent scientists, many of them Professors, who contributed considerable theory regarding the radiation of electric waves through space. Others, such as Augusto Righi, E. Branly, Alexander Popoff and Nikola Tesla, all carried out experiments in this field and contributed much of the knowledge that was needed to finalise the possibility of wireless transmission over distances other than across the confines of a laboratory.

Guglielmo Marconi was born on 25 April 1874 in the Italian town of Bologna. His father, Giuseppe Marconi, was a wealthy landowner who had married an Irish girl, Annie Jameson, related to the well-known distillers of Irish Whiskey of that name. By nature retiring and studious, the young Marconi often displayed a determination which no doubt ensured the success he achieved in all his work, even that embarked upon at a very early age. Aside from his native Italian, Marconi was acquainted with numerous other languages and spoke both English and French without trace of accent. This was a valuable asset to a man who during the course of his life spent a good deal of his time in England involved with his various "wireless" companies and working in countries all over the world installing and testing wireless equipment as well as carrying out innumerable experiments. He became well known to members of Royal Families of a number of different countries, including our own, and to leading figures everywhere involved with the scientific and practical applications of electricity, magnetism and wireless. As a result of these accomplishments, he was awarded many honours including the G.C.V.O., was President of a number of scientific institutes and was conferred with the degrees of Doctor of Science, Doctor of Law and Doctor of Engineering by a number of notable universities. He was awarded the Nobel prize for physics in 1909 [2].

When Marconi visited Bologna in 1926, thirty years after his first patent in "Wireless" had been granted, he said: *I had the idea, I might also say intuition, that these (wireless) waves might, in a not too distant future, furnish mankind with a new and powerful means of communication usable not only across continents and seas but also on board ships, bringing with it a diminution of the dangers of navigation and abolition of the isolation of those crossing the sea.*[3]

The First Experiments

Although Marconi was greatly influenced by the discoveries of Hertz in 1886 and the experiments carried out by the Italian scientist Augusto Righi with Hertzian waves, he could not understand why the potential applications of such a discovery had not been investigated. For a year he scanned the technical papers of the time for indications of this. Since nothing had appeared he set to work to improve the effectiveness of his own experimental apparatus which at that period was just capable of transmitting a signal from one side of a table to the other (Fig. 1.1).

Still living in Italy his more serious experiments with wireless began in 1895 at his father's country house, the Villa Griffone at Pontecchio, where with poles and wires in the garden and improved wireless apparatus he succeeded

in transmitting and receiving signals, first over very short distances but finally achieving a range of 3km. In a matter of six years he progressed from this to sending wireless signals across the Atlantic Ocean between Poldhu in Cornwall and the appropriately named Signal Hill at St. John's in Newfoundland, a distance of 2900km!

Marconi Comes to England

It is perhaps difficult for those acquainted with modern radio communication to realise the problems that Marconi and his assistants had to overcome in the course of his experiments and development of more efficient apparatus. The function of antennas as we know it today was barely understood, there were no valves for amplifying weak signals, or with which to generate radio frequency power. No factory-made components were available so these all had to be made by hand. In his book *Marconi and Wireless,* R. N. Vyvyan, one of Marconi's senior engineers at the time of the transatlantic tests (circa 1901-1905) said: *We knew nothing then about the effect of the length of the wave transmitted governing the distance over which communication could be effective. We did not have the means or instruments for measuring wavelength, in fact we did not know what wavelength we were using.* (1)

Following the experiments in Italy at the Villa Griffone, Marconi travelled to England and on 2 June 1896 applied for provisional protection for his invention. Shortly after he succeeded in getting an introduction to Sir William Preece, Chief Engineer of the British Post Office Telegraphs, who aided Marconi in the development of his systems for spark transmission. First attempts to increase distance resulted in only 6km and it was realised that aside from greater transmitting power and receivers with greater

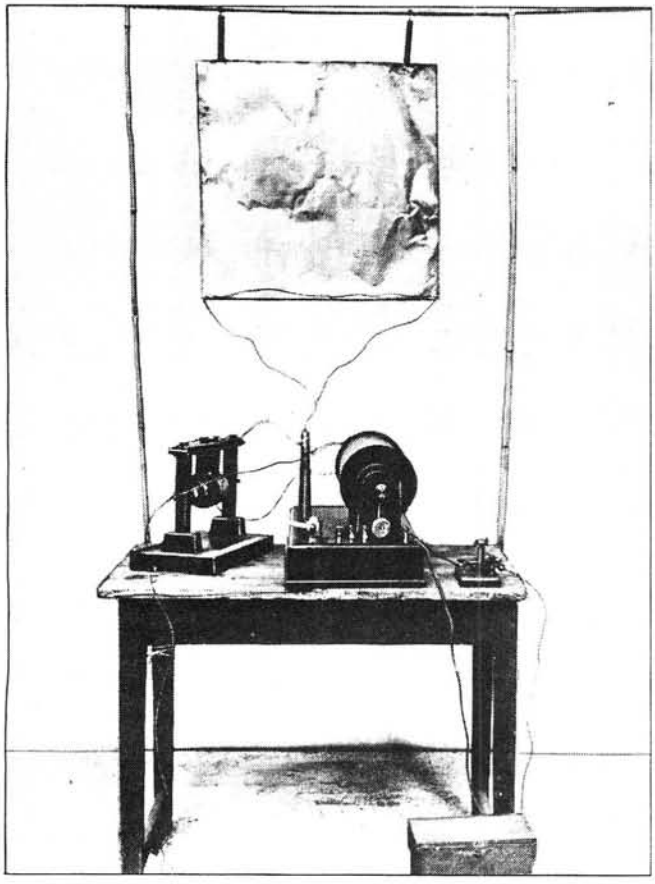

Fig. 1.1: Transmitter used by Guglielmo Marconi during early experiments in Italy during 1895

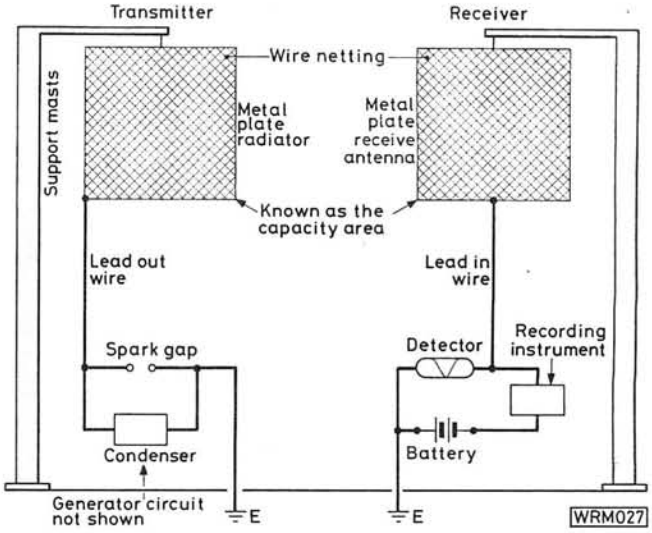

Fig. 1.2: "Capacity Area" antennas used by Marconi probably around 1896 but which gave little improvement in transmitting range (see text)

sensitivity that the antennas too had to be much more efficient. An illustration of a transmitting and receiving system used at the time is shown in Fig. 1.2 and it was from the "capacity areas" as they were called that the long wire antenna emerged as an efficient radiator. Marconi found that increasing the length of the lead wire to or from a capacity area increased the working range and eventually these "areas", or mesh plates, were discarded entirely and replaced with a long vertical wire carried by a mast. In order to use longer antennas for much more distant communication the wires were elevated by a kite or balloon. The long wire radiator became the basis for antennas used with all future systems. Marconi may well have related the antenna length and its elevation to the wavelength in use even though this relationship was not then fully understood. But in due course it was.

Meantime many more tests were carried out and demonstrations given to the British Post Office (Fig. 1.3) and other interested organisations as proof that communication by wireless was a viable proposition. By 1897 trials had been carried out over water and between ships and shore-based stations, mostly in Italy and later in England. Indeed antennas appeared in all kinds of places and readers of *Practical Wireless* may be interested to know that a station was set up by Marconi at the Haven Hotel in Poole, not far from the *PW* Offices and with an antenna mast 30m high. Details of this and the story connected with it were published in the March 1981 issue of *PW*. The antenna itself was made from stranded 7/20 copper wire insulated with india-rubber and tape.

Wireless Across the English Channel

About this time the Wireless Telegraph and Signal Company was formed (later to become the Marconi Wireless Telegraph Company). However, in March 1899 an attempt was made to bridge the English Channel and on the 27th of that month signals passed between South Foreland on the East Kent coast and Wimereux near Boulogne, a distance of about 48km. The antenna used was 45m high. There is an amusing sequel to the cross-channel tests. The station at Wimereux was visited by Lord Baden Powell to witness a demonstration of receiving wireless signals from England but at the appointed time and despite continuous calling, no signals were forthcoming. After checking everything and in sheer desperation even installing another receiver, there were still

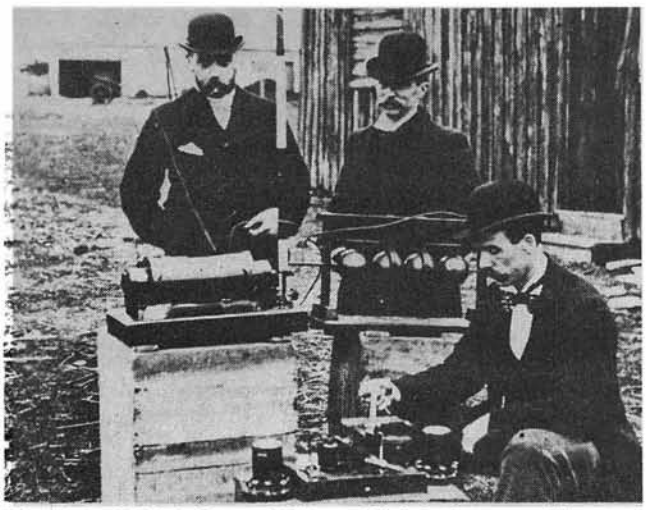

Fig. 1.3: British Post Office officials inspect Marconi wireless apparatus during the Bristol Channel demonstration (May 1897). A distance of 14km over water from Lavernock to Weston-super-Mare was achieved

no signals. Baden Powell realised that it was probably just a breakdown in the equipment but to Marconi himself it was a shattered faith. Suddenly however, in a shed behind the station where they waited, a bell rang and Marconi jumped like a scalded cat. *South Foreland,* yelled a mechanic and South Foreland it was with the following message: *Just back from supper, anything happened your end?* (2)

Tuning

From the experience gained during the first years of design, experiment and practical application, Marconi realised that some means of selective reception (and transmission) was necessary, what we today call tuning which we achieve with a high degree of selectivity because of the wide range of frequencies in use and the narrow bandwidths required. Up to the year 1900 the simple arrangement of the spark gap connected directly to the transmitter antennas in Fig. 1.4(a) offered no means of separation between two stations operating at the same time, i.e. the system was completely non-selective. Even in 1897 Sir Oliver Lodge had pointed out the desirability of being able to tune both transmitter and receiver to the same wavelength in order to secure privacy, or at least separation from other users of wireless communication.

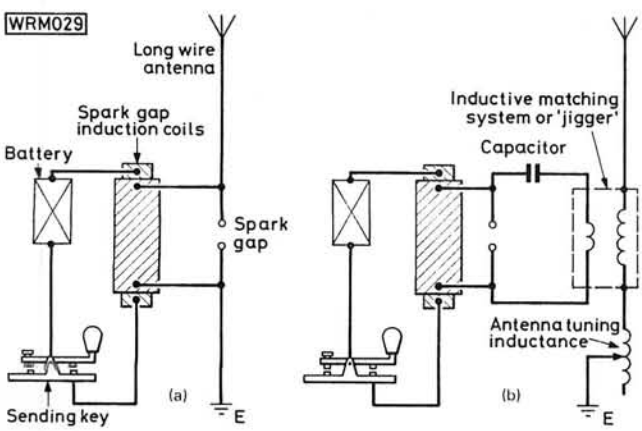

Fig. 1.4 (a): Transmitter circuit used prior to syntonic tuning. (b) The transmitter circuit with the 7777 patent syntony tuning system

Sir Oliver Lodge had in fact carried out experiments in 1889 to show that resonance, or "syntony" as it was called, could be obtained but his system severely limited the distance over which electro-magnetic waves could be radiated. Marconi's experiments with what we would call h.f. transformers began before 1897, the year in which Lodge had registered a patent for syntony. After many experiments Marconi finally took out patents on circuits that had given the best results and his patent of 1 June 1898 makes clear the desirability of tuning. *It is desirable that the induction coil should be in tune or syntony with the electrical oscillations transmitted. The most appropriate number of turns and most appropriate thickness of wire vary with the length of the wave transmitted.* Since the same applies to receiving, syntony was incorporated in all receivers and after a further series of experiments and developments and the registering of more patents, Marconi took out a master patent, number 7777, on 26 April *1900.* Both the patent and the number became famous later in litigation as the famous "four sevens patent" although its validity was finally upheld in High Court — but that is another story and one to be found in the various books about the life and work of this very talented man.

The importance of resonance was that it resulted in a much higher degree of efficiency in each case and allowed the antenna systems to be "tuned" as well. The arrangement of the circuitry of Marconi's syntonic, or tuned, wireless apparatus, under the patent 7777, is shown in Fig. 1.4(b). Incidentally the tuned transformer arrangement coupling the spark generator to the antenna was known as a "Jigger". The antenna tuning section, Fig. 1.4(b), no doubt looks familiar as it is more in keeping with antenna tuning arrangements used at the present time. Tuning was perhaps one of the most important developments in wireless, equal perhaps only to the invention of the valve which was yet to come.

Preparation for the Transatlantic Tests

With the problem of multi-station operation and consequent interference to each other now solved by the use of syntonic tuning, the time arrived for Marconi to attempt greater working ranges. His next venture was in fact to span the Atlantic Ocean. The first step was to find a suitable site for a station on the British mainland as physically near to America as possible and in due course some land overlooking Poldhu Cove in South West Cornwall was obtained. Work on setting up a station began in October 1900. In order that the signals transmitted from Poldhu could be monitored, another station was installed at the Lizard about 10km away. This was to serve not only for checking Poldhu transmissions but as an experimental station for testing syntonic circuits and also to operate as an additional ship-to-shore station. By 23 January 1901 the Lizard station was operational and set a new record, using syntonic tuning, by receiving signals from the Niton, Isle of Wight transmitter at a distance of 300km.

Meantime work at Poldhu had proceeded to a stage where preliminary tests could be carried out. The antenna system consisted of about 400 wires suspended in an inverted cone arrangement from a 61m circle of masts, there being 20 of these each 61m high. The wavelength was estimated at 366 metres (820kHz). The antenna is illustrated in Fig. 1.5. The next stage was to install a station in the USA. Marconi and one of his senior engineers, R. N. Vyvyan, travelled across to the selected site at Cape Cod in Massachusetts where Vyvyan remained to supervise the construction. Meantime, however, and in June of that year, transmissions from Poldhu were not only being

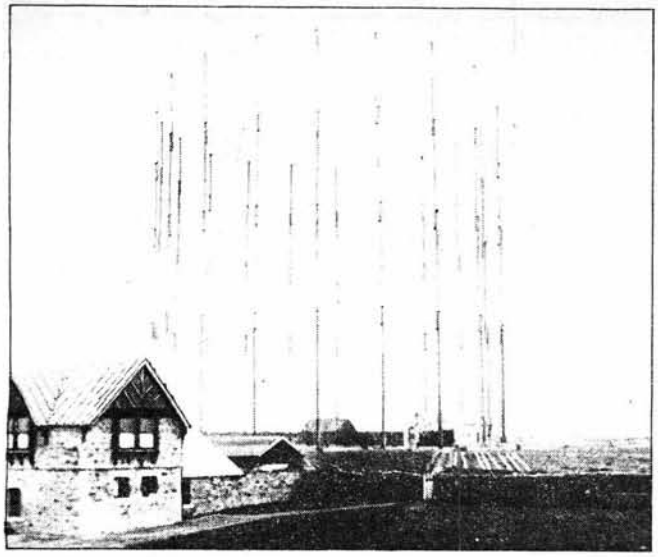

Fig. 1.5: Original antenna array at Poldhu prior to the transatlantic tests. This antenna was blown down by gale force winds before the tests could be carried out

received well at Niton but also from another new station at Crookhaven, County Cork in Ireland, at a distance of 365km. This had proved that radiated signals were not leaving the earth's surface at a tangent but were in fact following the curvature of the earth in some way. Little was known then of radio wave propagation but this made things look more promising for successful transatlantic tests. However, disaster struck later at Poldhu when gale force winds brought down the whole antenna system and its 20 masts. Worse was to follow, because on November 26 the complete ring of masts already set up by R. N. Vyvyan for the Cape Cod antenna, a replica of the one at Poldhu, suffered the same fate. Some £50 000 had already been spent on this scheme with nothing to show for it but a hopeless tangle of antenna wires and fallen masts and a now very depressing situation. With his usual determination and the help of a senior assistant, G. S. Kemp, Marconi set up a temporary antenna at Poldhu and made plans to use an alternative location on the other side of the Atlantic, namely St. John's, Newfoundland. What transpired is reserved for Part 2 but is described by W. J. Baker in his book *A History of the Marconi Company* rather appropriately as "The Atlantic Gamble".

References

1. *Marconi and Wireless*. R. N. Vyvyan. E.P. Publishing Ltd. (1974)
2. *Marconi Master of Space* (biography). B. L. Jacat and D. M. B. Collier. Hutchinson & Co.
3. *Pioneers of Wireless*. Ellison Hawks FRAS (1927). Methuen & Co. Ltd.

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by G. B. Clayton. Published by Butterworths
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To make the fullest use of this manual it should be read in conjunction with Operational Amplifiers Second Edition by the same author.

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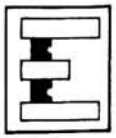
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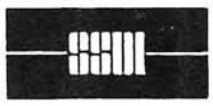
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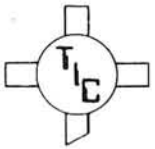
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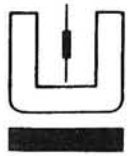
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Bipolar Transistor Parameters

C_{ibo}	Input capacitance, open circuit (common base)
C_{ieo}	Input capacitance, open circuit (common emitter)
C_{obo}	Output capacitance, open circuit (common base)
C_{oeo}	Output capacitance, open circuit (common emitter)
fc	Cut-off frequency
fT	Gain-bandwidth product (frequency at which small-signal forward current-transfer ratio common emitter, is unity, or 1)
g_{me}	Small-signal transconductance (common emitter)
h_{FB}	Static forward-current transfer ratio (common base)
h_{fb}	Small-signal forward-current transfer ratio, short circuit (common base)
h_{FE}	Static forward-current transfer ratio (common emitter)
h_{fe}	Small-signal forward-current transfer ratio, short circuit (common emitter)
h_{IE}	Static input resistance (common emitter)
h_{ie}	Small-signal input impedance, short circuit (common emitter)
I_b	Base current
I_c	Collector current
I_{CBO}	Collector cut-off current, base open
I_{CEO}	Collector cut-off current, emitter open
I_E	Emitter current
MAG	Maximum available amplifier gain
P_{CE}	Total d.c. or average power input to collector (common emitter)
P_{OE}	Large signal output power (common emitter)
R_L	Load resistance
R_S	Source resistance
V_{BB}	Base supply voltage
V_{BC}	Base to collector voltage
V_{BE}	Base to emitter voltage
V_{CB}	Collector to base voltage
V_{CBO}	Collector to base voltage (emitter open)
V_{CC}	Collector supply voltage
V_{CE}	Collector to emitter voltage
V_{CEO}	Collector to emitter voltage (base open)
$V_{CE(sat)}$	Collector to emitter saturation voltage
V_{EB}	Emitter to base voltage
V_{EBO}	Emitter to base voltage (collector open)
V_{EE}	Emitter supply voltage
Y_{fe}	Forward transconductance
Y_{ie}	Input admittance
Y_{oe}	Output admittance

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C_{gd}	Gate to drain capacitance (includes 0·1pF interlead capacitance)
C_{gs}	Gate to source interlead and case capacitance
C_{iss}	Small signal input capacitance, short circuit
C_{rss}	Small signal reverse transfer capacitance, short circuit
g_{fs}	Forward transconductance
g_{is}	Input conductance
g_{os}	Output conductance
I_D	DC drain current
$I_{DS(OFF)}$	Drain to source OFF current
I_{GSS}	Gate leakage current
r_c	Effective gate series resistance
$r_{DS(ON)}$	Drain to source ON resistance
r_{gd}	Gate to drain leakage resistance
r_{gs}	Gate to source leakage resistance
V_{DB}	Drain to substrate voltage
V_{DS}	Drain to source voltage
V_{GB}	DC gate to substrate voltage
V_{GB}	Peak gate to substrate voltage
V_{GS}	DC gate to source voltage
V_{GS}	Peak gate to source voltage
$V_{GS(OFF)}$	Gate to source cut-off voltage
Y_{fs}	Forward transadmittance $\approx g_{fs}$
Y_{os}	Output admittance
Y_L	Load admittance

