

The SHORT WAVE Magazine

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NUMBER 11



TRIO R1000

£298 inc VAT Carr £4.50

The R-1000 uses an advanced PLL system in an up-conversion scheme to a high (48MHz) first IF to remove any possibility of image responses. The receiver covers the entire frequency range from below 200kHz right up to 30MHz in 30 bands, each 1MHz wide. The bands are selected, not by ambiguous knob twiddling as in receivers using the Wadley loop but by a 30 position band switch which controls the PLL system.

The band switch also electronically selects the appropriate band pass filter network in the RF stages of the receiver so there are no "preselector" or "antenna trim" controls to twiddle — simply set the band switch to the range required — that's it!

A highly stable VFO tunes each 1MHz range and its linear, back lit scale makes readout easy. However, in addition to this dial, Trio have also provided 5 digit true frequency digital readout so as to guarantee spot on accuracy on any frequency. As a further feature, the digital display can also be switched to read time, this being derived from a quartz standard. Marvellous for accurate log keeping. The display uses high intensity readout units which can be dimmed for use in low light conditions.

As for what else is inside this superb instrument — selectivity is catered for by three custom made IF filters; a 12kHz wide AM filter; 6kHz narrow AM filter; and a new 2.7kHz SSB filter with a shape factor of better than 1:2.6:60dB. Selectable sidebands are available at the touch of a switch.

For the first time in mid-price receiver, a true noise blanker is provided to remove pulse type ignition noise.

To minimise front end overload, a step RF attenuator is included which gives 0-60dB attenuation in four steps.

All the rear panel connectors are recessed on a sloping panel so that you can stand the receiver either on its back, or pushed hard against a wall when used in conventional shelf mounting. The antenna inputs allow the use of either a high impedance wire aerial or a 50ohm balanced input so that the proverbial long lump of wire will work really well with the R-1000.

This receiver is so advanced it makes everything in its price range completely obsolete.

LOWE ELECTRONICS LTD. CHESTERFIELD ROAD, MATLOCK, DERBYSHIRE.

LOWE ELECTRONICS LTD

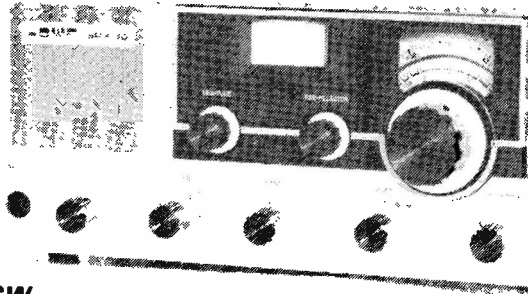
LOWE SRX- 30

New Receiver

500 kHz to 30 MHz. AM.SSB.CW

Mains/12v Operation

Drift Cancelling System for Spot On Accuracy



£178

Carr £4.50

SRX-30

For the advanced, keen short wave listener, the choice of receiver has usually been between cheap and nasty or very good but very expensive equipment. We think that the SRX-30 will provide that listener with excellent performance at a reasonable cost and is the answer to this eternal problem.

The SRX-30 Provides AM, CW, USB and LSB reception on all frequencies from 500 kHz to 30 MHz. All right, so does your Sooper Blooper Mk. 3 but you can't set the Sooper Blooper dial to the frequency you want and be sure that it's correct.

The SRX-30 tuning system is so simple to operate. You have a dial reading in MHz from 0.29 and a main tuning dial reading 0-1000 kHz. So — if you know that Radio Slobovia is broadcasting on 10.295 MHz, you set the MHz dial to 10, the kHz dial to 295 and there you are. The MHz dial setting is not critical, as stability is guaranteed by a triple mixing drift cancelling system, thereby overcoming another problem in your Sooper Blooper Mk. 3: drift.

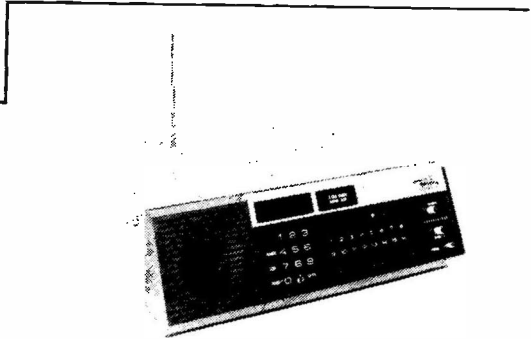
A further drawback to cheap receivers is massive image interference on the higher frequencies due to the use of a low IF, typically 455 kHz. The cure for this problem is the use of a high IF and the SRX-30 employs a first IF of around 40

MHz — so goodbye to first IF images. You could of course find the same system as this in the Racal RA17 series receivers; after all, the SRX-30 has copied the basic idea from this very receiver. The big drawback to the RA17 (apart from the price!!) is that unless you have the muscles of a prize fighter, lifting the RA17 may send you for a holiday at Herrnia Bay (staying at the Truss House?)

To summarise, the SRX-30 covers 500 kHz to 30 MHz with excellent dial readout and reset accuracy; it has all mode (AM, CW, SSB) reception and is equally at home in broadcast or amateur bands; it has all the facilities of a top class communications receiver, RF gain, fine tuning, selectable sidebands, built-in loudspeaker, operation from AC mains or 12v. DC, rugged construction and super styling and all at an attractive price — £158.00 inc. VAT.

See it soon at your nearest stockist, you will be agreeably impressed.

The new digital flight scan receiver from Regency of America is a stunning improvement on any other air band monitor receiver. Utilising its own micro computer system to control an advanced synthesiser, the flight scan allows you to monitor any air band frequency in the range 108-136 MHz and to store up to 16 channels which can then be scanned continuously. Other features include fast keyboard entry of frequency, full band search facilities, channel lockout and much more. For the last word in air band monitors contact us today. Also available — K100 digital FM scanner covering 30-50 MHz, 144-174 MHz and 430-512 MHz. Flight Scan: £230.00 inc. VAT. K100 FM Scanner: £180.00 inc. VAT.



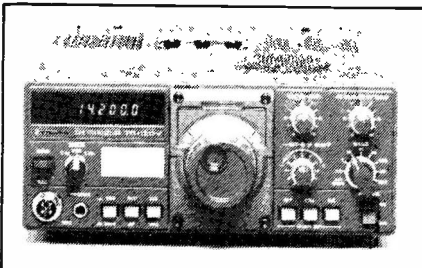
TS120V only £408 inc VAT

Measuring only $9\frac{1}{2}'' \times 3\frac{1}{2}'' \times 9\frac{1}{2}''$ — which is about the size of a packet of cornflakes, the TS120V can best be described as a miniature TS820. The rig covers all bands 80-10 metres — and all of 10 metres 28-30 MHz so it's ideal for transverter driving, has digital readout built-in, vox, break-in CW, RIT, noise blanker and the unique Trio passband tuning system used in the 820. The power output is 10W and a matching linear will be along shortly.

The TS120V is clearly a winner for mobile operation but is equally attractive at home and is perfect for the VHF/UHF enthusiast who requires a high performance I.F. system for his transverters.

The transceiver is based on an advanced PLL system and the digital readout gives you the correct operating frequency at all times unlike many other rigs. Remember my previous comments about Trio attention to detail.

For ease of operation, the TS120V is unsurpassed; simply select the band required, tune the VFO to the frequency you want and there you are; no preselector or PA tuning to worry about, and a distinct safety feature for the mobile operator.



**STOP PRESS — TS120S now in stock. As TS120V but 200W P.E.P. £495 inc. VAT.
SEND 50p IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK
PLEASE SPECIFY ANY PARTICULAR INTEREST AND WE WILL SEND FULL INFORMATION**

LOWE ELECTRONICS Ltd

TRIO TR2300 £199 inc VAT

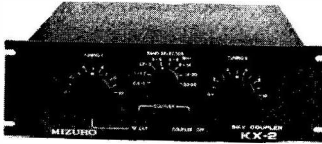


The TR2300 is a remarkable package which combines all the advantages of a portable station with those of a sophisticated mobile set. With the TR2300, you get full band coverage from 144-146 MHz in fully synthesized 25 kHz channels together with 600 kHz repeater shift (and reverse repeater if required) with automatic 1750 Hz tone burst.

The dial is directly calibrated in frequency and has switched illumination for ease of use at night. The transmitter puts out a very clean signal at a power in excess of one watt, and the receiver is very sensitive, in fact better than many big rigs. The external power and external antenna sockets allow one to use it as a fixed station when desired.

The TR2300 is amazingly small, much smaller than its predecessor the TR2200GX and uses a more sophisticated case design and modular construction making a really rugged rig. It comes complete with carrying case, shoulder strap, battery charger, external power cord, etc. Needless to say, you don't need any crystals!

And now some new goodies from Matlock



An interesting new range of station accessories aimed at the advanced short wave listener. Based on a mini rack system, each unit measures only 8 1/2" wide and 2 1/2" high and is individually designed to fulfil a particular need in the station. Any unit or combination of units can be mounted in the mini rack or, of course, used alone.



AX-1 Sky Changer. £27.00, including VAT — This is a complete station aerial switching system to allow instant connection of up to six different aerials or accessories to any one of six receivers. Both single wire and coaxial feeds are available and the additional facility of a variable attenuator which can be switched into the system to reduce receiver overload.



KX-2 Sky Coupler. £29.90, including VAT. An entirely new wide range aerial tuning system which covers the frequency range 500 KHz to 30 MHz thereby not only catering for all HF aeriels and receivers but for the first time the 500 KHz - 1.7 MHz range for the keen MW DX listener. Already selling like wildfire, this is the new standard for all SWL tuning units.

AP11 Audio Processor. £45.15, including VAT. A complete audio processing system to suit any receiver, the AP11 simply plugs into the receiver phone socket and provides a variable band width filter with variable frequency tuning as well as a tunable deep rejection notch to take out those difficult to deal with heterodyne whistles. Requires 12V DC for operation and really has to be handled to hear the benefits which a good audio processor can give. Transforms your DX listening.

DX-008D Programmable counter. £115.00, including VAT. The Rolls Royce of station counters, the DX-008D embodies more good ideas than any instrument we have yet seen. Incorporating its own 240V AC power supply, the DX-008D is basically a high stability digital frequency meter using a large 008D is that each digit in the counter can be individually programmed by simple slide switches (20 of them!) so as to include any IF offset, whether it be 10.7 MHz, 455 KHz, 1.6 MHz, 3.18 MHz or almost any IF in current use. Thus, by measuring the VFO in your receiver or transceiver, the operating frequency is directly displayed. For the equipment such as Collins, Trio and KW in which the VFO tunes high to low when the rig operating frequency is tuning low to high, the DX-008D can be switched to count down from zero instead of up from zero (if it's confusing, just call and ask us to explain). It doesn't matter if the receiver oscillator is above or below the signal frequency, the DX-008D can accommodate it. Truly the ultimate accessory for the man who needs to know his frequency — and at a similar price to many ordinary counters not having the facilities.



FOR 2 METRES OR MARINE



TUNABLE + CRYSTAL CONTROL FOR UNDER £50



NEW PRICE £168 inc VAT

SURELY THE MOST AMAZING HAND-HELD TRANSCEIVER YET!

The AR240 is a truly staggering rig. In a small hand-held unit, you have a fully synthesized 2 metre FM transceiver covering 144-148 MHz in 5 kHz steps. Frequency selection is by direct reading top mounted decade switches giving instant access to any frequency in the tuning range. Power output is over 1W and the receiver sensitivity is not only excellent, it's maintained across the full tuning range by automatic voltage controlled tracking. Both up and down 600 kHz repeater shifts are built in as is a 1750 Hz tone burst.

What more could you ask for in a hand held, except possibly a price of £168 including VAT?

LOWE ELECTRONICS HEAD OFFICE AND SERVICE CENTRE

CHESTERFIELD ROAD, MATLOCK, DERBYS. TEL: 0629-2817 or 2430. TELEX 377482. OPEN 9-5.30 TUES-SAT. PHONE IN 9am-9pm.

Agents: John, G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex, Ringmer B12071. Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr Glasgow. 041-771 0364

COME AND SEE US SOON — IT'S WORTH THE VISIT. 73 DE G3PCY

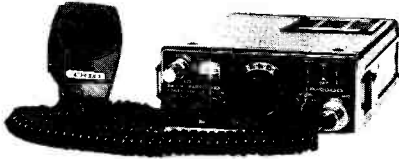
WATERS & STANTON ELECTRONICS

SOUTH EAST TRIO CENTRE



COMMUNICATIONS HI-FI

TRIO TR2300 80CH PORTABLE £199



The TR2300 is a remarkable package which combines all the advantages of a portable station with those of a mobile transceiver. In many ways it's the ideal "starter rig" in amateur radio. Full band coverage from 144-146MHz in 80 x 25kHz channels plus 600kHz repeater shift and 1750Hz automatic tone-burst complete its versatility. The dial is directly calibrated in frequency and has illumination for night use. The transmitter is exceptionally clean with an output power in excess of 1 watt. Receiver sensitivity is every bit as good as the best mobile rigs and either internal batteries or an external DC source may be used. Fits easily into a suit case or on a corner of a desk and makes a really compact mobile rig. Price includes carrying case, shoulder strap, battery charger, external DC cord and, of course, the Waters & Stanton 12 month warranty. An absolute bargain — we even sell them to our staff!



TRIO

R1000

TRIO

The R-1000 uses an advanced PLL system in an up-conversion scheme to a high (48MHz) first IF to remove any possibility of image responses. The receiver covers the entire frequency range from below 200kHz right up to 30MHz in 30 bands, each 1MHz wide. The bands are selected, not by ambiguous knob twiddling as in receivers using the Wadley loop but by a 30 position band switch which controls the PLL system.

The band switch also electronically selects the appropriate band pass filter network in the RF stages of the receiver so there are no "preselector" or "antenna trim" controls to twiddle — simply set the band switch to the range required — that's it!

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As for what else is inside this superb instrument — selectivity is catered for by three custom made IF filters; a 12kHz wide AM filter; 6kHz narrow AM filter; and a new 2.7kHz SSB filter with a shape factor of better than 1:2 6:60dB. Selectable sidebands are available at the touch of a switch.

For the first time in mid-price receiver, a true noise blanker is provided to remove pulse type ignition noise.

To minimise front end overload, a step RF attenuator is included which gives 0-60dB attenuation in four steps.

All the rear panel connectors are recessed on a sloping panel so that you can stand the receiver either on its back, or pushed hard against a wall when used in conventional shelf mounting. The antenna inputs allowed the use of either a high impedance wire aerial or a 50ohm balanced input so that the proverbial long lump of wire will work really well with the R-1000.

£298 inc. VAT SECURICOR DELIVERY

WATERS & STANTON ELECTRONICS

SHORT WAVE LISTENERS . . . OUR RECEIVERS ARE BETTER—WHY!

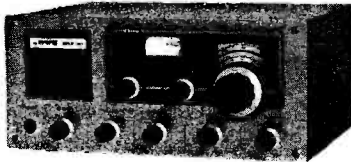
In choosing a receiver you'll want to be sure that you're making the right choice. There's quite a few to choose from but do not fall into the trap of thinking that a receiver produced by any of the large domestic hi-fi manufacturers and purporting to be a "true short wave or communications receiver" is necessarily a sound investment! We've been in the communications business long enough to know the good ones from the rest. Listed below are the ones we can recommend as best buys.

All are produced by acknowledged leaders in the communications field and all will give you hours of satisfactory and enjoyable listening, whether it be amateur or broadcast stations you wish to monitor.

But, to make sure you really are getting the best value for money, it's no good purchasing a sealed box. All the receivers listed below have travelled many thousands of miles and are produced on a production line where final alignment time is limited. That's why we test each receiver carefully before selling it. Our tests involve the use of several thousand pounds worth of instrumentation and it's because of this that we can guarantee you that a receiver purchased from us is quite likely to be better than a similar model purchased elsewhere.

Don't therefore take risks with your hard earned cash. Our advice is free and so are our pre-delivery checks — we can deliver anywhere in the U.K. and can quote competitive H.P. terms and accept telephoned orders against Access or Barclaycard — so if it's a receiver you want, come to Waters & Stanton Electronics, one of the largest amateur radio outlets in the U.K.!

LOWE SRX30



The SRX30 is designed as a budget priced receiver that outperforms many receivers costing 3 times as much. Featuring the Barlow Wadley loop, it will enable you to explore the exciting world of short wave radio — amateurs, broadcast, aircraft, shipping, etc. This is a completely self-contained package, having all the features necessary for complete and reliable coverage of the frequency range 0.5 MHz to 30 MHz.

£178 inc. VAT and delivery

YAESU FRG7



The FRG7 is one of the best known receivers. Many thousands have been sold and for value for money it's hard to beat. Based on the Barlow Wadley loop, this sensitive receiver is able to cope with today's crowded air waves. SSB/CW/AM — all are copied perfectly — the receiver has thirty 1 MHz bands with excellent bandwidth, operates from 230 volts or 12 volts and built-in speaker — frequency coverage is 0.5 MHz to 30 MHz.

£214 inc. VAT and delivery

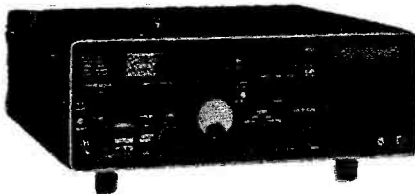
ASK ABOUT SUITABLE AERIALS & MATCHING TUNERS

Dear Sirs,
 Thank you for your most excellent service and unbiased advice when I called in to purchase a short wave receiver. I might say that I did intend to buy in London but when I was told by one dealer that their repairs were done elsewhere, I became suspicious. How confident I was when I saw your large service department — my message to any other customer would be: Go to Waters and Stanton — they have the experience and facilities at their new premises that far exceeds any other retailer in the South I have visited

R. THOMSON, London, E17.

ASK ABOUT AIR BAND MONITORS

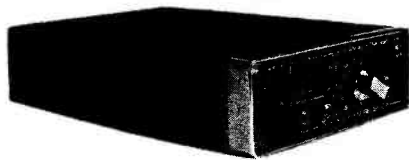
YAESU FRG7000



£375 inc. VAT and Delivery

The FRG7000 is based on the successful FRG7 design with a host of features that make it a deluxe receiver for the really serious short wave listener. Digital readout, electronic clock and timer, superb selectivity all go to make up the receiver that everyone aspires to own. Frequency coverage is 0.2 MHz to 30 MHz and the clear digital readout makes it one of the easiest receivers to use.

FDK TM56B



£106 inc. VAT and Delivery

The TM56B is a highly sensitive VHF monitor receiver for listening to the popular 2 metre FM transmissions from amateurs throughout the U.K. Hear your local amateurs transmitting from their cars, or from home or through one of the many repeaters sited around the country. 230 volt AC or 12 volt DC operation is possible and a built-in auto-scan circuit monitors 4 priority channels. The receiver is supplied with xtals for the 10 most popular channels in the U.K. Extra crystals are stocked at **£2.45 each.** Marine version **£115**

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HOLD IT!

FDK PALM IV

1 WATT 6 CHANNEL 70cms HAND-HELD

Another first from our Japanese factory. The smallest, cheapest and finest 70cms hand-held ever to be offered to the radio amateur. And if we sound enthusiastic about this delightful little package, you're right. Look at what £159 buys — Palm IV fitted SU20; 6 channel capability; simplex, plus and minus 1.6 MHz shift; single xtal per channel (£3); xtal controlled automatic tone-burst; quarter wave flexible BNC whip; ni-cad rechargeable battery pack; 240V AC mains charger; external 12 volt cigar lighter; power cord; built in condenser microphone; 1 watt output and English operating manual. This is the ultimate in portability and slips easily into ones coat pocket. Optional accessories include leather case, HP7 external battery pouch for prolonged life and all the popular simplex and repeater channels ex-stock (£3 each or 5 for £12!)

£159 inc. 15% VAT ex stock

Also Palm II **£99***
2M Palmsizer **£149***

* Includes nicads
and AC 240v charger
SAE for Details



FDK MULTI-700E MK II

THE PERFECT 2M FM MOBILE TRANSCEIVER

12½ kHz or 25 kHz + 25 Watts

NEW
PRICE **£195 inc. VAT & Delivery**



Will your Rig operate on 12½ kHz?

THINK ABOUT IT!

When a transceiver has so many more features than its rivals and yet sells for less than most, then surely it can be rightly described as the "best buy" for 1979. Truly a concept of design that looks to the future as well as the present. Its powerful 25 watts makes it twice as powerful as its competitors and ensures more solid QSO's. 2 RF stages in the receiver ensure that the high power is matched by the most sensitive receiver on the market. No more xtals to buy, the Multi 700E comes 144.75 to 145.975 MHz in 25 kHz click tuned channels and for the 1980's 12½ kHz channels can be interspaced at the touch of a button. Repeater operation is taken care of at the flick of a switch for either normal repeater mode or reverse mode for listening on the input channel. Automatic xtal controlled tone-burst is built in and the power output is continuously variable down to 1 watt. Altogether a remarkable transceiver at an amazing price. Included in the package is a quick release mobile bracket, matching microphone, mounting hardware kit, DC fused lead and English operating manual. Send SAE for full details of the "PERFECT" rig.

STOP PRESS!

Mobile safety mics back in stock complete with boom and gear lever switching boxes. State transceiver model when ordering. **£20.95 inc VAT**

WATERS & STANTON ELECTRONICS

TRY OUR FAST MAIL ORDER SERVICE

SECURICOR OR MAIL ANYWHERE IN THE UK

STOP PRESS: New Trio TR2400 2m FM Digital handheld just arriving. Price including Ni-Cads and charger. £210 inc VAT.