Low Power Signal Diode Parameters

i	Incremental current sensitivity (detector diodes)
i	Total current sensitivity (detector diodes)
d	Damping coefficient
E_p	Single pulse energy (detector diodes)
$E_{p(rep)}$	Repetitive pulse energy (detector diodes)
i_f	Instantaneous forward current
I_f	Forward continuous (direct) current
I_{FM}	Peak forward current
I_{FSM}	Surge forward current
I_O	Average output rectified current
i_R	Instantaneous reverse current
I_R	Reverse continuous (direct) current
I_{RM}	Peak reverse current
i_{rr}	Reverse recovery current
M	Factor of merit (detector diodes)
η	Efficiency
η_r	Rectification efficiency
P_{cw}	RF c.w. power dissipation (detector diodes)
P_{RFP}	Pulse r.f. power dissipation (detector diodes)
P_{SM}	Surge non-repetitive power
Q_s	Recovered charge (stored charge)
r	Differential resistance
r_d	Damping resistance
r_{op}	Operating point differential resistance (detector diodes)
t_{fr}	Forward recovery time
t_{rr}	Reverse recovery time
$V_{(BR)}$	Breakdown voltage
V_F	Instantaneous total forward voltage
V_F	Forward continuous (direct) voltage
$V_{F(AV)}$	Average forward voltage
V_{FR}	Forward recovery voltage
V_{FRM}	Peak value of forward recovery voltage
V_R	Instantaneous total reverse voltage
V_R	Reverse continuous (direct) voltage
V_{RM}	Peak reverse voltage
V_{RSM}	Surge reverse voltage
W_p	Single pulse energy (detector diodes)

Thyristor Parameters

$dv/dt\ (c)$	Critical rate of rise of commutating voltage
$I_{(BO)}$	Continuous (direct) breakover current
I_D	Continuous (direct) off-state current
I_{FG}	Forward gate continuous (direct) current
I_{FGM}	Peak forward gate current
I_{GD}	Gate non-trigger continuous (direct) current
I_{GQ}	Gate turn-off continuous (direct) current
I_{GT}	Gate trigger continuous (direct) current
I_H	Continuous (direct) holding current
I_L	Latching current
$I_{(OV)}$	Overload on-state current
I_R	Continuous (direct) reverse blocking current
I_{RG}	Reverse gate continuous (direct) current
I_{RR}	Reverse recovery current
I_{RRM}	Repetitive peak reverse current
I_T	Continuous (direct) on-state current
I_{TRM}	Repetitive peak on-state current
I_{TSM}	Surge (non-repetitive) on-state current
P_D	Off-state power dissipation
P_{DQ}	Total instantaneous turn-off dissipation
$P_{DQ(AV)}$	Average turn-off dissipation
P_{QM}	Peak turn-off dissipation
P_R	Reverse power dissipation (for reverse blocking and conducting triode thyristors)
P_{RQ}	Total instantaneous turn-off dissipation
$P_{RQ(AV)}$	Average turn-off dissipation
P_{RQM}	Peak turn-off dissipation
P_T	On-state power dissipation
P_{TT}	Total instantaneous turn-on dissipation
$P_{TT(AV)}$	Average turn-on dissipation
P_{TTM}	Peak turn-on dissipation
Q_{dr}	Off-state recovered charge (for reverse conducting triode thyristor)
r_T	On-state slope resistance
t_{dr}	Off-state recovery time (for reverse conducting triode thyristors)
t_{gd}	Gate-controlled delay time
t_{gq}	Gate-controlled turn-off time
t_{gr}	Gate-controlled rise time
t_{gt}	Gate-controlled turn-on time
t_q	Circuit commutated recovery time (circuit commutated turn-off time)
$V_{(BO)}$	Breakover continuous (direct) voltage
$V_{(BR)}$	Reverse breakdown voltage
V_D	Continuous (direct) off-state voltage
V_{DM}	Peak off-state voltage
V_{DRM}	Repetitive peak off-state voltage
V_{DSM}	Non-repetitive peak off-state voltage
V_{DWM}	Crest (peak) working off-state voltage
V_{FG}	Forward gate continuous (direct) voltage
V_{FGM}	Peak forward gate voltage
V_{GD}	Gate non-trigger continuous (direct) voltage
V_{GQ}	Gate turn-off continuous (direct) voltage
V_{GT}	Gate trigger continuous (direct) voltage
V_{GTMIN}	Minimum gate trigger voltage
V_R	Continuous (direct) reverse voltage
V_{RG}	Reverse gate continuous (direct) voltage
V_{RGM}	Peak reverse gate voltage
V_{RRM}	Repetitive peak reverse voltage
V_{RSM}	Non-repetitive peak reverse voltage
V_{RWM}	Crest (peak) working reverse voltage
V_T	Continuous (direct) on-state voltage
V_{TMIN}	Minimum on-state voltage
$V_{T(TO)}$	On-state threshold voltage

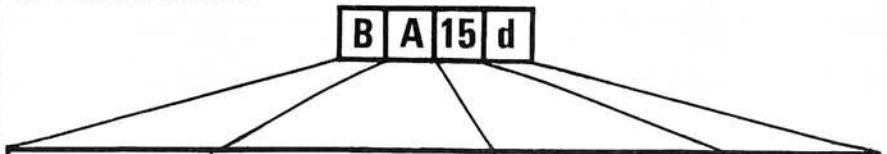
Lamp Codes

A number of codes are used to identify small lamps, describing either the cap or the glass shape and size.

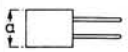
1. LAMP CAPS

1.1 Name/Abbreviation For example bayonet cap (b.c.) or miniature edison screw (m.e.s.).

1.2 International Code



CAPFORM	PIN-LENGTH	CAP DIAMETER	CONTACTS
B Bayonet E Edison screw P Pre-focus S Special W Wedge	On the smaller bayonet caps, the letter "A", standing for Automobile, indicates short locating pins	Approximate overall diameter in mm	d Double s Single



Bi-pin Cap

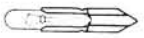
Nominal Diameter of Cap "a"	Glass Size Code
3mm	T1
4mm	T1¼
6mm	T1¾

Wedge Base

Nominal Diameter "a"	International Cap Code	Glass Size Code
5mm	—	T1½
10mm	W2·1 × 9·5d	T3¼

Capless (wire-ended)

Nominal Diameter "a"	Glass Size Code
2·5mm	T¾
3mm	T1
4mm	T1¼
5mm	T1½
6mm	T1¾



P.O. No. 2 Switchboard Lamps

Nominal Diameter "a"	Rating	Colour Code
5·5mm	6V 0·04A	Grey
	12V 0·1A	Red/Yellow
	17V 0·045A	Orange
	24V 0·05A	Yellow
	45V 0·039A	Blue/White
	50V 0·1A	White
	60V 0·06A	Mauve

2. GLASS SHAPE/SIZE

2.1 International Code (originally U.S.)

A letter: T meaning Tubular, or
G meaning Globular
followed by a figure giving the approximate overall diameter of the glass envelope in eighths of an inch and fractions of eighths.

So, a T1 lamp has a tubular envelope of ⅛in (0·125in) diameter, while a G3½ has a round envelope of $3\frac{1}{2} \times \frac{1}{8} = \frac{7}{16}$ in (0·4375in) diameter, which is approximately 11mm.

2.2 By Description

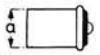
Approximate diameter of glass envelope in millimetres, followed by abbreviation:
Rd. meaning Round, or
Tub. meaning Tubular

Single Contact (Suffix "s")

Double Contact (Suffix "d")

Bayonet Cap

Nominal Diameter of Cap "a"	Cap Name (abbreviation)	International Cap Code	Glass Size		
			Code	Outline	Description
7mm	Bayonet Automobile	BA7s	T2		
9mm	Miniature centre contact (m.c.c.) or Miniature bayonet cap (m.b.c.)	BA9s	T3¼		10mm Tub.
			G3½		11mm Rd.
			—		15mm Rd.
15mm	Small centre contact (s.c.c.)	BA15s			
	Small bayonet cap (s.b.c.)	B15d/BA15d			
22mm	Bayonet cap (b.c.)	B22			



Flange Cap

Nominal Diameter of Cap "a"	Cap Name	International Cap Code	Glass Size Code
4mm	Sub-Midget Flange	SX3s	T1
6mm	Midget Flange	SX6s (S6/8)	T1¾

Edison Screw Form Cap

Nominal Diameter of Cap "a"	Cap Name	International Cap Code	Glass Size		
			Code	Outline	Description
5mm	Lilliput e.s. (l.e.s.)	E5	T1½		
10mm	Miniature e.s. (m.e.s.)	E10	T3¼		10mm Tub.
			G3½		11mm Rd.
			—		15mm Rd.
12mm	Candelabra e.s. (c.e.s.)	E12			
14mm	Small e.s. (s.e.s.)	E14			
27mm	Edison screw (e.s.)	E27			
40mm	Goliath e.s. (g.e.s.)	E40			

Fuse Wire Ratings

Rewireable fuse links are found in a wide variety of sizes, and the form and size of the carrier has a considerable effect on the rating of a given gauge of wire. For this reason, general tables of ratings for fuse wire should always be treated with the greatest caution. Where the fuse carrier or box carries a table applicable to its own design, this information should always be followed in preference to that obtained from a general table such as the following:

Copper fuse wire is usually coated with tin to minimise corrosion. This coating has little effect on rating.

Carrying Current (amps)	Fusing Current (amps)	Copper	Wire Size (s.w.g.)	
			Platinoid	Lead or Lead/Tin Alloy
0·7	1	47	43	35
1·3	2	43	39	29
2	3	41	36	27
2·5	4	39	35	25
3	5	38	33	23
7	10	33	27	20
10	15	30	24	18
13	20	28	23	16
16	25	26	21	15
20	30	25	20	14
24	35	24	20	13
27	40	23	19	13
30	45	22	19	12

Wire-Winding Pitch

Nominal bare diameter (mm)	Turns per 10mm	Nominal bare diameter (mm)	Turns per 10mm
1·600	5·9	0·500	18·3
1·500	6·3	0·450	20·2
1·400	6·8	0·400	22·6
1·320	7·2	0·355	25·3
1·250	7·5	0·315	28·4
1·180	8·0	0·280	31·8
1·120	8·4	0·250	35·2
1·060	8·8	0·224	39·1
1·000	9·4	0·200	43·5
0·950	9·9	0·180	47·9
0·900	10·4	0·160	53·5
0·850	11·0	0·140	60·2
0·800	11·6	0·125	67·1
0·750	12·4	0·112	74·6
0·710	13·0	0·100	82·6
0·630	14·6	0·090	90·0
0·560	16·4	0·080	102·0

SWG	Turns per in	SWG	Turns per in
16	15·0	30	73·3
17	17·1	31	77·8
18	19·8	32	83·0
19	23·7	33	88·9
20	26·1	34	98·0
21	29·4	35	106
22	33·3	36	116
23	38·8	37	128
24	42·1	38	143
25	46·0	39	168
26	50·6	40	180
27	55·9	41	194
28	61·4	42	211
29	66·2	43	230

SWG	Diameter (in)	Diameter (mm)	AWG	Diameter (in)	Diameter (mm)	Std metric	Diameter (mm)
10	0·128	3·25	8	0·128	3·26		
11	0·116	2·95					
			9	0·114	2·90		
12	0·014	2·64					
			10	0·102	2·59		
13	0·092	2·34					
			11	0·091	2·30		
14	0·081	2·03	12	0·081	2·05		
15	0·071	1·83	13	0·072	1·83		
16	0·064	1·63	14	0·064	1·63		
						17	1·5
			15	0·057	1·45		
17	0·056	1·42					
			16	0·051	1·29		
						18	1·24
18	0·048	1·22					
			17	0·045	1·15		
19	0·040	1·02	18	0·040	1·02		
						19	1·00
20	0·036	0·92	19	0·036	0·91		
21	0·032	0·81	20	0·032	0·81		
						21	0·80
22	0·028	0·71	21	0·028	0·72	22	0·71
			22	0·025	0·64		
23	0·024	0·61					
24	0·023	0·56	23	0·023	0·57	24	0·56
25	0·020	0·51					
						25	0·50
26	0·018	0·46	25	0·018	0·45		
27	0·016	0·41	26	0·016	0·40	27	0·40
28	0·014	0·38	27	0·014	0·36		
29	0·013	0·35	28	0·013	0·32		
						30	0·315
30	0·012	0·305					
31	0·011	0·29	29	0·011	0·29		
32	0·0106	0·27					
33	0·010	0·254	30	0·010	0·25	33	0·25
34	0·009	0·229	31	0·009	0·23		
						34	0·224
35	0·008	0·203	32	0·008	0·20	35	0·20
36	0·007	0·178	33	0·007	0·18		
37	0·0067	0·17					
			34	0·0063	0·16		
38	0·006	0·15					
			35	0·0056	0·14		
39	0·005	0·127	36	0·005	0·13		
40	0·0048	0·122					
			37	0·0045	0·114		
41	0·0044	0·112					

Decibels

GAIN			LOSS	
Power Ratio	Voltage or Current Ratio	+dB−	Power Ratio	Voltage or Current Ratio
1·000	1·000	0	1·0000	1·0000
1·259	1·122	1	0·7943	0·8193
1·585	1·259	2	0·6310	0·7943
1·995	1·413	3	0·5012	0·7079
2·512	1·585	4	0·3981	0·6310
3·162	1·778	5	0·3162	0·5623
3·981	1·995	6	0·2512	0·5012
5·012	2·239	7	0·1995	0·4467
6·310	2·512	8	0·1585	0·3981
7·943	2·818	9	0·1259	0·3548
10	3·162	10	10^{-1}	$3·162 \times 10$
10^2	10	20	10^{-2}	10^{-1}
10^3	$3·162 \times 10$	30	10^{-3}	$3·162 \times 10^{-1}$
10^4	10^2	40	10^{-4}	10^{-2}
10^5	$3·162 \times 10^2$	50	10^{-5}	$3·162 \times 10^{-2}$
10^6	10^3	60	10^{-6}	10^{-3}
10^7	$3·162 \times 10^3$	70	10^{-7}	$3·162 \times 10^{-3}$
10^8	10^4	80	10^{-8}	10^{-4}
10^9	$3·162 \times 10^4$	90	10^{-9}	$3·162 \times 10^{-4}$
10^{10}	10^5	100	10^{-10}	10^{-5}

To express a gain of 36dB as a power ratio.
From the table:
Power ratio for 30dB = 1000
Power ratio for 6dB = 3·981
Power ratio for 36dB = 1000 × 3·981 = 3981

To express a level of 12dB below zero level (1mW) as power output in milliwatts.
From the table:
Power ratio for −10dB = 0·1
Power ratio for −2dB = 0·6310
Power output (reference 1mW) = 0·1 × 0·6310 × 1 = 0·0631mW

To express a voltage gain of 28dB as output voltage when the input level is 0·5V. Input and output impedances are assumed to be equal.
From the table:
Voltage ratio for 20dB = 10
Voltage ratio for 8dB = 2·512
Output voltage (reference 0·5V) = 10 × 2·512 × 0·5 = 12·56V

◀ Wire-Gauge Comparisons

Swap Spot

Have Nikon f.e. 35mm camera, flash gun, X2 lens adaptor. Would exchange for good h.f. receiver, ideally FRG-7. Tel: Hemel Hempstead 68978. *U648*

Have two brand new Mullard TY4-400C valves, value about £160 the pair. Would exchange for two new 4CX250B valves and two u.h.f. bases. Geoff G8ONG. Tel: Norwich 715423 evenings or weekends. *U649*

Have CB rigs—"President" homebase, mains and Maxcom 7E mobile with s.w.r. meter, antenna matcher, Thunderpole II base antenna with interlocking steel mast loft dipole. All boxed with all leads and plugs. Would exchange for Eddystone EA12 receiver or similar. Tel: Guildford 224327. *U652*

Have Suzuki FZ50, 2700 miles only, 1980, MOT, some extras, careful lady driver, immaculate. Also have Mizuho MX2, two reel-reel recorders and Marconi CR100. Would exchange for 144MHz multimode, rotator, 'scope or w.h.y. Hacker, 122 Trafalgar Street, Gillingham, Kent. Tel: Medway 53874 evenings. *U657*

Have SMC Oscar 29MHz mobile transceiver. Would exchange for any TI/994A module. Also have SMC 12 channel hand-held marine monitor with charger and NiCads. Would exchange for w.h.y. Tel: 0703 864510 (Totton, Hants). *U658*

Have l.c.d. frequency display, 3 ranges 500kHz–108MHz for any receiver. Also have Lowe 144MHz 6-channel receiver and Kodak EK160-EF instant camera. Would exchange for rotator or ZX Spectrum c.w./RTTY program plus interface. Tel: Plymouth 880674. *U659*

Have Uniden 2030 144MHz f.m. transceiver with 12 channels. Would exchange for a working h.f. transceiver. Tel: Marlow 3186. *U672*

Have Feinwerkbau 127 Sport (·22) high power air rifle with case and Tasco 3—9 × 50 sights with one piece mount. Cost over £230 new, Securicor delivery. Would exchange for 144MHz rig multimode or f.m. Write, C. Sutton, Merchant Navy College, Greenhithe, Kent DA9 9NY. *U673*

Have C Scope VLF1000 metal detector. Has 4 discrimination and ground exclusion balance mode. Cost £200. Would exchange for either Racal RA17, AR88 or No. 19 set. Must be working. Tel: 021-550 1563. *U689*

Have two six channel 35MHz radio control sets, Sanwa, Futaba, servos etc. One set new, unused. Two radio control model aircraft, Spitfire and bi-plane, engines, full flight box, starter, etc. Would exchange for good 144MHz rig. FRG-7700 receiver or similar. Tel: Farnworth 78981. *U690*

Have Standard C8800 144MHz f.m. transceiver, Microwave Modules 144MHz 100W linear also IC-202. Would exchange for h.f. transceiver. M. Lee. Tel: 0737 66571 (Redhill, Surrey). *U705*

Have Trio TS-130V (including new bands) and mobile mic. Would exchange for TR9130/TR9000, or other v.h.f. multimode, w.h.y. Martyn Bolt, 112 Leeds Road, Mirfield, Yorkshire WF14 0JE. *U707*

Have trailer/sailer, 2½ berth cabin, full inventory. Would exchange for any working radio gear, BBC computer add-ons. Tel: Southampton 558843, or write G4KMU, 7 Old Farm Drive, Townhill Park, Southampton. *U706*

Have voice synthesiser for CB rig, talks channel number. Would exchange for 500 + 500pF variable capacitor, w.h.y. Also have Pye M294 mobile transceiver less case, 6 channel 12½kHz channels f.m. fully working with circuit diagrams and notes. Easy modification. Would exchange for r.f. generator or 'scope capable of 10·7MHZ +. Write, Andy, 6 Sedgefield Close, Salford, Manchester M5 4JL. *U716*

Have Murphy B40 receiver with Datong active antenna model AD270, with power unit and Global a.t.u. Everything needed for receiving station, spare valves and handbook. Would exchange for motorcycle, any considered. Tel: Taunton 86952. *U718*

Have large GB stamp collection, cat. value approximately £2500, sound investment, or start own business. Would exchange for RX/TX, FTDX401, scanner, antenna, Morse tutor, 144MHz receiver, anything considered. Must collect, 214 Horninglow Road, Sheffield. *U719*

Have Harvard 420M 40 channel f.m. transceiver, plus two s.w.r. meters, p.s.u., mag mount antenna and base station antenna. Would exchange for airband receiver or Sinclair ZX81. Tel: Isle of Wight 854850. *U730*

Have Murphy base station, f.m. CB, with Leson DT252A power mic. Would exchange for good general coverage receiver. Also have camera and electronic flash gun, enlarger. Would exchange for marine band receiver. All as new. N. Beadsworth, 2 Lapwing Way, Clooney Estate, Waterside, Londonderry, N. Ireland. Tel: 46871. *U740*

Have ZX81, 16K RAM, printer and software (total value £148), also Jaybeam D7/2m antenna. Would exchange for 432MHz for 144MHz input transverter, 144MHz pre-amp. and cash, w.h.y. GM6JXY, 3 Yetholm Terrace, Hillhouse, Hamilton, Strathclyde, Scotland ML3 9SH. *U741*

Have Trio 2200GX 12 channel 144MHz rig, 5 repeaters, 4 channels, plus NiCads. Would exchange for receiver, cash adjustment where necessary. Also TI994A computer, both articles together or separate latter for anything radio. Tel: Chorley 68910. *U742*

Have Yashica FR1 s.l.r. camera, fully automatic with manual override. F1.7 lens and electronic shutter, including case, hardly used. Would exchange for 144MHz f.m. handheld transceiver. D. Durham, 27 Felbridge Close, East Grinstead, West Sussex. Tel: 313478. *U754*

Have service communications receiver DIS-100 Mk3, one of the rarest of collectors' receivers, requires attention, Bolex P4, standard 8 film, Rolleicord VB. Would exchange for AR88 or similar. Tel: Pontypridd 404598. *U755*

Have Harvard f.m. 410T CB transceiver with rechargeable batteries and rubber duck. Would exchange for a ZX81 with 16K RAM or similar computer. A. Price, 245 North Court, Haverfordwest, Dyfed SA61 2TE. *U756*

PW "SWAP SPOT"

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G4? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE in our new feature SWAP SPOT. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless,* Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issue of the magazine.

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

RTTY with the ZX81

by Dick Ganderton G8VFH

FOLLOW UP

The RTTY terminal unit described in the June 83 issue of *Practical Wireless* was designed with ease of construction and alignment in mind. In general it succeeded but some constructors have reported difficulties, mainly in the receive section. These notes outline the possible problems and give the cures needed to overcome them.

Receive Circuits

Two problems have been noted, both of which affect the output on the screen. Not all constructors have suffered from these problems and to some extent they seem to be related to both the source of the 567 p.l.l. chips as well as the batch. The first problem seems to be related to a form of "jitter" caused by the v.c.o. in the chip taking a finite number of cycles to lock. This causes the output to "bounce" upsetting the computer sampling.

A cure can be effected by connecting a capacitor between pins 1 and 8 of the two 567s (IC2, 3). The value of this capacitor will need to be determined empirically, but somewhere between 0·1μF and 0·22μF seems to be about right. The capacitor latches the output until the v.c.o. locks but the value must not be made so large as to latch the chip for longer than 20ms, otherwise you will make matters worse!

A related effect is false triggering caused by the output stage of the p.l.l. being too sensitive. The sensitivity of this stage can be adjusted by sourcing or sinking current at pin 1. Sensitivity can be reduced by connecting a resistor from pin 1 to the +5V rail but a better method is to use a preset potentiometer to allow you to vary the sensitivity as required. Fig. 1 shows the mods described.

The components can be soldered to the leads of other related components and mounted on the top of the p.c.b. with their leads cut short. The settings of the two presets can be determined by recording a test tape from the a.f.s.k. output and replaying it through the t.u., setting the presets to give a good printout on the screen.

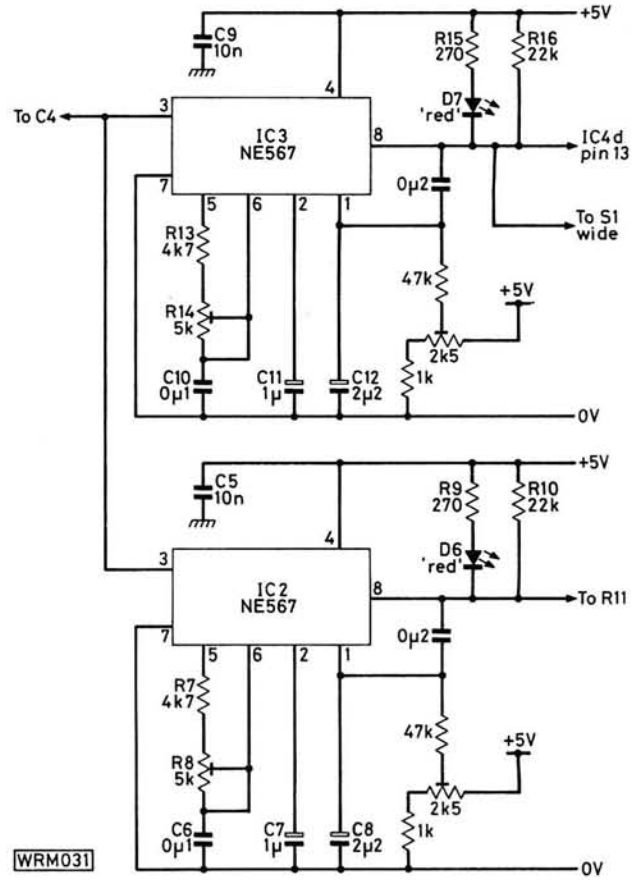
Transmit Circuit

Frequency drift can be cured by replacing D8 (1N914) with a good quality, high-stability resistor of 560Ω. Note that C15 must be a 2 per cent polystyrene capacitor, not a disc ceramic as in the components list. It may be necessary to change the value of R25, either up or down, to achieve a balanced sinewave output for both frequencies.

Power Supplies

Some readers have had problems with the regulated supply rails oscillating. To prevent this either replace C25 and C26 with 1μF tantalum bead capacitors or solder the extra capacitors across C25 and C26.

I would like to thank those readers who have taken the trouble to keep me informed of their progress with this project and reported their success, or otherwise, with either my suggested mods or their own ideas.



PW 144MHz QRP CONTEST—1984

Following *PW's* most successful first venture into organising an open 144MHz contest last year, we will be repeating the event this year.

The *PW 144MHz QRP Contest 1984* will take place on Sunday 17 June between 0900 and 1700GMT (10am to 6pm local time).

Look out for final details in the June issue of *Practical Wireless.*

WATERS & STANTON ELECTRONICS

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Pictured above is a corner of our Hockley shop.

ICOM
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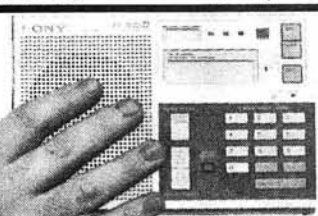

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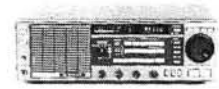

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PW REVIEW

YAESU FT-980 HF TRANSCEIVER

The FT-980 with the optional MD-1 microphone with frequency UP/DOWN control

A "button-pusher's paradise" or "knob-twiddler's delight"—either description would fit the Yaesu FT-980 very well. On the front panel there are 22 rotary controls, 38 push-buttons and the on-off switch; on the rear panel six switches plus one rotary control. When you realise too, that there are no less than 19 connectors to cope with just about every accessory and add-on unit you could think of, you will see that this is a very flexible rig.

The FT-980 is described by Yaesu as a "CAT System" rig. "CAT" stands for Computer Aided Transceiver, and it means that a personal computer can be coupled to the FT-980 to control it and make it perform a range of tasks automatically.

Special features of the FT-980 include: full break-in c.w. capability; a 24 volt supply rail for the transmitter output stage transistors to give very low intermodulation distortion; independent receiver front ends for amateur bands and general-coverage modes, using high I_{dss} j.f.e.t. amplifiers and independent v.f.o.s; true frequency readout when used with v.h.f/u.h.f. transverters; f.m. and f.s.k. modes and r.f. speech processor included as standard.

A quick run-through the various controls will give a fair idea of the full range of facilities, beginning with the front panel. At the top left-hand corner there are two illuminated meters. The first shows either V_{cc} (all modes) or Discriminator tuning (f.m. only) on receive. On transmit, it can be switched to show final stage current, speech compression level, output power, or the forward power set point for v.s.w.r. measurements. The second meter operates as an S-meter on receive, and on transmit shows either a.l.c. level or v.s.w.r.

The main frequency readout is a 7-digit fluorescent display (expanding to 8-digit when a v.h.f. or u.h.f. transverter is in use), though there is a push-button which will blank the last (10Hz) digit if preferred. To the left of this display is the mode indicator, also fluorescent, and above it a row of l.e.d.s which show: the source of frequency control (v.f.o. or memory); whether split-frequency operation has been selected; when external computer control is being used; when the r.f. attenuator has been switched in; when the main display is being used to check memory contents, rather than to show the current operating frequency.

The row of push-buttons below the meters control: MOX—manual transmit/receive switching; AMGC—"automatic mic gain control", a sort of audio squelch which stops background noises picked up by the microphone in the absence of speech from reaching the modulator; PROC—the r.f. speech processor; ALC METER HOLD—switches in a 1-second peak-hold on the a.l.c. meter; CW CAL—provides a tone of the same frequency as the b.f.o. offset, to facilitate setting the transmitter exactly onto an incoming signal; NB—actuates the noise blanker; APF—actuates the audio peak filter; NOTCH—actuates the i.f. notch filter; AGC FAST/SLOW and ON/OFF.

A row of concentric controls below the push-buttons set: DELAY—"hang-time" of the automatic transmit/receive switching, adjustable down to full QSK; VOX—sensitivity of the voice-operated transmit/receive switching; MIC—microphone gain; COMP—speech processor compression; DRIVE—transmitter carrier/drive level; NB—noise blanker time constant (pulse-width); MONI—audio level from the i.f. transmitter monitor circuit; KEYER—speed of the optional internal electronic c.w. keyer.

The bottom row of controls (again all concentric) set the receiver functions: AF gain; RF gain; TONE; SQL—f.m. squelch threshold; NOTCH—i.f. notch frequency; APF—audio peak filter frequency.

Ignoring all frequency-setting controls for the moment, and moving to the lower right-hand corner of the front panel, we find controls for: WIDTH—allowing either the lower or upper skirt of the i.f. passband to be moved in towards the centre frequency; SHIFT—allowing the i.f. passband to be moved relative to the receiver tuned frequency; MODE—an 8-position switch which caters for the optional c.w. and a.m. filters as well as the standard bandwidths; ATTN—a switched 0/10/20/30dB r.f. attenuator.

A variety of methods of frequency selection are incorporated into the FT-980. Conventional rotary tuning is provided by the central main tuning knob, though this changes the frequency in 10Hz steps, rather than continuously. The tuning rate is 10kHz per revolution. Beneath the main tuning knob are three buttons marked DOWN-FAST-UP which drive the 10Hz/step frequency scanner, at either 300Hz/second or 30kHz/second approximately.

Larger frequency steps are provided on the main keypad. These are 5kHz (useful when scanning the h.f. broadcast bands), and 500kHz (or band-steps when in the HAM amateur bands mode). Either single-step or REPEAT modes (6 steps per second) are available for both of these.

The remainder of the main keypad is two-function, one set of functions being printed on the panel above the buttons and the other, numerals for direct frequency entry, on the buttons themselves. The control functions are: CLAR TX and RX—transmitter and receiver incremental tune; TAB SET—rather like tabulator keys on a typewriter these allow the user to define frequency limits for the tuning range of each of the two v.f.o.s; HAM or GEN (general) v.f.o. selection; SELECT buttons—let you choose the v.f.o. or the memory as

★ specifications

TRANSMITTER

Frequency coverage: 1·5–1·99999MHz (160m)
3·5–3·99999MHz (80m)
7·0–7·49999MHz (40m)
10·0–10·49999MHz (30m)
14·0–14·49999MHz (20m)
18·0–18·49999MHz (17m)
21·0–21·49999MHz (15m)
24·5–24·99999MHz (12m)
28·0–29·99999MHz (10m)

Types of emission: c.w. (A1A), u.s.b./l.s.b. (J3E), a.m. (A3E), a.f.s.k. (J1B), f.m. (F3E)

Power output: c.w., s.s.b. 100W p.e.p.
a.m. 25W
a.f.s.k., f.m. 50W

Carrier suppression: Better than 40dB

Unwanted sideband: Better than −50dB

Spurious radiation: Better than −50dB

3rd Order i.m.d. Better than −40dB
Referenced to peak output

Frequency accuracy: Better than ±3 p.p.m. from 0–40°C

Max. deviation (f.m.): ±5kHz

FSK shift frequencies: 170,425,850Hz

Antenna impedance: 50Ω unbalanced

Microphone impedance: 500–600Ω

Audio response: Better than 6dB, 250–2750Hz

GENERAL

Tuning steps: 10Hz, 5kHz, 500kHz (band step)

Power requirements: 100/120V or 200/234V 50/60Hz
530VA transmit
72VA receive

Dimensions: 165 × 380 × 465mm approx. overall

Weight: 17kg approx.

RECEIVER

Frequency coverage: 150kHz–29·9999MHz

Clarifier range: ±10kHz

Intermediate frequencies: 1st i.f. 47·055MHz
2nd i.f. 8·9875MHz
3rd i.f. 455kHz
f.m. i.f. 455kHz

Sensitivity (min): Input for 10dB(S + N)/N:

Mode (B/W)	<2MHz	>2MHz
c.w.(W)/s.s.b./a.f.s.k.	4·0μV	0·25μV
c.w.(N)*	1·6μV	0·1μV
c.w.(W)*	2·6μV	0·16μV
a.m.(W)	22μV	1·4μV
a.m.(W)*	20μV	1·25μV
a.m.(N)	16μV	1·0μV
f.m.	—	0·6μV for 12dB SINAD

* Option

Image rejection: Better than 70dB

I.F. rejection: Better than 70dB

Selectivity: WIDTH control at maximum
I.F. SHIFT centred

Mode (B/W)	−6dB	−60dB
c.w.(W)/s.s.b./a.f.s.k.	2·5kHz	4·2kHz
c.w.(N)*	300Hz	600Hz
c.w.(W)*	600Hz	1·2kHz
c.w.(W)	6kHz	17kHz
a.m.(W)*	5kHz	12kHz
a.m.(N)	3kHz	9kHz
f.m.	12kHz	24kHz

* Option

Dynamic range: Better than 95dB with optional 300Hz filter (at maximum sensitivity)

Audio peak filter: 350–1400Hz

I.F. notch filter: 500–2700Hz (demodulated)

Audio output: 3W min. in 4Ω, less than 10% t.h.d.

Audio output impedance: 4–16Ω

the frequency controller, or give split-frequency operation with the transmit frequency controlled by one and the receive frequency by the other. A further button, marked OFFSET FREQ, lets you display the frequency difference of the split.

Above the main keypad are the FWD SET control, used in v.s.w.r. measurements, and the MEMORY controls. A 12-position rotary switch selects the memory channel required. Two WRITE buttons, when pressed, write the displayed frequency, mode, and HAM/GEN information into the selected channel. A SHIFT button unlocks the memory channel and allows it to be tuned with any of the tuning controls, whilst still remembering the original setting. The shifted frequency will be shown on the main (digital) display but the original memory frequency will be shown on a "pseudo-analogue" display just above the main tuning knob, of which more will be said a little later. A CHECK button enables you to see what frequency/mode is stored in each memory channel whilst still receiving on another frequency/mode, as mentioned earlier.

The last two buttons each have a second function: LDB which blanks the 10Hz digit on the main display, as described earlier, and V/U which allows the hundreds of megahertz digit to be displayed when a transverter is connected to the FT-980.

The "pseudo-analogue" display uses a 9-digit fluorescent display to give a relative frequency indication which scrolls to left or right as the v.f.o. frequency is changed. Digital display of the kilohertz portion of the v.f.o. frequency to the nearest 50kHz is provided, with ±50kHz on either side always represented, scrolling in 10kHz steps. Beneath the digits is a scrolling cursor, which steps from one digit location to the next for each 1kHz of v.f.o. change. The value of the 1kHz digit can be read from numbers printed at the

★ test measurements

TRANSMITTER

Outputs in c.w. mode: (240V supply)

Freq. (MHz)	Output (W)	F.S. Ic (A)	Harmonic Outputs (dBc) 2nd	3rd	4th	5th	Spurious Outputs (dBc)
1·81	100	10	—	−54	—	—	—
3·51	110	9·5	—	−66	−70	—	—
7·01	105	9·5	—	−54	—	−68	—
10·11	105	10	−68	−57	—	—	—
14·01	115	10	−60	−58	—	—	—
18·11	115	8	−58	−64	—	—	—
21·01	110	8·5	—	−69	−74	−70	—
24·91	120	8·5	−66	−66	−74	—	—
28·01	105	7·5	—	−60	—	—	—
29·01	105	7·5	—	−60	—	—	—

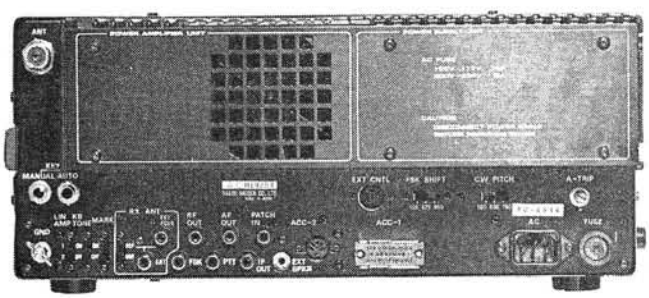
Maximum output at 14·1MHz:

Mode	Final Stage Ic(A)	Power Out (W)	Indicated Power Out (W)
c.w.	10	115	98
s.s.b.†	6·5	110	100
a.m.	4·5	27	25
f.m.	6·5	57	50
a.f.s.k.	6·5	57	50

† 2-tone test

Carrier suppression: 40dB relative p.e.p. (u.s.b.)
50dB relative p.e.p. (l.s.b.)
Unwanted sideband suppression: 66dB (1kHz tone at 14MHz)
3rd Order i.m.d.: 45dB below p.e.p.
Frequency stability: Drift 35Hz during first hour after 10 min. warm-up (14·01MHz)
Frequency setting accuracy: Within 30Hz at 14MHz
Maximum deviation (f.m.): ±3·5kHz

Test equipment used:
2017 and 2019 signal generators, TF2370/TK2373 spectrum analyser, 2435 frequency meter, TF2304 modulation meter, TF2337A distortion meter, TF2005R two-tone generator, TF893A power meter, all by Marconi Instruments; Bird Model 43 r.f. power meter; Tektronix 2215 oscilloscope.



RECEIVER

Image rejection: Better than 84dB
I.F. rejection:

Receiver tuned to (MHz)	Input Signal (MHz)	I.F. rejection (dB)
9·010	8·9875	85

Selectivity:
WIDTH control at maximum I.F. SHIFT centred

Mode (B/W)	−6dB	−60dB
s.s.b./c.w.	2·5kHz	3·9kHz
a.m.(W)/f.m.	5·8kHz	9kHz
a.m.(N)	4kHz	5·3kHz

RIT/Clarifier: ±10kHz
AGC: Output change for 120dB input change, relative to 3µV threshold: 1dB
Audio output: 2·5W into 4Ω with 10% t.h.d. for 500µV input at 14MHz
Audio peak filter: 350–1600kHz

Sensitivity:

Freq. (MHz)	Input e.m.f. (µV) for 10dB (S + N)/N c.w./s.s.b.	a.m.	Input e.m.f. (µV) for S9 (s.s.b.)
1·81	0·18	1·13	156
3·51	0·22	1·25	187
7·01	0·23	1·38	213
10·11	0·24	1·38	186
14·01	0·22	1·24	148
18·11	0·25	1·43	173
21·01	0·23	1·25	167
24·91	0·27	1·57	175
28·01	0·25	2·01	191
29·01	0·30	1·77	264
29·01	0·58µV e.m.f. for 12dB SINAD on f.m. (3kHz dev. at 1kHz)		

Squelch threshold: 0·2µV min.
0·6µV max.
S-Meter calibration: (At 14·01MHz u.s.b.)

Reading	Input required µV e.m.f.	dBµV
S1	3·2	10
S2	5·5	15
S3	9·6	20
S4	15·5	24
S5	25·0	28
S6	40	32
S7	64	36
S8	102	40
S9	148	43
+10dB	390	52
+20dB	1·1mV	61
+30dB	3·3mV	70
+40dB	8·8mV	79

bottom edge of the display window. The photograph may make this description easier to understand, but really the only solution is to handle the FT-980 for yourself and watch the display changing.

Apart from buttons for bright/dim display, and frequency lock, the only other front-panel items are the on/off switch, an 8-pin microphone socket and a headphone socket.

Turning now to the rear panel of the FT-980, we find the large heatsinks and fan housing for the power supply and power amplifier units, plus usual SO-239 antenna socket, a wing-nut ground terminal and the standard IEC 3-pole mains connector and an associated cartridge fuse (5A for 200–234V operation).

Two $\frac{1}{4}$in jacks are provided for Morse keys. One, a 2-pole, is for a straight or "bug" manual key. The other, a 3-pole, is for the paddle when the optional electronic keyer unit is installed in the rig.

A total of 6 slide switches provide the following functions: CW PITCH—allows the user to select his own favourite c.w. sidetone note (and CW CAL tone, previously described) from a choice of 500, 600 or 700Hz; FSK SHIFT—allows selection of a shift of SPACE tone of 170, 425 or 850Hz relative to the MARK tone of 2295Hz; LIN AMP—selects the appropriate control connection for a linear amplifier according to its capability of full break-in operation; KB TONE—activates a bleeper which will produce a short tone each time the main keypad, mode or memory channel selectors are operated; MARK—controls a 25kHz marker signal generator; RX ANT SEP/NOR—allows the FT-980 receiver to be fed from either the main transmitting antenna or a separate receiving antenna. The transmitting antenna can also be fed out to a separate receiver, both the receive antenna connectors being RCA "phono" jacks.

Further RCA "phono" jacks are provided for: FSK—keying line; RF OUT—low-level (–6dBm, 100mV into 50Ω) r.f. output from the transmitter pre-driver for a transverter; PTT—for external press-to-talk switch; AF OUT—a constant level (200mV into 50kΩ) audio output for recording or data decoding; IF OUT—a buffered 455kHz i.f. output; PATCH IN—for an audio input to the microphone from a tape recorder or a phone patch (where permitted by licence regulations). There is also a 3·5mm miniature phone jack for an external loudspeaker.

A 28-pin connector provides multiplexed outputs and inputs for the c.p.u. from an external accessory such as a digitally controlled transverter, TX and RX filter controls, p.t.t., a.l.c., a.g.c., etc. A 5-pin DIN connector provides a.l.c., T-R relay and p.t.t. services for a linear amplifier. A 6-pin DIN connector provides the necessary serial data input and output lines, plus p.t.t. and a.g.c. for the microcomputer interface for external control.

That leaves us with just one potentiometer on the rear panel, this sets the threshold level of the VOX anti-trip circuit which prevents audio from the FT-980 loudspeaker triggering the VOX circuit.

Underneath the transceiver, a small door gives access to the two size-AA batteries for memory back-up.

Performance

The results of our laboratory tests on the FT-980 are shown in the Table. Particularly notable were the very low 3rd order inter-modulation products, resulting from the higher-than-usual supply rail of 24 volts.

From a practical operating point of view, the rig performed well in all respects on the air. Those of you who stayed with me throughout the description of all the features will have realised that it takes a long time to become familiar with all the things that can be done with this transceiver.

Although the operating handbook is good by any conventional standard, including circuit and wiring diagrams, I do get the feeling that with equipment of this complexity, someone should be sitting down and thinking about how to devise an entirely new form of operating manual, which will lead the new owner more gently into understanding his new pride and joy. At pre-

THE CAT SYSTEM

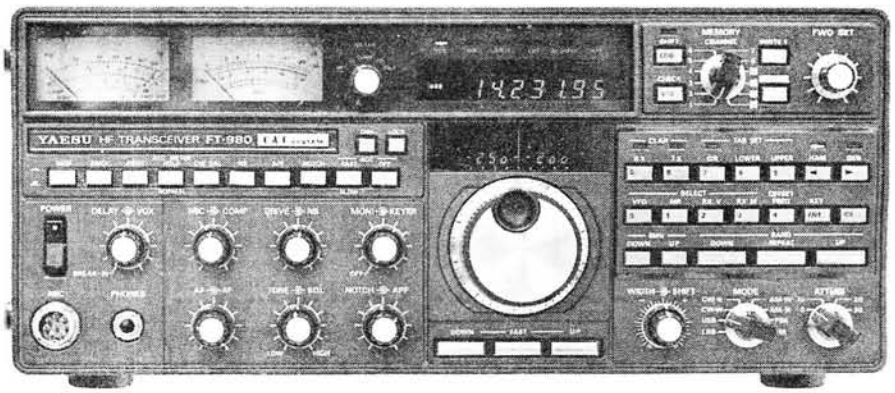
When a microcomputer is connected via an interface to the FT-980, it can be used to control all functions which operate digitally. In other words, everything normally controlled from the right-hand half of the front panel (excluding the attenuator and forward power set controls), plus f.s.k. shift. Software is provided with the Yaesu Interface Units.