TRIO TS820S 160-10m transceiver 200w digital £832.00 (3.75)	MML 432/100w linear amplifier MML-144/25W £48.30 (N/C)	Mustang 2Kw 20-15-10m Hy-gain 12 AVQ 20-15-10m £43.00 (2.00)
TS820 160-10m less digital £710.00 (3.75)	SEM 2m converters £23.00 (N/C)	Hy-gain 14 AVQ 40-10m £60.00 (2.00)
SP820 External speaker £39.00 (1.50)	70cms converters £23.00 (N/C)	Hy-gain 18 AVT/WB 80-10m £87.00 (2.25)
TS520SE 160-10m transceiver 200w £485.00 (3.75)	2m pre-amp £13.22 (N/C)	Mosley TD3JR 20-15-10m dipole £26.00 (1.00)
SP520 External speaker £18.00 (1.25)	2m auto switching pre-amp £17.83 (N/C)	Mosley RD5 SWL ham dipole 31.00 (1.00)
VFO520S External VFO £103.00 (3.75)	70 cms auto switching pre-amp £20.90 (N/C)	EL-40X 80-40 Mini dipole £39.50 (1.00)
TS120S 80-10m Solid state 200w £495.00 (3.75)	2m PA3 pre-amp £8.00 (N/C)	HF5 5 band vertical £41.50 (1.00)
TS120V 80-10m Solid state 10w £408.00 (3.75)	70cm PA3 pre-amp £10.00 (N/C)	VHF ANTENNAS (JAYBEAM) 4Y/4M 4el yagi £17.20 (2.00)
PS20 AC PSU (TS120V) £52.00 (3.75)	2m 48 watt linear/pre-amp £66.70 (0.95)	C5/2M 5db colinear £40.00 (2.00)
PS30 AV PSU (TS120s & TS180s) £98.00 (3.75)	S023q sockets £1.73 extra	5Y/2M 5el yagi £10.25 (1.50)
MB100 Mobile mount £17.00 (0.75)	HF auto pre-amp 2-40mHz £14.95 (N/C)	8Y/2M 8el yagi £13.25 (1.50)
AT120 3 30mHz ATV £67.50 (1.50)	HF pre-amp 2-40mHz £10.90 (N/C)	10Y/2M 10el yagi £28.40 (2.00)
MC30S Desk microphone (Super!) £27.50 (1.50)	HF Z-MATCH ATU 80-10m £40.25 (1.00)	PBM10/2M 10el parabeam £33.60 (2.00)
MC30S Noise cancelling hand mic. £13.30 (0.50)	VHF MONITOR Rx's TM56B 12v/240 AC auto scan 10 ch's £106.00 (N/C)	PBM14/2M 14el parabeam £40.90 (2.50)
TR9000 2m all made approx £365.00	TM56B Marine model £115.00 (N/C)	5XY/2M X'd 5 element £25.85 (2.00)
R1000 Receiver £298.00	SR9 12v DC Amateur model £46.00 (N/C)	8XY/2M X'd 8 element £34.90 (2.00)
TR7625 2m FM mobile 25w 80ch £240.00 (3.75)	Extra xtals £2.45 (N/C)	10XY/2M X'd 10 element £42.50 (2.00)
TR2300 2m FM portable 80ch £199.00 (3.75)	FDK Multi 3000 2m All mode £495.00 (N/C)	Q4/2M 4el quad £21.50 (1.50)
MB2 Mobile mount (2300) £18.90 (1.00)	Multi 8000 2m 25 watts £289.00 (N/C)	Q6/2M 6el quad £28.50 (2.00)
TS180s 160-10m solid state transceiver £825.00 (3.75)	Multi 700E 2m 25 watts £195.00 (N/C)	D5/2M 5 over 8 £18.30 (1.50)
TR3200 70cm portable 3 ch. fitted £140.00 (3.75)	Multi Palm II 2m handheld £99.95 (N/C)	D8/2M 8 over 8 £24.85 (2.00)
TR2400 2m Scan hand held £210.00	M-11/Q16 xtals £5.00 Palm II & IV xtals £3.00	SVMK vertical kit £6.60 (1.25)
YAESU FRG-7 General coverage receiver £214.00 (N/C)	Multi-Palmsizer 2m synthesised 40 channel hand held £149.00 (N/C)	UGP/2 Ground plane £9.35 (1.25)
FRG-7000 Digital readout receiver £375.00 (N/C)	PIV 70cms handheld £159.00 (N/C)	HO/2M 2m halo £4.25 (0.75)
FT1012 Transceiver £575.00 (N/C)	DENTRON MLA 2500 160-10m 2Kw linear £699.00 (N/C)	HM/2M Above with 24' mast £5.05 (0.75)
FT1012ZD Digital Transceiver (F) £659.00 (N/C)	MT3000A 3Kw 160-10m tuner £180.00 (N/C)	C8/70cm 8db colinear £45.40 (2.50)
FT7B 50w Mobile Transceiver £399.00 (N/C)	160-10AT Supertuner 1Kw £99.95 (N/C)	DB/70cm 8 over 8 £20.45 (2.00)
FT225RD 2m Transceiver £615.00 (N/C)	JR Monitor 160-10m tuner 300w £59.95 (N/C)	PBM18/70 18 el parabeam £24.75 (2.00)
FT207RB Scan hand-held £198.00 (N/C)	W-2 160-10m PEP/SWR meter £59.95 (N/C)	M8M/48 70 el Multibeam £28.20 (2.00)
QTR-24D World Clock £25.80 (N/C)	MT200A Transceiver £399.00 (N/C)	M8M88/70 88 el Multibeam £37.50 (2.00)
FT272RB Scan 2m Transceiver £263.00 (N/C)	1Kw 80-10m linear 240v GLA1000 £295.00 (N/C)	8XY/70 8 el X'd yagi £31.05 (1.50)
LOWE RECEIVER SRX30 0.5-30MHz AM/SSB/CW £178.00 (N/C)	HF200A Transceiver £395.00 (N/C)	12XY/70 12 el X'd yagi £38.50 (2.00)
ICOM IC255E 2m Transceiver £255.50 (N/C)	AR AR240 Synthesised hand-portable £199.00 (N/C)	D15/1296 15 over 15 £30.95 (1.50)
IC260 t.b.a.	MIZUHO 2m SSB 1 watt portable £165.00 (N/C)	ACCESSORIES 9502 rotator £55.80 (1.75)
IC245 SSB/FM mobile P.O.A. (N/C)	Extra xtals £3.00	KR400 rotator £105.80 (2.00)
IC215E FM 3w portable P.O.A. (N/C)	NAIGAI 2200 2m 500w PIP linear £485.00 (N/C)	AR40 rotator £54.50 (1.50)
MICROWAVE MODULES (New Prices!) MMT 432/28-S transverter £136.75 (N/C)	ADONIS MICROPHONES AM802G Compressor-3 outputs £59.95 (N/C)	Stolle 2030 rotator £56.00 (1.50)
MMT 432/144-R transverter £173.50 (N/C)	AM502G Compressor-1 output £39.95 (N/C)	Stolle 2010 rotator £50.00 (1.50)
MMT 144/28 transverter £90.75 (N/C)	HF ANTENNAS HQ-120-15-10m mini-quad £96.50 (2.50)	CDE44 rotator £109.00 (2.00)
NMC 144/2-4, 4-6 or 28-30 IF £21.85 (N/C)	C4 20-15-10m vertical £48.50 (2.00)	HAM-M MkIII rotator £159.50 (2.00)
NMC 144/28 LO converter £24.15 (N/C)	Mosley 20-15-10m mini-beam 600w £99.00 (2.00)	Shure 444 microphone £27.50 (0.75)
NMC 70/28 converter £21.85 (N/C)	Mosley 2Kw version £129.00 (2.00)	Shure 201 microphone £11.75 (0.75)
NMC 432/28 S converter £24.15 (N/C)	TA32 600 watts 20-15-10m £81.00 (2.00)	Shure 526T microphone Type II £36.35 (0.75)
NMC 432/144 S converter £29.90 (N/C)	TA33 600 watts 20-15-10m £118.00 (2.50)	Hand Morse key £9.70 (0.50)
NMC 28/144 10m up converter £32.00 (N/C)	All prices include VAT at 15% Carriage costs shown in brackets	EK121 Electronic "Bug" £31.00 (0.75)
NMC 28/144 10m up converter £20.70 (N/C)		50ohm balun £11.25 (0.50)
NMD 050/500mHz coupler £69.00 (N/C)		UR67 per metre £0.62 (0.05)
MMA 144 2m pre-amp £14.90 (N/C)		UR43 per metre £0.22 (0.03)
NMD 500P 500mHz pre-scaler £23.00 (N/C)		5 core cable per metre £0.30 (0.03)
NMV 1296 varactor tripler £34.50 (N/C)		HP3A high pass filter £3.00 (0.20)
MML 144/100w linear amplifier £142.50 (N/C)		Drake low pass filter £18.40 (0.75)
		TV 1 ferrite rings £0.35 (0.05)
		Plastic antenna insulators £0.25 (0.05)
		Twin SWR meters 3-150mHz £13.50 (0.50)
		JAYBEAM (HF) TB 3 ele 2Kw Beam £155.00 (2.00)
		VR3 Triband vertical £39.00 (2.00)
		HILOMAST LTD PNAM-1 Telescopes to 9m £244.00 (14.00)
		PNAM-2 Telescopes to 14½ £299.00 (15.00)
		SAE for details.

MONDAY-SATURDAY 9-5.30 **THE COMPLETE HAM RADIO CENTRE** EARLY CLOSING WED 1.00pm
 18/20 MAIN ROAD, HOCKLEY, ESSEX Telephone (03704) 6835 Telex 897406
 PHONE ORDERS ACCESS BARCLAYCARD MAIL ORDER RETAIL CALLERS
 AGENTS:- G3PWJ (03844) 77778 G3WRA (0432) 67864 G8NMU (0272) 669454 G3XTX (0708) 68956 GM3GRX (0324) 24428

PAUL
G3VJF



IT'S HERE!! GET HER (OR HIM) TO BUY YOU ONE FOR XMAS! **THE MOBILE OF CHOICE FROM THE WORLD FAMOUS ICOM STABLE — THE IC-255E**



**25 WATTS — 5 MEMORIES — SCANNING — 600 KHz AND USER SELECTABLE
REPEATER SHIFT — FULL COVERAGE IN 5 KHz or 25 KHz STEPS**

We have had a poke around one of these little beauties and are certain that Icom, yet again, have come up with a winner. As you can see, it has the expected smart Icom appearance. Features include:—

- ★ Crystal controlled Tone Burst
- ★ Full band coverage — extendable to 148 MHz if required
- ★ Four digit LED display
- ★ 25 Watts output or 1W low power. A superb receiver using grounded gate FET front end
- ★ Scanning over a user programmable range
- ★ Memory scan
- ★ Stop on empty or busy channels
- ★ Tuning in 25KHz or 5KHz steps
- ★ 5 Memories — retained while the power is connected to the rig
- ★ Built-in 600 KHz Repeater shift
- ★ Alternative programmable shift
- ★ Reverse Repeater facilities
- ★ RIT (± 3 KHz) for those off channel stations
- ★ Scan control from the microphone (an optional mic available shortly)
- ★ Good loud audio
- ★ Optically coupled tuning between control knob and CPU
- ★ Multiway 24 pin socket on back for touchpad, computer, or external control (note the current RM3 cannot be used but a new version is to be introduced)
- ★ Rugged modular PA (guaranteed of course!)
- ★ Mobile mount which can be padlocked

At £255 including VAT these are such value for money that demand may exceed supply for a while — but they are worth waiting for! (Delivery is free of course by Registered First Class Letter Post.)

FROM

THANET

OF COURSE



**DON'T WORRY — WE GUARANTEE
ALL SOLID STATE RIGS
INCLUDING PAs
IC-211E
2m
All-mode**

**DAVE
G4ELP**



Covering the full 2 metre band with fully synthesised multi-mode operations, the IC211E is the most advanced, highest quality 2 metre transceiver available anywhere. The IC211E comes complete with ICOM's single-knob frequency selection and two digital VFO functions, standard features at no extra cost.

The large weighted flywheel knob mounted with low friction ball bearings is used to drive an optical chopper to provide pulses to the synthesiser LSI, which shows a full 7 digit readout. A braking mechanism, which operates electrically, engages to provide a smooth feel, at slow speeds; and a "dial lock" button holds the reading at the time it is pushed, even though the knob continues to rotate.

The IC211 incorporates computer compatible interface via the 24 pin accessory socket on the rear which enables PIA connection for the micro-processor buff.

The IC211's synthesiser steps are displayed, with positively no time lag, backlash or uncertainty in display stability, in increments of 100Hz or 5kHz from 144-146MHz. Any offset for repeater use can be programmed.

SMALL ENOUGH FOR MOBILE!

The IC211 contains both 240v ac and 13.6v dc power supplies and has a built-in high SWR autopower control. Variable output power contributes to the IC211's versatility. Output between 500milliwatts and 10 watts may be front panel controlled on FM.

More of the maximiser's built-in standard features include: a pulse type IF noise blanker; front panel discriminator meter, SWR meter; VOX with adjustable VOX gain delay and antivoix; CW monitor volume level; and semibreak-in CW operation.

And your new IC211 carries the THANET 1 year warranty backed by spare parts and technical expertise if bought directly from us.

COMPARE THE IC211 WITH THE OTHERS! £549 inc. VAT

**Computer compatible — the Best!
IC-701 HF £899**



ICOM's superior LSI technology takes the lead in Amateur HF. The extremely compact IC-701 delivers 100 watts output from a completely solid state, no tune (broad band design) final, on all modes and all bands, from 160-10 M. With single knob frequency selection and built-in dual VFO's, the LSI controlled IC-701 is the choice in computer compatible, multi-mode Amateur HF transceivers.

The IC-701's single frequency control knob puts fully synthesised instant tuning at a single finger tip. WIDE bandwidth, with 100Hz per division and 5kHz per turn, is instantly co-ordinated between the smooth turning knob and the synthesiser's digital read-out with positively no time lag or backlash (no waiting for counter to update: less operator fatigue). And at the push of the electronic high speed tuning button, the synthesiser flies through megacycles at 10kHz per step (500Hz per turn).

The computer compatible IC-701 LSI chip provides input of incremental step

or digit-by-digit programming data from an external source, such as the microprocessor controlled accessory which will also provide remote band selection and other functions.

Full band coverage of all six HF bands, and continuously variable bandwidth on filter widths for SSB, RTTY, and even SSTV, help to make the IC-701 the very best HF transceiver ever made. IC-701 includes two CW widths, all of this standard at no extra cost.

Sold complete with the high quality electret condenser base mic (SM-2), the IC-701 is loaded with many ICOM quality standard features. Standard in every IC-701 are two independently selectable, digitally synthesised VFO's at no extra cost. Also standard are a double-balanced schottky diode 1st mixer for excellent receiver IMD, and RF speech processor, separate drop times for voice and CW VOX, optionally continuous RIT, fast/slow AGC, efficient IF noise blanker, fast break-in CW, and full metering capability.

FROM

THANET

OF COURSE



Tried — Tested and Popular . . .



THE LEADER BASE STATION

IC-211E

Fast becoming one of the most popular base station rigs because of its superb performance and advanced technology, the IC-211E leads the field in 2M base stations. With a full synthesizer which employs state of the art technology it provides all you want for full coverage on FM USB, LSB or CW on 2 metres with that extra bit of quality for which ICOM are so renowned, plus the chance to use the latest digital technology and even drive it from your home computer if you wish!

Less VAT = £477.39 With VAT = £549

"New"



THE MOBILES

IC-255E 25 watt FM!

- ★ 25 watt output (1 watt low power).
- ★ 5 memories.
- ★ 2 VFOs.
- ★ Built-in scanner (with optional mic for scan control from the mic). Can scan the whole band, a selected portion, or just the memories.
- ★ Normal and reverse repeat — 600 kHz shift built-in plus another user programmable shift, from the front panel (for 70 cm transverting?).
- ★ Size 64 x 185 x 223 mm.
- ★ Price **£255** in VAT.



IC-240
NOW £193 inc.



IC-280E
NOW £250 inc.

- ★ WITH SCANNER £260

As usual, ICOM have kept ahead with technology and have produced their revolutionary new IC-280E which uses a microprocessor to produce frequencies throughout the 2m band at the ideal 25kHz spacing required today. The IC-280 has the ideal advantage of being separable into two parts for easy mounting into today's cars which so often forget to leave space for a rig. The removable front panel, with all controls, is only 3" deep and will fit in any convenient spot — in the glove pocket, on the dash or even on the sun visor! The main part of the set can be mounted anywhere within 4 feet — or even further in many cases — under the passenger's seat is quite handy! Display is of frequency on an LED readout and there are three memories for your favourite channels. These are not cleared when the set is switched off as long as it is left connected to the car battery.

Less VAT = £217.50 With VAT = £260

The IC-240 is the ideal mobile rig for most people. Apart from the fact that it is quite a lot cheaper than most, it is, in fact, more suitable than many to use in the car while driving (and let's face it, it is under those conditions that most mobiles are used). It can be operated with ease without taking your eyes off the road and provides up to 22 channels (which is more than you are likely to need). Being synthesized, of course, there are no crystals to buy for extra channels. Full repeat, reverse repeat and automatic tone burst plus a low power facility are selectable from the front panel. By adding a 'Superscan' at a later date you can obtain full scanning facilities over the whole band at a VERY competitive price.

The IC-240 is a superbly built and very reliable piece of equipment as witnessed by the many thousands in use. All Icom equipment is built to a very high standard and the IC-240 is no exception. It has an excellently sensitive receiver and a very clean transmitter and will give you hours of headache-free pleasurable use — so why not get one now before the price goes up again!

240 Alone
Less VAT = £167.91 With VAT = £193.00

AGENTS (PHONE FIRST — All evenings and weekends only, except Norfolk and Burnley)

Scotland — Jack GM8GEC (031-665 2420)
Wales — Tony GW3FKO (0222 702982) Burnley — (0282 38481) Midlands — Tony G8AVH (021-329 2305)
North West — Gordon G3LEQ (Knutsford (0565) 4040) Yorkshire — Barnsley (022678 2517) Evenings
Barnsley (0226 5031) Days



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THANET ELECTRONICS

143 Reculver Road, Beltinge, Herne Bay, Kent (02273 63859)





... Simply the Best ...



IC-215
£162 inc.

The IC-215 is getting more and more popular also as it combines the advantages of a portable, which can be operated anywhere, with the ability to double as a low power base station by virtue of its 3 Watts of output and SO239 antenna connector on the back. Of course there are facilities to operate it from an external power supply, and if it is fitted with Ni-Cads you can arrange to trickle charge these at the same time. The batteries used are of a sensible size being C type (or U11) instead of the 'penlight' batteries used by most of its competitors. This gives at least three times the operating power when you are away from home which you will appreciate if ever you have run out of battery in the middle of QSO! It comes already crystallised up for 12 channels, S20, S22 and all the repeater channels 0 to 9. We think the extra power and larger batteries far outweigh the advantages of having the extra channels produced from a synthesizer.

Less VAT = £140.87 With VAT = £162.00



IC-202S
£199 inc.

ICOM's range of sideband portables has been recently expanded. The well known and tested IC-202E has now been improved in the form of the IC-202S which has lower side band fitted also and provides sidetone on CW. The receiver has been hotted up making it even more suitable for use as a base station, either barefoot or as a prime mover. The new IC-402 is the 70cm version of the 202S giving the same facilities as its 2m cousin over the range 432-435.2 MHz. Both use a very stable VXO circuit, to give fully tuneable coverage of the band a 200 kHz segments and both have extremely clean signals so that using them to drive a linear to the full legal limit presents no problems. We are very impressed with both the 202S and the 402.

IC-202S Less VAT = £173.04 With VAT = £199.00
IC-402 Less VAT = £255.65 With VAT = £294.00



IC-402

"New"



IC260E MULTIMODE MOBILE

This exciting new mobile offers you FM, USB, LSB and CW, all in a neat small package. All with a built-in scanner too! Will scan 3 memory channels or scan between two programmed frequencies stopping on a received signal **IN ALL MODES**.

Other features include: Noise blanker, CW break-in, CW monitor, automatic PA protection, microcomputer control, two independent VFOs, tuning steps of 1 KHz and 100 Hz in SSB and CW or 5 KHz and 1 KHz in FM, full frequency readout in bright LED. Fast/slow AGC. don't hesitate to ask for more details.

Phone — or put a message on the ansafone for further details
ALSO AVAILABLE FROM OUR SHOP IN HERNE BAY

MICROWAVE MODULES WESTERN ANTENNA SPECIALISTS J-BEAM
STANDARD BEARCAT G WHIP YAESU MUSEN RSGB PUBLICATIONS

HP AND PART EXCHANGE WELCOMED

AMATEUR ELECTRONICS UK

AEUK — Your number one

AS FACTORY APPOINTED DISTRIBUTORS WE OFFER YOU—
WIDEST CHOICE, LARGEST STOCKS, PROMPTEST DEAL AND
FAST, SURE SERVICE RIGHT THROUGH



Access or attractive
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available for on-the-
spot transactions. Full
demonstration facili-
ties. Free Securicor
delivery.



HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ¼ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

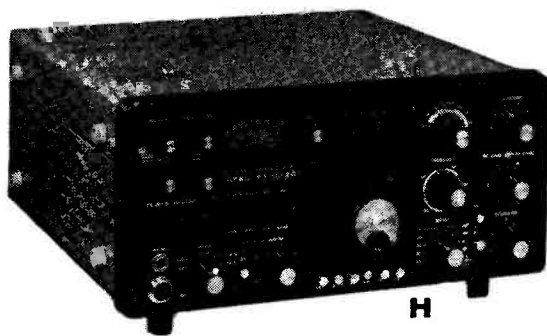
FROM THE WEST AND SOUTH WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M6 at junction 4 or 3 and proceed to inner ring road. Turn south on ring road and leave on A47 (East). We are located three miles from this point.



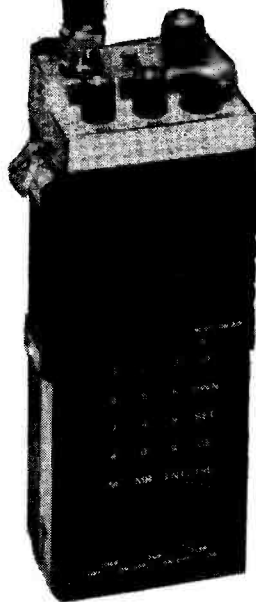
Hours: 9.30-5.30 Continuous Including Saturdays—Early closing Wednesday, 1pm

AMATEUR ELECTRONICS UK

source for YAESU MUSEN



This month we show just a portion of YAESU's ever-growing range although included is the exciting new FT-207R microprocessor controlled 2 metre hand held. Time did not permit us to feature the new all solid state FT-107M HF Transceiver as displayed at Leicester but when this appears in print our first deliveries should be through. (Please see below regarding full literature.)



A — FT-202 ultra-compact 2m FM hand-held. Weighs less than a pound, comes in like a ton of bricks!

B — FT-901DM Competition Grade all-band HF Transceiver — strictly for that class of operator who will insist on the best and *only* the best!

C — What would the aspiring SWL do without the sturdy FRG-7? Used in thousands throughout the world and giving better performance than many a more expensive set.

D — FT-227R Memorizer 2m mobile. Sophisticated electronics coupled with the usual Yaesu high quality construction makes this the best scanning rig on the market.

E — FT-225RD 2m all-mode base station. Whatever the options you'll never find a finer VHF rig and its new low price makes it the best buy on the market.

F — Dedicated SWL's **please note**. When you invest in that receiver to end all receivers don't cut corners on cost and regret it at your leisure. With the famous FRG-7000 General Coverage Receiver you find the very best in electronics together with superb mechanical construction in a *non-miniature* set that does justice to your station and yet is light weight enough for complete portability.

G — Here's a brand new FT-207R which is selling like wildfire simply because it's the best synthesized 2m hand-held on the market. Anyway what else would you expect from something with the YAESU label on it?

H — What can be said about the superb FT-101ZD HF Transceiver? Apart from the fact that it is really excellent value for money there are features which leave many other makers' products standing. Don't take our word for it, however, just listen on the bands!

The above is only part of the Yaesu story — for full details of all the models 36p in stamps will bring you the latest glossy catalogue of the full product range together with our credit voucher for £3.60 — A 10-1 Winning Offer!

AND WHAT ELSE IS AT AMATEUR ELECTRONICS?

The short answer is 'PLENTY', but the full reply is a very lengthy one indeed these days. Quite apart from the host of accessories and ancillary units stocked we import the superb SWAN range as per our recent advertisements and carry ATLAS equipment and latterly the full ICOM range. Add to these the superb new STANDARD RADIO models and you'll soon see that a visit could be well worth while. If you can't make it, of course, then we shall be pleased to send you all the information you require by return of post. Have a very Happy New Year!

- BRANCH: AMATEUR ELECTRONICS, UK — COASTAL, CLIFTONVILLE,
KENT, KEN McINNES, G3FTE, THANET (0843) 291297. 9 am-10.30 pm.
- BRANCH: AMATEUR ELECTRONICS UK — SCOTLAND, 287 MAIN STREET, WISHAW
LANARKSHIRE, GORDON McCALLUM, GM3UCI.
TELEPHONE WISHAW 71382. (EVENINGS CARLUKE 70914).
- AGENT: WALES & WEST — ROSS CLARE, GW3NWS, CAERLEON, NEWPORT.
(CAERLEON 422232) — ONLY 20 MINUTES OVER THE SEVERN BRIDGE.



**508-514 ALUM ROCK ROAD
BIRMINGHAM 8**

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Telex 337045 6313**

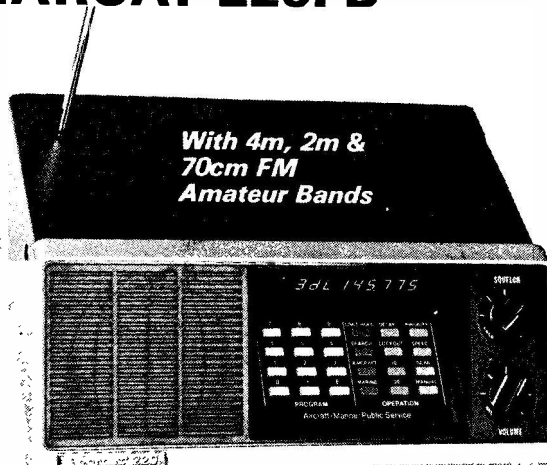
RADIO SHACK for BEARCAT 220

THE VERSATILE BEARCAT 220FB

Bearcat® 220FB

Features:

- **20 Channels/2 banks** — Scan up to 20 frequencies at once or either of two banks of 10 channels.
- **7 Band Coverage** — Includes Low, High, UHF, UHF-Gov't and UHF-T public service bands, the 2-meter amateur (Ham) band, plus the aircraft band.
- **Automatic Search** — Seek and find new, exciting frequencies.
- **Aircraft Search** — Automatically search the entire Aircraft Band.
- **Marine Search** — Automatically search Marine frequencies by pressing one button.
- **Priority** — Samples designated priority frequency on channel 1 every 2 seconds.
- **Limit** — Sets upper and lower frequencies of search range.
- **Speed** — Choice of either 5 or 15 channels per second scan and search speed for closer monitoring of desired frequencies.
- **Automatic Lockout** — Locks out channels and "skips" frequencies not of current interest.
- **Selective Scan Delay** — Adds a two-second delay on desired channels to prevent missing transmissions when "calls" and "answers" are on the same frequency. Patented by Electra.
- **Simple Programming** — Simply punch in the frequency you wish to monitor.
- **Decimal Display** — The large decimal display shows channels and frequency as well as features selected.
- **Patented Track Tuning** — Receive frequencies across the full band without adjustment. Circuitry is automatically aligned to each frequency monitored.
- **Crystalless** — Without ever buying a crystal you can select from all local frequencies.
- **Automatic Squelch** — Factory-set squelch automatically blocks out unwanted noise.
- **Direct Channel Access** — Move directly to desired channel without stepping through all channels.
- **Deluxe Keyboard** — Makes frequency and feature selection easy for simple programming.
- **Space age Circuitry** — Custom integrated circuits — a Bearcat tradition in scanning radios.
- **Rolling Zeros** — This Bearcat exclusive tells you which channels your scanner is monitoring.
- **AC/DC** — Operates at home or in authorised vehicle.
- **UL Listed/FCC Certified** — Tested for sale, quality design and manufacture.



Bearcat 220 £210.00 ex. £241.50 inc.

Bearcat® 220 FB

Specifications

Frequency Range:

Low Band Mobile	66- 88MHz
Aircraft	118-136MHz
Amateur Band	144-148MHz
Public Services & Marine	148-174MHz
UHF Amateur	420-450MHz
UHF Band	450-470MHz
UHF Band	470-512MHz

Size:

10 $\frac{1}{2}$ " W x 3" H x 7 $\frac{1}{2}$ " D

Weight:

5 lbs.

Power Requirements:

240V AC, 50 Hz.
12-15V DC, 8 Watts

Audio Output:
2.0 W rms.

Antenna:
Telescoping (Supplied)

Sensitivity:
0.6 μ v for 12dB Sinad on L and H bands
 μ bands slightly less
1.0 μ v for 10dB S/N on aircraft
Scan Rate:
5 or 15 channels per second

Connectors:
External antenna; external speaker;
AC power, DC power

Accessories (included):
Mounting bracket and hardware;
DC cord

Hear It All With One Antenna

Total Frequency Coverage

— 40 To 700 MHz

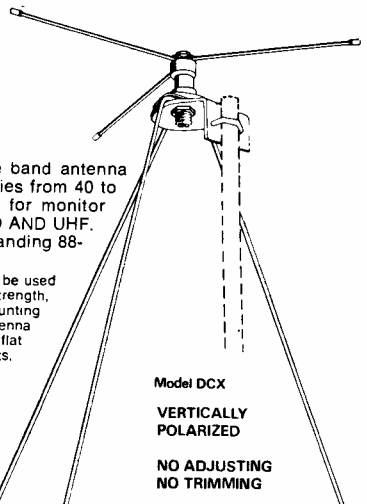
DISCONE

The Hustler Discone Model DCX is a wide band antenna and has complete coverage of all frequencies from 40 to 700 MHz. This design is especially suited for monitor radio reception of LOW-BAND, HIGH-BAND AND UHF. As a plus feature, use the Discone for outstanding 88-108 MHz. FM stereo reception.

The Discone is easy to assemble and install and may be used with any length coax cable. Manufactured from high strength, solid aluminum rod, zinc plated hardware and mounting assembly, complete with SO-239 connector. Antenna mounts on vertical support up to 1 $\frac{1}{4}$ " O.D. or on a flat surface. Cone elements, 55" in length. Disc elements, 20" in length. Shipping Wt. 2.5 lbs

Discone With Cable

Discone antenna supplied with 50' coax and factory installed connectors; PL-259 one end and monitor pin plug type on the other. Shipping Wt. 4.5 lbs.



RADIO SHACK LIMITED
TELEX 23718

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TELEPHONE 01-624 7174

RADIO SHACK LTD for DRAKE



Designed and made by R. L. Drake Co, in Ohio USA

for details send 15p stamps or
4 international reply coupons

DRAKE PRICES

(Inclusive of 15% VAT)

		£
TR-7/DR-7	Transceiver, gen. cov. receiver & Digital	897.00
PS-7	Power Supply 120/240v for TR-7	158.70
RV-7	Remote VFO for TR-7	126.50
MS-7	Matching Speaker for TR-7 & R-7	25.30
R-7/DR-7	Receiver 0-30 MHz	833.75
SL-300	CW Filter for TR-7 & R-7 (300Hz)	39.10
SL-500	CW Filter for TR-7 & R-7 (500Hz)	39.10
SL-1800	SSB/RTTY Filter for TR-7 & R-7 (1800Hz)	39.10
SL-4000	AM Filter (4000Hz) for R-7 Receiver	39.10
SL-6000	AM Filter for TR-7 & R-7 (6000Hz)	39.10
AUX-7	Range Programme board & 1 Receive Module	32.20
RRM-7	Range receive modules (500kHz) for AUX-7	5.52
RTM-7	Range transceive modules (500 kHz) for AUX-7	5.52
NB-7	Noise Blanker for TR-7	66.24
FA-7	Fan for TR-7 & PS-7	18.40
MMK-7	Mobile mounting kit for TR-7	34.50
MN-7	ATU/RF Wattmeter 160-10m, 250 w	124.20
MN-2700	ATU/RF Wattmeter 160-10m, 2kw	197.80
WH-7	RF Wattmeter/VSWR bridge HF	59.80
385-0004	Service Manual for TR-7	16.50
7037	TR-7 Service Kit	37.95
L-7	Linear Amplifier 2 kw 10-160m	759.00
TR-4CW(RIT)	Transceiver AM/SSB/CW with R.I.T.	496.80
AC-4	120/240v Power supply for TR-4CW	109.25
34-PNB	Plug in Noise Blanker for TR-4CW	73.60
DC-4	DC Power Supply for TR-4CW	138.00
RV-4C	Remote VFO for TR-4CW	109.25
FF-1	Crystal Control for TR-4CW	39.10
MS-4	Speaker for TR-4CW, R-4C & SPR-4	25.30
TV-42LP	Low Pass Filter 100w	10.35
TV-3300LP	Low Pass Filter 2kw	18.40
RP-500	Receiver Protector	73.60
7072	Hand microphone for TR-4CW	13.80
7073	Hand microphone for TR-7	13.80
7077	Desk microphone for TR-7	25.30
DL-300	Dummy Load, 300 watts	20.70
DL-1000	Dummy Load, 1000 watts	37.95
RCS-4	Remote control antenna switch, 5 way	82.90
B-1000	Balun 4:1 for MN-7 & Mn-2700	19.40
1525-EM	Encoder microphone	36.80
AA-10	2m. Amplifier 1w in-10w output	46.00
WV-4	RF Wattmeter 20-200 MHz	69.00
SPR-4	Programmable general purpose receiver	460.00
DC-PC	DC Power cord for SPR-4	4.60
FL-Filters	For R-4C, .25/, 5/1, 5/4, 0& 6.0 kHz, each	39.10
Manuals	Spare operator manuals	5.00
Crystals	Accessory crystals for R-4C & SPR-4	5.06

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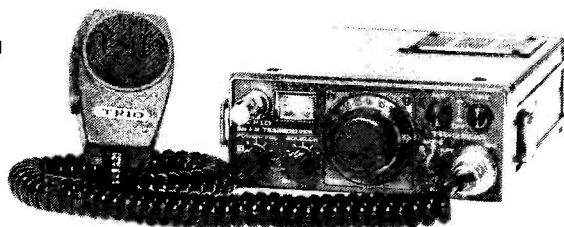
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SHORT WAVE MAGAZINE

ADVERTISERS' INDEX

	Page
Amateur Electronics UK ...	586-587
Amateur Radio Exchange ...	594
B. Bamber Electronics ...	640
J. Birkett ...	638
Bredhurst Electronics ...	626
British National Radio and Electronics School ...	638
BSW ...	644
Butterworth Co., Ltd. ...	639
Cambridge Kits ...	644
Catronics Ltd. ...	592
C.B. Electronics ...	639
Colomor Electronics Ltd. ...	643
Crayford Electronics ...	643
Datong Electronics Ltd. ...	625
G2DYM Aerials ...	643
G3HSC (Rhythm Morse Courses) ...	643
D. P. Hobbs Ltd. ...	644
K.W. Communications Ltd.	637
Lee Electronics Ltd. ...	627
Leeds Amateur Radio ...	644
London Car Telephones ...	643
Low Electronics <i>front cover, inside front cover, 577</i>	643
M.H. Electronics ...	643
Partridge Electronics Ltd. ...	641
P.M. Electronics Services ...	636
Quartslab Marketing Ltd. ...	635
Radio Shack Ltd. ...	588-589
R.T. & I. Electronics Ltd. ...	637
SEM ...	634
South Midlands Communications Ltd. 630-631-632-633	640
Spacemark Ltd. ...	640
Stephens-James Ltd. ...	628-629
S.W.M. Publications back cover, IBC	642
Thanet Electronics ...	582-583, 584-585
T.M.P. Electronics ...	640
Uppington Tele/Radio (Bristol) Ltd. ...	643
Reg Ward & Co. Ltd. ...	640
Waters & Stanton Electronics 578-579-580-581	643
Geoff Watts ...	643
Western Electronics (UK) Ltd. 590-591	643
W. H. Westlake ...	643

(GB3SWM)

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Vol. XXXVII

JANUARY, 1980

No. 435

CONTENTS

	Page
Editorial — <i>WARC '79 Stop Press</i>	595
Communication and DX News , by <i>E. P. Essery, G3KFE</i>	596
The "S.C.D." — <i>Part I</i> , by <i>Rev. G. C. Dobbs, G3RJV</i>	599
Clubs Roundup	603
Digital Frequency Readout and Other Improvements for the Yaesu-Musen FRG-7 Receiver, Part I , by <i>Robert Dawson</i>	608
"SWL" — <i>Listener Feature</i>	614
Two-Metre Omni-Directional Masthead Aerial , by <i>F. G. Rayer, T.Eng(CEI), G30GR</i>	617
A Digital Channel Selector for the IC-240 , by <i>Ian H. Moth, B.Sc., GM8SOH</i>	618
VHF Bands , by <i>N. A. S. Fitch, G3FPK</i>	620

Editor: PAUL ESSERY, G3KFE/G3SWM

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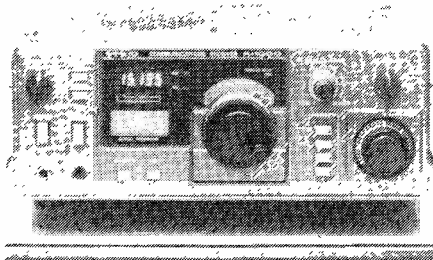
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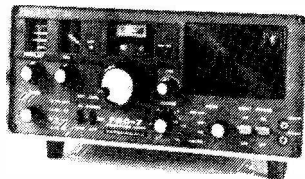
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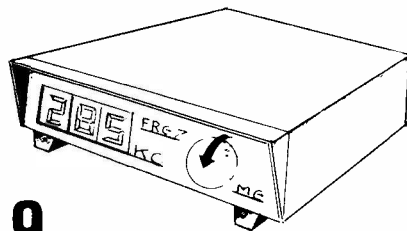
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Magazine

EDITORIAL

WARC '79 Stop Press

As this issue was closing for press we received from ARRL Hq their Bulletin No. 121, addressed to all radio amateurs, which reads in part as follows. "The final plenary meeting of WARC '79 was completed on the evening of Monday, December 3rd, and Amateur Radio has fared extremely well. Because of the pressures on the spectrum it would have been a victory to have maintained the status quo; but we have more than maintained the status quo. There are three, repeat three, new amateur bands at 10, 18 and 24 MHz. In addition there have been significant improvements in our VHF status".

We shall of course publish full details about the changes as they come to hand; but in the meantime, all of us here at *Short Wave Magazine* would like to thank, on behalf of U.K. radio amateurs, those who worked so hard at the Conference for the interests of all radio amateurs everywhere.

John
3KFE.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

The Bands

As one would expect the peak of a sunspot cycle; even the bad days are better than the wildest dreams of, say 1976, and the contributor who described conditions on a certain day during the period as "fabulous" proves by his list just how good it really was.

This being the case, one supposes we should look and see what is on the cards. G3RCA has passed round the word that VP8SU is on South Georgia and will be there for the next year or so. By the time this in print it is hoped there will be an FT-101 in the shack, which will expand the operating facilities a little, currently 14 MHz SSB and 7 MHz CW — so January may see him on any band or mode and without a list operation.

Lloyd and Iris closed down their operation from J3ABV (VP2G) after knocking up some 10,000 contacts — which was the best they have ever done during a 3-4 week stopover. There was DXCC in the log by the end of the first week, and again over the weekend of the CQ WW Phone, and when they moved on the log showed 153 countries worked. The next stop was St. Vincent and VP2SAX. QSLs should go to the Yasme Foundation, PO Box 2025, Castro Valley, Ca. 94546, U.S.A. We understand that this particular trip will be lasting about six months, the start with J3ABV being in October.

If you didn't work Desecheo, then you have a long wait ahead of you it seems, because KP4AM says licences are not being granted, even to U.S. residents. On the other hand if you want Palmyra or Kingman Reef, start tuning-up quick! We have it that K6LPL/KH5 will be on Palmyra late-ish (200z) January 4, with WA2FIJ/KH5K appearing some 12 hours later; on Forty they will be in the 7-7.1 MHz band, the rest being off-limits, and likewise Eighty will be to European band limits — that should live things up around 3798 KHz!

That 604LS job says he has got a 60 licence but that his operation is from the Panamanian ship *Jody* in Mogadischu harbour.

Personalities come next, and we will run down the letters as they come. Morgan, W4WFL, is now safely in Beirut University College. The serious shooting seems to go on in the centre of commerce and the docks areas of the city, but everywhere you go it is normal to hear the rattle of small arms fire as someone lets fly just for the hell of it. No-one takes any notice unless it happens to be one of the Russian guns which are of larger calibre and make a *lot* more noise. On the radio side, the FT-101 seems to have arrived safely, albeit with a mighty dent in the cover. But, as Morgan said, better a dented rig than none at all! It is hoped that the OD5 licence will be not too long in the obtaining. It would appear that most of the OD5s confine themselves to local nattering, but there are a few who do a bit of DX operating.

Next we have WIBB's Bulletin, and he notes that the fine HF-band conditions have reduced activity on Top Band; this is of course true but there can be no doubt whatever that the fall in Top Band activity is, on this side of the pond at least, much more to do with the fact that nearly all stations used to make a start on the band. If they had a good aerial and one of the locals was at all knowledgeable about Top Band DX-ing, then our newcomer was persuaded to get up betimes with a good chance of a W contact. Nowadays the newcomers go on two-metres and QSL each other for contacts made through a repeater, oblivious to the fact that each end has *worked the repeater only* and no way can a "QSO" through a repeater be called a contact between the two stations at the ends. (Trouble is, the repeater can't write and hasn't the money for QSLs anyway!). We hope that our continued support of Top Band activities will help, and of course that the outcome of WARC does not materially affect Top Band. WIBB himself is now at 148 countries worked and confirmed, and 75 years young; we guess he will be cutting down a bit on the all-night sessions out at the towers, where nowadays he has problems with vandals, dope addicts

and drunks — not to mention a highish noise level.

G3WW sends us a copy of his SS/TV CQ DX Award, he being number three in the world to achieve this on slow-scan. Congratulations!

We had part-expected to see G3NJ at the Leicester Show (or indeed have time to visit him) but it didn't for many reasons pan out like that. Nick still operates Eighty, though, in his chase for the QRP signals. In the first three weeks of November there were over 100 non-local contacts made on Eighty, some after dark and through the EU QRM, all on the HW-8. One particularly nice one was with OK2BMF of Brno, who was being chased but came straight back to G2NJ's flea-power call — three watts at G2NJ and 300 in Brno. Another very nice one was with G3GXW, Gerry, in the Royal Hospital, Chelsea; Gerry, a "Chelsea Pensioner," was using an indoor aerial of some ninety feet.

'CDXN' deadlines for the next three months—

February issue—January 10th

March issue—January 31st

April issue—March 6th

Please be sure to note these dates.

G3BTO (Basingstoke) writes to note that he activated his F0BMW call during the RSGB Top Band contest. On the transmit side there was a ten-watt Codar AT5, while reception was catered for by a Sentinel converter into a HW-101 on 14 MHz; the aerial was a dipole at around 30 feet in the centre in the inverted-V shape, the spot being Neuville-sur-Sarthe near Le Mans in Dept. 72. The gear was handed to the local club, F8GE, for MCC when it was operated on 1826 KHz CW, which is the spot frequency the Fs can use at times of international contests. F0BMW managed some 53 G contacts during his session on November 10, and F8GE a fairly small number. Anyone wanting a QSL for a

QSO with F0BMW or F8GE may send his card to G3BTO, either direct or through the Bureau.

A real 28 MHz and CW enthusiast is G2ADZ at Chessington who seems to have had quite a time. Mind, some got away, as for instance HM1AV, TG9ML, HH2T, VK1FT, and YN1JCC. The QRM level, even with the best of filters it was pretty high, but Bill managed with 8Z4A, HP1XEK, OA4IU, VE1-7, KL7CYL and KL7AF, ZL3KR and ZL3GQ, UAOLFK in Vladivostok, J28CB, F79WARC, VP2VJ, VP9KG, VP2SQ, VK5KO, VK2SB, KP2B (US Virgin Is.), J3ABV, ZF2BN, KH61BA, VO2CW, K9EF/8RI, ZE2MX, all W call areas, PY and LU.

the G3PKS signals on Top Band several times, but no reply from G3PKS — so Jack reckons he will have to apply himself to the matter of rectifying the deficiency, which means persevering with Top Band operation on a more regular basis.

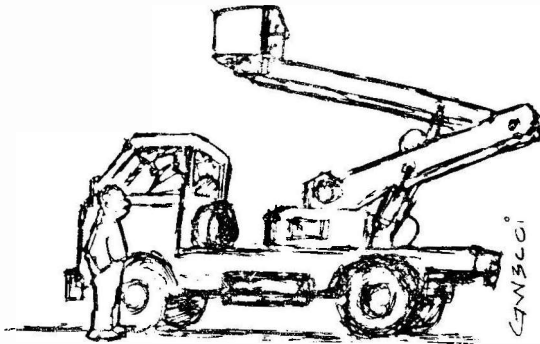
Our next item is the regular W1WY Contest Calendar, and we have the results to hand of the 1979 CQWW 160 'test. Looking at the Top Ten single-op outside USA, we see seven of the ten are Europeans, namely GD4BEG at third, G3SZA fourth, GU5CIA sixth; outside U.K. YU3EF was fifth, YV10B seventh, OK2KUB 8th, and a couple of Germans bring up in ninth and tenth place respectively. As for the first two places in this category, it is not very surprising that

Australian waters they count. Essentially you have to work the members in VK at one point a throw, or two if the QSO was on Eighty. No doubt G3LIK has some copies of the detailed rules, which include a statement that the application cost is 7 IRCs. It looks an interesting one.

Our latest letter from G2BJY (Walsall) indicates he is mildly under the weather, but fortified by home-brewed ale he still manages to appear on the bands — mainly 28 and 21 MHz, but also on occasion on Twenty and Eighty. Geoff has a 1952-vintage TV set which still works, but your scribe can beat this: he has an old Pye TRF for Channel 1 double-sideband which is either pre-war or a prototype of the post-war model, the difference being that the one here has an AC power supply with a mains transformer and isolation, whereas the post-war ones went straight to AC/DC techniques. The original 9in. tube gives quite a decent picture, admittedly with the aid of a solid-state EHT rectifier which replaced the original.

What next? G2HKU (Sheppey) has a blast at the complications in the modern commercial amateur gear, and wonders what one does when it fails. Either have adequate test gear and mend it, or send it to someone who can. The snag lies in that word "adequate"! Anyway, to Ted's DX and Top Band first: SSB with PA0PN, plus CW with RQ2GCR, DJ0GP, UK2PBP, F6BWO, F0BMW, DJ8SW, OK1DFF, UC2AAK, UQ2GBD, OK1DKZ, SP3DH, OH1HU, UR2RFK, OH2BO, OH2SX, F6CNI, UA2FCW, UQ2PM, HB7ALM, DJ5PN and DJ0PG. On 3.5 MHz the QRP rig was brought out to work PA5ODIN, and UP2BDW on CW. Just one contact noted on 7 MHz, with UA9WDDV, while on 14 MHz we see the usual SSB contacts with the ZLs — ZL1VN, ZL3SE, ZL3RS, and ZL3FV, plus CW with U18ADS, UL7TM, 9Y4W, and U18ADQ. CW again on 21 MHz, for 4U1UN and ZL3IS. That leaves 28 MHz, again CW, with FR0MM (Reunion Is.) and W0SD.

G2HLU (Earley) waxes philosophical about contests and the worth of contacts made during them. Harold initially reckons that they aren't "proper" QSOs with just an exchange of call signs (sometimes!) and a six-digit number. But then he



"... 'e wants to know if 'e can borrow the wagon to fiddle with 'is driven element..."

G3PKS and G3OTK (Wells) collaborated on a piece showing how an HW-101 can be converted for Top Band, which we have in the pipeline for an early issue. Of these two, G3PKS is the DX hunter and he mentions that his aerial seems to have a direct wire link over to North America on 28 MHz; as a result of this G3PKS keyed with W5HNS, VE3ESC, W6KRO, W6UA, KQ4C, N2BJP, 4Z4UO, K8BCV, K4ZRH, KB8IG, WD5FTH, WB0UZZ, WB7SPF, W8CD, K5RC, K5NU, PY2CC, K3TN, and NIACU. In one half-hour spell in a contest of some sort, Jack hooked N9MM, W3MM, K3QMR, W0YK, K3WW, K8MFO, K5VGK, K0RF, K9EYA, and AB4H. Turning away from Ten, a chat with Adam at SP9DH indicated that he has heard

KV4FZ led, followed by WA1RFM/VP9. Congratulations to all. Turning to the multi-op class, GM4GRC was first in the world, and K1PBW was top of the W/VE pile. The 1980 contest comes in the weekend January 25-26 with rules as in past years. The mailing deadline is February 29, and the new address is CQ Magazine, 160 Contest, 76 N. Broadway, Hicksville, N.Y. 11801.

Now to RNARS — member G3LIK who writes in with a copy of the 'Endeavour' Award, which in four colours looks as though it will be quite a fine decoration for the shack. To gain the award you are to work RNARS members who are resident in VK, or /MM in VK territorial waters, the latter covering the case of non-VK members; as long as they are in

recalls the CQ WW CW leg and thinks that if you could grab a choice bit of DX through that QRM, you have a good cause for patting yourself on the back and reckoning it as a tough QSO to manage! On a different tack, G2HLU heard a YU in a contest calling CQ at 35 w.p.m. and getting no takers; after a 'QRS' to the chap he slowed down to 25 and was promptly whipped from under the G2HLU nose by another G! Let's look at 28 MHz first, and on SSB, G2HLU talked to C5AAP, HI8XWL, JA1P1G/PZ, K1CO/PJ7, TF3IM, and VP2VFK; the CW gave him C6ACY, PJ2CC, all W call areas, YV6AZC, and 9Y4W. As for 21 MHz, CW first with C5AAP, CE3CEW, FR0MM, HH2MC, TG9CH, UH8HAI, all W call areas, ZD8TC, and 9Y4W, plus SSB with UI8LAG and VK4VU.

Now a bit more news on the QRP front, from G3RJV, who took a QRP rig with him on a hill-walking autumn holiday, with the evenings given over to a couple of watts into a 90-foot ended wire slung over a tree, matched by L-networks into a couple of counterpoises for 7 and 14 MHz. The first day was devoted to 7 MHz on which six members are known to have called him but he heard only one — but the six evenings on 14 MHz netted some 25 countries. That was not bad for a session at the base of the Ceiriog Valley!

Now for G4EAN (Nottingham) who has been occupied with the idea of forming a radio club for the Boots the Chemists who have about twenty amateurs spread across the country, not to mention anything going on with the U.S. or Canadian arms. On the home front, the aerial feeder has been brought down for inspection, and the operating area all varnished up and tidy. There was just time for 3 contacts, with W1HIF, K1QKW and W4VAC, all Ten SSB. An interesting

aerial point — Ian mentions that it is handy to have the vertical as well as the beam, as a change to the vertical on receive reduces the QRM. And, we suspect, it might also work the other way too.