All commands to the transceiver are five bytes in length. If received correctly, the FT-980 will respond with an "Echo Back" of the same command which the computer must be programmed to compare with the original. If they do not match, the computer will repeat the command. If the "Echo Back" is identical, the computer sends an "OK" signal, whereupon the FT-980 executes the instruction and returns a "Status Update" which the computer incorporates into its memory and the screen display.

Data handling routines in the external computer should be in machine code, as BASIC and other high-level languages are generally too slow.

Applications of external computer control will obviously expand as amateurs experiment with it. One example of a system already implemented is automatic logging of signal strength from a selection of beacons, using the analogue a.g.c. level output provided on the computer interface socket.

The three interfaces currently available are for the NEC PC8001 (£99.65), Apple II (£51.35) and for RS232 (£58.40). Prices include VAT.



sent, information about the purpose and use of each control tends to be divided between various chapters or sections, and I often find myself hunting for a comment which I know I've seen somewhere, but can't remember where.

Receiver spurii were no problem at all. There are very weak "birdies" at 100kHz intervals on h.f., but they were only just above the receiver noise floor in the lab. Again, in the lab, synthesiser noise below 2MHz was noticeably worse on general coverage than on amateur band mode. However, the synthesiser buzz was well below the natural atmospheric noise level coming from an antenna, and so is of no consequence at all in practice.

Where the controls are concerned, I found some good points and some bad. I liked the new form of concentric i.f. width/shift control. Earlier Yaesu models with this feature had a dual knob that seemed to have a lot of friction between its two sections, so that adjusting width or shift always disturbed the other setting as well, making me very cross!

The main tuning knob, on the other hand, is so lacking in friction that I found fine tuning to resolve a sideband signal a very ticklish operation. Since the clarifier uses the same knob, with the same tuning rate, there was no easy way out of the problem. An adjustable friction brake would be nice.

As already mentioned most of the main keypad buttons have two functions, with the numerals for direct frequency entry engraved into the satin-chrome buttons and filled with black paint. I found this made the numerals very difficult to see without bobbing my head down level with the keypad. Keeping a sheet of white paper on the desk in front of the FT-980 helped a bit, as the white reflected in the satin-chrome and improved the contrast, but this keypad needs modifying in some way.

When using the memory channels both frequency and mode are stored. You can tune away from the memorised frequency but you can't change the mode. Whether you consider this an absolute pain or a great help really depends on the sort of operating you do. It would be nice to have the option of unlocking the mode as well as the frequency of the memory channels. You may have wondered about the two WRITE buttons for the memory function. For some reason totally beyond my comprehension, when writing into memories 1–8 you press just WRITE 1, but for memories 9–12 you have to press WRITE 1 and WRITE 2 simultaneously. I wondered whether the intention was that you could store split-frequency channels in memories 9–12 and they'd forgotten to put it in the operating instructions, but I couldn't find a way of doing this. A real mystery!

The heatsink cooling fan is thermostatically controlled, but it comes on at times even when just receiving in a room at normal temperature. It's a bit noisy, though I've heard worse.

Price

The Yaesu FT-980 in its basic form (less microphone, electronic keyer and optional filters) is currently priced at £1265. Our thanks to **South Midlands Communications Ltd., SM House, Rumbridge Street, Totton, Southampton SO4 4DP, telephone (0703) 867333,** for the extended loan of the review transceiver.

Geoff Arnold

An HF Tune-Up Aid

by L. G. Parkin BA G3UVY

The "tuning-up" procedure for s.s.b. transmissions can be a fiddly business, especially if your rig has valves in the final and may be running into an a.t.u., possibly via a further linear amplifier. There are cases where no preliminary tune-up is necessary—for example, a transistorised broadband final feeding a trap dipole. Otherwise, some r.f. must be generated by the transmitter during tuning, and this cannot be done directly on s.s.b.

A typical tune-up procedure might run as follows:

1. Switch to c.w. (or f.s.k.)
2. Reduce the drive control setting
3. Key the transmitter on
4. Tweek the final, linear or a.t.u. controls
5. Key the transmitter off
6. Switch back to s.s.b.
7. Restore the drive control setting.

This technique is not difficult, but in a hasty tune-up there are many opportunities for error. It is not surprising that many people take the easy way—don't touch the transmitter, press the p.t.t. switch, make noises into the microphone and tweek the a.t.u., etc. Hence the noises often heard on h.f., sounding more appropriate to a doctor's surgery than a preliminary to communication!

A better way, described here, is to use a tone generator built into the microphone case. A touch on a button close to the microphone p.t.t. switch provides a tuning signal of known amplitude, leaving the transmitter on normal s.s.b. drive and microphone gain settings.

Much experiment went into producing a small, sinusoidal a.f. oscillator, working at low power level, with smooth on/off switching, the resultant tone being fed into the transmitter microphone input. The basic idea can be used in one of two ways—as a single-tone generator for tuning an h.f. s.s.b. rig, as described, or as a two-tone generator to add a facility for checking distortion drive levels in an s.s.b. transmitter, or for the preliminary tuning of a valve transmitter into a dummy load.

Circuit Description

The circuit diagram of Fig. 1 shows the two-tone version tune-up aid; a single-tone version would only use the circuit to the left of the dotted line.

The basic circuit comprises a twin-T oscillator, the frequency of which can be set by the values of resistors R2, R3 and R4 or R8, R9 and R10. The values shown in Fig. 1 produce tones at about 850 and 1450Hz.

Biasing of Tr1 is via resistors R2, R3 and R5 from collector to base, giving good working point stabilisation even at the low (1·4V) supply voltage. Negative feedback is introduced by R7/R13 which can be adjusted for good sinusoidal waveforms, besides allowing the two oscillators to be set for equal output amplitude. The required output is only around 2mV, and this is developed across variable resistor R1, which is in series with the "earthy" side of the microphone. Because of the low value of R1, normal microphone operation is unaffected by the resistance or by the d.c. across it (10mV worst case). The design suits a 600Ω dynamic microphone, but for other impedances, the value of R1 could be raised.

The method chosen for oscillator on/off switching is unusual—the intention is to give a slow turn on/turn off, preventing "thumps" in the microphone input to the transmitter. When push button S1 closes, Tr1 turns on slowly, as capacitor C2 discharges through R5. Opening S1 causes Tr1 to turn off slowly as C2 charges. Capacitor C5 is included to decouple stray r.f.

Power for the oscillators is provided by a single 1·4V mercury "button" cell, the type sold for hearing aids. The circuit operates down to 1V and consumption is 50 microamps per oscillator for a few seconds at a time; shelf life can thus be expected from the cell.

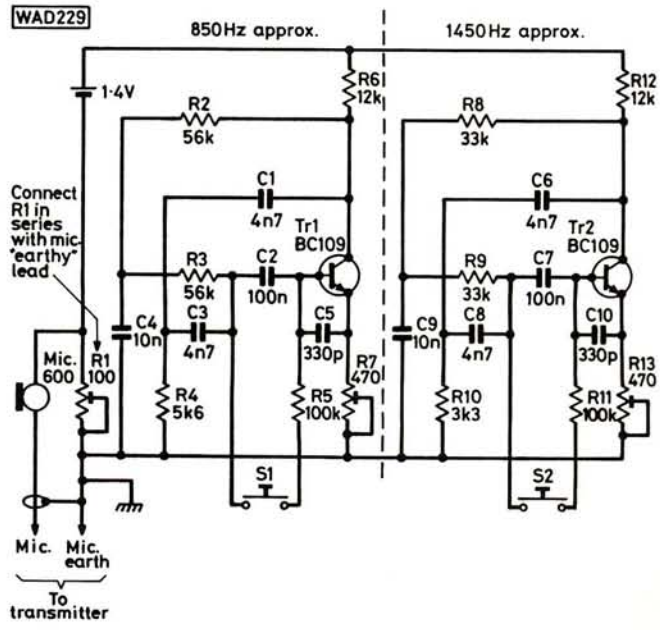


Fig. 1: Circuit diagram of the two-tone oscillator

★ components

Resistors

Carbon film ¼W 5%

3·3kΩ	1	R10
5·6kΩ	1	R4
12kΩ	2	R6,12
33kΩ	2	R8,9
56kΩ	2	R2,3
100kΩ	2	R5,11

Potentiometers

Miniature carbon track

100Ω	1	R1
470Ω	2	R7,13

Capacitors

Miniature polyester

10nF	2	C4,9
0·1µF	2	C2,7

Polystyrene

330pF	2	C5,10
4·7nF	4	C1,3,6,8

Semiconductors

Transistors

BC109	2	Tr1,2

Miscellaneous

Sub-miniature s.p. switch (2); Veroboard (see text)

At the time a tone button is pressed, the transmitter p.t.t. line must be activated. This can be done in one of three ways:

1. Acquire the knack of pressing the p.t.t. switch and one or two tone buttons together (not difficult if the buttons are sensibly placed).
2. If VOX is in use, pressing a tone button will activate the transmitter by the tone fed into the microphone circuit.
3. Use a d.p.s.t. switch for S1 and wire the second pair of contacts across the microphone p.t.t. switch. Pressing S1 then activates the transmitter, and injects a tone.

Design Alternatives

A frequency of 1000Hz may be preferred for a single-tone version; component values for this are given in Table 1 together with values for a single-tone oscillator used in a different role—built into the microphone of a 144 or 430MHz transceiver to give a 1750Hz toneburst for repeater access.

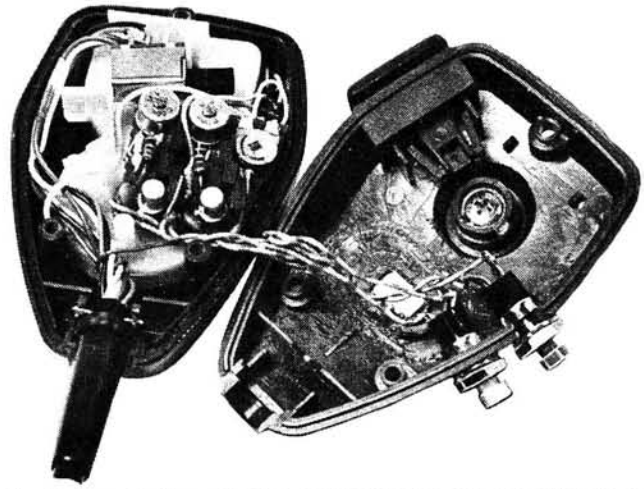
Table 1

Frequency	R2	R3	R4
1000Hz	47kΩ	47kΩ	4·7kΩ
1750Hz	27kΩ*	27kΩ*	2·7kΩ

* Some adjustment of values may be necessary to give correct repeater access tone.

Construction

The prototype two-tone version was built on a 25 × 25mm piece of Veroboard fitted into a Yaesu YM35 fist microphone. A single-tone generator would (not surprisingly) be about half of that size. The mercury cell, circuit board, and push buttons were installed in "spare" spaces in the YM35 case. It seems likely that most base-station fist microphones, and all desk-stand types, could contain a circuit board of this size, although to fit the two-tone version into the YM35 case a little "surgery" was required to remove some unnecessary plastic moulding.



An internal view of the author's prototype two-tone oscillator. Construction is based on 0·15 pitch Veroboard using a "piggy back" technique to produce a very compact assembly within the YM-35 microphone body

A layout drawing is not shown because the space available in your microphone case will dictate the size and shape of the circuit board. A convenient way of making a holder for the mercury cell is shown in Fig. 2.

Setting up—HF Version

If an oscilloscope is not available the circuit may be set up using the "forward" indication of an s.w.r. bridge, or the "r.f. output" metering of a transmitter. The transmitter is first connected to an appropriately rated dummy load and the following steps observed:

1. Set the s.w.r. meter sensitivity for f.s.d. on full power c.w.
2. Switch to 3·5MHz (80m) s.s.b. with drive and microphone gain at normal settings; set R1 and R7 to minimum resistance.

BUYING GUIDE

All components for this project are readily available from regular sources. The 1·4V button cell can be obtained from a chemist

Approximate Cost £3.50

Construction Rating Intermediate

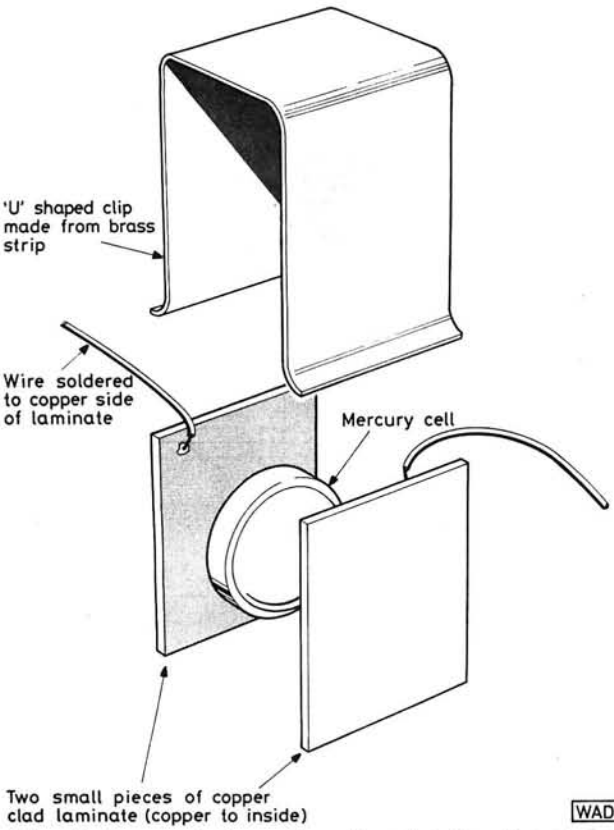


Fig. 2: Suggested construction details of a mercury "button" cell holder. The 1·4V cell is of the type used in hearing aids

3. Press the p.t.t. switch and S1. Advance R1 until maximum r.f. output is indicated. Turn R7 to give 2/3 maximum reading. Finally readjust R1 to give 1/2 maximum reading.
4. For the two-tone version only, press p.t.t. and S2. Adjust R13 for 1/2 maximum reading.

After following this procedure two-tone drive will now produce maximum peak output, but the output meter will indicate average power—about 70 per cent on the meter.

If a 'scope is available, aim for 400mV pk-pk at the collectors of Tr1/2, and a two-tone test waveform at the transmitter output, showing peaks at maximum power and sharp "crossovers".

With the circuit set up as described, tune-up procedure becomes a simple matter of pressing the tone button and the p.t.t. switch, and adjusting any tuning, loading or a.t.u. controls. Release the button and you're ready to go. ●

Letters

UK Novice Licence

Sir: I cannot see any justifiable reason for the introduction of a novice licence as there must be already far too many incapable licensed operators—clearly shown during the W5LFL saga.

Mr. Abel's proposals are laughable; if there is to be any test, then it must be difficult enough to separate the wheat from the chaff. The RAE is not a very difficult exam, I managed to pass it at 13 after reading three RSGB books, despite two hours each day of normal homework.

If anyone can understand Morse at 5 w.p.m., surely 12 w.p.m. can be achieved after a little extra time?

The time period of two years is too long, because if the RAE is not passed within about six months, the candidate clearly lacks the necessary aptitude. Novices would seem to be offered a better deal than the "B" holders by being allowed to go straight on to the h.f. bands.

If Mr. Abel is wanting to encourage newcomers, then why does he not campaign for a clause in the existing licence to allow them to gain operating experience under the supervision of a full licence holder.

Gavin Watt G4UCR
Alton, Hants

Old Microphones

Sir: In *Did you know* in November 1983 *PW* you mention that the Magnetophone field current was switched on only during the performance of any item, but you don't say why. I can suggest a good reason, the field excitation required, which at 4A at 8V = 32 watts, no less! This would cause considerable heating which would hardly be conducive to stability of the Vaseline coil suspension.

These microphones were used not only by the BBC, they were also to be found in broadcast stations in other countries which were equipped with Marconi apparatus.

It appears that the above was not the only method of coil suspension used. See article *The Marconi-Sykes Magnetophone* in the *Wireless World* for 26 November 1924; also the sequel article *Loud Speakers* in the 17 December issue, both articles by Capt. Round.

You may also be interested to know that in the article Broadcasting in *Encyclopaedia Britannica,* 14th ed. (1929) you will find a frequency-response graph for the Magnetophone and, as if that were not enough, you will also see given there a map showing the r.f. field-intensity contours for 2LO.

Don Sutherland,
Wanganui, New Zealand.

News

On the Move

As a result of continuing expansion, Ambit International, the electronics component supplier, is to move its headquarters from Brentwood in Essex to Broxbourne in Hertfordshire, though a sales counter will be retained.

Due to steadily rising demand, the point has been reached where the Brentwood premises no longer provide the necessary facilities.

All staff are being offered the opportunity to re-locate to Broxbourne, which is the headquarters of Ambit's parent company, CirKit Holdings PLC, and sister company, Broxlea Limited. *Ambit International, Park Lane, Broxbourne, Herts. EN10 7NQ.*

What Do You Think?

Chas. E. Miller, contributor to *PW* and *Television* magazine and author of *Practical Handbook of Valve Radio Design,* is contemplating writing a definitive handbook for valved communications receivers.

The handbook envisaged would include technical details of the best-known earlier communications receivers, including, of course, those immortal ex-government examples from both Britain and the USA.

However, as the subject is of a rather specialised nature, Chas. would greatly appreciate the opinions and comments of *PW* readers.

Interested parties are invited to write direct to: *Chas. E. Miller, "Larkhill", Newport Road, Woodseaves, Stafford ST20 ONP.*

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.

The potential radio amateur can be forgiven if he or she decides to forsake the hobby because of the likely cost of setting up an amateur station. The idea that AR is an expensive hobby is a common fallacy which should not allow a likely RAE candidate to be swayed from the straight and narrow path to the finest hobby in the world.

Of course, it **can** be expensive, and if one has the wherewithal that's fine; but on the other hand, one can get on the air with a reasonable signal, albeit c.w., at literally no cost at all by building one's own simple equipment from scrounged parts. Any radio or TV dealer will gladly part with an old TV set or radio that is beyond economical repair, and which will contain many components suitable for a receiver or c.w. transmitter. In fact, one of the most costly aspects of AR is the RAE itself and the licence, not to mention the c.w. test!

The prices of AR commercial gear in the ads in our magazines are positively frightening, and four figures are soon reached in totting up the cost of a transceiver, antenna and the other peripherals. The fact remains that relatively few of us can find that sort of money and resorting to home-brew equipment provides a very satisfying challenge, a viewpoint supported by the recent enormous burgeoning interest in low power (QRP) operation, mainly on c.w. It is sad to realise that today it is virtually impossible to buy a straightforward c.w. transmitter for the amateur bands. It is about time that some UK manufacturer homed in on this potentially profitable market.

This train of thought was started by a letter I received from **Bill Stevenson** G4KKI, of Swinton, in Greater Manchester, living in a terraced house without any facilities for an outside antenna. He started off with high-power gear but soon sold that and concentrated on making his own QRP transmitters, using a couple of transistors, in conjunction with an SRX-30 receiver. With an output of just 1·5W to a folded dipole in the loft, he has worked over 50 countries on the 14MHz band on c.w. including Australia, and a W4 QRPer who was using only 750 milliwatts. Yes, that's right, just 0·75W! This contact earned Bill the "1000 miles per watt" award. His QSO with VK2VA ran to over 10 000 mpW!

A separate rig for the 7MHz band has a single crystal which he is able to "pull" over a range of about 15kHz to give added versatility. On the 28MHz band, Bill has managed to erect a ground-plane antenna in the loft. All Bill's gear is home-brew, including an s.w.r. bridge, crystal calibrator, a.t.u., power output meter, and a 4W power amplifier "for when the going gets tough" he quips.

Let this lesson be a guide for all those contemplating AR as a hobby, but fearful that they won't have enough of the "readies" to get on the air once they have their ticket. I know, from personal experience, that far more satisfaction is gained using equipment made with the proverbial sweat of the brow than from any commercial equipment. Congratulations, Bill, on your fine efforts to date and best DX in the future.

I wonder how many *PW* readers keep a shack or workshop notebook? I have done so for many years and it has proved to be invaluable. Details of any constructional project with circuit diagrams, duly altered as modifications to the design are made, lengths of wire used in experimental antennas, cuttings of interesting articles from AR magazines, and so on. I recently came across a design for a Top Band loop antenna in an old notebook, but the source and date are unknown. In view of the high level of interest in this band I thought readers might like a few details. Hopefully, I'll be making one for myself in the near future.

The general arrangement, with a four-turn coil inside the ½in diameter copper tube, which can be got from the many DIY shops around these days or a central heating installer, is shown in Fig. 1. A length of about 2m should be bent into a circle round something pretty solid and about 0·6m in diameter, such as a rain barrel or your hot water cylinder! Cut the tube exactly opposite the break and then join those ends together with a piece of plastics tubing on the outside. This insulated gap MUST be made or the copper tube will act like a shorted turn and ruin the performance of the loop.