A nice long letter from 'copper' Chris Page, G4BUE (Upper Beeding). Work-wise there has been a training course to attend, so all radio has been confined to weekends. On the QRO side, new countries were booked in by way of N4HX/TT8 on 21 MHz SSB, and C21AA on 20 metres SSB. 8Z4A was worked both with the big rig and QRP. Which brings us to the CQ WW CW contest, which was entered with the sole purpose of beating OA8V who pushed him into second place last year. It ended up with a claimed score of 481, 347 points from 923 QSOs and a multiplier of 237. All these following worked with less than five watts input: on 28 MHz, FR0MM, UH8HAI, VP2SX, NP4A, C6ANY, 9Y4W, KV4FZ, LU8DQ, VP2MD and FG7AS; 21 MHz gave EA9EU, VK3IRA, PJ2CC, VP2MD, TG0AA, 9Y4W, VP2VEQ, CP7GM, VP2SX, CX7CO, HH2MC, and LU6DYR; on 14 MHz, PJ2CC, VE1A1/1 (Sable ls.), ZL3GQ (by long path at 0400), KL7PJ, VP2VEQ, NP4A, 9Y4W, and HH2MC. Still further LF and on 7 MHz there was NP4A, PJ2CC, and some 39 Ws in W1-5; 3.5 MHz saw contacts with EA9EU, W1 and W3. On the weekend prior to the contest, Chris hung up two sloping dipoles, one *NW* and one *NE*, from 35 feet up the tower, and selectable. There was also the 7 MHz dipole inverted-vee at 30 feet, expressly for catching the high-angle Europeans, but the two slopers were put up with the very definite idea that they should work the DX — and they did. The text-books says you should have four or five, but the proof of the pudding . . . after all, if you can work 39 Ws with five watts

and two slopers, what could you do with four and full power!

On an entirely different tack, G4BUE sent along the details of the QRP Club activity weekends, which we shall be publishing in the February issue.

Our final bit is the BARTG Spring RTTY contest for 1980, which is over the weekend March 22-24, 1980. 30 hours operating out of a total time of 48, and the summary and log sheets, not to mention the full Rules, are to be found in the hands of Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

Future

As far as the writer is concerned, the sooner he can forget 1979 the better, certainly so far as CDXN is concerned. Every month we have had mail come in too late to take in, but quite clearly posted in what would have been ample time fifty years ago. And, of course, it would be nice if all those who got fed up with trying to keep up with our own irregularities last year were to return to the fold — we miss some of the humour in them, and they all added to the news value of the piece! Send all your news, views, scores and contributions to, as usual, "CDXN", Short Wave Magazine, 34 High Street, Welwyn, Herts. — to arrive by the due deadline.

From the next issue onwards, we will be starting a *Six-Band Countries Table*, giving country total band by band, and a seventh line for total countries, just as we used to; and we will set the entries out in order of a different band, or total countries changing each month. And we'd love to have lots of entries, of course!

And, final-final, our Best Wishes to you and yours for this 1980, and may it be peaceful and happy for all readers and contributors. 73, *es DX*.

Amateur radio retailers who also stock "Short Wave Magazine" include:— D. P. Hobbs Ltd., Amateur Radio Shop (G4MH), Derwent Radio, Waters and Stanton Electronics, Amateur Radio Exchange.

THE "S.C.D." — PART I

A LOW COST, LOW TECHNOLOGY, AMATEUR BANDS TRANSCEIVER PROJECT

REV. G. C. DOBBS, G3RJV

IT is something of an irony that at a time when technology is leaping ahead at a pace that leaves most of us gasping for breath, groups have arisen in most scientific fields which emphasise simplicity. Most of us have read about the "Appropriate Technology" groups, and in America the slogan K.I.S.S. (Keep It Simple Stupid!) has appeared. Certainly in the late '50s when I first became interested in amateur radio *all* of our technology seemed appropriate, relying on the easily available and cheap government surplus of the time and individual cunning. Since that time readily available commercial equipment and some of the complex methods of modern communication have diverted the hobby away from the home construction of amateur communication equipment.

The question remains — "Is it possible to enjoy communication on today's amateur bands with simple equipment?" Well at least several hundred members of the G-QRP Club do so all the time, as do many others. There is still a satisfaction in communicating with fellow radio amateurs using simple equipment built with one's own hands. Naturally QRP fans have their own axe to grind and like to win converts, but even if you are still going to run your QRO rig, or 2 metre "grey box", I can promise you a lot of fun, at little expense from this project.

The S.C.D. is a complete, simple, amateur radio station that can be built on a kitchen table with simple handtools, requiring no other test equipment than the average station multimeter. It can be built stage by stage, each stage representing a complete unit so all or just part of the project can be made. The stages are:

Part I: VXO Transmitter, Sidetone Generator.

Part II: Receiver section, VFO facility, transmit/receive arrangement.

Part III: Receiver filter, incremental tuning, SWR bridge and ATU.

The simple design reduces constructional working problems, component values and types are reasonably open to variation; low cost and easy construction has been the aim throughout.

The Transmitter

In a simple transceiver, the transmitter forms the heart and as such is most likely to give the most trouble for the constructor. The circuit, shown in Fig. 1, is one of the most reliable simple circuits I have tried and its basis has been passing around QRP circles for some years. This particular version is my modification of the W6YBP "Knobless Wonder". At a stage when building simple QRP rigs was almost an obsession with me, variations on this simple theme almost always seemed to produce good results. Apart from the ease with which this circuit seems to work, it has the distinct advantage of no critical tuned circuits: it is indeed possible to build a transmitter without a single knob control from the circuit.

The oscillator (TR1) is a Colpitts circuit using a cheaply available FET directly coupled into an FET untuned buffer stage (TR2). The basic transmitter shown here is crystal controlled with some VXO swing of the crystal frequency allowed by VC1; this may appear to be a serious setback for amateur band operation, but it does allow this transmitter, in its simplest form, to be used on the 80, 40 and 20 metre amateur bands. It is quite an asset to have a four-transistor transmitter which can work four bands. To change bands all one has to do is change crystal and change the output filter.

In the next section of this project TR1 will be shown working as a VFO circuit, but it is easier to get the transmitter working as a VXO circuit first. There are many crystals around for the 80 and 40 metre bands and at least one stockist still sells them at low cost. The transmitter is also simple to operate on the 20 metre band, but here suitable crystals can be more of a problem to obtain cheaply. Don't decry VXO working on the amateur bands: in the Spring of 1979, G3DOP using a VXO transmitter, even simpler than this one, and one crystal, worked 30 countries in about as many days on 20 metres!

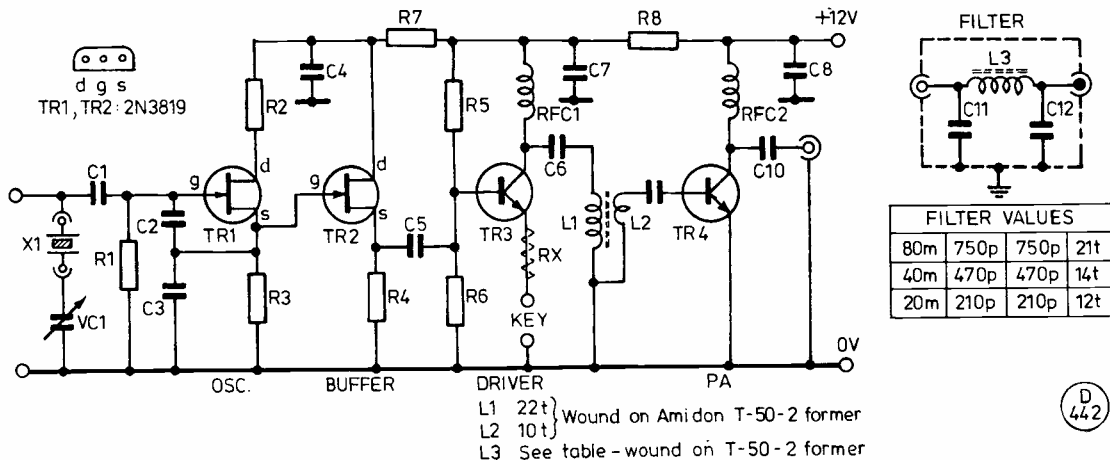


Fig. 1 TRANSMITTER

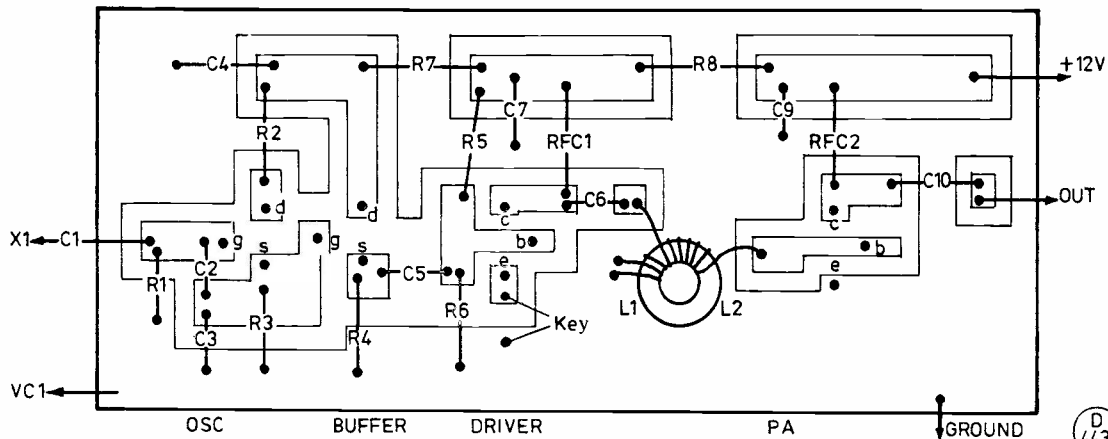


Fig. 2 TRANSMITTER LAYOUT (Actual size)

The two stages described above use the cheap 2N3819 FET. Some problems have been experienced with several circuits using this device: they are produced with a wide tolerance of specification, and the drain current of individual 2N3819's can deviate widely. However I have yet to experience problems with *this* circuit using the device bought from the cheapest source I know. The cautious constructor could explore the effect of trying several of the devices in TR1 and TR2 positions, or even be so rash as to buy the expensive MPF102 device. He could also spend £500 on a grey box!

The buffer feeds the signal, *via* C5, to an untuned driver stage. This stage is a little more critical, as can be seen from the surreptitious marking of R_x , but itself is quite simple; RFC1 can be almost anything and is open to experiment. (Don't buy expensive new chokes unless you really have no alternative.) This is the keyed stage; in fact I have tried to key every stage in this circuit, including the oscillator, and all seem to perform the task without any real problem. Another good alternative keying point is the PA stage between the top of RFC2 and the 12 volt line. R_x in the emitter line may be required to control the amount of drive, but more about that later.

The output from the driver stage is fed, *via* C6, to the RF Transformer L1/L2. This is a compromise, untuned, arrangement wound on a T-50-2 Amidon toroidal core. The method of winding is shown in the detail in Fig. 1. C9 then feeds the signal directly to the base of the PA transistor (TR4); this Power Amplifier stage is a simple untuned circuit again.

The PA may not be sophisticated, but it seems to work well with an input of some 2 watts DC. It has been said that the transistor is the "quickest fuse on three legs" and PA stages can put this to the test. This circuit seems to produce clean RF — a small claim to all but those who spent an evening or two with a solid state PA. Running this stage as an untuned PA feeding a broadband pi-output filter really does make final results easier to achieve. RFC2, the collector load, is a simple homemade choke which offers a fair RF load with little DC resistance. How does one get 8 turns through a small ferrite bead? Struggle! The output from the PA goes *via* C10 to a screened output socket.

A wide variety of transistors may be used for the PA stage

and the driver stage. The prototype worked well with the common 2N3053 and the BFY51, although some of the BFY51's in my surplus-priced stock gave quite low outputs. Almost any suitable transistors capable of dissipating a few watts at the required frequency will work. Some of the best results in the prototype were obtained from some unknown computer switching transistors, with short leads, coded 00652. A reasonable heat-sink is required for the PA transistor of the 'star' or clip-on kind; it is common for some transistors, even with heat sinks, to run quite hot in this circuit.

C10 feeds the output of the PA to a phono socket, and into this plugs a broadband pi-network for each band. This filter provides a clean 50 ohm output tuned to the CW end of each required band. In the VXO mode the transmitter works well on 80m., 40m. and 20m. (The values for the filters are given in the Table in Fig. 1). The values for C11 and C12 should be as close as possible, but more than one capacitor may be used to make up the required value. Avoid using very small ceramic types as these may then get too hot and cause power losses. L3 coils are close wound on a T-50-2 toroid core.

Table of Values
Fig. 1

R1 = 82K	C8 = 50 μ F, 16 v. w.
R2, R8 = 100R	VC1 = 100 pF
R3, R4 = 1K	RFC1 = 25-50 μ H
R5 = 27K	RFC2 = 7-8 turns 30 s.w.g. wire on ferrite bead.
R6 = 1K2	L1 = 22 turns 22 s.w.g. enam. on Amidon T-50-2 former.
R7 = 680R	L2 = 10 turns 22 s.w.g. over L1, <i>see</i> drawing.
R_x = <i>see</i> text	X1 = Crystal for band
C1 = 150 pF	TR1, TR2 = 2N3819
C2, C3 = 47 pF	TR3, TR4 = BFY51, 2N3053, or <i>see</i> text.
C4, C6, C7,	
C9, C10 = 0.1 μ F	
C5 = 500 pF	

Also suitable crystal holders, and phono plugs and sockets. *Note:* All pF values are silver mica.

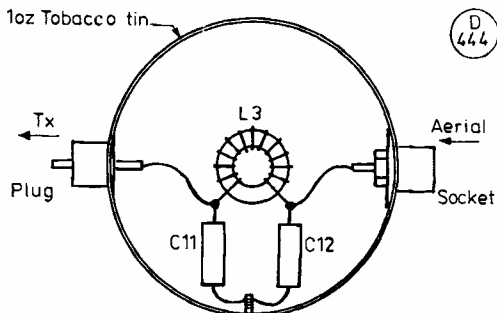


Fig 3 FILTER LAYOUT

Construction

At one time I built experiment QRP transmitters on a breadboard of 0.1-in. spaced perforated material, joining the components under the side on which they were mounted, rather like a printed circuit board. This transmitter can be built in such a fashion, but the prototype was built on a printed circuit type of breadboard which I have found ideal for such a circuit. In this system the components are soldered onto etched copper pads, these being on the component side, so no holes are required and component changing and experimentation is simple. Some amateurs are wary of etching printed circuit board, but the process used to produce this type of breadboard is very easy. The acid resist material is plastic adhesive backed sheet of the 'Fablon' variety. To make the prototype I covered the piece of unetched printed circuit board material with white 'Fablon' and sketched the circuit directly onto the plastic with a pencil. This is convenient because the component spacing can be adjusted by rubbing out with a normal pencil eraser. The solder pads required are then sketched-in and tidied up with pencil and ruler.

For this transmitter, the constructor can follow my layout as shown in Fig. 2. This shows the layout used in the prototype. The positions of the components between the pads are shown; note that each pad is in fact a small 'island' of copper and as much copper as possible is left on the board in the non-etched portions to form an earth mat. This not only acts as effective screening, but also provides convenient earthing points close to all the components for short earth returns when required.

To duplicate this board, the constructor will need to cover a suitable piece of single-sided PCB with adhesive plastic sheeting. The layout of Fig. 2 can then be copied or traced onto the plastic. The actual lines can be firmly pencilled in with the aid of a ruler. The areas which are to be etched are then removed by carefully cutting along the lines with a modelling knife and ruler; the plastic not required can then be peeled off. This may sound a rather fiddly job, but completed boards have been made by this method from the circuit drawing to the completed etched board in under an hour. The surplus copper is etched away in the usual ferric chloride solution. If the plastic has been evenly stuck down a very neat board can be obtained with good straight edges.

The transmitter is best built, then tested, stage by stage. All that is required for testing is the simple RF probe circuit of Fig. 6; this can be built on a piece of surplus PCB or a small tagstrip. The range required on the multimeter will

vary according to the point on the circuit to be measured and the multimeter used. Low DC voltage ranges usually give a good indication of RF output, but if the reading is low a low DC current range can be used.

Build the oscillator first, or perhaps the oscillator and buffer together, and check that oscillation occurs by finding the output on the station receiver. This is best done without VC1, its position being shorted out.

This can then be added and the VXO shift may be checked on the receiver. I have never failed to get a crystal to oscillate in this circuit, even large 10XJ types. However some large old 10XJ crystals do not respond well to the VXO capacitor and oscillation may stop if extremes of frequency shift are required. Not much frequency shift can be expected from such a simple VXO arrangement, but the amount depends upon the type of crystal and the frequency. The few KHz of shift obtained with most crystals is useful enough to make the VXO facility worthwhile. The transmitter can be built without VC1 and in this form has no control knobs at all! It should be possible to measure the RF output of the buffer at the source of TR2, that is the top of R4. One interesting experiment is to alter the value of R2 to see if oscillation can be maintained with a higher output; it is also possible to try a small RF choke in place of R2 and check oscillation and output.

The driver stage can now be added. At first use a short circuit for R_x , this value might have to be increased to obtain the required drive for the PA. Short out the key position and check the RF output at the collector of TR3. The rest of the main transmit board can now be completed.

A heat sink must be added to TR4. The PA stage should not be run without a load as this will probably destroy the transistor, and a simple load to place between the output of C10 and earth could be a 2 watt, or more, 50 to 100-ohm resistor. The RF probe is connected across this load and the transmitter output can, hopefully, be seen. At this stage the

Table of Values
Fig. 4

$R1, R2 = 3K3$	$RV2 = 5K$ preset
$C1, C2 = 0.1 \mu F$	TR1 = BC108 or similar
$RV1 = 22K$ preset	TR2 = Unijunction TIS43 etc. (E5557, UT46)

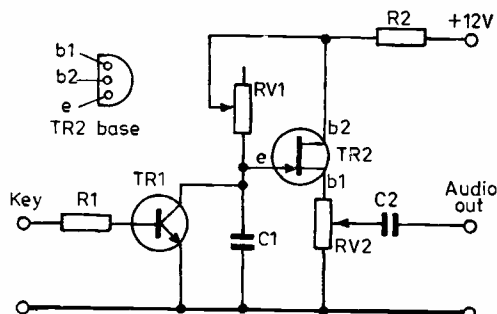


Fig 4 SIDETONE OSCILLATOR

drive can be adjusted. Since the filter is 50 ohms impedance, in and out, TR4 is run between about 1.5 to 2 watts DC input to give a suitable impedance at the collector.

Lift the top of RFC2 from the positive pad and insert a milli-ammeter — a multimeter on a 250 mA or similar range is suitable. Key the transmitter into the dummy load. To give a DC input of 2 watts with a 12 volt supply, 166 mA is required; for 1.5 watts the current is 125 mA. A resistor may be added to the position R_x to give an input of this order (this may be a small resistance of some 100 ohms or so).

The filter, which is built in a 1 oz. tobacco tin as shown in Fig. 3, can then be added. (Do not listen to idle rumours that these are now 25 gm tins: true pipe smokers will be asking for an ounce until they cough themselves into the grave!). A suitable dummy load can now be added between the output of the filter and earth. The checking of R_x and DC power into the PA can be repeated with the filter in use. The transmitter can now be checked by listening on the main station receiver.

Transistor PA stages are often noted for parasitic oscillations. Key the signal and listen to see if it sounds clean, tune around the sidebands of the signal and listen for 'nasties'. Many constructors believe in adding little ferrite beads to the inputs of PA stages — I just try to build tidy PA's and pray! Although no problems were experienced with the prototype, a ferrite bead could be added either to the lead on the emitter side of C9 or the actual transistor emitter lead of TR4. The transmitter should sound clean on the receiver and key cleanly; keying the positive to RFC2 could also be tried.

The transmitter is now completed and can be air tested. The output must be matched in as near a 50-ohm load as possible, so a simple dipole for the band in question is quite suitable (long wires and many other aerials will require an ATU). An L-Match is usually enough, a suitable circuit will be described later. Because the oscillator is on all the time, even with the key up, the receiver used will require muting

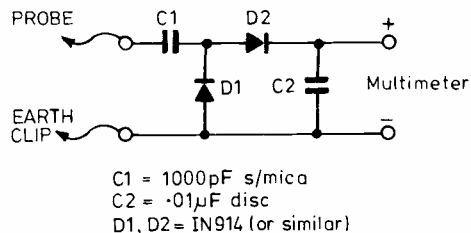


Fig. 6 RF PROBE

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on 'transmit' in addition to simple aerial changeover. Since most of us do not like to key 'deaf' a sidetone oscillator is a useful item. A suitable circuit is shown in Fig. 4.

TR2 is a unijunction relaxation oscillator, the frequency being set by the values of VR1 and C1. TR1 acts as a transistor switch. The free-end of R1 goes to the top of the key if the driver emitter is keyed. In the key up condition, the voltage appearing at the collector of TR1 allows the transistor to short out C1, stopping oscillation. When the key is pressed TR2 oscillates; the output is taken via C2 from an audio gain preset VR2. It is convenient to just feed this to a high-impedance headphone or even a crystal earpiece placed near the transmitter. This gives enough audio to follow the keying.

The sidetone circuit was built on a piece of 0.1-in. pitch Veroboard, as shown in Fig. 5. VR1 can be replaced by a fixed resistor of a suitable value to give the required pitch of note. If the positive of the PA transistor is being keyed, the sidetone can still be used. TR1 is removed and the +12v. line from R2 of the sidetone goes to the 12 volts keyed to the transmitter PA. VR2 could also be a fixed value, but a preset will be useful when a matching receive section is added to the transmitter.

Using the Transmitter

Operating QRP can be a pleasure or a frustration, and whichever depends partly on attitude and partly on technique. I have never used over 5 watts (DC input) for many years and always worked into dipoles or matched long wires. This little rig can be set up quite simply with a normal station receiver, at first with a manual aerial changeover and some form of receiver muting. There are recognised QRP calling frequencies, which for the bands in question are 3560, 7030 and 14060 kHz. However crystals for any CW frequency on the required band should be fine, the QRP frequencies being mainly used for two-way QRP contacts which, as they say these days, is a "different ball game".

It is unlikely that much will be achieved by simply calling CQ. Try it if you like, but a far better technique for QRP working is to prow around for stations to call. Listen for CQ calls or wait for contacts on the frequency to end and 'tail-end': that is, after the final 73's have been exchanged, call the required station. Naturally the signal strength will be down, but expect reasonable reports. The first excursion onto 20m. with the prototype brought an almost instant 599 report from a UV3 in Moscow. Reports of S5 and S6 will be more common. Great fun can be had using simple equipment made by ones own hands.

The next part of this article will add a receive board to this simple rig and give it VFO capabilities.

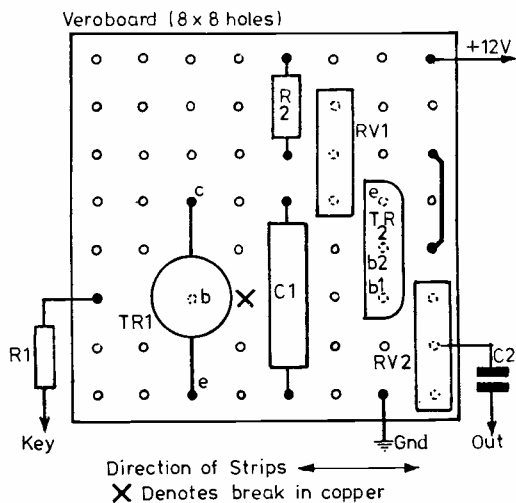


Fig. 5 SIDETONE LAYOUT

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446

Component Sources

J. Birkett, 25 the Strait, Lincoln, can supply all the components for this project; he can also supply crystals for the 80m. and 40m. band.

Crystals for the 20m. band can be ordered from *P. R. Golledge Electronics*, Merriott, Somerset. This firm will also supply inexpensive 3575 crystals designed for television use.

Crystals for 20m. can also be obtained from *W. H. Westlake*, West Park, Clawton, N. Devon. Ask for list number 5.

Toroidal cores of the T-50-2 type can be supplied by *TMP Electronic Supplies*, Britannia Stores, Leeswood, Mold, Clwyd.

to be continued

CLUBS ROUNDUP

By "Club Secretary"

PERHAPS the most common 'beef' we see in the "Clubs" mail is this: "No matter what we do, some of the chaps in the district won't join; while of those who do join, many do so in theory only, turning up once in a while". Now, your scribe has been a regular club member of the local group wherever he has lived for the thick end of 25 years, and of his present club he is a founder member. And yet . . . he stayed at home for the last meeting, despite an offer of a lift there and back. Why?