The four-turn loop of wire inside the tube is made by inserting four lengths of wire in parallel into the tube and then joining the ends appropriately at the bottom to form a continuous loop. This process will be considerably facilitated if four wires of different colours are used. Ordinary pvc flex is satisfactory, often called bell wire. Otherwise, an ohmmeter will be needed to identify the wires. It is probably far less difficult than it sounds! The bottom ends of the tube are fitted to an aluminium box with metal clamps,

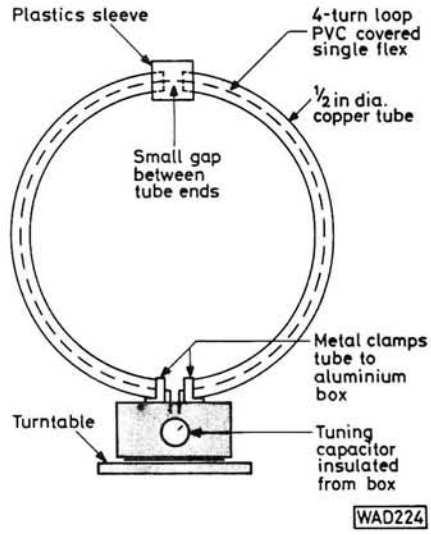


Fig. 1: General arrangements of d.f. loop for the 1·8MHz band. The ends of the copper tube are clamped to the top of the box to maintain electrical continuity. If suitable copper screwed fittings are soldered to the tube ends, the ends could be bolted to the sides of the box, improving the general screening. The finished loop antenna is placed on top of a turntable to permit it to be rotated

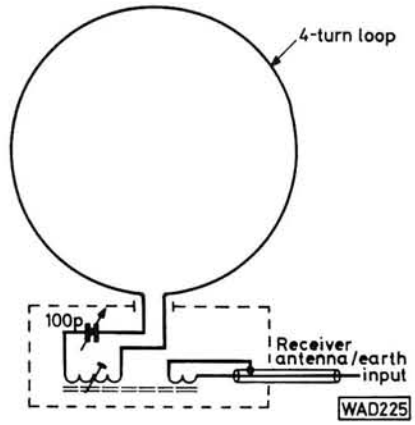


Fig. 2: Circuit of the loop antenna. Note that the tuning capacitor is in series with the medium-wave coil and should be insulated from the aluminium box

leaving a small gap for the wire ends of the loop to pass through the box to the tuning components.

The inductance is a simple medium-wave coil with a low-impedance coupling winding going to the antenna and earth socket on the receiver. A Denco coil is ideal here as it has an adjustable slug making the initial tuning up of the loop much easier. The slug is positioned so that the 100pF variable capacitor will tune the loop between about 1·8 and 2MHz.

Such a loop will give a high degree of rejection of local electrical noise and of unwanted signals, provided that there is a reasonable angle between the bearing of the wanted and unwanted signals. The null points either side of the loop should be quite sharp. The loop could easily be weatherproofed and fitted to an external wall if required, with a broomstick fitted to the underside of the box to provide a means of rotation.

General

Stephen Beare down in Feock, Truro, Cornwall, reports in again after a long absence to say he has acquired an almost new Trio 9R59DS receiver which he is using with an a.t.u. and long wire. He is also about to get hold of a Panda Cub transmitter in anticipation of passing the next RAE, so we wish you well, OM. He wonders if other readers have heard of the Beverage antenna but, as I pointed out to Stephen, this very old design has to be several wavelengths long to be classified as such. There are very few amateurs that have the space for such a monster, especially on the lower frequency bands where it is most effective. I have contacted American stations who use such a long wire antenna on the 3·5MHz band, just for receiving, where it is very effective indeed. It is usually erected at a few metres above ground on poles, and may be several hundred metres long. It may be terminated at one end or the other by a suitable resistor, switched by relays, to give bi-directional characteristics more or less along the line of the wire.

Quite a response to the comments by Matthew Probert in the February issue, in which he suggested that licensed amateurs regard s.w.l.s as "failed RAE" types and a kind of second-class citizen! Not so, say many readers, and of course they are quite right. Often, s.w.l.s are very busy with some particular aspect of AR that does not involve transmitting, such as dealing with award programmes. Others admit that they just don't have the memory any more, so taking the RAE would be a waste of time, but they enjoy s.w.l.ing all the same. Right, correspondence closed on that subject!

DX Time

A note from **Jim Burke** GM4TNF says that his brother VP8AQA was QRT at the Faraday Base, in Antarctica, as from January 1 and should reach the UK via several of the Antarctic bases, Chile and Brazil, in late May. Jim has a copy of VP8AQA's log and QSL cards will be on their way soon. Cards should be sent to GM4GRC for QSOs with VP8AQA.

Don Hardman G4VAK is another of the QRP stalwarts, and wonders if I shouldn't run a QRP corner. I'd be glad to if there is sufficient material forthcoming every month. Jim uses a 5W home-brew rig and a wire in the loft space, with SRX-30D and 9R-59DS receivers. Jim is another complaining at the lack of a multi-band c.w. transmitter on the market. He approached Ten-Tec, but he says they seem to cater mainly for the CBer these days.

Dave Coggins (Knutsford, Cheshire) comments on the Canadian time signal station on 7·335MHz CHU as being a good, consistent signal, and a guide to band conditions. He says it is often audible as late as 1430Z and then starting to come in again by 1800Z. CHU may be recognised by the one-second pulses being transmitted.

Good news from **Dave Shapiro** of Prestwich, Manchester, who is now G1EIK after getting two distinctions in the RAE. He admits not telling me he was about to take the exam "in case he failed". He needn't have worried! Thanks, Dave, for all your contributions to the column in the past and good DXing in the future. He is going for the code test 'ere long, but QRM from "A" level exams is a problem.

Up in Harrogate **Marcus Walden** has been sampling most of the bands with his DX302 and 20m-long wire in the attic. On 3·8MHz it was C31SD, 6W1DY and 7X2HM, with 4Z4FR and 9H1EU on 7MHz among the BC QRM. Better things on 14MHz and SU1AC, VQ9AC, YI1BGD and 9X5NH in the log. A couple of useful ones on 21MHz were PZ1AP and YC4FW while 28MHz was unusually active with EA8ALY, Z21GN, ZS3KB and 9Y4VU.

In London W6, not the best of DXing sites, **Denis Norton** has put his FRDX-500 to good use with his 20m-long antenna, although he is contemplating erecting a five-band vertical in the near future, at least when it gets a bit warmer! He comments on the likes of OE8HFL/YK and wonders why such stations do not use the 4U United Nations prefix since they are in the UN forces. My own guess is that there is no administration capable of issuing such licences to other than UN bods in Geneva. Catches for Denis on 3·8MHz were CY0SAB on Sable Island, and logged by just about everybody, FB8WJ, FC6FPH, JT64V in Mongolia (that's a queer one if you like!), JW6MY, 3V8PS, 5B4LP, 5N1ARY and 7X2LS. The OE8HFL/YK popped up on 14MHz, as did XT2BM, 3X4EX, VU7WCY and 7X2FK who was using just 3W. On 21MHz, Denis caught C53EK in The Gambia, FM7WD (QSL to W3HNK) and YB3AY. Sole catch on 28MHz was 4X6IL.

A huge log from **Bob Stone** in Plymouth, from which I have culled the best. He has the choice of five different wires with an a.t.u. feeding his B40 receiver. On 28MHz he found a goodie in XV3ZG, thought to be in Vietnam, and YM3BB who said it was a special callsign for Turkey. On 21MHz it was ZS4EE, 5T5RD and VP2ELC. Not much on 14MHz but 7MHz produced P29CWS, FW8AM on Wallis Island, and JA6BSM, DF3NG/ST2, OE8HFL/YK and C6AEY. OY8R said cards to POB 343/3800 Torshaven, on Top Band, where Bob also logged VE5RE for an unusual one.

After something like a year, I'm glad to say that **Pat Cullen** of Saltburn-by-Sea, Cleveland, has written in again with an excellent log, mainly for 21 and 14MHz s.s.b. He runs a Panasonic DR48 receiver with a dipole of unspecified dimensions in his attic. So to 14MHz and D44BC, FB8WJ, FY7BB, J6LJ, J37AH on Grenada with cards to WB2LCH, PJ4CR, P29LB, VP2KD, VQ9GE on Diego Garcia, and QSLs to WB7AWO, VS5MS, 5T5RU, while ending on 21MHz with FM7BX, HL1ALA, VU2GDG in the Laccadive Islands, 6W1KI and 9U5JB.

I want to emphasise for the umpteenth time the undesirability of using a dipole cut for a particular band, and fed with coaxial feeder, for any other band. Unless it is used on an odd harmonic of the design frequency there will be a severe mismatch of impedances at the junction of the coaxial cable and the centre of the dipole. That implies signal strengths much lower than would be obtained on the band for which the antenna was designed. This problem often goes unnoticed on a receiver, but the high standing wave ratio (s.w.r.) that would result when being used with a transmitter would be quite prohibitive.

Unless one can have separate dipoles for each band, then it is much better to use open wire feeder or 300Ω flat twin feeder into an antenna tuning unit (a.t.u.) when the antenna can be tuned "on the nose" on any band or frequency. In this context a dipole is a half-wave wire fed at the centre and if it can be a half-wave at the lowest frequency in use, say approximately 20m for 3·5MHz band, so much the better.

I was glad to get a report from **Graham Cunningham** up in Paisley, Scotland, from where logs are pretty sparse, so thanks for filling the gap, OM. His FR-100B is fed from a quarter-wave vertical on 14MHz, a dipole for 21MHz and a 30m-long wire for other bands. He did have a two-element quad for 28MHz, but the recent gales put an end to that. Considering that Graham is on the top of a 25m building, which itself is on the top of a steep hill, perhaps that is hardly surprising! What a lovely QTH for DXing!

Graham is anxious to get hold of a manual for the FR-100B, so if anyone can help, the address is 37 Oakshaw Street, Paisley. He also points out that the QSL manager for VP8AEN is GM3ITN and not GM4ITN as I noted recently. On 21MHz, Graham logged HI8JAK, EC9HR, ZB2GR, 9H4B, and ZS6AD with ZL7AWY, 9H1GX, 7X2HM, ET2BR for a rare one, ZS6CC, 901ZW, EA9KN and ZS6BCR. More extensive logs are promised for the future.

Club Time

There is a very satisfying increase of late of newsletters, magazines and information from a number of the smaller and less well-known AR clubs around the UK. It seems that the publicity derived from a club being mentioned in *PW* is very productive, with clubs reporting increasing membership as a direct result. In one case a club asked me to stop mentioning them in this column as the membership had outgrown the club facilities available!

The clubs mentioned in any one particular issue are only a part of the large number on which I receive information every month, so if you are fresh to amateur radio and looking for a local club just go back over a few issues of *PW* and you are likely to find something suitable.

A word, too, to club secs and PROs. When you get an enquiry, written or by telephone or personally, please make every effort to deal with the matter as soon as possible. Apart from being common courtesy anyway, it will stop disgruntled potential club members from complaining, and quite rightly, about the lack of a reply, inevitably to me or *PW*'s editor.

Abergavenny & Nevill Hall ARC Thursdays at 7.30pm in the club room above Male Ward 2 at the Pen-y-fal Hospital, A'gavenny, the AGM to be held there on April 12. RAE classes, however, take place at the Seminar Room, Nevill Hall Hospital, A'gavenny, on Tuesdays at 7.15. The club is also an RAE exam centre where 23 sat the last exam. The club's own pass rate was 72 per cent on that occasion. Hon sec Dave Jones GW3SSY will be glad to advise on the RAE classes, or the centre, from 80 Croesonen Parc, Abergavenny, Gwent, or buzz (0873) 78674.

Ainsdale ARC G2OA The club is pleased at being able to commemorate late long-time member and chairman G2OA by being allocated his callsign for club use. Normally, meetings are held at the Scout HQ, Marine Drive, which is near the pier, apparently, but on Tuesdays April 10, 17th and May 1 d.f. hunts are organised, an activity very popular now in the club, with the intention of entering a team in the national d.f. events. The club treats the annual national field day in June more as a social event than a contest, with a large barbeque promised, plus presentation of club awards. But more on that and any other club matters from sec David Morris G4TUP on Southport 35947.

Axe Vale ARC First Friday of the month at 7.30, the Cavalier Hotel, West Street, Axminster, Devon, which is just west of the parish church on the A35. Construction techniques form the subject of the April 6 talk, while on Saturday the 28th the club will be off on a coach trip to the RSGB show at the NEC Birmingham. Non-club members and YLs and XYLs are being made particularly welcome to join the trip, says R. W. Jones G3YMK, 10 Oak Tree Close, Upottery, near Honiton, Devon, also known as Upottery 468.

Bath & District RC G4TMH All facets of amateur radio are catered for by the club, according to new PRO Colin Ashley G4UMN, of 57 Stonebridge Drive, Frome, Somerset, also Frome 63939. The ghastly "alternate" Wednesdays crops up again, so contact Colin for latest club meeting dates. Anyway, it's the Englishcombe Inn, Englishcombe Lane, Bath, at 7.45, when you have the dates.

Biggin Hill ARC Dave Howes G4KQH of C. M. Howes Communications will be displaying and demonstrating a wide range of gear at the meeting on Tuesday April 17, in St Marks Church Hall, Church Road, Biggin Hill, Kent. Worth making a note of plans to demonstrate AR in conjunction with the local scout group on Saturday May 12. Sec Ian Mitchell G4NSD of Greenway Cottage, Tatsfield, Westerham, Kent, can fill you in on (09598) 376 if you so wish.

Bridgend & District RC The club meets on the second Wednesday of the month at the NCB's HQ in Tondu, the April function being a bring-and-buy sale, at which all are welcome. That makes it April 11. Much more info from sec T. C. Morgan GW4SML, 4 Rhiw Tremaen, Brackla, Bridgend, Mid Glam, likewise (0656) 93 226198.

Cardiff (S.E.W.R.G.) The South-East Wales Repeater Group are holding a first meeting at the Ty-Rhiw community centre, Taffswell, off the A470 on April 6 at 7.30pm. All those interested in the proposal to establish 430MHz and 1·3GHz repeaters in the South Glamorgan area are very welcome. Refreshments are available and there will be talk-in on 145·550MHz (S22) and 433·200MHz (SU8). Further details from Steve, GW6CUR QTHR, or Tel. 0222 498835.

Carmarthen ARS A brief note from Mrs Meredith of 50 Caecoed, Llandybie, Ammanford, Dyfed, says the club foregathers at the West Wales Hospital Social Club, The Quay, Carmarthen, on the second and fourth Fridays, time unknown but 8pm ought to be safe.

Cheltenham ARA G5BK Meets at the Stanton Room, Charlton King's Library, C'ham, on first and third Fridays by the look of it from the club's magazine *CARA News*. Like many other clubs, a visit to the RSGB show at Birmingham is on the cards, but more on that and the club's activities from Gillian Harmsworth G6COH on C'ham 525162.

Coulsdon Amateur Transmitting Society G4FUR Second Monday of the month at St Swithin's Church Hall, Grovelands Road, Purley, Surrey, and be there by 7.30. Especially on April 9 when G3ZMF will talk on the secrets of converting commercial gear for amateur use. Advance notice of the meet on May 14, an open night for all and sundry showing the many aspects of AR with displays and demonstrations plus club station G4FUR in full cry. Much more from Alan Bartle G6HC on 01-684 0610. Club mag *CATS Whispers* has an ingenious circuit for providing a high-current load at low voltage for assessing the performance of power supplies, using only a handful of transistors and resistors and the like.

Dudley ARC G4DAR April meeting has G6FK dealing with v.h.f./u.h.f. operation, on the 10th, and being Easter time the meeting due on the 24th is cancelled. So, normally, the second and fourth Tuesdays at 7.45 in the Central Library, Dudley, with Cheryl Wilding G4SQP around to answer your questions at 92 Ravenhill Drive, Codsall, Wolverhampton, which is also Codsall 5636.

Dunstable Downs RC Generally speaking, formal meetings with lectures intermingle with natter nites at Chews House, High Street South, Dunstable, every Friday at 8. As always, potential members and visitors to the district will be very welcome at meetings. So says P. G. Seaford G8XTW of 12 Jupiter Drive, Leighton Buzzard, Beds, which is also (0525) 384419. Programme for April shows a talk by a visitor from the Leighton Linslade club on the 6th, and a d.f. hunt on both Top Band and 144MHz on the 27th. Being Good Friday, there is no meeting on the 20th.

East Kent RS G3LTY G6EKR It all happens at the Cabin, Kings Road, Herne Bay, Kent, on the first and third Thursdays at 8pm, with a talk on April 5 expected to deal with interference problems, with the subject on the 19th unknown at press time. However, Stuart Alexander G6LZG, 6Downs Road, Canterbury, Kent, will have the latest info no doubt. For the diary, note the society's Mobile Rally on Sunday August 5, with more details later.

East London RSGB Group Seemingly a lack of active interest by the group members has caused meetings to be reduced to a quarterly fixture, the next gathering being on Sunday April 15 at Wanstead House, Wanstead, London E1, which is about 100 yards behind Wanstead underground station. There will be a question and answer session with two RSGB Council members, G8VR and G3VPK. All are welcome to attend the meetings whether members of the RSGB or not. The club sec is Clive Ramsey G8VZD and the chairman Sheila Gabriel G3HCQ, but if you have any queries address them to J. M. Greenberg G6DXW at Wanstead House.

Edgware & District RS G3ASR G8ERS A change of officers at the club means that the Publicity Officer is now Michael Harlock G4TOC, located at 91 Flamborough Road, Ruislip Manor, Middx, or Ruislip 72855 if you are in a hurry. It's second and fourth Thursdays at 8, at 145 Orange Hill Road, Burnt Oak, Edgware, with G3GC chatting on antenna radiation patterns on April 12, the 26th gathering being termed "informal". There is still time for members to think about an entry in the constructional contest with judging on May 24.

Fareham & District ARC G3VEF G8KGI The h.f. station at the shack is being supplemented with v.h.f./u.h.f. gear, and contest operation is envisaged for those members interested and, of course, available to any others duly licensed. The club committee has done its

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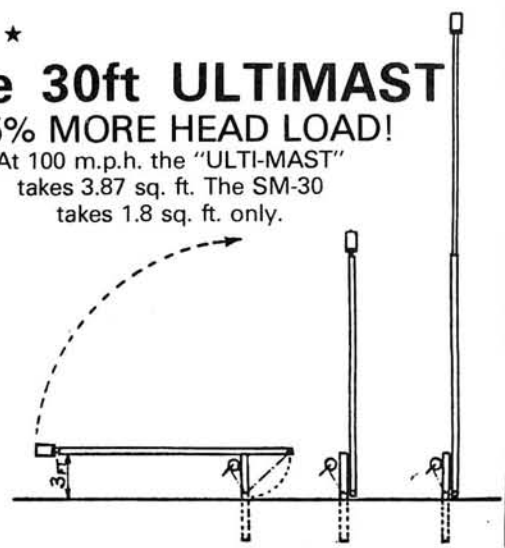

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job and produced a programme of events for the rest of the year, with April dates being the 11th with a discourse on naval communications by G3YTQ, an on-the-air and natter nite on the 18th and a junk sale on the 25th. Summing up, it's every Wednesday at 7.30, the Portchester Community Centre, Westlands Grove, Portchester, Hants. Your man is Brian Davey G4ITG, 31 Somervell Drive, Fareham, Hants, or ring Fareham 234904.

Flight Refuelling ARS G4RFR G6SFR Meetings scheduled for April are, 1st, Mike Pomeroy talking on Fast Aid—what everyone should know about First Aid etc. Then, on April 8, it's Spectrum Communications on Home Brew—no, not the liquid type. April 15 brings Contests—theory and practice, v.h.f., u.h.f. and s.h.f., by the FRARS Contest Committee. Lastly, on April 29 it's Paul Shoosmith G3MDH and Power Supplies—or don't be down in the vaults! Details from club sec Mike Owen on Wimborne 882271.

Also there is a note about the Flight Refuelling ARS and RAIBC Hamfest 84 which is on Sunday August 19—more details to follow.

Fylde ARS The Kite Club on Blackpool Airport is the club's HQ on the first and third Tuesdays at around 7.45. April 17 is mostly informal with a code class to get things going. Note now the visit to HMS *Inskip* on May 1, with a sale of surplus equipment on the 15th. Latest info from programme sec H. Fenton G8GG, 5 Cromer Road, St Annes, Lytham St Annes, Lancs.

Goole Radio & Electronics Society On April 10 a talk on unusual antennas by Mike Ward G6IDL could be very interesting, with the 17th devoted to an on-the-air session with the club station. April 24 is down as a "mystery trip" so I can't enlighten you any further. So, every Tuesday at the Goole Junior Chamber, Boothferry Road, Goole, according to sec Richard Sugden G8IOH of 8 Kings Road, Swinefleet, Goole, N. Humberside, or buzz Reedness 462.

Greater Peterborough ARC G4EHW All set for a giant junk sale/quiz/raffle on April 12, which is the second Thursday of the month whereas normally monthly meetings are on the fourth Thursday, all depending upon whether the venue, the Southfields Junior School, is in session or not, and 7.30pm is a good time to get there. Your contact is Frank Brisley G4NRJ, 27 Lady Lodge Drive, Orton Longueville, Peterborough.

Hornsea ARC Yet another newcomer to the Club Time column, so welcome girls and guys! Every Wednesday at 7.30 at the Mill, Atwick Road, Hornsea, Yorks, is all I know, with sec Norman Bedford G4NJP on (0262) 73635 ready and willing to fill in the details.

Louth ARC G4LRC A computer section has just been formed at this club, which meets on the first Wednesday at the Kings Head Hotel, Louth, with specialist meetings from time to time on the third Wednesday of the month. More from Paul Empringham G6GZS, on North Somercotes 483.