The nearest to a satisfactory answer is "Don't know" — and that is hardly a reasonable answer. However your conductor did sit down for an hour and try to rationalise it out, and was able to eliminate the obvious negative factors: we have a warm comfortable club room, usually a decent speaker, there is a bar down below which is the cheapest in town and quite civilised enough for us to entertain a guest speaker before or after the show. Whatever the negative factor was, it was personal in the sub-conscious.

Why all this talk? Simply to emphasise that to keep up the attendance you need all the positive club factors you can manage, but even then you have to contend with people who find it easier to sit and sleep in front of the telly; and some of 'em wouldn't even turn up if you hired a troupe of go-go girls! The moral is for Club Secretaries not to worry *too* much if the numbers aren't increasing, and for lecturers, particularly in winter, not to be surprised if there is a poor turn-out to listen to them. Remember — without *you* and others like you, the club movement in amateur radio would be in vast distress!

The Mail

We really are due for a celebration — three clubs from GM in the pile; but we do wish we could hear from a few more, and a bit more often! First we have **Helensburgh** who are based on East Clyde Street School, on the first and third Wednesdays of each month, where they have the facility of a permanent shack, as well as the usual space for film shows, talks and whatever. The Hon Sec says he would also very much like to hear from visitors and potential new members.

At **West of Scotland** the venue is 22 Robertson Street, Glasgow G2. In addition to the HF gear, the shack is now

being kitted out with VHF tackle. The general routine is to head for Hq every Friday evening, the programme being arranged to alternate yak-sessions with lectures or other such activities. January 18 looks like the first talk of the 1980 season, when GM8DMZ will be discussing two-metre DX. This one will be followed up on February 1 for GM8PSM to look at RTTY.

Next we come to **Edinburgh**, where the new, interim, Hon Sec mentions that he was once Hon Sec of the previous Edinburgh group, mentioned in this piece as far back as October 1956!

Deadlines for "Clubs" for the next three months—

(February issue—January 4th)

March issue—January 25th

April issue—February 29th

May issue—March 28th

Please be sure to note these dates!

Fire!

Acton, Brentford & Chiswick operated in MCC from the Hq they have had for the past quarter-century; on the Monday evening after this the place was gutted by fire and G3GEH reckons it looks to be a write-off-and-rebuild exercise. However, the group will for the moment have their place in the Large Committee Room of Chiswick Town Hall; the date unchanged at January 15. What can we add, save to say we hope they didn't have any valuable club gear lost in the fire, and that the new Hq won't lead to a sharp rise in the annual sub.

East London RSGB are one of the few clubs of any sort who have their booking for Sunday afternoons. One wonders whether it makes easier the task of finding speakers; they have G3JIX coming over to Wanstead House, 21 The Green, Wanstead, E11 on January 20.

B.A.T.C. is the group catering for all the variants of amateur television; slow-scan, fast scan, low-definition, and now medium-scan — this last taking up some 36 KHz on a carrier frequency of 29.150 MHz (which is the frequency assigned to the Americans for this activity). We understand that G3OUF at RSGB Hq has indicated that those Gs who are interested in the transmit side should get in touch with him, with a view to negotiating a permit. General enquiries about B.A.T.C. go to the Hon Sec — *see*

Panel — while specific questions about MSTV could go direct to G8CGK (QTHR).

Now we head off to **Ipswich**, a pleasant corner of Eastern England at the head of the Orwell, where the local club is well organised with a weekly meeting and something set up for each one. January 2 is skipped, January 9 is a talk on submarine cables and fibre-optics at the school in Ranelagh Road, January 16 and 23 are down for some Morse (at Handford House on the corner of Ranelagh Road and Crane Hill), and on January 30 G4GVW will be giving, at the School, a talk and demonstration on the construction of an HF-band beam — which sounds like an outdoor exercise if ever your scribe heard one!

The letter from **Milton Keynes** has a correction — we congratulate 'the late' G8POU on his becoming G4HZI: but it hasn't let him off the secretarial chores we note! The venue is the Lovat Hall in Newport Pagnell on the second Monday in the month.

At **Cornish** the SWEB Clubroom is hard put to seat the normal attendance of 65 or so which converges at the Hq in Pool, Camborne, on the first Thursday in each month.

R.A.I.B.C. caters for all invalid and blind amateurs and SWLs; and the Hon Sec can tell us of dozens of jobs to be done, mainly of course to do with fund raising and setting-up gear, but right through to such tasks as taping the interesting bits of 'RadCom' (G3VIJ does that task — what about one of our readers doing the same with *Short Wave Magazine*?) or getting a receiver from John O'Groats to Lands End. Talk to the Hon Sec — her address is in the Panel.

Over the water to **Eire**, and **IRTS** which seems to be the place for all questions pertaining to our hobby in Eire. There used to be another group called ARSI, but we've not heard of them for a long time and so assume they have folded; it's hard enough to keep a club going at any time with a good slate of officers, but your scribe has himself seen a group go from thriving to moribund in the time taken for an AGM! Anyway, anything to do with amateur radio in EI-land, the Hon Sec's your man — see Panel.

Nice to hear from **Kidderminster**, who now have a fortnightly date on Tuesdays at Aggborough Recreation Centre, Hoo Road, Kidderminster; a good Hq has had the usual effect and things are going from strength to strength. More details from the Hon Sec — see Panel.

It seems a very long time since last we heard of the **Cambridge** crowd, but we have a note to say they are based on the ATC Hut 730, Newmarket Road, Cambridge, on Friday evenings. In general the first Fridays of the month are given over to beginners and new members, with lectures or whatever on alternate dates, and the gaps filled in by informals — the club no doubt uses its FT-250 on such occasions.

Over to **Sutton & Cheam** where the newsletter has a large heading saying "Welcome back MCC" — but, at the time of writing, no log has arrived at this end! Thanks, anyhow, fellers. Now to the matter of their meetings: the problem of venues still exists, but the January 18 and February 14 sessions will both be at Sutton College of Liberal Arts. Details from the Hon Sec.

Now we turn to **Reigate** and here we must refer you to the Hon Sec for all the details, the newsletter we have to hand being filled with earlier material and the notice of an EGM. So — see the Panel for the necessary.

A problem arises with **B.A.R.T.G.** as to the name to put



The recently-formed Contest group of the Blackwood A.R.S. Left to right: GW4BLE, GW3KAA, GW8SAI, GW4EAI, GW4HBK and GW8FXM.

in the panel, as we have not yet received notice of the new Hon Sec. Thus, we have last year's details in the Panel, but doubtless GW3IGG won't mind passing any mail on to the appropriate quarter.

Addiscombe are in the main a contest club; thus if you join you either are, or will be made into, a contest operator. They can be found any Tuesday evening in the Lounge bar of the Prince of Denmark, 152 Portland Road, South Norwood, from around 9.15p.m.

The January 18 session at **West Kent** should be of some interest, as G6TQ will be talking about "the secret listeners," at the Adult Education Centre, Monson Road, Tunbridge Wells. This is also the venue of February 1, when they start the preliminary thinking for HF and VHF NFDs. In between the Monson Road dates they also have informals on alternate Tuesdays at the Drill Hall, Victoria Road.

At **Crystal Palace** there has been some shifting-around of programme material, and it is hoped by have Amateur TV as the topic on January 19, given to G8AAI (the third Saturday in the month as usual), at Emmanuel Church Hall, Barry Road, London S.E.22. There is also an informal on the first Tuesday in each month at a member's home. One would think that before attending one of these, even if you have the venue, it would be polite to contact the Hon Sec for an invitation.

Stourbridge have January 7 for a Constructional Evening, the Annual Dinner on 14, at the Watercourse in Oldswinford, and on January 21 the Constructors Contest. Now ask us *where* . . . although the newsletter doesn't say so, we understand they are booked in to the Library at Longlands School, and that they are having a membership drive.

Our next stop is with **AMSAT**; and if you are in any way interested in the Oscars, then you should join AMSAT-UK and get to know a bit more about the inside story. Details from the Hon Sec — see Panel.

South Birmingham, based on Hampstead House, Fairfax Road, West Heath always interest the writer, having spent most of his childhood in their catchment area. They have a

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 B.A.T.C.: M. Cox, G8HUA, 13 Dane Close, Broughton, Brigg, South Humberside
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 CAMBRIDGE: D. Wilcock, G2FKS, 19 Cavendish Avenue, Cambridge CB1 4UP. (Cambridge (0223) 47220)
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 MAIDENHEAD: J. Patrick, G3TGW, Bedford Lodge, Camden Place, Bourne End. (Bourne End (06285) 25275)
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 NOTTINGHAM: M. C. Shaw, G4EKW, 50 White Road, Nottingham NG5 1JR.
 ORMSKIRK: J. Higgins, G4IGK, 8 Delph Top, Greetby Hill, Ormskirk L39 2DX. (Ormskirk 75546)
 R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, KT7 4TE.
 REIGATE: J. S. Roberts, G8FDJ, 15 Bakehouse Road, off Horley Row, Horley, Surrey.
 SCARBOROUGH: Mrs. M. A. Crofts, G4JAO, 43 Broadlands Drive, East Ayton, Scarborough, N. Yorks YO13 9ET.
 SCUNTHORPE: J. A. Sheardoun, G8TIY, 5 Winteringham Lane, West Halton, Scunthorpe, South Humberside DN15 9AX. (Scunthorpe (0724) 732438)
 SOUTH BIRMINGHAM: Mrs. G. P. Apperley, G4GZI, 35 Denise Drive, Harborne, Birmingham 17.
 STEVENAGE: E. Godfrey, 94 Common View, Letchworth. (Letchworth 72184)
 STOURBRIDGE: C. Willamson G4IEB, 14 Lawn Street, Stourbridge. (Stourbridge 2006)
 SURREY: R. Howells, G4FFY, 7 Betchworth Close, Sutton, Surrey SM1 4NR. (01-642 9871)
 SUTTON & CHEAM: G. Brind, G4CMU, 26 Grange Meadow, Banstead, Surrey.
 VERULAM: A. Clarke, G8MAE, 24 Kiln Ground, Hemel Hempstead, Herts. HP3 8EZ. (Hemel Hempstead (0442) 64751)
 WACRAL: L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Hull, Yorks HU7 5XU.
 WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF. (Sevenoaks (0732) 56708)
 WEST OF SCOTLAND: I. E. McGarvie, 3 Kelso Avenue, Paisley PA2 9JE.
 YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset. (Yeovil (0935) 24956)
 YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

formal date on the first Wednesday in each month, followed up by Thursdays in the shack on HF, and an Open Evening every Friday evening. January 9 we have noted as a Surplus Sale — visitors welcome.

Not far way is **Midland**, now based in Room 118 at Aston University; January 22 sees G8KIG talking about home computers.

We get news from **Southgate** regularly, and see that the Hq in Wilson Street Scout Hut, which is near Winchmore Hill Green, seems to have become a settled home after a period of moving-around. Look for them on the second Thursday of each month; and if you are going for the first time it is suggested you contact the Hon Sec — see Panel. Doubtless he will then tell you how to get to Hq and also be able to bring you into the circle — both good ideas.

A short while ago we mentioned the possibility of a club being formed in **Louth** — well, it duly happened, and the

Hon Sec would be delighted to hear from some more potential members!

The most important meeting of the year comes up for **Edgware** on January 10, namely the AGM, followed by an informal on January 24, both at Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.

It's a long time since we used to hear regularly from **Coventry**, but the notepaper rang a bell instantly. They foregather in Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. January 4 is the Annual Dinner at the Falcon Carvery, 11th is down for a night on the air, 18th an open night with RTTY, and on 25th there is another HF night on the air.

Sad to say the **Cheltenham** January activities don't appear in the copy of the newsletter we have at the moment; however, the group are based on the Old Bakery, Chester Walk, Clarence Street, Cheltenham, where they may be

found on the first Thursday and the third Friday of the month.

On we go now to **Hereford** and the Civil Defence Hq in Gaol Street. It is quite interesting to note that a few years ago they were complaining of a low membership, but now there are over seventy! Alternate Fridays give us dates of January 4 for a talk by G3JFH, and January 18 for which details are not known. We suggest a check with the Hon Sec — see Panel.

Guildford have a place at the Model Engineers' Hq in Stoke Park; on January 11, "Doctor" Drackley, G3HTP conducts his clinic for black boxes, to be followed up on January 25 by a talk on Propagation by Ray Flavell, G3LTP.

For **Surrey** the details for January 2 and February 6 are both still to be sorted out; in any case the former will be ahead of our publication date. The venue will be as usual at *T.S. Terra Nova*, 34 The Waldrons, South Croydon.

The **Stevenage** group have January 3 for a talk by Frank Collett, G30VT on a subject to be announced, and on January 17 G30ZF will be talking about RTTY. They have a place at the Senior Staff Canteen, British Aerospace Site B, Gunnels Wood Road.

We have a brief note to advise us of a change of Hon Sec for the **Exmouth** club — and for more details of the club, we must refer you to the Panel.

The lads get together at the United Services Club, 61 Micklegate, **York** on Fridays *except* the third one in each month.

For once in a way we are stuck for the right information as to the January **Verulam** activities; however it looks to be January 3 for the informal at the R.A.F.A. Hq in Victoria Street and January 17 for the main meeting in the Jubilee Hall, Catherine Street, St. Albans. As the AGM is down for December doubtless we'll be updated for next time.

We must now turn to **Nottingham**, based on Sherwood Community Association, Woodthorpe House, Mansfield Road, Nottingham, who are to be found there on Thursday evenings. January 3 is a Forum, 10th a talk about a clock based on MSF, 17th an Activity Night, 24th their DXpedition to GD by G3TDY, G3YUT, and G4AFJ, and the month is rounded off by the Junk Sale on 31st.

The **Bury** programme for January is a bit tentative at the time of writing, but no doubt they'll be doing something to resolve that. January 8 is down for G3NOM to talk about CW techniques; although the group are in session every Tuesday evening, it is the second one in the month which contains the 'meat'. As for the venue, it is at the Mosses Community Centre, Cecil Street.

Next we look in at **Ormskirk** who are now to be found on Tuesdays at the Over-60's Hut, Liverpool Road, which is opposite Christ Church at 8.30. For more details, contact the Hon Sec — see Panel.

New officers report in for **Basingstoke** after the AGM; they get together on the third Wednesday in each month in Chineham House, Popley, Basingstoke.

Cray Valley put themselves ahead of our publication day for January, but we note it is January 3 for details of the Kent Repeater Group; followed on February 2 when they will have a talk on the Metropolitan Police radio network. The January natter session date is not yet firm but will be either 10th or 31st. All are at Christchurch Centre, High Street, Eltham.

We have the newsletter of **Northern Heights** from which we understand the editor's name to be Zaphod Babblerox, and his call G8BMI — the Call Book must be in error! It is easy enough to get it right, though, on any Wednesday evening at the Bradshaw Tavern, Bradshaw, Halifax. On January 16 they have some films, and on 30th it is "Any Questions".

At **Bournemouth**, the Hon Sec writes to let us know they are still to be found at the Dolphin Hotel, Holdenhurst Road, Bournemouth, on the first and third Friday of each month; as the new committee had yet to meet when he wrote, we must refer you to him for the "doings". However, we believe that on January 18, G4GTH will be talking about how chips are made — no not the edible ones!

On to **Liverpool**, and the Conservative Rooms, Church Road, Wavertree, every Tuesday. Apart from the meetings, they have a QSL Bureau for outgoing cards, YL/XYL section and library. On January 8 there is a Quiz, set up by G8CFM, and on 15th part-two of a talk on microprocessors, this one dealing with the software, by G4EST. The Surplus Sale on January 22 should come at a time when all the bills are in and some part of the station needs flogging for the cash — scent of bargains? Finally, on January 29, a visit from the RSGB's Region 1 Representative, G3SMM.

Now we press on to **Ashford** in Kent, where we have in the past commented that it sounds like a difficult spot to find — the letter from the Hon Sec confirms that this is so, and also that it is on private land. Thus, it would be best all round if anyone wishing to make contact with the gang were to start by getting in touch with the Hon Sec at the address in the Panel.

Another change of Hon Sec is noted at **Lincoln** — it seems to be the season! The lads may be found on the second and fourth Wednesdays in each month in a room of the Lincoln Corporation Social Club, Waterside South, Lincoln. We have it that the programme at the time of writing was a bit in the air, but it will doubtless be settled in good time.

Quite a while since we heard from **Yeovil**, but we gather some head-clashing goes on to rectify the situation. They still have their place in Building 101, Houndstone Camp, Yeovil, with something firm organised for most weeks. And don't take the comment about head-clashing too seriously — we know the chaps concerned too well!

Looking at the January picture from **Cheshunt**, we see them having a rig clinic on January 9; 2nd, 16th and 30th are natter sessions, leaving January 23 for a Film Show. Looking forward a little we notice February 6 as down for a talk on Aerial Supports by G3NEE.

Up in **Scarborough** the group have moved Hq to the Cricket Club, North Marine Road, on Mondays, with January 14 down for the AGM. We understand they have also taken to CW as a major activity interest at the moment, and a newsletter is also in the pipeline.

Up in the same general area we have **Scunthorpe** who have a shack at Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe, S. Humberside. Here they are to be found on Tuesday evenings for the more formal activities, RAE and Morse taking over on Thursdays. The shack is in fact available for operations seven days a week until 2300z.

At **Maidenhead** on January 15 they have a talk on radio control of models. The venue is the Red Cross Hall, The Crescent, Maidenhead.

Melton Mowbray have G3XXK talking about Photography on January 18 at the St. John Ambulance Hall, Asfordby Hill, Melton Mowbray. Odd how so many radio amateurs have photography as an alternative form of relaxation.

WACRAL is the group of radio amateurs world-wide who are practising Christians of any denomination; they recently had a weekend conference and get-together at Cromford, near Matlock, which was so much enjoyed that a decision was made there and then to have the 1980 event at the same place on the same weekend. Details from the Hon Sec — see Panel for his address.

Derby, having redecorated and modernised their Hq, have promptly had their rent bumped up 50% — but that won't stop a group that has survived some 60 years of the rigours of life! They are at 119 Green Lane, Derby each Wednesday. January starts with a Junk Sale on 2nd, and on 9th there is to be a discussion, followed on 16th by a talk by G3URU on some useful gadgets for the shack. January 23 is down for a display of components from *John Birkett* of Lincoln, while January 30 is set aside for a demonstration of equipment by Jewell and Powis.

They seem to have been enjoying themselves of late at **Crawley**, but problems loom in the near future, as the AGM is up on January 23, and an Hon Sec volunteer is required to be nominated. Trinity United Reformed Church Ifield Drive is where the deed is to be done.

Our last letter for this time comes from **Barking**, and reports they are now back in business for the winter. The venue is Westbury Recreation Centre, Westbury School, Ripple Road, Barking, and they have various activities, details of which are best obtained from the Hon Sec — see Panel.

Updates

None of the "serial entries" have been taken in this month for the simple reason that we have so many letters covering the current period that we have filled our space; sad, but the Gaffer won't let us have any more!

Deadlines

As usual, are to be found in the 'box' in the body of the piece; as these dates are to arrive with us, we do strongly recommend that you allow at least a full week for the first-class "24 hour" post to do its thing. The address, of course, is to your "Club Secretary", **SHORT WAVE MAGAZINE**, 34 High Street, Welwyn, Herts. AL6 9EQ.

STOLEN

The following gear was stolen during a smash-and-grab at the premises of D. P. Hobbs Ltd., 11 King Street, Luton, Beds: Lowe SRX-30 receiver; Yaesu FRG-7 receiver (s/n 288M 241674); KDK FM-2016E 2m. transceiver (s/n E1470); Microwave Modules MMT432/285 transverter (s/n 1368); used Trio QR-666 receiver (s/n 230178). If anyone comes across any of this equipment would they please ring D. P. Hobbs Ltd., Luton 20907.



Above, on one occasion during the Leicester Exhibition the only way Brenda Aptaker, G8SXY, could get into her stand was to be lifted by willing helpers! Below, Pauline G4HTP, buys a raffle ticket at the Leicestershire Repeater Group stand, watched by G4BRV.



DIGITAL FREQUENCY READOUT AND OTHER IMPROVEMENTS FOR THE YAESU MUSEN FRG-7 RECEIVER

PART I

ROBERT DAWSON

THE FRG-7 is a very popular general coverage receiver having a quoted frequency range from 500 kHz to 29.9 MHz, which it covers in thirty 1 MHz bands. The principle of its operation is not a new one — Racal used it in one of their earlier receivers. Its triple-conversion Barlow-Wadley loop system shown in Fig. 1 enables mechanical dials to be calibrated and set with much more ease of repeatability of frequency accuracy (both in manufacture and in use) and also, very importantly, in repair, than with conventional single-conversion superhet systems. Its first up-conversion to a much higher frequency, in the case of the FRG-7 to around 55 MHz, enables high image rejection to be achieved without the difficulties of several ganged tuned circuits otherwise necessary in RF stages of conventional single-conversion superhets. It also enables continuous coverage from the lowest to the highest frequencies specified.

Against these advantages must be set the disadvantages that (a) the RF tuning is carried out independently of the main tuning (although in practice this is far from being a great drawback) and (b) a number of spurious signals are produced internally in the receiver. In the author's receiver, these signals are in the same place on the dial in every band and so can be recognised. There are three main such signals on each band: two are produced by the internal 1 MHz oscillator and appear at 0 and 1000 on the dial. The third is produced by the internal BFO oscillator and is hence present only when the BFO is on (that is, when on SSB or CW). It therefore appears in a slightly different position on the dial when switching between USB and LSB at around 750. The level of these signals is such that they are not at all significant. Standard Frequency transmissions can be tuned in on 5 MHz, 10 MHz and 15 MHz with no difficulty where the internally generated signals are also positioned.

There are several other signals produced by the BFO but the level of all of them is less than the noise level of the receiver RF stage. The band 0 to 1 MHz has additional signals produced internally, one at 910 kHz and a strong hiss below 500 kHz outside the stated range of the receiver. (The author's receiver will pick up BBC Droitwich on 200 kHz, but obviously the RF stage is not properly tuned since its lowest frequency tunable is only a little below 500 kHz.) It is somewhat surprising with four mixers and four oscillators and hardly any internal screening measures (only the 1 MHz oscillator is in a screening box) that more spurious are not produced. Nevertheless, the receiver gives very good performance for its price range.