Mid-Warwickshire ARS HQ is at 61 Emscote Road, Warwick, at 8pm on the second and fourth Tuesdays says sec Carol Finnis G4TIL, 37 Stowe Drive, Southam, Warks, otherwise Southam 4765. On April 10, G3BA will talk on radio in a POW camp, the 24th being a natter nite. You will also like to know that G3OOQ will hold forth about electron microscopes on May 8.

Nene Valley RC G4NWZ G6GWZ Split venues for the club's activities mean lectures and the like at the Dolben Arms, Finedon, near Wellingborough, Northants, starting at 8.30pm, while transmitting facilities are to be found in the nearby 1st St Mary's Scout Hall. On Sat/Sunday April 7/8 it's a special event station GB4WBB for the Boys' Brigade Anchor Chain, with normal club meeting on April 11 with a video evening showing *World at their Fingertips* and *World of Amateur Radio*. On the 18th a lecture from the County Emergency Planning Officer is yet to be confirmed. (I didn't realise that emergencies were planned!) No meeting on the 25th being just after Easter, but May 2 is a special ladies' night with a buffet supper about which Lionel Parker G4PLJ, 128 Northampton Road, Wellingborough, will be able to tell you more, being hon sec.

Oldham ARC G4ORC Meets every Monday at 8.30pm at the Devonshire Arms, Elliot Street, Lees, which is near Oldham, Lancs. So says sec Fiona Butterworth, who may be contacted through POB 29, Oldham, or you may prefer 061-652 8862.

Rhyl & District ARC First and third Mondays at the 1st Rhyl Scout HQ, Tynewydd Road, Rhyl, at 7.30. Main attraction in April is the d.f. fox hunt on the 16th. More details from John McCann GW4PFC, 67 Ashley Court, St Asaph, Clywd, or St A 583467.

Robin Hood ARS This group meets every Friday evening at the White Hart Inn, Ollerton, Notts, at 8pm and a welcome is extended to anyone interested in AR and allied subjects. Current constructional projects include units for RTTY operation. Contests and special event stations are other activities in this busy club. A visit to the local traffic control centre is on the cards. Further information from Pete G6VGN, POB 1, New Ollerton, Newark, Notts.

Rolls Royce ARC G3RR The RR Sports and Social Club, Barnoldswick, is the spot every Monday at 7.30 with a Morse class to get things going. Sunday mornings also, at 11.30, for a natter and constructional sessions. Special event on Wednesday May 2 is a d.f. fox hunt starting at 7.30pm, says sec L. Logan G4ILG, 19 Fenton Avenue, Barnoldswick, Colne, Lancs, also to be found on (0282) 812288.

Salisbury Radio & Electronics Society At recent AGM, Sir Evan Nepean G5YN was re-elected as chairman of the club. Meetings are held every Tuesday at 7.30 at Grosvenor House. The projected programme of activities include fêtes, talks, d.f. hunts, demonstrations, and entry in various contests and competitions. Bert Newman G2FIX at 74 Victoria Road, Wilton, near Salisbury, is also on Salisbury 743837 and willing to answer your queries on the club.

South-East Derbyshire ARS All I can tell you is that this club meets every Tuesday at 7.30, the SE Derbyshire College, Ilkeston Road, Heanor, for discussions, talks and the like. I'm sure the sec W. F. Peck G4VNB will be glad to tell you of the current goings-on at the club if you contact him at 2 Sandfield Avenue, Ravenshead, Nottingham (0623) 795380.

South Manchester RC G3FVA G3UHF G8SMR It's nattering on Mondays and lectures and the like on Fridays at 8 at the Sale Moor Community Centre, Norris Road, Sale, seemingly only about five minutes' drive from junction 8 on the M63. Operation on v.h.f. and u.h.f. contests as well as the h.f. bands is very popular with members but other interests run to d.f. hunts, running the national final last year. There is the Spring d.f. hunt on April 6. Of special interest is the forthcoming talk by Christine Barker G8WEN on radio signalling in British Rail, visiting the club and coming from Derby. Note there will not be a meeting on the 20th due to Easter festivities. The club's home-brew constructional contest in three classes will be judged on April 27. Right, hon sec for all these goings-on is D. Holland G3WFT, obtainable on 061-973 1837.

Three Counties ARC G6WWR The Railway Hotel, Liphook, Hants, is the spot every other Wednesday, which a quick glance at the calendar makes it April 11, when a sale of surplus equipment will be the high-spot. The operation of special event stations forms the subject for G3TBT on the 25th, but this is subject to confirmation, obtainable from Connie Baker, 19 Waterside Close, Bordon, Hants, or Bordon 3395.

Torbay ARS G3NJA G8NJA The club HQ is at the rear of 94 Belgrave Road, in Bath Lane, Torquay, with informal meetings every Friday evening at 7.30, the last Saturday of the month being considered formal for talks, lectures, demos and the like. All are most welcome at any time. Club PRO is Tony Rider G6GLP at 7 Kingston Close, Kingkerswell, S. Devon, or you might prefer to address yourself to the secretary, Margaret Rider, at the same QTH.

University of Kent ARS I am pleased to learn from sec Christine Coles G6RQV that the society meets every Tuesday at 7.30 in the shack located on the campus, and there is a talk-in facility on S15. In addition to the usual activities there is also an amateur TV group now very active. For more info contact Christine at Rutherford College, The University, Canterbury, Kent.

West Bromwich Central RC G4WBC Usually, every Sunday evening at 8, the Victoria in Lyng Lane, WB. Anyone with a genuine interest in SWL or the AR field is very welcome to join and take advantage of the Morse code and RAE tuition available at the club. Interested? Then contact John Bates G6ZLW, 28 Westbourne Road, West Bromwich, W. Mids, or buzz 021-553 0531.

Westmorland RS The Strickland Arms, Sizergh, near Kendal, Cumbria, is the venue for the club gatherings on the second Tuesday of the month, at 8. The April meet will involve a visit to the Heysham nuclear power station, while May 8 is AGM time. More details of the club's activities from sec Frank Burrow G8BME, Holly Trees, Church Close, Levens, with Sedgewick 60803 also being available for queries.

Wimbledon & District RS A surplus equipment sale dominates the meeting on April 13 while the 27th is scheduled as a natter nite combined with Morse code practice. That makes it the second and last Fridays, at St John Ambulance HQ, 124 Kingston Road, London SW19, at 8pm. Geoff Mellett G4MVS at 26 Paget Avenue, Sutton, Surrey, will be glad to answer questions on the club's programme.

There we have it for another month, lots of clubs not mentioned previously, but information on clubs in GM, GW and GI-land, not to mention GU and GJ, would be very welcome to fill the present dearth from those parts.

A break here to tell you that S. Granger G4NSG has organised an inaugural meeting with the object of forming a club of those in the Midland Regional area of the Post Office or British Telecom who have an interest in the hobby, whether still employed or retired. It seems that a competition will be held to find a suitable name for the club with a nominal prize for the winning suggestion. Hope it is not too long! The title, that is. Anyone interested should contact the temporary secretary, M. Green, on 021-643 3258 or 6945.

MEDIUM WAVE BROADCAST BAND DX

by Charles Molloy G8BUS

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

"I have just picked up my first Region 2 station on the medium waves—CJYQ on 930kHz. I had to detune to 929kHz because of splashover from Bremen on 936kHz and CJYQ seemed to have a regular slow fade every six or seven minutes" writes **Chris Achenbach** of Pinner who was using a Sony ICF-2001 with 6m random wire antenna. Chris goes on to ask what kind of details should be given in a reception report intended for Canadian and American medium wave stations.

Reception Reporting

It is worth remembering when writing to distant medium wave stations that you are outside the service area so you are not a member of the intended audience. It is unlikely that the reception report will be of any value though it may be of interest, so you are really asking the station to do you a favour and verify that you have actually heard it. To do this you have to supply evidence that you really did pick them up.

Firstly the address to write to. The Chief Engineer, CJYQ Radio, St John's, Newfoundland, Canada may not be the correct or even the full postal address but your letter will certainly be delivered. This is the format to use when writing to North American stations. Station callsigns are widely used in North America so the postal authorities should have no difficulty with delivery. Of course if you have the correct address then use it. Always send return postage. A single International Reply Coupon will cover a reply by surface mail but send two for airmail.

What sort of information should go into the report? Each broadcaster will have a station log which is kept at the transmitter and filled in by the duty engineer, hence the need to send the report to the Chief Engineer. This log will not contain details of programme content such as the titles of pieces of music, etc. but it will list the times when station identification and time checks are made, when newscasts and weather reports are given and when programme changes occur. Some details of adverts will also be included. This sort of information can be collected near the hour and the half hour, the best time being from 5 minutes before the hour until a few minutes after. Fading and QRM do not always oblige so you will have to make do with whatever you can pick up.

"Should the time be in UTC?" asks Chris. Ideally the time and date should be the station's own as they are not used to dealing with a foreigh audience. Use their local time if you know it and quote the local date if it is different from ours. I usually start off the report by giving the time in UTC and the Greenwich date which I quote as being equivalent to theirs, e.g. from 0100 to 0115 UTC on the 20th equivalent to 8pm to 8.15pm EST on 19 March. Accurate timing of the items heard is essential as the station log will be accurate to the nearest half minute.

Dial Search 1984

The third edition of this "Listeners Check List and Guide to European Broadcasting" is now available. Aimed at the user of a portable receiver who wishes to exploit the directional properties of the internal antenna, it contains two colour maps. One is of the British Isles and Northern France (A4 size) and the other of Europe and the Mediterranean (A3). These pin-point some 300 transmitter sites and enable bearings to be taken to obtain optimum reception, or a null, or to help with identification.

There is a frequency list of medium- and long-wave stations in the UK. There is a complete v.h.f. list for the British Isles plus some entries for Northern France and the Low Countries. The music notation of 80 European and British signature tunes and interval signals, plus a selection of broadcasts in English, will help the newcomer to find his way around the crowded medium- and long-wave bands.

Dial-Search, which is an A5-sized paper back, contains 48 pages and costs £2.75, or 15 IRCs abroad, is available from George Wilcox, 9 Thurrock Close, Eastbourne, East Sussex BN20 9NF or it can be ordered through bookshops under ISBN 0 9508575 1 3.

Local Radio DXing

Local radio in the UK is a comparatively recent development which followed on from the era of pirate radio ships of the 1960s. There are now two chains of stations scattered across the country. One is owned by the BBC and the other by the IBA. The stations are mainly low power, 2kW being typical; there is some frequency sharing and many are on the air 24 hours a day.

Local radio DXing is a good way for the newcomer to get acquainted with the medium waves. No special equipment is required, the ordinary domestic portable being adequate. The secret is to make use of the directional properties of the set's internal antenna by turning the whole receiver (rotating about the vertical axis) to separate stations sharing the same frequency but lying in different directions from the listener.

Another tip is to listen at twilight when the changeover from daytime ground wave reception to night-time sky wave propagation is taking place. Distant stations can peak up for a period while near

Fig. 1

ones fade, due to skip effect. Start listening an hour before sunset, and an hour before sunrise as well if you are really keen. Try for Manx Radio in the Isle of Man on 1368kHz, which is the first and oldest commercial station in the British Isles. *Dial Search* contains a complete listing of local radio in the UK and there are also two free booklets to be had for the asking. Write to the BBC Engineering Information Department, London W1A 1AA for a copy of *BBC Television and Radio Stations 1984* and to the IBA Engineering Information Service, Crawley Court, Winchester, Hampshire SO21 2QA for *Transmitting Stations, a Pocket Guide.*

A Cakestand Turntable

Last month I referred to the Hitachi WH-1160 d.f. receiver (Fig. 1) which has a rotatable ferrite rod antenna inside the plastics box mounted on top of the set. I've found it a lot easier to null out a station with the ferrite rod alone than by turning the whole receiver, so I thought I'd mention another piece of "equipment" in use in my shack. This is a rotatable plastics cake-stand, the type used by cake decorators, so I'm told. The receiver is placed on the stand which can be controlled with one finger if necessary. My Vega portable on the cake-stand is shown

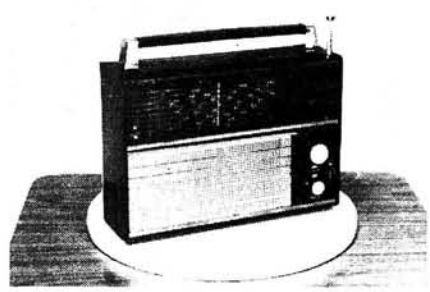


Fig. 2

in Fig. 2. The model I use is 330mm in diameter and 15mm high and is made of white plastics. Printed in relief on the underside is Copydex Merry-go-round Major 13in. In spite of the simple construction this stand will support a surprising weight. I've tried the DX160 on it as an experiment. As well as supporting a portable it could also be used as a base for a small loop antenna.

SHORT WAVE BROADCAST BANDS

by Charles Molloy G8BUS

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

My request in the February issue for a source of supply for traps for a trapped dipole for the broadcast bands brought two replies. Reader **Bill Pentland** of Dairsie in Scotland uses a trapped dipole which covers the 9MHz (31m) to 18MHz (16m) bands. It was obtained from Gilfer Shortwave, Box 239, Park Ridge, NJ 07656, USA. From nearer home **R. Benham-Holman** (G2DYM) writes to say that he has been custom-building traps for his trap dipoles for some time now and he will, to special order, do a pair to any frequency in the range 3MHz to 30MHz. "If there be a call for broadcast band traps I hope I can fill it" concludes G2DYM who, as some readers will know, is a retired BBC engineer. Further information and data sheets are available from G2DYM Aerials, Uplowman, Tiverton, Devon, Tel: 03986 215, who incidentally, advertises regularly in *PW*.

Trapped Dipoles

After all this I can hear the question, especially from newcomers — what on earth is a trapped dipole? To answer this we must start off with the ordinary dipole (Fig. 1). The distance between the end insulators is about half a wavelength (0·95 $\lambda/2$ to be exact) while the impedance at the centre is around 50 ohms. For example, if we want a dipole for the 21MHz (13m) broadcast band which extends from 21·45MHz to 21·75MHz then the mid point is 21·6MHz and a dipole cut for this frequency would be 6·6 metres in length. We now have an antenna that resonates in the middle of the 21MHz band so it will give signals in that band a boost. The antenna will be directional on the 21MHz band with minimum pick up along the direction of the wire which may, or may not, be an advantage to the user. The antenna impedance on 21MHz will be around 50 ohms which means that it can be connected directly to the receiver without an antenna tuning unit. We now have a single-band directional antenna cut for the 21MHz band.

Suppose we replace the two insulators with parallel tuned circuits resonant at 21·6MHz. Operation on the 21MHz band will be unaffected since the two resonant circuits will have a very high impedance and will act as insulators. At frequencies lower than 21MHz the tuned circuits, which are called traps, will behave like inductors, so we can lengthen the antenna beyond the traps to make it resonate on a second band as well; that set up is shown in Fig. 2. The distance D1 is chosen for the highest frequency band. Distance D2 will be less than the value for half a wavelength for the second band because of the loading effect of the traps. We now have a simple trapped dipole for two bands whose overall length is less than it would have been if we had constructed a dipole for the lower frequency band alone.

We can of course add further traps to make our antenna resonate in each of the seven bands between 6MHz and 21MHz but this would require a total of 12 traps and two insulators. You can also add traps to a vertical if you want an omnidirectional antenna and G2DYM covers this too in his data sheets. Obviously the traps have to be protected from the weather by encapsulation.

Next month we will have a look at an alternative method of constructing an an-

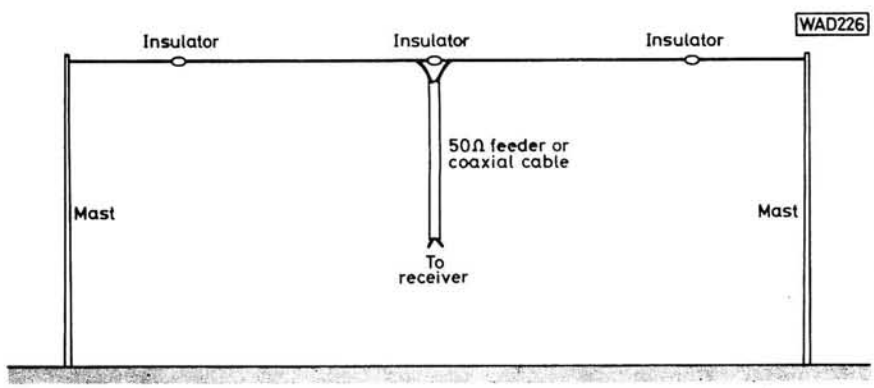
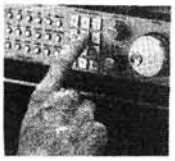


Fig. 1: Dipole antenna



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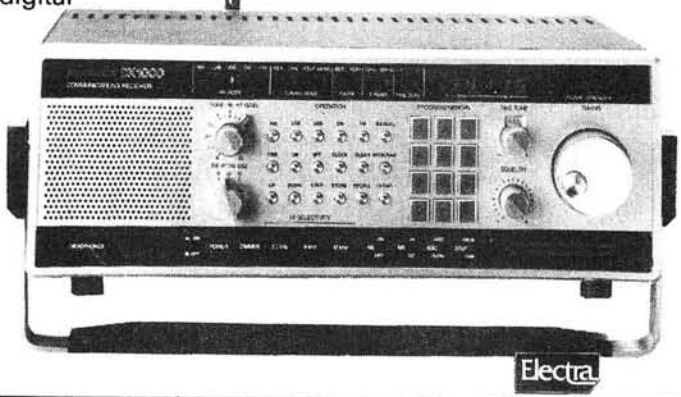

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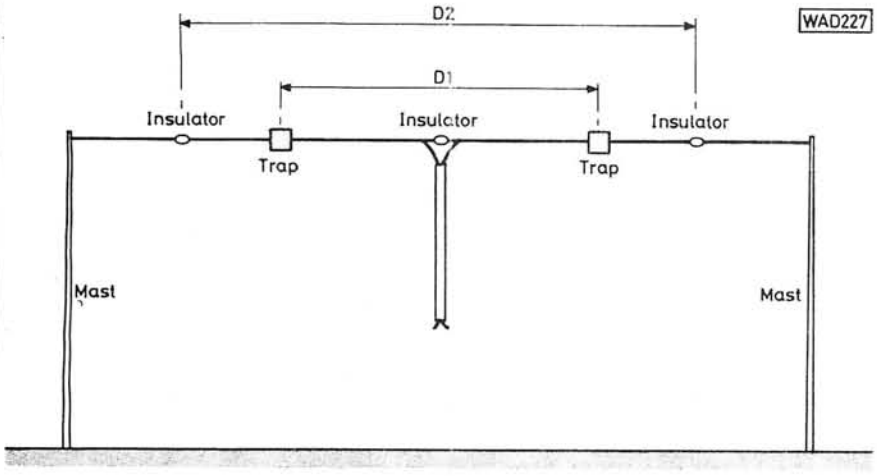

Fig. 2: Trapped dipole

tenna that will resonate on several bands. It does require a lot of space though, so if this is at a premium then the trap dipole is the one for you.

Try the Lower Frequencies

The current decline in solar activity as reflected by the reduction in the monthly sunspot number is bringing improved reception on the mid and lower frequency bands, counterbalanced unfortunately by a decline at the higher frequencies. Overcrowding is on the increase as broadcasters move away from the h.f. bands, one result being more out-of-band transmissions. The unofficial 7MHz (41m) band extends almost to 7·5MHz, a recent addition being Madrid on 7·45MHz which comes in as a good solid signal at my QTH in the evening.

There is an increasing amount of DX to be heard now, if you listen outside the usual evening peak listening times. Try 11MHz (25m) and 9MHz (31m) in the late evening for signals from Latin America where these bands are used for domestic broadcasting. After dark 6MHz (49m) and 7MHz (41m) are fruitful areas for the DXer. The tropical bands too are producing interesting DX, a trend that should continue as we move towards the sunspot minimum.

The 4MHz or 75metre Band

This small neglected band, which extends from 3·9MHz to 4·0MHz, lies almost midway between the international short wave bands and the medium waves. It is allocated to broadcasting in parts of the world outside of the Americas, i.e. ITU Region 2, the upper 50kHz from 3·95MHz to 4·00MHz being used by stations in Europe. Propagation in this part of the spectrum is similar to that on the medium waves in so far as a path of darkness from transmitter to receiver is required, but long-distance reception is more likely. Listen on the 4MHz band from an hour before sunset to an hour after sunrise if you are interested in DX, as you will not hear any during the daytime.

What can we expect to hear? The BBC World Service is on 3·955 and 3·970MHz, Switzerland is on 3·985, the Voice of America in Munich on 3·980, France 3·965, Warsaw 3·955, Deutsche Welle 3·995, Rome 3·995. These can be considered as locals and should be audible when using a portable or table receiver with a whip.

For DXing a more ambitious set up with outdoor antenna and a receiver capable of handling signals from it, is desirable. Listen for China on 3·94 and 3·95MHz, Afghanistan on 3·965, India on 3·905 and 3·925, BBC Singapore 3·915, Capital Radio Transkei 3·930, Meyerton in RSA 3·965. Try too for Indonesia on 3·905, 3·935, 3·960, and 3·975MHz, Cameroon on 3·970 and 4·000, Japan on 3·925 and Cape Verde Islands on 3·930. Greenland, although in Region 2, is now back on 3·999MHz while Port Stanley in the Falkland Islands has been reported on 3·958 and Papua in New Guinea is occasionally logged on 3·905.

The 4MHz band provides an introduction to tropical band DXing for the short-wave listener who may be discouraged if he moves directly from the busy s.w. bands to the 5MHz band. There is something for everyone on 4MHz. Interest by broadcasters in this part of the spectrum is certain to increase as the higher frequencies become less usable.

The DX Association of Great Britain

Secretary **Simon Spanswick** writes to say that readers may be interested to learn of the existence of the DXAGB which has been around since 1977 and hosted the 1983 European DX Conference in London. As well as covering broadcast band DXing the monthly magazine *DXAGB News* contains information about Amateur Radio and CB plus a new section on TV DX. An information pack and a copy of the magazine is available from DXAGB, Five Acres, Whiteditch Lane, Newport, Saffron Walden, Essex, CB11 3UD.

Readers' Letters

A useful log of DX on the lower frequencies comes from **W. M. Rigby** (Morecambe) who mentions hearing Afghanistan in English on 4·450MHz at 0930, Uganda on 5·027 at 1920, Nigeria on 4·770 at 2315 and Beijing in English on 6·860 at 1900. The National Micro 009 receiver referred to under Travellers Sets in the March issue interests **Glyn Watson** (G8UHU) who has been unable to obtain information about it. National Panasonic say it is not one of theirs. Can anyone help?

QSL card from Radio Cairo

"When sending taped reception reports should I always include a note of what frequency, date and time the broadcast was taped" asks reader **James McGraw** of Inverness. Yes, every reception report should contain this information, with a taped report though it is not necessary to mention anything else as the tape will speak for itself.

"I have just received HCJB's newsheet *Wavelength*" writes **Leslie Biss** of Knaresborough who goes on to say that this station will be building a new antenna for the 6MHz band for programmes to Europe and South Pacific. The reason is to overcome the effects of the low solar activity expected over the next few years. Very welcome too as reception of *DX Party Line* on the 15MHz band is now unreliable though it may pick up during the summer.

VHF BANDS by Ron Ham BRS15744

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

Readers often ask me about antennas for v.h.f. "What do you think of this?" "Which is the best Yagi?" "How many elements should I use?" And so on. Unfortunately there is no easy answer to this and in my view, for us in the world of amateur radio, it is a matter of compromise and trying to get as near as possible to having one's cake and eating it. Ideally, if two v.h.f. stations a good distance apart were going to work each other only, then highly directional antennas, say long Yagis, cut to the exact working frequency and mounted to face each other precisely, would be used.

However, because the interests of the radio amateur and the broadcast bands DXer cover such a wide range of radio frequencies with signals coming from all directions, a compromise between beamwidth, bandwidth, gain, height, rotatability, size and local problems like nearness to neighbours and planning permission, must, in most cases, be found. Bearing in mind that the antenna forms part of a tuned circuit at the forefront of the signals entering or leaving your station, the one you choose should be well designed for the desired radio frequency, strongly constructed to withstand high winds, mounted for the correct polarisation, horizontally or vertically and fed by a suitable good-quality low-loss feeder, with sound soldered connections at each end. Do remember that there is little point in spending a lot of money on good equipment and then skimping on the very device on which it relies to perform satisfactorily.

If you need advice on this subject, then seek it, because this is an important decision for the future of your station. Talk to members of your local amateur radio club, have a word with the dealer who supplied your gear or one of our advertisers who specialise in stocking antennas and their associated masts and fittings. Finally, make sure that the antenna system of your choice is installed properly and safely because a collapse can have serious consequences. Don't be backward in asking a good local antenna rigger for a quote especially if he happens to be a radio enthusiast as well.

Solar

After several months of minimal activity from the sun, **Cmdr Henry Hatfield,** Sevenoaks, and I recorded solar noise storms, severe at times, on 136 and 143MHz respectively, from January 24 to February 2 and from the 8th to 11th inclusive. We also recorded several varying-intensity bursts of noise on January 20, 22 and 28 and February 5, 7, 14 and 16. On January 18, Henry, using his spectrohelioscope, observed 3 large and 2 small sunspots with active areas around the larger ones, and on the 26th he saw 4 sunspot groups with a total of 27 spots. Three of the groups were in a long chain with plages in each one and at 1130 on the 31st, Henry found two large and angry spot groups and the remnants of a flare, which no doubt accounted for the intense radio noise he recorded that day at both 136 and 197MHz.

The intensity of the radio noise which I recorded as the sun passed through my antenna beamwidth at midday on January 27 is shown in Fig. 1. It was possibly caused by two medium sized bipolar groups, with poles connected by penumbra, seen by **Ted Waring** at his observatory in Bristol. Ted also counted 15 sunspots on January 23, 25 on the 28th, 12 on February 2, 21 on the 9th and 14 on the 13th.

Aurora

With the large amount of solar activity it was not surprising to hear that several auroral events had taken place. **Dave Coggins** told me that a good friend of his, **Tony Usher** G4HZW, Knutsford, worked a GM on the 28MHz band via aurora around 2000 on February 4. During the event on the 10th, **Paul Whatton** G4DCV, Dover, worked a couple of SM5s and had a chat to **Jon Hague** GM3JIJ, in Stornoway. "Jon is like an auroral beacon as he is audible every opening, usually on the key, and he has enabled many hundreds of amateurs all across Europe to work the Hebrides and WS square", said Paul.

The 28MHz Band

"10m opened up quite nicely on February 11", writes **Peter Lewis** G4VFG, Ivybridge, who worked stations in CE3, EA8, PP8, PY1, ZD7 on St Helena, 3X and 4X4, and heard FM7, PP5, TU, 6W and 9J. "It was interesting to see how the skip was north/south and shortened noticeably, starting by extending around the Tropic of Capricorn whereas by the afternoon it extended to about 30°N latitude. The band closed gradually during the afternoon and was all but QRT at 1600", says Peter who uses a CB half-wave vertical antenna and plans to build a VK2ABQ beam for 28MHz this summer.

During sporadic-E disturbances on January 8 and 29, Dave Coggins logged signals from stations in Czechoslovakia, Greece, Italy, Poland and Yugoslavia. He also heard VK6IV on the 7th, CX6CB and LU2CC on the 8th, 4X6FP on the 22nd and EA8 and 9, 6W1AR and 9J2ITU on the 29th under normal conditions. Due to the continual high winds in January, Dave removed his quad and used a sloping dipole which performs very well. Knowing that this antenna is directional with quite a low angle of radiation towards the direction it is sloping, Dave decided to experiment with a four-way multiband, multi-directional sloper, with one centre mast, the dipoles sloping downward facing NE, NW, SE and SW, with a relay to switch the feeders. Look forward to hearing more about this one Dave.

"On February 5, East Germans were coming through in the 28MHz beacon band with contest activity", writes **John Coulter,** Winchester. **Greg Lovelock**

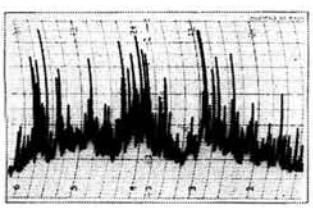

Fig. 1

Fig. 2

Fig. 3

Fig. 4

G3III, Shipston-On-Stour, reports hearing broadcast stations, Teletype noises and English-speaking s.s.b. without any callsigns between 28·195 and 28·300MHz around 1400 on the 13th. This could have been harmonics from lower frequencies Greg due to a brief period of sporadic-E. On January 29, I logged 5B4BS, K8XF/MM and UK4FAV, G, OK, Y4 and UA6 on February 5 and A4 and UA6 on the 7th.

"I really enjoy my ham radio hobby" writes **Sheri Chalmers** VK4VMB, Cairns, who is active with 30W at 0800GMT daily using a Kenwood TS-930S and 6-element mono-quad on 28MHz. Sheri has many friends in the UK so lads and lasses, keep an ear open for her, there is no mistaking her enthusiastic voice and no doubt after a QSO or a report you may, like me, get one of her QSL cards, Fig. 3.

The 28MHz Beacons

"The 10m beacon log is very slim" writes **Norman Hyde** G2AIH, Epsom Downs, and commented that this time he logged only 9 beacons compared with 16 for the same period last year. "10m is now really in the doldrums with most of the beacons struggling to get through", writes Dave Coggins and adds "at present the most persistent seem to be the beacons in Cyprus 5B4CY and South Africa ZS6PW and Z21ANB". Dave also reports hearing the beacons in Germany DF0AAB, DK0TE and DL0IGI and Hungary HG2BHA, via sporadic-E on January 7, 8, 10, 11 and 29 and DL0IGI via meteor scatter on the 6th. Around 1300 on February 2, Norman received signals from ZS1STB via meteor scatter and among the present, occasional, beacons heard was ZS6DN by Dave on January 19. **Ted Owen,** Maldon and Greg heard the Hong Kong beacon VS6TEN on February 9. Ted also heard ZS5VHF and ZS5TEN on the 10th.

Greg Lovelock, using a Microwave Modules transverter into a Yaesu FT-290 and a half-wave sloping dipole, checks the 28MHz beacons around 0900 and 1400 daily and his list of beacons heard, along with those of Dave Coggins, John Coulter, Henry Hatfield, Norman Hyde, **Bill Kelly,** Belfast, Ted Owen, Ted Waring and me, is included in our monthly beacon chart, Fig. 5.

Any 28MHz beacon news is welcome readers no matter how large or small, the information is valuable in the compilation of the monthly report.

28MHz Satellites

"I see that the Russian satellites are back to normal as stated in the AMSAT-UK mags", writes John Coulter and Bill Kelly reports hearing signals from RS8 at 1420 on January 30. **Peter Firmin** G4SES, Thames Ditton, works all bands with an Icom 751, AT500 a.t.u. and 3-element Tri-bander antenna. He is an active member of the Thames Valley Amateur Radio Society, is equipped to operate mobile on both the 144 and 430MHz bands and plans to take a greater interest in the amateur satellites. Good show Peter, the more the merrier. With a number of club members currently operational on the RS satellites and interest growing all the time, **Chris Bryan** G4EHG, Chichester and District Amateur Radio Club secretary, has published some orbit times for RS5, 6, 7 and 8 and OSCAR 10 in the club newsletter in order to help members who are working, listening or tracking these interesting space craft.

Tropospheric

The atmospheric pressure, measured at my QTH, began this period on January 16, low at 29·6in (1002mb), rose and hovered around 30·0 (1015) from the 18th to the 21st, went down to 29·5 (998) on the 22nd and on down, really low, to 28·9 (980) by 1800 on the 23rd. This was followed by a few days of fluctuations between 29·5 and 30·0 until noon on February 8 when the prevailing gales cleared and the pressure rocketed up from 29·5 to 30·6 (1036) in a matter of 30 hours. My barograph then drew a straight line at this high level until midday on the 15th when it began to fall gradually reaching 30·0 at 2200 on the 19th.

During the past 2½ years, Paul Whatton G4DCV, Dover, Fig. 4, worked 33 countries and 183 squares using all modes on 144MHz and is sometimes active on the 70 and 430MHz bands. Paul uses an FT-221 plus muTek board, home-brew amplifier with two 4CX250Bs and 14-element MET NBS Yagi on 144MHz and 5-element and 14-element MET antennas for 70 and 430MHz respectively. Although conditions were poor for the RSGB's 144MHz c.w. contest on February 5, Paul made 101 QSOs with DK3FW at 591km his best DX.

Simon Hamer, New Radnor, heard a variety of stations through the 144MHz repeaters in Aylesbury GB3VA on R4, Birmingham GB3BM R5, Derbyshire GB3HH R4, Leamington Spa GB3YJ R7, Leicester GB3CF R0, Malvern Hills GB3MH R3, Powys GB3PW R3, Reading GB3RD R3 and Royston GB3PI R6, during the evening of the 13th. "Last night (13th), stations in the north of England were enjoying a tropo opening to Scandinavia although nothing at all was audible here despite the fact that I have a sea take-off in that direction", writes Paul Whatton who did log the German beacon DL0PR on 144·910MHz, about S5, during the morning of the 14th. Later that evening I heard Dutch stations via one of the repeaters on R4.

Band II

Apart from hearing signals from France Cultur and Inter, **Damien Read,** Newport, found Band II quiet from the DX point of view during January. However his new receiver, an Amstrad 8040, is ready for when conditions are right. At present Damien is pondering about new Band II antennas for his station.

As the pressure fell on January 25, I logged several French stations between 98 and 100MHz, while parked near the famous show ground in Ardingly, using the radio section of my TVR5D with its telescopic rod antenna. Using the same equipment, 200m a.s.l. in Ashdown Forest, I heard 3 French stations between 96 and 100MHz at 1400 on February 10 and 14 and several Dutch and French stations throughout Band II from the home QTH around 0900 on the 15th. During the evening of the 13th, **John Williams,** Cheltenham, using a Fidelity RAD26 and telescopic antenna, received BBC Radio Devon and ILR Signal Radio. On the 14th, Simon Hamer with a new Aiwa 9700 stereo tuner listened to programmes from BBC Radios Devon, Manchester, Sussex and York and ILR Gwent Broadcasting, Marcher Sound, Mercia Sound, Piccadilly Radio, Signal Radio and Southern Sound, all in stereo

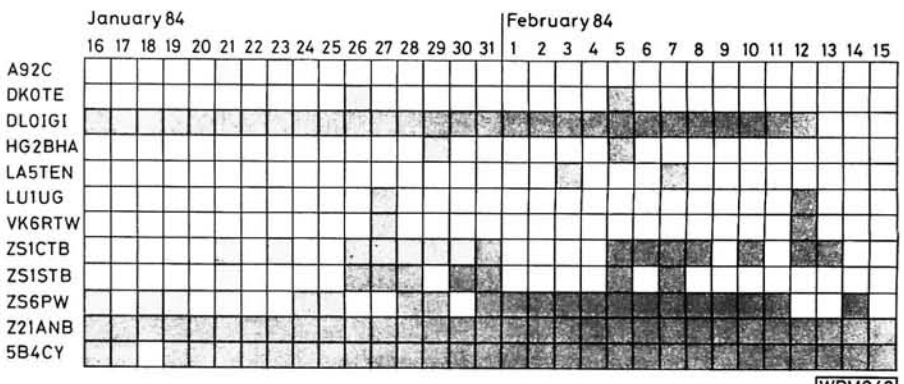

Fig. 5: Distribution of beacon signals

between 95 and 104MHz. While the pressure was high, **Harold Brodribb,** St Leonards on Sea, received signals from 11 French stations and 5 editions of BBC Radios 2, 3 and 4 on February 10, 14 French and 6 editions of Radio 2 on the 13th and 14 French on the 16th.

RTTY

Although computer experimenting and programming takes a lot of his time, **Peter Lincoln** BRS42979, Aldershot, copied the usual European stations on 14MHz RTTY during the month prior to February 13. He also logged VU2VIM, his first Indian and 6W1CK, another new one for him on 21MHz. During the period Peter received RTTY signals from FR7AZ and YC0EBS and says, "ZS6CC, the South African mailbox, has been copied a few times and always puts in a strong signal even when the band is pretty dead".

Among the variety of QSL cards I get from readers is one from Peter Lincoln, custom produced on his Sharp MZ700 computer and printed on the machine's plotter/printer. Peter tells me that he would be pleased to have a land line chat to anyone interested in RTTY, SSTV or Sharp MZ80K or MZ700 computers, so readers, give him a ring on 0252 317870 and I think you will find him a mine of information on these subjects. "It is a case of being in the right place at the right time" said Peter on February 13 and that proved to be the case for me when I popped into the shack and switched on the RTTY gear in time to see both sides of a QSO between an EA9 and VK7HV at 1030 on the 14th. Between January 16 and February 17, I copied RTTY signals from 23 prefixes, CT, CT2, DL, EA, EA9, J2, HA, HL, I, IT9, LZ, OE, OH, OZ, N8, SM, T7, VE, VK, WO, YO, YU and Y22 around 14·090MHz and 13 prefixes, DL, EA, EA9, EC, HB9, OH, Ws 1,2,3,4,5 and 9 and YU around 21·090MHz.

Between January 15 and February 14, **Norman Jennings,** Rye, received RTTY signals from 47 different countries, of which 27 were Europeans. His best catch for the month was CR9AN and like Peter he copied VU2VIM and 6W1CK. I see from Norman's log that JAs, VEs and VKs were among the DX and that he logged the Indian station on 21MHz most mornings around 1115 at very good copy. It all goes to show readers, there is a lot of enjoyment in RTTY.

Tailpiece

"The British Meteor Society is most interested to collect information from amateurs about meteor scatter activity on the v.h.f. and u.h.f. bands", writes BMS member Paul Whatton and emphasises that it is an area in which both licensed amateurs and s.w.l.s can assist with current research work in this field. Readers interested should write for log sheets and society information to the Director, Robert Mackenzie, 26 Adrian St., Dover, Kent. The Society also publish a comprehensive list of meteor activity throughout the world entitled *The Radiant Catalogue* at £1.50, post free.

Dave Ballard is looking for an ex-army Wireless Set No. 11, to fit in a 1936 Morris commercial PU8 wireless truck which he is restoring. Dave tells me that this vehicle is one of only seven known so if anyone can help with this important project, please contact Dave at 23 New Road, Fairoak, Eastleigh, Hants SO5 7EN.

The Marconi Radio and Electronics Club, Portsmouth will be active on June 3 and 4 using callsigns GB2MAR on h.f. at Fort Widley and GB1MAR on Southsea Common for the 1984 D-DAY reunion events. Contacts with these stations will count toward the *Mary Rose* award, details of which are available by sending an s.a.e. to club secretary, G3FWE, 50 Park Avenue, Widley, Purbrook, Hants.

At 1600 on February 17, GM4LNN and GM6WPA/P made the first QSO through the new Orkney 144MHz repeater GB30C. This instrument is the first to be installed by the Orkney-Caithness Repeater Group at a site some 230m a.s.l., about 3·5km west of Kirkwall and operating on Ch. R2. "Thanks are due to all who helped, including Jaycee Electronics and Heller Electronics and the many amateurs and professionals who gave their time and substance", writes Bill Wright GM3IBU, Chairman of the group. Many congratulations all round Bill, keep us informed about developments.

TELEVISION *by Ron Ham BRS15744*

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

It is not always possible to use all of the TV photographs you kindly send me in one issue, so I try to use those which are immediately relative to the prevailing activity and hold the others to illustrate particular points about DXTV in later issues. I have found this a great help to our new readers, for instance, before the 1984 sporadic-E season gets under way and a new chapter in television DX begins, let us look back to 1983. First at u.h.f. and a testcard, Fig. 1 and caption, Fig. 2 received by **Martin Messias,** a Dutch caption, Fig. 3 and a German ZDF advert, Fig. 4, by **David Girdlestone,** a Dutch announcement, Fig. 5, by **Tony Palfreyman** and a German logo and caption, Fig. 6, by **Steve Green.** During the 1983 sporadic-E season a logo from Spain, Fig. 7, was caught by **Iain Dunworth,** a children's programme from Spain, Fig. 8 and a colour picture from the USSR, Fig. 9, by **Len Eastman,** a German test card, Fig. 10, by Steve Green and an East German clock caption, Fig. 11, from the authors of the test card book, **Keith Hamer** and **Garry Smith.** Many of the photographs seen now and published in the past are of great value, especially at this time of year when the new DXer is trying to identify signals for the first time.

Dutch TV

Early in 1983, **Bart Wormgoor,** Gorinchem, purchased a Satellit 2700 receiver and while he has learnt a lot about short-wave DXing from our magazine, he feels that we do not fully understand the Dutch radio and TV broadcasting system. Although he realises that a full explanation would occupy about 10 pages, Bart has made a fine effort to abbreviate it and still give us a better idea about their unique broadcasting arrangements.

"The principle here is that radio and TV are free!" writes Bart and adds, "This means that when you have an association with at least 100 000 members you can ask the government for time to broadcast (radio or TV). The more members you have, the more time you get, i.e. 100 000 gives you about 5 to 6 hours per week; 500 000 or more about 20 to 25 hours. Besides the associations there is the NOS, which is comparable with your BBC. Anyhow, everybody is more or less supervised by the government and they are all using the facilities (cameras, etc.) from the NOS." Bart continued to explain that NOS has no members and they present the daily news and all sorts of other items and give their opinion. AVRO has more than 500 000 members and their approach is comparable to the Conservatives in the UK. TROS also has more than 500 000 members and their attitude is the same as AVRO, but they never give an opinion on news-facts. Their programmes are sports, all kinds of films and other entertainment. VARA has about 250 000 members and this broadcasting system is supported by the Labour party. NCRV has some 350 000 members and is the representation of the Protestant part of the country and KRO

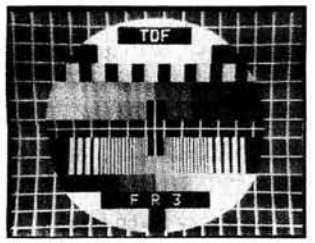

Fig. 1

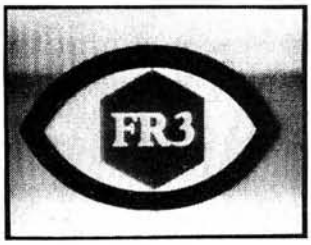

Fig. 2

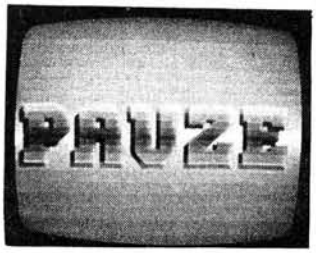

Fig. 3

Fig. 4

Fig. 5

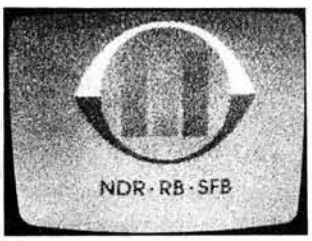

Fig. 6

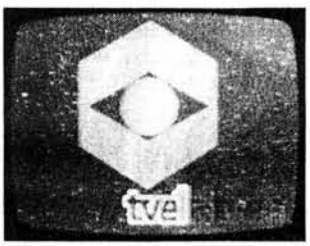

Fig. 7


Fig. 8


Fig. 9

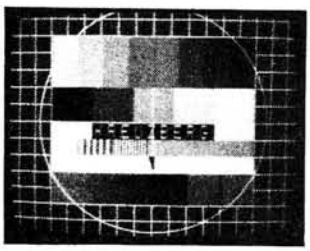
Fig. 10

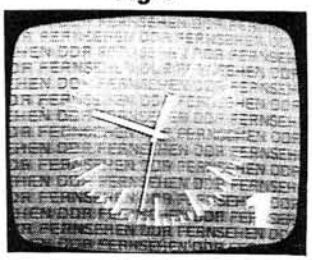
Fig. 11

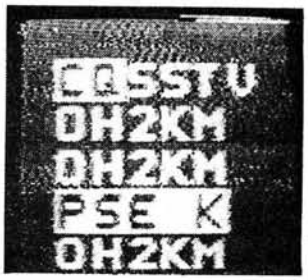

Fig. 12

Fig. 13

Fig. 14

Fig. 15


Fig. 16

is as NCRV but for the Catholic part and VERONICA, see the TROS, no opinion, just entertainment. Bart tells me that these organisations take about 90 per cent of the broadcasting time and that he would be pleased to give more detailed information to any reader wanting it. I will give his address to anyone wishing to take up the offer. Many thanks Bart, I sincerely hope that I have interpreted your name correctly and given a fair report on the most interesting letter you sent me. I know that many of our readers are interested in the programme content of stations as well as the reception of DX.