Alright, you may say, the advantages outweigh the disadvantages, so, how can the radio be improved? As it

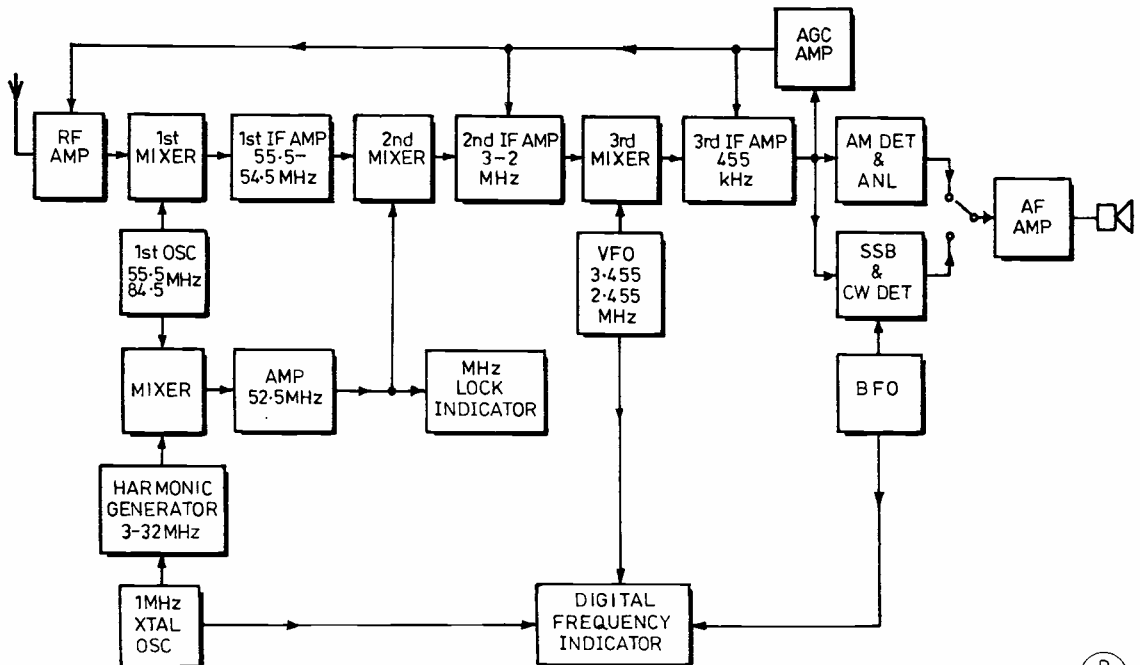


Fig.1 BLOCK DIAGRAM OF FRG7 ALSO SHOWING THE LOCATION OF DIGITAL FREQUENCY READOUT

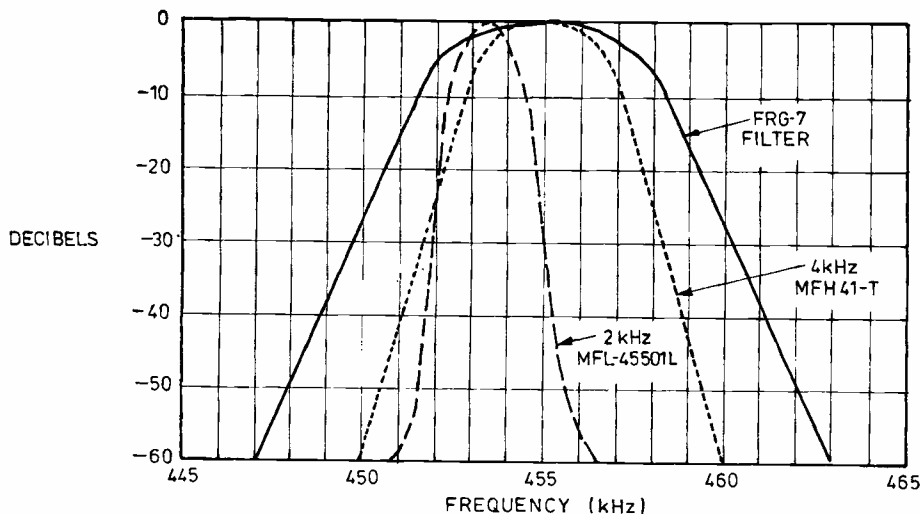


Fig. 2 COMPARISON OF DIFFERENT IF FILTER CHARACTERISTICS

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431

stands, the FRG-7 receiver is fine for general strong-signal broadcast reception. It is very disappointing, however, when trying to tune in amateur SSB transmissions. The reason is not hard to see when one considers the IF filter characteristics shown in Fig. 2. The comparison between the FRG-7 6 kHz ceramic filter, the Toko MFH41T mechanical elinvar filter and the Toko MFL-45501L SSB filter containing six mechanical elements is readily seen. The first modification is therefore to fit the MFH41T 4 kHz filter to enable improved broadcast reception, for instance, when listening or searching for DX or weak stations in a crowded band; stations can be heard which would otherwise not be. The second modification is to fit the MFL-45501L SSB filter; this vastly improves the results when listening to SSB amateurs.

The addition of SSB filters has been described previously by other writers; however, there are two major differences and one minor difference between their methods and that to be described here. These differences are:

1. Previous writers have assumed that any new filters must be positioned in the same place in the circuitry as the existing ceramic filter. Their methods have consequently entailed either the removal of the existing filter or the cutting of the track on the printed circuit board. The method herein described requires neither, and does not make the assumption mentioned.

2. The MFH41T filter and the MFL-45501L filter both introduce an insertion loss of 10 to 12dB. Previous designs have relied on the AGC to make up this loss when operating on strong signals; with weak signals the AGC is inactive and consequently cannot counteract the loss. Furthermore, the signal strength meter cannot maintain the same indication as it should. The author's design introduces a small amount of amplification to overcome this loss.

3. A minor difference exists in the method of switching between the filters. Other designs have used biased diode switching with its attendant chokes, etc. However Yaesu Musen have already kindly provided sufficient spare ways on the Mode switch wafers to enable all the switching to be

carried out without any complication. The filters used come supplied complete with matching transformers and these are used to trim out any effect of circuit stray capacitances, so the screened leads used have no adverse effects whatsoever on the filters.

Digital Frequency Readout

The third modification is the introduction of digital frequency readout to the receiver. Although the Barlow Wadley principle has the advantages already outlined, digital frequency readout is desirable because:

1. With the appearance of a number of LSI counter devices, mechanical dials with their calibration inaccuracies are being superseded by electronic indicators.

2. There are cumulative errors which can add up to an appreciable amount, even in the FRG-7. These are: (a) the calibration of the Main Tuning dial of the FRG-7 (Fig. 3 shows the inaccuracies of calibration on the author's FRG-7). It can be seen that at its two worst cases, the dial reads 2.8 kHz higher than it should, and 3.7 kHz lower than it should, the total swing being 6.5 kHz; (b) with the introduction of the 2 kHz SSB filter, centred on 453.5 kHz, it can be seen from Fig. 2 that the BFO carrier injection frequency, when operating in the Lower Sideband mode is 455 kHz, and when operating in the Upper Sideband mode the BFO carrier injection frequency (and therefore the effective intermediate frequency of the receiver) is 452 kHz. The tuning scale therefore indicates 3 kHz wrongly when in the Upper Sideband SSB mode. Using the original filter which is centred on 455 kHz, the appropriate BFO frequencies are, for the Lower Sideband SSB mode 457 kHz, and for the Upper Sideband SSB mode 453 kHz. The tuning scale therefore indicates 2 kHz wrongly on both LSB and USB; (c) the fine tuning control. On the author's receiver, with the Main Tuning control set at 0, the Fine Tuning control knob altered the actual received frequency by - 6.8 kHz to + 6.8 kHz (13.6 kHz total swing). With the Main Tuning control set at 1000, the Fine Tuning control knob altered the actual received frequency by - 2.5 kHz to

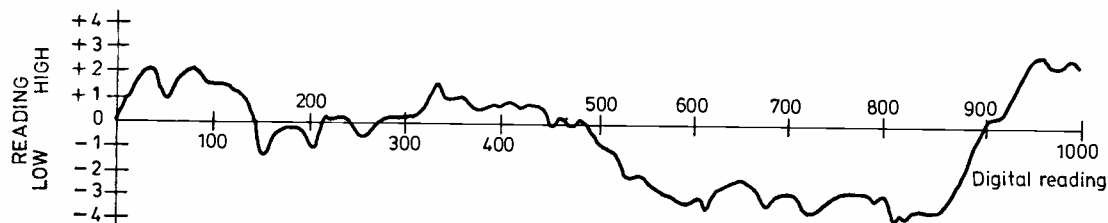


Fig. 3 DIAL INNACCURACIES OF A TYPICAL FRG7

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+2.4 kHz. The actual received frequency may therefore vary anywhere between 0 and 6.8 kHz from what is indicated by the dial; (d) the temperature variation of the BFO when using LSB or USB modes. The components forming the oscillator used for SSB carrier injection are mounted on a PCB adjacent to the audio amplifier IC and the power supply regulator, both of which produce appreciable amounts of heat. Consequently the BFO is prone to drift. This is illustrated in Fig. 4; it can be seen that the greatest drift occurred 15 minutes after switch-on when the Lower Sideband Injection frequency had drifted by +318 Hz and the Upper Sideband frequency had drifted by +434 Hz. (The errors of the main tuning dial VFO temperature variation can be disregarded when using the analogue dial since it can be re-calibrated to the internal 1 MHz oscillator using the movable dial cursor. The errors due to the drift of the 1 MHz crystal oscillator itself are considered to be negligible in conditions of small temperature change — as are variations in the regulated 9v. power supply which will affect all the oscillators.) There is thus a grey area of possible uncertainty of approximately $3.7 + 2 + 6.8 + 0.4 = 12.7$ kHz although some errors may be negative and reduce this total.

With the provision of the digital readout of the author's design, the dial calibration errors in 2(a) are eradicated because the dial is removed. The LSB/USB injection errors of 2(b) are eradicated because the digital logic is designed to

automatically take into account the correct Intermediate Frequency and display the correct result. (Another way could have been to utilise a second similar SSB filter centred on 456.5 kHz for the Upper Sideband mode and maintain the BFO at 455 kHz but it would be a more expensive method as such filters are not readily available.)

The fine tuning errors of 2(c) are removed since any changes due to fine tuning are automatically indicated by the digital readout. The temperature drift of the BFO of 2(d) is a little more subtle in its action: on the face of it, +318 Hz or +434 Hz are of little consequence when considering the dial accuracy, but it has a greater consequence when consideration is given to the operation of the BFO with the 2 kHz filter. In the Upper Sideband case, the BFO would drift over 400 Hz higher than 452 kHz into the passband curve of Fig. 2, and in the Lower Sideband case, the BFO would drift over 300 Hz higher than 455 kHz away from the passband curve. These results have a marked adverse effect on the sound of the SSB signal and on the ease of tuning.

With the original FRG-7 filter, these drifts would have little effect as both BFO frequencies at 453.4 kHz and 457.3 kHz are still within the passband of the relatively wide ceramic filter. This is evidently (cost considerations aside) why a filter is used having such a wide bandwidth: to enable BFO drift to be accommodated. The fourth modification to enable a narrow bandwidth SSB filter to be properly

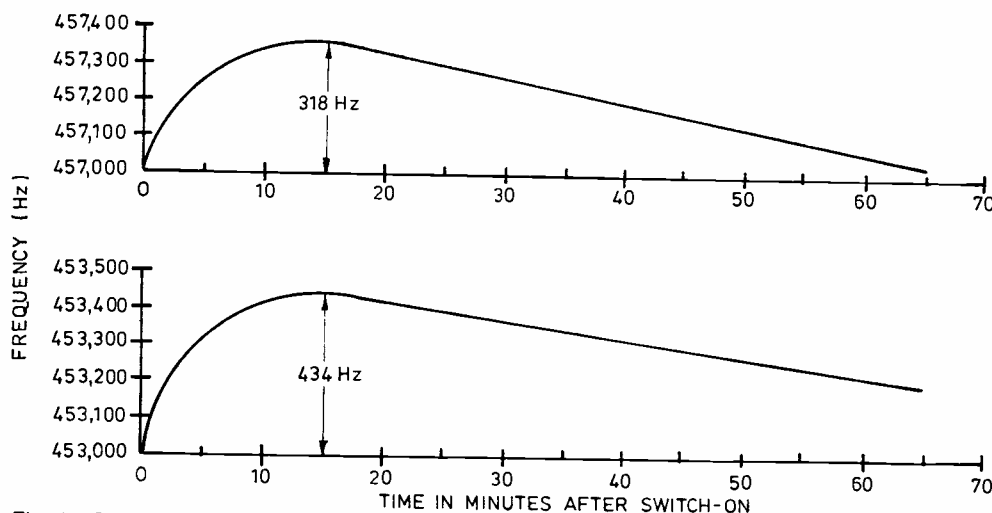


Fig. 4 BFO DRIFT

D
433

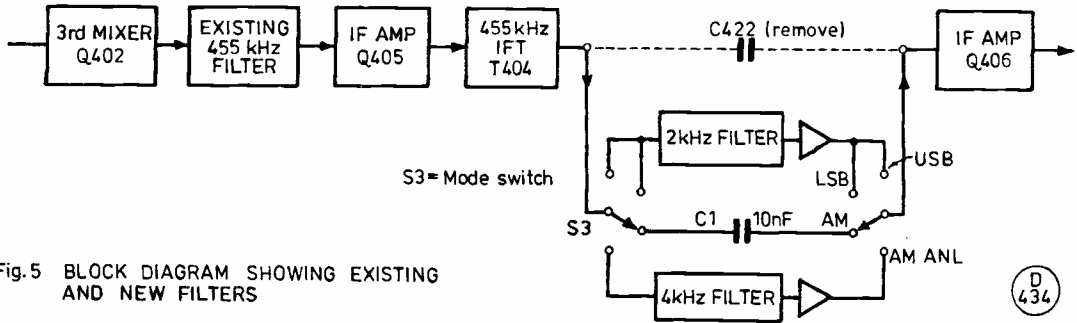


Fig. 5 BLOCK DIAGRAM SHOWING EXISTING AND NEW FILTERS

utilised is to use part of the digital readout circuitry and so provide a stable reference frequency source to enable the BFO to be operated in a phase locked loop — oscillating at 455 kHz or 452 kHz precisely at all times (the BFO being locked ultimately to the internal 1 MHz crystal oscillator). It would be possible, of course, instead of providing a phase lock loop, to provide two crystals, one at 455 kHz, the other at 452 kHz, to operate a crystal oscillator BFO, but this would cost more than the extra IC's for the phase lock loop. The phase lock loop BFO therefore eradicates the BFO drift errors of 2(d), both in the frequency readout and in allowing the proper operation of the de-modulation process. Furthermore, any drift of the main tuning VFO from any cause is automatically detected and the correct frequency is always displayed on the digital readout.

The provision of the author's four digit digital readout provides a receiver with a precision of frequency setting and readout limited only by the accuracy of the internal 1 MHz crystal oscillator. To this end, an internal adjustment is

provided to enable the crystal oscillator to be set absolutely accurately against a known Standard. (The unmodified FRG-7 has no such adjustment.) How to do this is described later. The readout is accurate to ± 100 Hz at the temperature at which the 1 MHz crystal oscillator is set.

With all the modifications to be described carried out, the FRG-7 becomes a pleasure to use, with remarkably improved easy tuning and spot-on accuracy of its digital readout, and more suitable for ham use. Either SSB mode can be used for CW Morse reception, thus enabling a measure of control over interfering signals, or for zero beating to measure the frequency of a signal. Despite the fact that as one tunes from one side of a station, through the station's frequency, to the other side, the beat note on one side or the other is missing, which side missing being dependent upon whether USB or LSB is chosen, it is still possible to zero beat signals. In effect, the receiver becomes a highly sensitive tunable 30 MHz digital frequency meter.

Many digital readouts, like most electronic counters, are

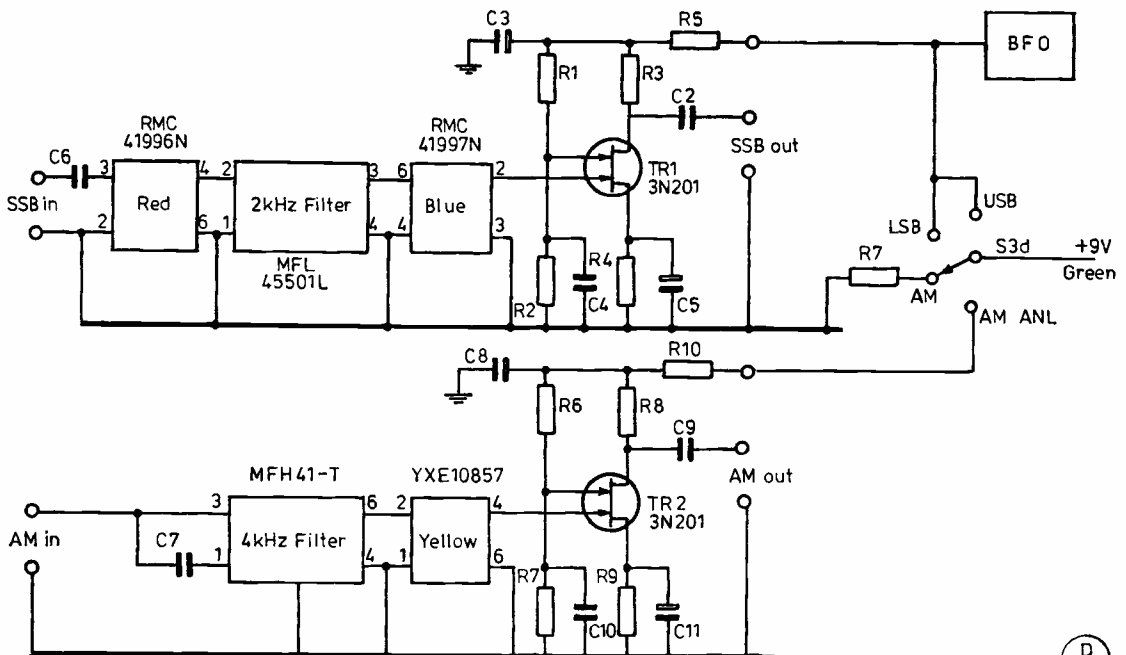


Fig. 6 CIRCUIT SCHEMATIC OF NEW FILTERS AND AMPLIFIERS.

a prolific source of radio interference with their rectangular and sometimes spikey waveforms rich in harmonics. Some of them, including previous efforts by the author, have proven so difficult to tame in the presence of very sensitive radio receivers that their use has not been of much benefit because of the interference they produce, particularly at the higher frequencies. *So Beware!*

However, the design to be described uses entirely C-MOS logic and produces absolutely no interference signals on the FRG-7 whatsoever. An open wire aerial can be connected to the aerial socket and still pick up no spurious emissions from the digital devices.

It must be emphasised that all the modifications to be described have been designed by the author in such a way that any changes to the FRG-7 are as minimal as possible and easily reversible, otherwise the re-sale value of the receiver will be adversely affected. Indeed, it was the intention that these modifications should be carried out in a thoroughly professional manner so that the value of the receiver is increased. To this end, the author has developed professional style, high density printed circuit boards, and these are obtainable.

Provision of Improved IF Filters

These modifications entail the introduction of a 4 kHz filter for AM and a 2 kHz filter for SSB and although these modifications could be carried out independently, they are here taken together because a single printed circuit board has been designed to accommodate both.

Reference was made earlier to assumptions by other writers that new filters must be positioned in the same place electrically as the existing filter. This is not so: Fig. 5 shows the position used. This requires the removal of just one capacitor, C422, a ceramic 10nF type. (A copy of the FRG-7 diagram and handbook is required to help identify this and other items easily.) C422 is very easy to remove, preferably using a proper desoldering tool to remove molten solder — then it simply falls out. It can be seen from Fig. 5 that the new filters are in effect in series with the existing filter when switched into circuit at the appropriate mode switch position. This can take place because, as can be seen from Fig. 2, the existing filter passband is wider than, and encompasses the passbands of, both the two new filters. The 2 kHz filter and amplifier are switched into circuit on LSB and USB modes, a 10nF capacitor is switched into circuit on the AM mode to fulfil the same function as C422, the one that is removed. (Although the capacitor that is removed could be used here, it has short leads that are not long enough to enable its re-use in this position without extending, since the required capacitor is mounted across the switch tags. If not used, it should be retained in the receiver for future demodification by soldering it to a suitable earth point.)

The 4 kHz filter and amplifier are switched into circuit on the AM ANL mode. This was chosen because the Automatic Noise Limiter circuit affects the tone of the audio heard in the speaker by attenuating the higher audio frequencies somewhat. Whilst the reduction from 6 kHz bandwidth to 4 kHz bandwidth also affects the tone, so the effect of top cut is not so noticeable with 4 kHz bandwidth. The Automatic Noise Limiter itself is quite simple and perhaps a more sophisticated type would be beneficial.

Dual gate FET's were used in the amplifiers because they

Table of Values

R1, R2, R6, R7 = 68K	C1, C2, C9, C17, C25 to C35 = 10 nF
R3 = 560R	C3, C8, C14, C20,
R4 = 330R	C24 = 22 μ F, 16v. tant.
R5, R9, R10 = 120R	C4, C10, C18, C21 = 1 nF ceramic
R8, R11 = 1K	C5, C11 = 0.68 μ F, 35v. tant.
R12 = 56K	C6 = 220 pF ceramic
R13 = 6.8K	C7 = 470 pF poly
R14 = 22K	C12 = 470 μ F 16v.
R15, R19, R20 = 1M	C13 = 2000 μ F 10v.
R16, R23, R24, R25 = 27K	C15, C16 = 0.1 μ F 35v. tant.
R17 = 120K	C19 = 33 pF ceramic
R18 = 470K	C22 = 22000 pF ceramic
R21 = 100K	C23 = 2.2 μ F 35v. tant.
R22, R23 = 180K	C36 = 4.7 pF ceramic
R26 = 10R	C37 = 22 pF trimmer
D1 to D9 = 1N4148	TR1, TR2 = 3N201
D10, D11, D12 = BB110	TR3 = 2N706

IC's = 7217, 4016, 7805, 4046, 4520, 4027, 4068, 4528, 2 \times 4011, 2 \times 4518.

IC sockets = 1 \times 28 pin, 4 \times 14 pin, 6 \times 16 pin.

LED's = 4 \times DL707 7-segment.

All resistors are $\frac{1}{4}$ -watt Hystab.

The above available from Doram (RS), Leeds 452548

Toko MFL-45501L 2 kHz filter and matching transformers.

Toko MFH41-T 4 kHz filter and matching transformer.

Available from Ambit International Ltd, 0277-216029

PCB's or complete units and hardware, pillars etc, available from RD, Worcester 426881.

were available (a number of types will do, such as the 3N201, the 40673, or the cheaper version sold by *J. Birkett*) no neutralisation is required and a relatively large signal can be handled linearly with not much current drain. The object is not to obtain a lot of gain, but merely to overcome the insertion loss of the filters. Too much gain simply amplifies the noise from the receiver front-end. The high input impedance transistor is mismatched to the filter coupling transformer by using the tap designed for bipolar transistor matching; this mismatch serves to keep the gain down. Screened leads using close-mesh screening (the author used UR95 miniature feeder) are used to make connection to the switch wafers as shown in Fig. 14.

The screens of all the screened wires are connected together at the mode switch ends on a 6BA solder tag fixed under the uppermost (when viewing the chassis from underneath) nut securing the switch wafers onto their studding. Likewise, all the screens are connected at their respective FRG-7 PCB ends to the nearest earth point on the PCB and those screens at the new filter PCB are connected to the earth points provided. The new PCB is mounted beneath the chassis on two 1 inch long hexagonal plastic pillars, which are in turn screwed onto the projecting ends of two of the existing screws securing the FRG-7 IF-AF unit PCB to the chassis. This is illustrated in the

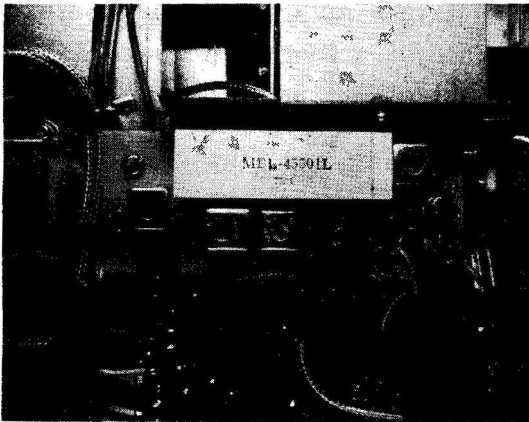


Fig. 7. Showing filter and amplifier PCB. The Mode switch is at the bottom right, and the VFO main tuning capacitor is beneath the screening lid at the top.

photograph in Fig. 7. The neat assembly can be seen, still leaving the FRG-7 PCB accessible. The new PCB can be raised from its pillars without disconnecting any wires (the wires should not be left excessively long for this purpose). For a professional finish, the screened leads should be properly terminated with sleeving and with an overall rubber sleeve at both ends using three-pronged pliers.

Another switch on the mode switch assembly is used to feed to the filter amplifiers the 'zenered' +9v. supply that powers the oscillators (the green wire). The current drawn by each amplifier (5mA) still leaves sufficient current flowing through the zener diode D413 to allow its proper operation. The 3.3 k resistor R7 is disconnected from the AM ANL tag of switch wafer S3d since current is drawn by the 4 kHz amplifier in this position. R7 is, however, still left connected to the S3d AM tag, since with the mode switch in this position the receiver is returned to its original unmodified state. The 9v. supply is used to power the amplifiers so that each can be switched off when not required (beneficial when operating from batteries) because there are insufficient switches on the mode switch wafers to do otherwise when all the modifications are incorporated.

It is stressed that either of these modifications could be carried out independently and without progressing to the further modifications to be described. However, if the 2 kHz filter is fitted, the BFO should be readjusted, using a frequency counter, to operate on 455 kHz when on LSB, and 452 kHz when on USB. But, as already described, the full benefits are only obtained by completing the following modifications also.