SSTV

On Friday January 13, a vicious gust of wind damaged **Richard Thurlow's** antenna system, but despite this G3WW was not off the air for long. In fact, before repairs were complete and with his Hy-Gain 205BA 5-element Yagi pointing skyward from a horizontal tower and with its reflector on the ground, Richard worked several of the usual DX SSTV stations as well as new ones including K6KUF, LC8PUF, OZ1DOZ, VK2BOD and WA8WDQ/I. Richard would like to thank his friends who came to the rescue by drilling out snapped bolts, straightening and re-welding the 10m boom of his 14MHz Monobander antenna, etc., and Jack Tweedy (SMC) Ltd, Chesterfield and Radio Shack, London, for their 24-hour spare parts service. I know the feeling Richard, I lost some of my antennas during a gale and it is great to have the help.

In early February, Richard had 2 way colour QSOs with DL7ADR, I6GKI and PA0LAM/EA on 14MHz and increased his "first time" QSO score to 1967. At 1705 on February 6, G3WW had a half hour, 24 seconds single frame, colour QSO with ZS6BTB who was using his WA7WOD modified 400 and is considering the TRS80C computer-controlled system. "George Palmer, Queensland, is now re-licensed VK4ZG and is looking for G SSTV QSOs" writes Richard who learnt that KX6PO is active on 14MHz SSTV in the Marshall Islands.

Although copy was often difficult during the month prior to February 13, **Peter Lincoln** received a few SSTV signals from stations in North America and South Africa, a couple of CQs from OH2KM, Figs. 12 and 13 and mainly French, Fig. 14, Germans and Italians from Europe. Last May Peter received a CQ from IK3AIU, Fig. 15 and Richard received a picture of a cat from I3XQW, Fig. 16. Peter's latest confirmation of an SSTV report came from IC8POF on the island of Capri. I understand that one of our advertisers, Davtrend Ltd, is bringing out a SSTV receiver compatible with the standard amateur radio specification used world-wide and plans to add a transmit module later on.

Tropospheric

Although conditions generally were disappointing for DX during the period of very high pressure in early February, I

did see a Dutch School TV caption on Ch. E4 62·25MHz with the words Pauze and Volgende Uitzending 9.35 at 0825 on the 15th, alongside a clock showing 0925, one hour ahead of GMT. On the 13th, **Brian Renforth,** using a HMV 1400 on 405 lines, received pictures from Emley Moor on Ch. B10 and Holm Moss on Ch. B2. Brian plans to keep a 405-line set working for DX until such time as the system in Bands I and III is finally closed down.

I noticed considerable co-channel interference in the u.h.f. bands during the afternoon and evening of the 14th and most of the 15th. During this period **Simon Hamer,** New Radnor, received pictures from Granada IBA, Winter Hill on Ch. 59 for the first time and BBC1 North West on Ch. 55 on the 14th and 15th. He also logged signals from the IBA stations Anglia from Sandy Heath, Thames from Crystal Palace, Central from Oxford and Waltham and TVS from Hannington and Rowridge. Simon said that he was very pleased to see that BBC station because he is completely screened to the north and had directed his antennas toward some hills in the south-west.

Band I

"The local BBC Band I transmitter has finally shut down and I for one will not miss it. I am now able to use my Vega 402E to its full potential as until January 3, when the transmitter closed, I had nothing except for distorted BBC pictures on the band" writes **Philip Heaney,** Norwich. To prove his delight and with a home-brew wide-band dipole, he saw a cartoon *Doctor Snuggles* from TVE1 Spain on Chs. E2 48·25MHz and E3 55·25MHz, at 1740 on the 12th, a YL presenter and clock from the USSR on Chs. R1 49·75MHz and R2 59·25MHz at 1140 and pictures from TVP Poland on R2 around 1800 on the 14th. Two different YL announcers and a clock from unidentifiable stations and a test card from NRK Norway, were seen at 1730 on the 18th. Also on the 18th, Brian Renforth, from his new QTH in Wallsend, received excellent test cards from Portugal scribed RTP Porto and Yugoslavia labelled JRT-RTV LJNA, on Ch. E3 and at 1326 on the 26th, I received bursts of test card, RS-KH, from Czechoslovakia on Ch. R1.

Station Reports

During his two and a half years TVDXing, **David Moller,** Eastbourne, has received pictures from Belgium, Czechoslovakia, Holland, Hungary, Italy, Rumania, USSR and Yugoslavia in Band I and most European and Scandinavian countries in Band III and u.h.f. when conditions were right. Periodically, David takes his 6in converted Sony receiver, powered by a car battery, and Maxview caravan antenna to Beachy Head, a high point on the east-Sussex coast, for portable DXing. At his home, about 30m a.s.l., he uses a wideband antenna for Band I and a twin Colour King for u.h.f., both mounted on a rotator. These were installed on his chimney until one of those excessive winds last November damaged the antennas and he re-installed the Colour Kings and the rotator in his loft. Together with fellow Eastbourne DXer, **Ron King,** David has been experimenting with a 14in Otake semi-multi standard receiver, with L/SECAM facility, for receiving French television and, using a VCR, replaying the French pictures in the I/PAL mode on a UK set. "The results have been interesting", writes David and explains, "Via the Otake I have taped French programmes which play back in the I/PAL mode on any UK TV! The interesting thing is that it only plays back the French programme in monochrome but retains the sound on UK TVs". I look forward to hearing more about this David.

My thanks to **H. F. Beekhuizen,** The Hague, for the information that the mystery test card, Fig. 9, in our January issue is the normal card used by the Dutch PTT every morning. He also sent the January 9 page from a Nederland TV guide showing the items HEIR en Nu and NCRV proving that Figs. 5, 7 and 8 in our January issue were Dutch and not German pictures as we said. NCRV can be seen again in Fig. 5 in this column.

I am always pleased to hear about new products and receivers that may help my readers with their DXTV stations and recently I received a pamphlet from MET Antennas about their non-metallic mast, made from reinforced polyester, available in 1·5 and 3m lengths. "The purpose of the 3m length is to allow the replacement of a steel or aluminium stud masting above the rotator" says the gen sheet and I suggest that readers wanting more information should write to Metalfayre, 12 Kingsdown Rd, St Margarets at Cliffe, Dover CT15 6AZ.

While talking about video recorders last week, I was shown a Telefunken catalogue from which I noted that their variety of television receivers and v.c.r.s are fitted with v.h.f./u.h.f. tuners and some models work on 12 volts as well as the mains. I think that a visit to a Telefunken stockist to see the sets and get more gen about the tuners could prove worthwhile.

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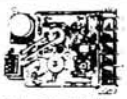

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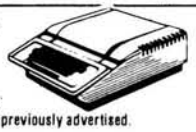

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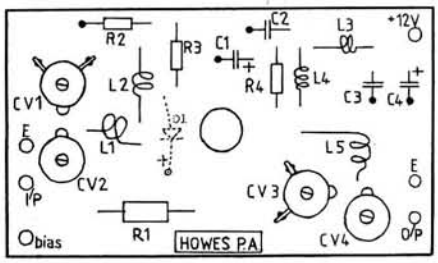

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These amplifiers have been designed to help you put out a stronger 2 meter signal. Double-sided board is used with screen printed parts location (see illustration above), PTFE output trimmers in the PA2/30. The easy way to build your own linear, complete with pre-formed inductors.

PA2/15 Up to 15W output, with 1½W drive (10dB gain) **kit £18.90, assembled PCB £22.80.**

PA2/30 Up to 30W output. This design gives approx 8dB gain and therefore has a good margin against overdriving with an FT290 or IC202. We feel that a signal that you can be proud of is more important than the slightly higher gain of some designs with their "wide" signals. **Kit £22.90, assembled PCB £26.90.**

CO1 TX/RX Switching Unit for use with the above, or any HF or 2M linear up to 100W. Coax relays are the best for TX/RX switching of linears or preamps, but they cost a fair bit. The CO1 uses high reliability, low cost conventional relays to give a reasonable performance at a sensible price. RF or PTT operated the CO1 also has provision for connecting a preamp if required. **Kit £8.90, assembled PCB £11.90.**

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AP3 Automatic Speech Processor. Kit £14.80, assembled PCB £19.80. This is the excellent processor described by Dave, G4KQH in the September '83 edition of "Ham Radio Today". We have sold hundreds and hundreds of these and many customers have come back to buy a second, third or even fourth unit for use with their other rigs. The AP3 uses a combination of compression, clipping, and response tailoring to give you a really "punchy" signal that enables you to make contacts that may not be possible without it. The unit will run from your rigs 12V supply or a 9V battery, it turns itself off automatically when not in use, so saving batteries. Clipping level is selectable in 6dB steps, no other operational controls to fiddle with, operation is fully automatic, speak as loudly or quietly as you like, the AP3 will adjust itself. Suitable for high and low impedance mics.

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER. Kit £13.95, built £18.90. DcRx is a low cost, easy to build amateur band receiver, designed so that a newcomer to the hoobby can build a shortwave receiver with the minimum of trouble. The DcRx is also proving to be very popular with experienced QRP operators. Two versions of the DcRx are available at the moment, one covering 10 or 14 MHz, and one covering 3.5MHz (80M). The kit comes complete with ready-wound coils and requires very little alignment. You will be amazed how well a simple receiver can work, don't be put off by the low price, this set performs well and is capable of world-wide reception. The DcRx runs from a nominal 12V supply and will drive a loudspeaker or headphones. Modes: SSB and CW. PCB size 77 by 77 by 25mm approx.

XM1 CRYSTAL CONTROLLED FREQUENCY MARKER. Kit £15.60, assembled £19.60. A really useful piece of test equipment, besides helping you meet Amateur licence frequency measurement requirements. Our kit has a built in voltage stabiliser to maintain accuracy over a wide voltage range (8 to 24V DC). The XM1 provides marker outputs at 1MHz, 100kHz, 25kHz and 10kHz, these are usable up to 70cm, unlike some CMOS designs. The XM1 has a pulsed ident facility for distinguishing markers from off-air signals on crowded bands. This facility is very useful, and much preferable to tone modulated markers, whose bandwidth becomes larger as a frequency increases. If you are going to invest in a piece of test equipment, it pays to go for a good quality design, the XM1 provides this.

ST2 CW SIDE-TONE UNIT or PRACTICE OSCILLATOR. Kit £6.20, built £8.90. The ST2 provides a nice sounding sinewave note, either from your key or from the output of your TX by RF sensing. This design should not be confused with cheap and nasty squarewave circuits so common in horrible sounding practice units. We think side-tone, or a practice oscillator should sound like a good off-air signal received on a quality set. Output is up to approx. 1W at 800Hz, a volume control is included.

If you would like more information on any item simply drop us a line, enclosing an SAE. We have an A4 information sheet for each of our products.

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73, Dave, G4KQH Technical Manager

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AC187K	0.28	BC212	0.09
AC188	0.25	BC212L	0.09
AD142	0.79	BC213	0.09
AD149	0.70	BC213L	0.09
AD161	0.39	BC237	0.10
AD162	0.39	BC238	0.09
AF124	0.34	BC307	0.09
AF125	0.35	BC327	0.10
AF126	0.32	BC461	0.35
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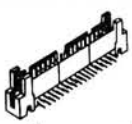
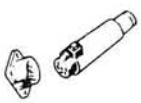
Not only will you find a wide selection of all the usual types you may require in our A-Z products list; there are also many others made necessary by today's ever-advancing electronics – just one more example of how much better Electrovalue serves you.





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D SERIES CONNECTORS
9, 15,25, 37 or 50 way connectors with corresponding covers and retainers. Gold-plated contacts. Max current per contact – 5A.

ID CONNECTORS
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5 way and 7 way chassis plus and sockets. DIN style layout. Gold-plated pins 250V/5A rating per socket.

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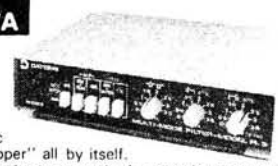
1

AUDIO FILTERS MODELS FL2, FL3, FL2/A



Model FL3 represents the ultimate in audio filters for SSB and CW. Connected in series with the loudspeaker, it gives variable extra selectivity better than a whole bank of expensive crystal filters. In addition it contains an automatic notch filter which can remove a "tuner-upper" all by itself. Model FL2 is exactly the same but without the auto-notch. Any existing or new FL2 can be up-graded to an FL3 by adding Model FL2/A conversion kit, which is a stand-alone auto-notch unit. Datong filters frequently allow continued copy when otherwise a QSO would have to be abandoned.

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DATONG ELECTRONICS LIMITED

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Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

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5/84

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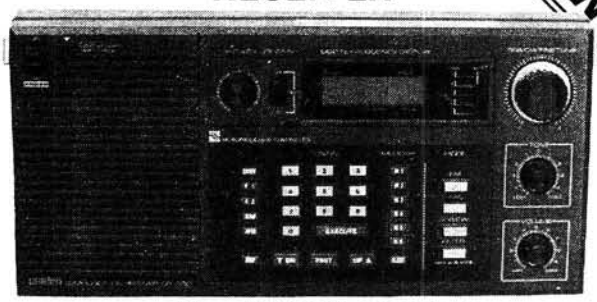
NEW



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FT730	70cm 10w. FM	259.00	(—)
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FT708	70cm H/Held	179.00	(—)
MMB10	Mobile Bracket	8.05	(0.75)
NC9C	Charger	8.80	(0.75)
NC8	Base/station Charger	54.05	(2.00)
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YP150	Wattmeter/Dummy Load 150w	98.00	(1.00)

ICOM PRODUCTS

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IC730	Mobile HF Transceiver	659.00	(—)
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PS30	Systems p.s.u. 25A	229.00	(—)
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IC290H	2m 25w M/Mode	469.00	(—)
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IC27E	25W FM mobile	299.00	(—)
IC45E	70c 10w FM	329.00	(—)
ICBU1	B/U Supply for 25/45/290	24.50	(1.00)
ICR70	General Coverage Receiver	549.00	(—)
ICR71	General Coverage Receiver	P.O.A.	(—)
IC02E	2m H/Held	229.00	(—)
IC2E	2m H/Held	169.00	(—)
ML1	2m 10w Linear	69.00	(2.00)
IC4E	70cm H/Held	219.00	(—)
BC30	Base Charger	56.35	(—)
HM9	Speaker mic	16.50	(0.75)
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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)

TRIO

		£	c&p
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	P.O.A.	(—)
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)
TS130S	8 Band 200W Pep Transceiver	555.45	(—)
SP120	Base Station External Speaker	27.14	(1.50)
AT130	100W Antenna Tuner	95.45	(1.50)
MC50	Dual Impedance Desk Microphone	31.97	(1.50)
MC35S	Fist Microphone 50K ohm IMP	14.95	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.95	(0.75)
LF30A	HF Low Pass Filter 1kW	21.85	(1.00)
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TW4000A	2M/70cm mobile	469.00	(—)
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TR3500	70cm Handheld	256.45	(—)
TR2500	2M FM Synthesised Handheld	237.82	(—)
ST2	Base Stand	53.13	(1.50)
SC4	Soft Case	14.03	(0.50)
SMC25	Speaker Mike	16.56	(1.00)
PB25	Spare Battery Pack	25.53	(1.00)
MS1	Mobile Stand	32.89	(1.00)
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)

DATONG PRODUCTS

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FL3	Audio filter for receivers	129.00	(1.00)
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ASP/A	r.f. speech clipper for Yaesu	82.80	(1.00)
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D75	Manual RF speech clipper	56.35	(1.00)
D70	Morse Tutor	56.35	(1.00)
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MPU	Mains power unit	6.90	(1.00)
DC144/28	2m converter	39.67	(1.00)
PTS1	Tone squelch unit	46.00	(1.00)
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TLNA 432s	70cm Switched preamp	74.90	(1.20)
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RPCB 251ub	Front end IC251/211	76.90	(1.20)
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MML144/50-S	inc preamp, switchable	92.00	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
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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.			
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TONO			
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MR 150	2m (10w in 120w out) inc preamp	169.00	(2.00)

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TOYO			
T430	144/432 120 W	39.49	(1.00)
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YAESU			
YS200	1.8 60MHz	52.90	(1.00)
YS2000	1.8 60MHz	69.79	(1.00)

POWER SUPPLIES

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T200	200W Dummy load	41.40	(1.50)
CT300	300W Dummy load	54.00	(2.00)
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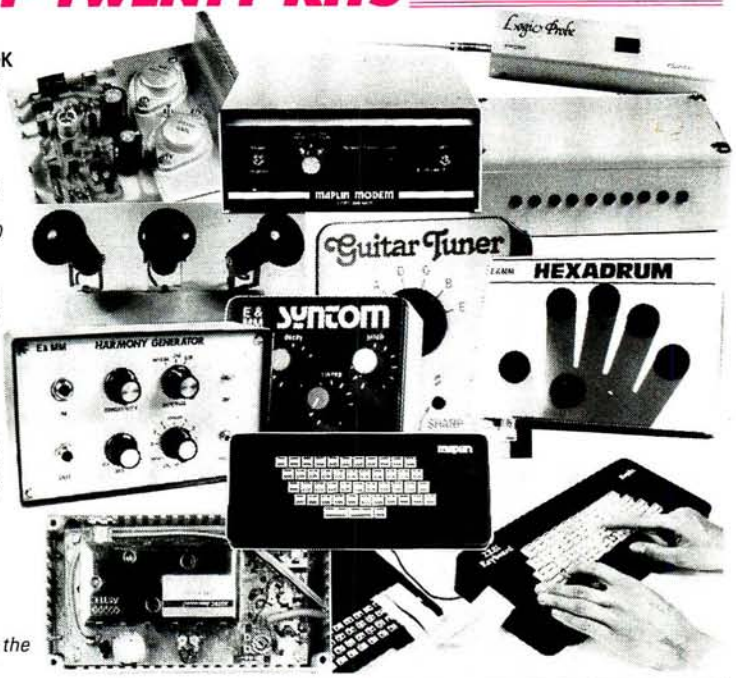
MAPLIN'S TOP TWENTY KITS

THIS MONTH	LAST	DESCRIPTION OF KIT	ORDER CODE	KIT PRICE	DETAILS IN PROJECT BOOK
1.	(1)	75W Mosfet Amp Module	LW51F	£12.95	Best of E&MM
2.	(3)	Modem	LW99H	£44.95	5 XA05F
		Case also available: YK62S Price £9.95.			
3.	(5)	ZX81 I/O Port	LW76H	£9.25	4 XA04E
4.	(4)	Car Burglar Alarm	LW78K	£6.95	4 XA04E
5.	(8)	Partylite	LW93B	£9.45	Best of E&MM
6.	(2)	Keyboard for ZX81	LW72P	£23.95	3 XA03D
		Case also available: XG17T £4.95. Complete ready-built: XG22Y £32.50			
7.	(10)	8W Amp Module	LW36P	£4.45	Catalogue
8.	(14)	VIC20/64 RS232 Interface	LK11M	£9.45	7 XA07H
9.	(7)	Syntom Drum Synthesiser	LW86T	£11.95	Best of E&MM
10.	(12)	Harmony Generator	LW91Y	£17.95	Best of E&MM
11.	(17)	Spectrum RS232 Interface	LK21X	£17.95	8 XA08J
12.	(6)	VIC20 Speech Synthesiser	LK00A	£22.95	6 XA06G
13.	(13)	ZX81 Sounds Generator	LW96E	£10.95	5 XA05F
14.	(11)	Ultrasonic Intruder Detctor	LW83E	£10.95	4 XA04E
15.	(15)	Logic Probe	LK13P	£9.95	8 XA08J
16.	(26)	Car Battery Monitor	LK42V	£6.25	Best of E&MM
17.	(18)	Hexadrum	LW85G	£19.95	Best of E&MM
18.	(21)	Synwave Sounds Synth	LW87U	£10.95	Best of E&MM
19.	(25)	Spectrum Keyboard	LK29G	£28.50	9 XA09K
		Also required: LK30H £6.50; Case: XG35Q £4.95 — Total £39.95.			
		Also available complete ready-built: XG36P £44.95.			
20.	(9)	ZX81 Speech Synthesiser	LK01B	£16.95	6 XA06G

Over 80 other kits also available. All kits supplied with instructions.

The descriptions above are necessarily short. Please ensure you know exactly what the kit is and what it comprises before ordering, by checking the appropriate Project Book mentioned in the list above.



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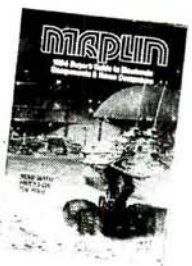

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