Provision of Digital Frequency Readout and Phase Locked Loop Carrier Injection Oscillator

It is customary in single-conversion superhets to measure the frequency of the local oscillator, subtract the Intermediate Frequency and display the result on a digital readout to indicate the frequency of the signal being received, since the local oscillator usually operates on the high side of the frequency of the signal being received. In

the FRG-7, the local oscillator is the VFO operated by the main tuning knob and it operates from 2.455 MHz to 3.455 MHz. Now, the digital logic in a digital frequency readout must be manipulated so that when the VFO is operating at 3.455 MHz, first the IF of 455 kHz must be subtracted and then the reading on the digital readout must be 0000. When the VFO is operating at 2.455 MHz, the IF must be subtracted and then the reading on the digital readout must be 1000. All points in between must give the right results also, to enable the digital readout reading of 0 to 1 MHz to be read, and when added to the MHz dial setting give the frequency to which the FRG-7 is tuned. Thus, the digital logic must perform three functions, first subtract the IF, second shift the result numerically lower, third take the complement of 1,000 of the shifted result and then display. On the face of it, this seems a formidable task to achieve with a few IC packages without a computer. However, the author's solution is arrived at by the following process.

When one reflects on the subtraction of an IF this does not appear simple because the time taken to count, say, 455,000 will be variable, depending upon the frequency to which it is added. That then means that if a fixed gating period is chosen in a counter, the variable IF subtraction period taken from a fixed gating period leaves a residue of time which is also variable, depending upon the frequency being fed in. However, it works out that this residue of time is the right gating period to count what is left of the input signal. For example, if a 2.455 MHz signal is allowed to pass for exactly one second into a counter, and after that counter has counted 455,000 pulses, a second counter is allowed to count for the remainder of the one second, the second counter must count 2,000,000. Thus IF subtraction is achieved. It can also be achieved in a similar way by setting a presettable up-counter to 455,000: after 455,000 pulses have been fed in, the counter will read zero and in the remaining gate time it will count to 2,000,000. (Preceding digits must be set to 9 also, in order for the 1 produced in the addition to disappear off the left hand end of the readout.)

Now, what happens if a presettable down-counter is set to 455,000? Well, precisely the same thing, except that instead of reading 2,000,000 after one second it would read the complement 8,000,000 (assuming the readout has 7 digits; any preceding digits would all read 9, assuming that the initial setting was --0000455000). Now consider the last six digits: these will pass through 000000 every time 1,000,000 pulses are passed. This zero reading occurs first when the counter has counted down 455,000 pulses, then again after another 1,000,000 pulses and again after another 1,000,000 pulses. At this time the 1 second gate period is completed and the reading in a 6 digit counter would be 000000.

This then is how the necessary arithmetic manipulations are accomplished. But, a gate time of 1 second is much too long for radio receiver tuning purposes. When the tuning knob is turned, one needs to see, apparently instantly, to what frequency the set is tuned. Neither is it usually necessary to have a resolution of 1 Hz. So the gate time has been reduced to 10 mS, enabling the tens and units digits to be missed off. Referring now to Fig. 8, the operation of the counter is explained.

to be concluded

• • • SWL • • •

SHORT WAVE LISTENER FEATURE

By Justin Cooper

ONE of the most difficult things to do in producing any magazine is to strike a reasonable balance to please the readers. The old (but nevertheless true) saw about "one man's meat, another man's poison," which will apply to every article in every issue of every magazine on every subject, means that the editor must make a conscious decision regarding which sectors of the market he wishes to aim for. Then at least he has a sporting chance of pleasing some of the readers for some of the time.

These thoughts were provoked by reading the letter from R. Howes (*Weymouth*); he makes a valid argument but starts it from an incorrect premise. Agreed, there wasn't an "SWL" piece in the October issue — it appears in alternate issues. As for articles on "basic amateur radio" with a full 100% layout shown, *Veroboard* track-cutting plans and so forth, these are not felt to be worthwhile because no two amateurs will build the thing exactly the same, as no two junk boxes are the same; and of course even if they buy new it is hardly likely that they will all buy identical bits. Secondly, if they *could* get identical bits and build identical items, they wouldn't learn anything from the project.

Reader Howes rather underlines the point when he says that many readers cannot translate a circuit diagram into a working 'gadget' — we use the word in its widest sense here. Clearly it hasn't occurred to him that no-one can do this without sitting down and getting all the data required. The circuit symbols themselves are simple enough, but some capacitors and some manufactured inductors also look like resistors and obey the same colour coding. As for the active devices — ICs, op-amp ICs, transistors and so forth — there is nothing for it but to get the data book out and take up the needed 'gen.'

Back in the pre-war days, the way of achieving a layout was to make card templates of each part, and 'play chess' with them on a bit of paper until you got another completed layout to compare with the one you did an hour ago; after several such tries, one built the best looking one. Today, the bits are so cheap and robust that it is quick enough and usually good enough to lay them out on to *Veroboard* just as they are on the drawing (component bodies on the back, so the wires stick out through the track) and solder into place. With care a minimum number of wire links will be needed on the back. Now, one must turn over to the track side and take away all the unwanted track by breaking it through with a drill bit. This surplus track can be removed altogether, or all the spare lengths of track joined together and earthed, or even just left unconnected.

But, of course, the learning starts when the darned thing *won't* work. The first thing is to re-check you have the wiring-up *all* correct. Mark-up each line on the circuit diagram as you wire it and again as you check it; then a third check is that each line has two ticks on it, before you try it out. Repeat if it doesn't go first time, after rubbing out the marks of the first wiring and checking. If that's all OK, check the colour code of all resistors to see they are all in the right place — a 22 K and a 2200 ohm resistor have been crossed before now, likewise a transistor with collector in the emitter hole!

Mail

First off, we have a letter from A. Kelly (*Bromsgrove*) who runs a station based around a Trio 9R-59DS, an ATU, some converters, and various dipole-type aerials. He heard PP5ZZ on 21 MHz, and also C31SS, and wonders just where they hail from. The latter is easy — Andorra, but the PP5 was a "special" variant on PY for Brazil.

Now to Mr. L. Joyce (*Grimshy*) with two lists, thanks to the postal pantomime; he has been an SWL back to the 1947 era, when he found the bands on a Bush receiver which boasted a short-wave band. This was followed by an Eddystone S504 (one of the best from that stable) and much time spent listening on the 28 MHz bands. Now there is an FRG-7, and a multiband trap dipole for the SW BC bands, plus the vertical which was built into the house.

We have much to answer for, says M. A. Thorpe (*Tudeley*) sternly. First he saw and bought a copy of the September issue of *Short Wave Magazine*, then came subs. to us and to RSGB, and an FRG-7000; the bug got in a bit deeper and along came an FT-101ZD and RAE classes; and we hear of his XYL also reading-up our output. We see what he means!

We now turn to K. Linge (*Willington*) who sends in a 'Nil' return — "How's that for brevity?"

B. Shepherd (*Staines*) returns to the lists, having been entangled in our problems on the one hand and a little absent-minded on the other.

A nice note from David Hill of *Crawley*, who bows out as an SWL having become G4IQM, after enjoying many years as an SWL and following in the footsteps of G3YVR.

B. F. Hughes (*Worcester*) sent us photostats of some of his rare DX QSLs — he has 308 countries confirmed, 306 on 14 MHz, and a total of some 127 awards collected. Of the photostats perhaps the most poignant was the one from K7LMU/TI9G, Comoran Reef: K7LMU and ZL2AWJ "Ted" Thorpe were both lost at sea in January 1966 during their DX-pedition.

One of the more pleasant things about the Leicester Exhibition is the meetings with old friends; this time we refer to S. Foster (*Metheringham*) who still manages some time at the receiver despite the demands of job and family.

J. Fitzgerald (*Gt. Missenden*) was another visitor to the *Short Wave Magazine* stand on the Saturday, and welcomed for a brief moment of chat. John is one more who still keeps going despite an increasing workload, and

ANNUAL HPX LADDER

Starting Date, January 1, 1979

SWL	PREFIXES		
S. B. Harris (Coventry)	477	T. Morgan (Swansea)	363
J. F. Hobson (Ely)	459	P. L. Spindler (Bradford)	344
Mrs. R. Smith (Nuneaton)	453	M. Pilsbury (Leyton, E.10)	241
C. Stevens (Spondon)	408	Miss J. Ribton (Oxted)	216
F. C. D. Barnes (Cardiff)	400	B. P. Collinge (Enugu, Nigeria)	212

200 Prefixes must have been heard for an entry to be made, all since January 1, 1979, and in accordance with HPX Rules.

he mentions putting on an SWL station for JOTA which gave the 1st Prestwood Scouts an insight to DX, and for once old Murphy relented and gave them some decent copy free of QRM.

One of many who complain that their newsagent has difficulty in getting the *Magazine* is Mrs. R. Smith (Nuneaton), she having received her October copy on one of the days when we were selling out of November issues at the Leicester Show. All we can do here is to repeat that for those who find themselves in a similar situation, the best answer still is to take out a direct subscription, even given the sometimes wild discrepancies in delivery times of sub. copies of a particular issue (all posted on the same day); the reasons being that 2nd class letter post is virtually always quicker than parcel post (the *Magazine* is sent parcel post to the wholesalers — any other method would be totally uneconomic) and that it removes altogether possible transit delays between wholesaler and retailer. To return to Mrs. Smith we had to chuckle at her comment on "regaining the AR88D on the departure of her son for Abu Dhabi!"

Another to suffer from the postal delays is D. C. Casson (Earley) who got his October issue on November 1. Let us hope the politicians can knock some sense into the system soon — we know of firms who have gone out of business because of the postal delays, making further additions to the unemployment statistics. However Derek mentions that he turned an old TV aerial into a ten-metre dipole with which some quite nice signals from JA, UA9, VE6, 6W8DY, and EA9FJ; the prize for the month, though, was the finding of FO8DF, FO8DU, and ZK1CL all between 0742 and 0752!

On to J. F. Hobson (Ely) who queries the T4 he heard twice: T4AEC in Vendaland. Another one cropped up in his second list as an OK station signing /D2A, which would make him from Angola. John was a bit alarmed at the writer's comments last time on saving paper, but he needn't have worried himself; he showed this old scribe a more-or-less foolproof method of recording the prefixes from the log proper such that duplication cannot occur. It doesn't, of course, account for the one that wasn't recorded on the sheet even though it had been logged. The main thing as far as the writer is concerned is that, not only is John's system sound in itself, but it is so easy to check the totals.

Practical Points

Lots of times people buy or build a bit of equipment, and then find mechanical short-comings; of course the commercial gear suffers from the inevitable requirement for a compromise which will appeal to a maximum number of potential buyers, but we suspect the home-brew ones are either the result of not enough time spent *thinking* about the project, or, when the start is made, not taking enough pains in the marking-out. Now we'll bet you have an electric drill, even if you only use it to polish the car and mix paint! Purchasing some of the other attachments can help with radio — the vertical stand for drilling holes more truly, and the horizontal stand which all but makes the drill the headstock for a lathe. This latter we guess was used by J. H. Askew (West Wittering) who found a simple solution to the FRG-7 drive problem. He went to West Hyde Developments, Ryefield Crescent, Northwood Hills, Northwood, Middx. Their knob, Catalogue No. 475-61 is the one to get; it has a skirt diameter of 42mm and must be

HPX RULES

- (1) The object is to hear and log as many *prefixes* as possible; a prefix can only count once for any list, whatever band it is heard on.
- (2) The /M and /MM suffixes create a new series; thus G3SWM, G3SWM/M and G3SWM/MM all count as prefixes, and where it is known to be legal, /AM also.
- (3) Where a suffix determines a *location* the suffix shall be the deciding factor, thus W1ZZZ/W4 counts as W4. Where the suffix has no number attached, e.g. VE1AED/P/SU, VE2UJ/P/SU, they are arbitrarily counted as SU1 and SU2 respectively, and the same holds good for similar callsigns.
- (4) When the prefix is changed both the old and the new may be counted; thus VQ4 and 5Z4 both count.
- (5) The object is to hear *prefixes* not countries, thus there is no discrimination between say MP4B and MP4K which count as one prefix.
- (6) Only calls issued for Amateur Radio operation may be included. Undercover and pirate callsigns will not be credited, nor may any MARS stations be claimed.
- (7) G2, G3, G4, etc., all count separately, as do GW2, GW3, GW4, etc., and in the same way K2, W2, WA2, WB2, WC2, WN2, all count separately, even though they may be in the same street.
- (8) Send your HPX list, in alphabetical and numerical order showing the total claimed score. With subsequent lists, it is sufficient to quote the last claimed score, the new list of prefixes, and the new total. Give your name and address on each sheet, and send to "SWL", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ, if possible to arrive before the SWL deadline for that particular month.
- (9) Failure to report for two consecutive listings, i.e. four months, will result in deletion from the Table, although there is no objection to a "Nil" report to hold your place.
- (10) Starting score 200. Phone Table is mixed AM/SSB, with a separate CW Table. No mixed Phone/CW Table, nor will AM-only or SSB-only entries be accepted.
- (11) Lists will be based on those shown in the current "Radio Amateur Prefix-Country-Zone List," published by Geoff. Watts (see Advertiser's Index in any recent issue of SHORT WAVE MAGAZINE).

reduced to 36mm, which is done simply by putting it on a bit of shaft scrap, *tightly*, and chucking it into the electric drill on the horizontal stand and removing the surplus with a file as the knob rotates.

With the next letter the writer was, to put it mildly, surprised. Had there not been the name of F. C. D. Barnes (Cardiff) on it, he would have sworn it came in from G3XAP — handwriting, phraseology, everything, all the same! Reader Barnes has a little gem which could well be taken to heart by all of us with callsigns: he heard VE3DLC working a station whom he copied as being "ZEHAD" in Umtali, and wonders whether he heard ZE8AD. No, the real answer is almost certainly ZE8JD: As to whether to enter it on the list and as what, must be a matter for the individual; in such a case as this, one feels he did the right

and proper thing, namely to claim it *but query it*. That makes sure the writer doesn't miss it, and it may serve to resolve someone else's problem as well.

P. Ford (*Longlevens*) is keeping himself well at it; first a separate shack in the garage all nicely insulated and heated, changing from chart to card-files for the HPX record, and so forth. Then there is the question of aerials and an ATU, and of a pre-amp. Given the receiver in use, namely an FR-101, there isn't much point in adding a pre-amplifier between it and the aerial or ATU. The reason is quite simple and is just that the receiver as it is (assuming it has no fault, of course) will hear any signal big enough to rise above the noise on the aerial if the band is dead, and any signal big enough to be copied with plenty of attenuation in circuit if the band is open and the aerial is effective. Perhaps we could make this a bit clearer. The sensitivity of a receiver is defined in terms of equivalent noise resistance or of noise factor in relation to the smallest signal it can pick up. Any decent receiver will be limited in most locations by the local noise level on the one hand, and the noise on the aerial on the other, except possibly on 28 MHz as far as the latter is concerned. In addition to these limitations we have another problem and that is the one of big signals near, but not actually on, the frequency of interest — most countries have megawatt jobs running into rhombics these days.

Now, one of these big ones arrives at the input of the receiver and overloads the front-end somewhere. It is usually the mixer but it may even be the first stage which is overloaded, implying that it is no longer acting as a linear device. Once this happens, every signal mixes with every other one over the whole range allowed in by the previous stages (which include the aerial and the ATU) to give a high noise level with only very big signals sticking up out of it. If now you put an attenuator between ATU and receiver, and gradually add more and more attenuation, then suddenly the noise will fall and signals will become audible which were "not there" previously. This is the point at which your receiver has come out of the over-loaded condition. Notice the point: the noise is being generated in an early stage of

the receiver, and hence before the selectivity (crystal filter or whatever) in the IF. Thus, to close up the selectivity is *no real help at all*. The ideal situation is to have all the gain after the filter (*i.e.* the crystal filter built into the ATU!) but practice must dictate otherwise.

What it all boils down to is compromise; and the skill of the operator as well as his mere technical know-how. For example a highly trained operator reading Morse will copy as long as it is a few dB above the noise. The keen CW-operating amateur, however, may well make 100% copy of a signal that is *below* the noise level: he is noting the difference between random noise when the key is up, and the loss of the random quality when the key is down. The difference between these two operators could more than counterbalance the differing performance of two receivers.

M. Shaw (*Huddersfield*) is one of those with an understanding wife — she found him an RAE class and is keeping his nose to the grindstone. Let's hope she can put the bite on a bit harder when the cold winter days make it all seem twice as hard and when classes thin out in a way which is most demoralising for the instructors.

Where is VK9JJ? That's the question raised by M. Ribton (*Oxted*) in his letter; as far as the *Call Book* is concerned, VK9s are all Norfolk Is. However, a look at Geoff Watts' list says VK9 was used by Papua and New Guinea before 1974, subsequently VK9N, VK9J, and VK9R are Norfolk Is., VK9X is Christmas Is., while VK9Z covers Willis Is. and Mellish Reef.

The letter from E. W. Robinson (*Bury St. Edmunds*) is always interesting and informative; this time he mentions the 3V8ONU Tunisian effort, Jacky of 3B8CF heard on Rodrigues as 3B9CF, and of course the PAs allowed to sign/J for the Jamboree-on-the-Air activity with local Scout groups.

Tail-enders for this time were the two letters which followed-up the main packet. One was a letter from B. Hughes of *Worcester* who seems to have been reading the Rules, and so collects quite a lot of buckshee prefixes by combing out the log — so far to 1970, and next time round the earlier ones. K. Kyezor needs to watch out for his crown! The other letter in the envelope came from Belfast, and contained an s.a.e.; we hope our letter in reply to Mr. McCracken will see another pensioner being turned into a licensed amateur, in the fullness of time.

Others

Here we mention lists and letters from T. Grimbleby (*Hull*); D. W. Waddell (*Herne Bay*); R. Middleton (*Bury St. Edmunds*); and an enormous rewrite of his list from M. Law (*Chesterfield*).

Finale

Dates are going to appear in the tailpiece for the next two "SWL" features from now on, so — January 22nd, and March 20th, it is to arrive here, addressed to your J. C., "SWL" SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. And, of course the March issue will be the final listing of the 1979 HPX Ladder, and if there are enough people to reach the start line it will also contain the first 1980 listing. So — get on there and start chasing!

HPX LADDER

(All-Time Post War)

SWL	PREFIXES		
PHONE ONLY			
K. Kyezor (Brandon)	2153	A. Twelves (Rhos-on-Sea)	751
B. Hughes (Worcester)	2028	L. Stockwell (Grays)	730
S. Foster (Lincoln)	1845	D. C. Casson (Reading)	684
J. Fitzgerald (Gt. Missenden)	1655	R. Middleton	
E. W. Robinson		(Bury St. Edmunds)	677
(Bury St. Edmunds)	1560	P. Ford (Longlevens)	655
M. C. P. Bennett (Datchet)	1455	G. F. Green (Middlesbrough)	563
M. J. Quintin (Wotton-u-Edge)	1443	B. Shepherd (Staines)	563
H. A. Londesborough		T. Anderson (Stroud)	540
(Swanland)	1388	L. Joyce (Grimsby)	541
H. M. Graham (Harefield)	1188	B. L. Henderson (Chetnole)	501
M. Rodgers (Harwood)	1147		
M. Ribton (Oxted)	1048		
M. Law (Chesterfield)	1047		
P. L. Shakespeare (Foulness)	1025		
M. Shaw (Huddersfield)	977		
D. Taylor (Harborne)	962		
J. Nicol (South Croxton)	916		
K. Linge (Willington)	867		
D. Hill (Crawley)	800		
		CW ONLY	
		H. A. Londesborough	
		(Swanland)	1174
		D. W. Waddell (Herne Bay)	1024
		P. L. Shakespeare (Foulness)	775
		T. Grimbleby (Hull)	473
		D. L. Hill (Crawley)	376

Minimum score for an entry: 500 for Phone, 200 for CW. Listings include only recent claims, and are in accordance with HPX Rules. A 'Nil' return is allowable, to hold a place.

TWO-METRE OMNI-DIRECTIONAL MASTHEAD AERIAL

F. G. RAYER, T.Eng(CEI), G3OGR

FOLLOWING a revival in 144 MHz interest, the aerial described here was constructed for non-directional coverage, and provided excellent all-round results without any cut-and-try. The SWR is under 1.4:1, Channels RO to S24, so the aerial is doubtless usable over a wide range. It was made largely from an old TV aerial, but new materials would be inexpensive.

The mast is a 1 inch alloy tube, and the block is a tight push fit on this. First mark and cut the sides at 30-degrees as shown in Fig. 1; a piece of 1½ inch thick hardwood is suitable.

The four sloping elements are slightly over ¼-wave, and of ⅜ inch diameter alloy tube, with the top ends closed by pinching in a vice; each is drilled for two fixing screws.

Hardwood was also used for the plug, but in view of the

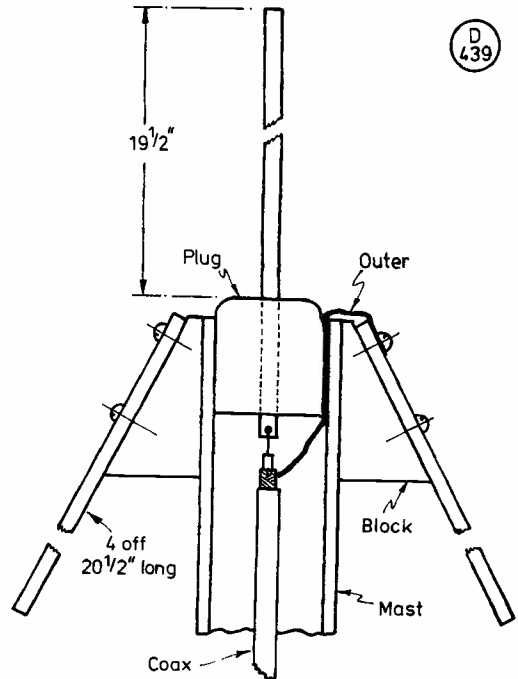
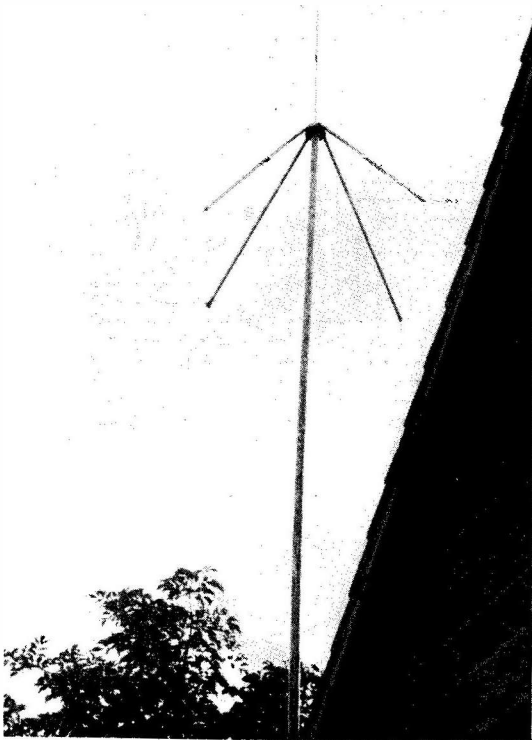


Fig.1 DETAIL OF THE 2M OMNI-DIRECTIONAL AERIAL

light vertical element, a cork might be fitted instead. This element is ⅜ inch diameter galvanised fencing wire (to permit easy soldering) and it is 20½ inch long, but 19½ inch projects. The feed impedance is approximately 50 ohm. Solder the inner to the bottom of the vertical, tape this to make sure no short can arise, and take a stout wire soldered to the 'outer' up between the plug and mast. This wire runs round the four lower elements, and is looped under their fixing screws (these screws can just penetrate the mast and plug at the top). Apply outdoor paint, varnish, or mastic to seal the vertical, plug top and mast against moisture; paint or varnish will also help preserve the outer block.

The weight of the co-ax inside the mast is suspended by the stout leads from its outer braid. At the bottom of this section, drill a hole in the tube for a tape binding, to take the weight of the cable lower down. Screw two metal brackets to a suitable wall with the aid of *Rawlplugs* and clamp the mast to them. A matching plug allows direct connection to the equipment — usually the station FM transceiver.

With a tall mast or heavy co-axial cable, it would be wise to provide anchorage near the top. This could be done by binding the cable with tape an inch or two under the plug, and bringing the tape out through a hole in the mast, so that it can be taken round the latter and tied. Also, the vertical is preferably solid, to avoid any seepage of moisture down into the cable.



A DIGITAL CHANNEL SELECTOR FOR THE IC-240

IAN H. MOTH B.Sc., GM8SOH

THE IC-240, a 2 m. transceiver by Icom, is a well-made and justly popular piece of equipment. Channel selection is by means of a 23-way rotary switch on the front panel: this is a simple and reliable approach, undeniably easier to manipulate while mobile, but having the drawback that only 23 of the available 40 FM channels are usable.

This project describes an accessory to the IC-240 which plugs into the transceiver and selects, by thumbwheel switches, any of the 40 channels in the FM band.

Circuit Description

Fig. 1 is a circuit schematic. TW1 is a straight decimal thumbwheel switch and TW2 is a binary coded decimal thumbwheel switch. TW1 energises one row of four rows of diodes in a matrix, each of which sets up a binary number

on the inputs of the integrated circuits IC1 and IC2. TW2 sets up a binary number on the input of IC1 directly. The ICs are 4-bit binary adders and the output is a binary number which is the sum of the numbers on TW1 and TW2.

An example will make the operation more clear. If 21 is set up on the thumbwheels, then binary 124, or 01111100, is added to binary 1, or 0001, and binary 125 (01111101) appears at the output. A glance at the IC-240 handbook will confirm that 01111101 is the "diode code" for 145.525 MHz, or in other words Channel 21. The outputs are taken to pins 1 to 8 of a nine-pin plug *via* a suitable length of cable. The 9th pin is used as a "switch on" signal input. Looking at Fig. 1 again, if 9v. appears at point A, then Q1 will switch on, RLA-1 will operate, and the circuit will start working. D2 will light to remind the operator. The 9v. switch on signal is taken from the IC-240 channel selector switch and is described below.

The circuit as shown is designed to operate from the same supply as the IC-240. A battery could be used however, in which case use a 9v. one and dispense with R4 and Z1. In this case, note that a shared 0v. line is essential, otherwise the circuit will "float" and not work. It is probable that the 9v. signal from the IC-240 could drive the pair of ICs and associated circuitry, eliminating the requirement for RLA-1

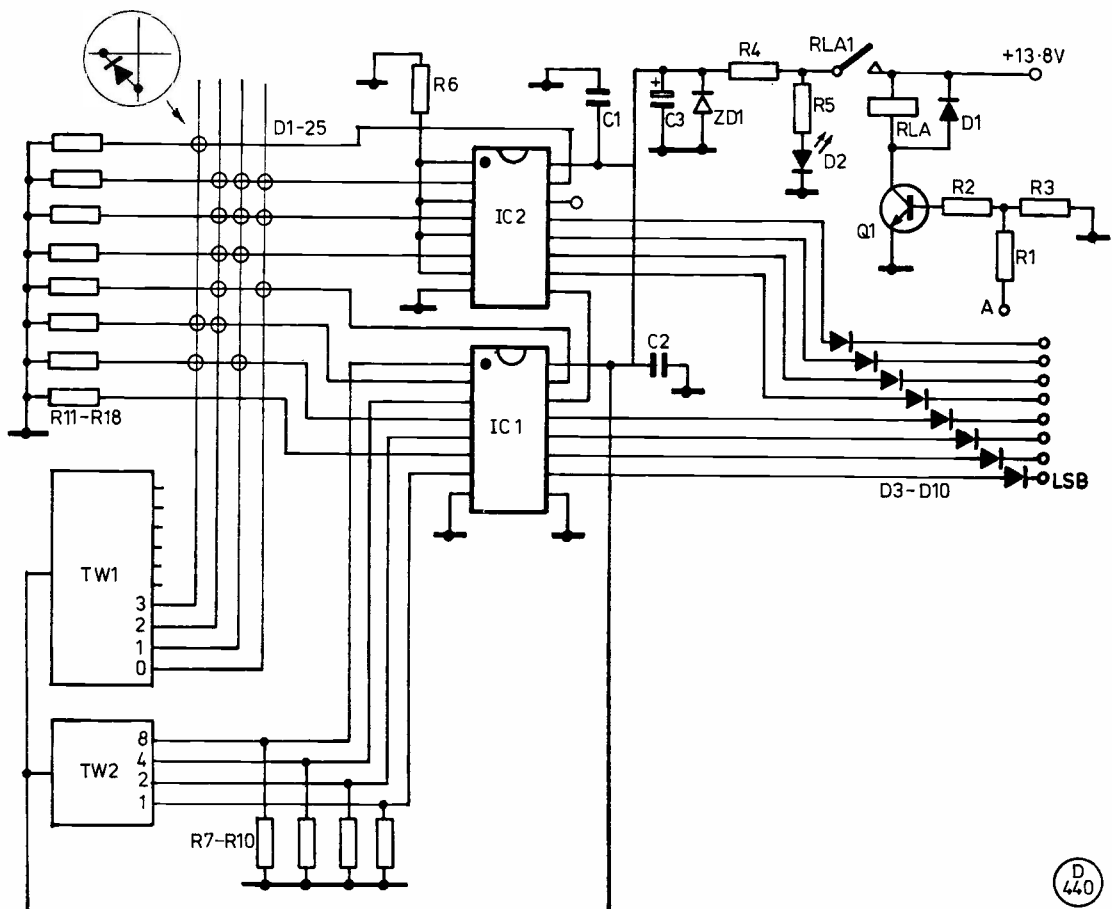


Fig. 1 DCS CIRCUIT SCHEMATIC

Table of Values

R1 = 39K	D1, D3-D25 = 1N914
R2, R6-R18 = 10K	D2 = LED
R3 = 18K	Q1 = BC108
R4 = 270R	IC1, IC2 = C-MOS 4008
R5 = 560R	TW1 = Decimal Thumbwheel Switch
C1, C2 = 0.01 μ F	TW2 = BCD Thumbwheel Switch
C3 = 10 μ F, 20v. elec.	RLA-1 = 12v. reed relay

All resistors are $\frac{1}{4}$ -watt, 5%. Miscellaneous items: *Veroboard*, 16DIL IC sockets, wire, 9-pin plug (1com accessory), case to suit.

and Q1, but this would present more load to the IC-240 PSU stages, especially in the event of accidental shorts.

Construction

0.1 inch matrix *Veroboard* is recommended as the PCB on grounds of availability and cost. Layout is not critical, but constructors will no doubt wish to spend some time on the arrangement in order to squeeze everything into the smallest possible box! The *Verobox* size 75-2684-A is suggested as a good compromise between size and ease of manufacture, but much will depend on the size of the thumbwheel switches obtained. IC sockets are recommended as well worth the extra cost against improved reliability and easier troubleshooting. Leave the ICs themselves in their conductive foam until the last moment. The Table of Values shows a complete list of parts.

Additions to IC-240

The IC-240 is not modified except in a very minor sense, and should not constitute "tampering" in any arguments over resale value.

Remove the covers of the radio and examine the 9-way socket at the back, see Fig. 2. Unsolder the wire connecting to pin 1 and after covering the end with tape, tuck it out of the way. A capacitor connects this pin with the centre earth: it will not affect operation and it should be left alone. Pin 8 is connected to this centre earth. Snip the wire where indicated, unsolder and withdraw the bottom part. The handbook for the transceiver mentions only 22 possible

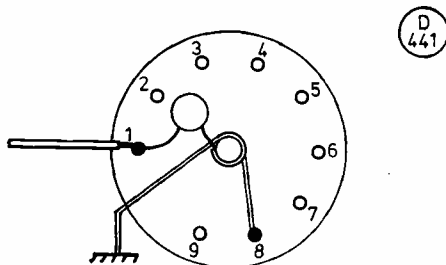


Fig.2 REAR VIEW IC-240 ACCESSORY SOCKET

channels. Examination of the diode board and the switch reveals provision for 23 channels, however. The IC-240 is supplied with a number of blank spaces on the diode board, and the constructor has the choice of using either one of these spaces for this project or the "23rd Channel". If the former, then a row is selected on the diode board and wires are soldered at the points where the cathodes of the diodes would have been inserted; the other ends of these eight wires are taken to pins 1-8 of the socket. The 9th wire, the 9v. switch on signal, is connected at any of the eight positions where an anode would have been inserted.

If using the "23rd Channel" option, use the 23rd row on the diode matrix board for the eight wires as detailed above and take the 9v. switch on signal from the hitherto unused terminal on the channel selector switch. In this latter case the DCS will be switched on when a dot appears in the IC-240 channel selector display.

Commissioning

Check through the circuitry, in particular check that the binary numbers are connected properly, as it is easy to confuse the least significant bit with the most significant, thereby turning the number backwards; make sure that 9v. appears at pin 9 on the IC-240 socket at the appropriate selector setting. Connect the DCS in parallel with the radio's supply and insert the plug into the socket. It is safer to listen to your contact's transmission on each channel before replying: if the DCS works on receive, then it will certainly be OK for transmitting.

This project will extend the use of the IC-240 enormously and is simple enough for a novice constructor. The components are easily available from the major mail order companies and probably from your local components shop, and the whole project should not cost more than £15.

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VHF BANDS

NORMAN FITCH, G3FPK

W.A.R.C. 1979

THE amateur radio movement has come out of the recent *World Administrative Radio Conference* in Geneva quite well considering the gloomy prophesies that some "experts" were making in the run up period. In this feature, only the VHF/UHF/SHF scene is considered so a brief resumé of the results follow.

The Morse requirement has been lowered to 30 MHz and this suggests that U.K. Class B licensees could be permitted to use the 4m. band at some future date. A proposal to extend this idea to incorporate the 10m. band was defeated. The 144-146 and 430-440 MHz bands remain available to radio amateurs on the present basis including the present space segments.

The 23, 13, 9, 5 and 3 cm. bands have been retained with specific allocations for space use in many instances. At present, the highest frequency band available to amateurs is 24 GHz. A number of new bands were agreed in the section from 24 to 275 GHz.

The years of preparation for this vital conference by the IARU has most certainly paid off. The team at Geneva deserves the highest praise for the skilful way it influenced national delegates. Even so, the final frequency table will bristle with footnotes by means of which certain countries will reserve the right to amend the world-wide plan for domestic reasons.

It must be stressed that it may be some considerable time before some of the new bands and space sub-bands in existing allocations are made available. Such information will be given by the Home Office in the usual way.

Repeater Notes

London VHF amateurs now have four 2m. repeaters to use. They came on line on December 8. The erstwhile GB3LO on R7 is now GB3SL on R2, while R7 is occupied by GB3NL at Enfield in North London. GB3WL is on R1 from Hillingdon and from Havering-atte-Bower, GB3EL is sounding off on R0. It will be interesting to hear if the London VHF repeater service will be improved now that much of the load has been taken off the greatly abused Crystal Palace relay.

Awards News

Two more QTH Squares Century Club certificates for 2m. have been awarded. No 6, dated Nov. 18, is the first to be issued for portable operation and goes to the Czechoslovakian Club Station, OK1KIR/P, for operation from GK square. All 109 contacts in the claim were *via* tropo.

QTHCC Award No. 7, dated Nov. 19, has been issued to Mike Lee, G3VYF, from Basildon in Essex. It took him just over a year to complete. Up to Oct. 1978, only 25 watts power was used thereafter 250 watts. The prime mover was an *Icom* IC-202E with *Modular Electronics* 3N204 preamp. Recently a *Yaesu* FT-101E with modified first RF stage and mixer has been used. Mike now uses the popular 16-ele. *Yagi* from *Tonna* (F9FT). Of the 101 QSO's confirmed, 11, were for *E's* contacts, 3 *via Aurora* and the rest all tropo. An *s.a.e.* to Welwyn will bring details of the rules and an application form.

The Satellite Scene

AMSAT-UK Secretary Ron Broadbent, G3AAJ, now has the group's own orbital calendar carrying predictions up to the end of March, 1980. These cover *Oscars* 7 and 8, and the two weather satellites, *NORAD 6* and *TIROS N*. The price to non-members is £1.72 post free from 94 Herongate Road, London E12 5EQ.

O-7 is still working when in sunlight. However, it is seeing less of the Sun now so may not be heard very much more. O-8's orbit has been further affected by recent solar outpourings and the above-mentioned predictions take this into account. It's operating schedule remains as follows:— Sat. and Sun, Mode "J," Mon. Mode

"A" but QRP; Tues. Modes "A" and "J;" Wed. experimental only, not for general use; Thurs. Mode "A;" Fri. Modes "A" and "J."

Confirmation has been received of the target, final orbit for the first Phase III satellite, the likely launch date of which is June 5 next. It is;— Inclination, 57°.

Apogee, 34,385 kms.

Perigee, 1,500 kms.

Argument of *perigee*, 210°.

Drift rate of the argument of *perigee*, 0.07 degrees per day.

Anomalous period, 628.8 minutes. Initial *perigee* latitude, 24.8°S.

The *anomalous period* is the time between two successive *perigees* and is different from the *nodal period*, which is the time interval between two successive ascending nodes.

This satellite will carry one transponder with a 124 kHz. wide uplink band centred on 435.215 MHz. and a downlink band centred on 145.900 MHz. In addition, there will be 28 kHz. wide bands at either end of the general communication band with beacons and special service channels.

Contests

Result:— The 70 MHz. Fixed Contest run on Oct. 21 attracted 24 entries. The winner was our regular contributor Arthur Brees, GD2HDZ, whose 28 QSO's netted 336 points. G4AEQ from Manchester came second with 314 pts. from 44 contacts. *Coming events*; The 70 MHz. CW event is the first fixture in the 1980 calendar and is scheduled for Jan. 20 from 1000 to 1500 GMT. The 432 MHz Fixed affair is on Feb. 3. The week Feb. 10-16 is devoted to the BATC Activity Week and TV Contest, daily from 2000-2230.

Beacon Notes

Last issue the frequency of the 6m. beacon in French Guiana had a *nought* missing. FY7THF is on 50.039 MHz. *Via* G3MOU and G4CFQ, news that VE1EI is operating a high-speed CW beacon on 144.9025 MHz. daily from 2100-1100 GMT. The aerial is aimed at Europe and the *e.r.p.* is 8 kW. It is just possible that, during major meteor showers, something could be copied but your scribe feels that 8 kW is too little for multi-hop MS. On 23 cm. GB3BPO (AM77j) is now QRV on 1296.83 MHz. with 400 watts *e.r.p.* Reports are sought by

Graham Murchie, G4FSG. (QTHR).

Six Metres

The question of whether or not U.K. amateurs will get an allocation in the 50 MHz. amateur band does not need a WARC decision. It is purely a domestic matter for our Home Office to decide. To that end, it is understood that some delicate negotiations are in progress, but with Band 1 TV still in full spate and other services with their greedy eyes on this part of the spectrum, we can hardly expect full privileges and a couple of Megahertz!

Throughout November, the continuously high solar flux and very low geomagnetic activity resulted in very high F₂ layer MUF's, sufficient to make transatlantic 6m. propagation possible on every day except the 24th. (The Meudon "A" index was up to 23 on that day.) The mean solar flux for the month was 232 units and the mean Meudon "A" index only 8.

Many hundreds of North American stations on 6m. have been worked by Europeans who were operating on 10m. enabling duplex operation to be used. On Nov. 18, Angus McKenzie, G3OSS, from London had a 45 min. QSO with Andy McLellan, VE1ASJ, starting at 1410. Andy's signals were strong on 51 MHz. and 52 MHz. but Angus heard nothing at 53 MHz. Initially using 600 watts to an 11-ele. Yagi, the Canadian station reduced power eventually down to ten milliwatts and was still Q5 at G3OSS. VE1ASJ used a Bird "Thru-line" wattmeter with the one watt plug for these power measurements and his meters were not moving at all.

It would seem that the MUF reached 61 MHz. maximum in the November period, but it is likely that 6m. activity will have declined considerably during December. On Dec. 2, FY7THF faded out at 1245 as the band opened up to the Caribbean. KP4EOR, KV4FZ and W4UWH/KV4 were particularly strong. There is a report that an FM repeater on 50.075 MHz. in Colombia was heard for a while at 1305. The Gibraltar beacon on 50.035 MHz. was copied in Britain for nearly two hours from 1215 on back scatter before the band faded out.

According to a GB2RS news item, G5KW logged FY7THF as early as 1035 on Dec. 3 and 4. W5DZF was planning a Bahamas trip from Dec. 28 and was keen to listen for Europeans

THREE BAND ANNUAL VHF TABLE
January to December 1979

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Countries	Countries	Countries	Countries	Countries	Countries	
G2HDZ	49	5	68	14	46	6	188
G2AXI	51	6	60	15	45	9	186
G3SPJ	36	5	58	12	36	6	153
G3FIJ	49	5	56	12	20	4	146
G8OPR	—	—	69	15	39	9	132
G3CO	41	4	47	10	22	4	128
G8GXE	—	—	58	14	46	8	126
G8LHT	—	—	70	19	28	7	124
G4ERX	45	5	30	8	26	6	120
G3PBV	14	3	54	13	26	7	117
G3KPU	—	—	61	12	38	6	117
G3BW	—	—	52	18	39	6	115
G4AEZ	23	3	48	14	22	4	114
G18EWM	—	—	69	8	25	6	108
G8KGF	—	—	57	15	33	3	108
G8KAX	—	—	49	10	34	9	102
G4BYP	32	4	40	9	14	2	101
G4ERG	—	—	67	29	—	—	96
G3FPK	—	—	73	21	—	—	94
G8GML	—	—	63	17	5	7	92
G8LEF	—	—	46	7	30	8	91
GM4COK	3	2	58	22	1	1	87
G8IFT	—	—	47	28	8	3	86
G4IGO	—	—	63	22	—	—	85
G4DEZ	—	—	59	21	—	—	80
GM4CXP	12	3	42	15	4	3	79
G8ITS	—	—	40	6	25	4	75
G8IJR	—	—	53	13	—	—	66
G4FBK	—	—	49	16	—	—	65
G4GHA	—	—	44	19	—	—	63
G4HAO	—	—	48	6	—	—	54
G8PRG	—	—	44	9	—	—	53
G8JGK	—	—	41	11	—	—	52
G4FKI	28	4	6	1	7	2	48
G4GXT	—	—	38	7	—	—	45

on 10m. for crossband working. Derek Wrightson, G3BTO (Hants.), has been monitoring 50 MHz. activity and by mid-November had heard all U.S.A. call areas except the 4th. plus VE1, VE2 and VE3. He mentions the gabbled callsigns making positive identification difficult at times. Derek was unable to make any 10m./6m. crossband contacts and suspects his 70 watts of CW into a trapped dipole on 28,880 to 28,890 KHz gets submerged under all the QRO SSB signals. Towards early December, he noticed the axis of optimum conditions had shifted from VE1/2/3 and W1/2/3/8 and 9 to the Gulf coast and Mexico. G3BTO suggests a better way of achieving crossband CW contacts would be for the Americans to listen for replies on "pro-rata" frequencies, e.g. a W1 on 50.020 MHz. would listen for replies on 28.020 MHz. This seems a very obvious idea and one, it is hoped, may be picked up across the pond.

John Baker, GW3MHW, had QSOed 206 6m. stations up to Dec. 2 in all ten U.S.A. areas, plus VE, VO, KP4 and KV4. Appropriately, his 100th crossband contact was with Ed Tilton, W1HDQ, who wrote the "QST" equivalent of this feature for several decades.

Another Baker, Andrew, G8UBD, from Kent is a keen listener on 6m. and logged lots of W's and VE's up to Nov. 14 after hearing his first SSB station, VE1AVX, on Oct. 20. On Nov. 2, HC1JX in Quito, Ecuador was copied at S9-plus 20 dB at 1316. Andrew also comments on the limited areas of the openings and also on the numerous meteor "pings" from Russian TV on 49.75 MHz.

Four Metres

"A 4m. freak!" is how David Thorpe, G4FKI, (Essex) describes himself. He is trying to compile a list of stations active on the band, especially those who have regular skeds. In London, he reports two or three on 70.26 MHz. AM, a few on 70.48 and 70.50 FM and about a dozen on SSB. David is QTHR and would like to hear from other 4m. buffs.

GW3MHW comes up nightly at 2000 from his mountain-top in Powys and hopes soon to have SSB permanently there. Broken pins in a B9A valve holder put his SSB exciter off the air for a bit. John reports G3OSS on Sunday mornings and enjoyed the good conditions on Nov. 28 when Essex stations G4FKI,

G3OIT, G3LVP and G3PSN were worked, plus G3COJ (Bucks.), G3ZRF, (W. Sussex).

Two Metres

The finest example of tropospheric ducting for over a decade is *the* topic this month. Over Iberia, there was a big anti-cyclone of 1034 mb. joined to a 1029 mb. area of high pressure over France when this phenomenon began on Nov. 27. Such ducting caused by a temperature inversion occurs fairly frequently and during any year, there are bound to be many reports of amateurs in a small area working long distances when other operators record normal propagation.

However, it is very rare for a temperature inversion to be so widespread as it was in this period. It extended over the entire country, and over a large area of Europe including Spain, France, Belgium, Holland and Southern Germany. In the U.K., while the ground level temperature was 11-12 degrees, it was some 7°C *higher* at 330 to 610 metres. One intriguing result was that signals from stations at high altitudes, like UHF TV Tx's and the Emley Moor, 70 cm. beacon, were *above* the inversion. Such signals exhibited noticeable fading. TV viewers were often receiving weaker-than-usual "local" signals with phenomenally strong co-channel DX ones. Your scribe gets a 25 millivolt signal on Ch. 23 yet at times the picture was not worth watching. This has never occurred before in the 10½ years on Riddlesdown.

With low pressure to the West, the southerly winds brought very warm, dry air form North Africa and the Western Mediterranean, laden with fine Saharan sand. In London, this caused a most spectacular, violet sunset.

Naturally, such long-awaited excellent conditions created tremendous activity. On the 27th, many stations to the South were worked by many readers, including EA1AB (YD41b) who was a consistently loud CW signal. However, G3BTO only heard EA's on SSB in XD square and missed out on EA1AB. In the early evening of the 28th, Derek heard a DF station in FH square at S8 but failed to hear anything from DM, HB, OE or OK.

Dave Sellars, G3PBV, (Devon) opened his innings on the 27th with

F1CDC and F1FBY, both in AD, and F6DHM (ZD). He heard, but could not raise, EA2HX (ZD) and EA2CA (YD). Clive Penna's, G3POI, (Kent) best DX was SP9DW in JK38c on the 29th on CW. From Dorset, John Cleator, G4GHA, worked F1FLW (ZD) and EA2HX who was S9-plus 40 dB. Assorted F's, DL's and PA's were also worked on the 28th. By the evening of the 29th, propagation favoured the East to Northeast and John contacted LX1FX (DJ) for a new country.

Paul Turner, G4IJE, (Essex) enjoyed his lift and notched up his 102nd. square for the year and 23 countries. He worked down to AD locator, a few HB's, lots of PA's and DL's and DM2CPA (GO). Tony Collett, G8GXE, (Berks.) is now fully operational on his new QTH with his *Yaesu* FT-221, 40 watts amplifier and 9-ele. *Yagi* at 25 ft. On the 27th, he worked stations in BH, DG and DJ squares but did not hear the more southerly stuff so reckons he must be screened in that direction. Early in the morning of the 29th, Tony worked three stations in FN but spent a lot of time jumping between 2m. and 70 cm. On a domestic level, he seeks skeds with Lancashire and Cumbria.

Dave Crisp, G8IXG, (Berks.) heard EA2HX on the 28th at S7 and mentions F1DMO (BG) and F6FHP/P (AE). Jon Stow, G8LFJ, (Essex) was in on the whole affair and singles out his best efforts as F1DDH (BG); DC3VW (DJ) and HB9MTY (DG) on the 27th; F1CMB (AH) and F6FHP/P (AE) on the 28th, and F2RN (DI); DB8YV (EM) and DB7LT (EO) on the 29th. Jon mentions another ducting event on Dec. 1 when F1FKJ/P (CH); F6FGV (DH); F1CYB (BH) and F0BJT (DG) were worked. The last was near Geneva running 300 watts to a 48-ele. array and could only hear Jon when he pointed it Southeast towards Mont Blanc.

Our third Mr. Baker, G8JGK, (Essex) arrived on the scene at 2128 on the 28th and by 2250 had worked 14 DL's, 9 PA's and an ON: Chris reports a "direct line" from AL23h to DM and DL squares, other directions being weak. On the 29th, he managed 68 DL's, 22 PA's and two each G's and ON's. East Germany eluded him though he did work someone only 10 kms. from the border.

At G3FPK, EA1AB was worked on

the key at 1902 on the 27th but at that time, there was not a great amount of CW activity. On the 29th, SM7AUI (GP36g) was contacted and said he was only running 15 watts to a 4-ele. beam on his balcony; he was S8 at 1300. OZ9KT (EO08a) was worked half an hour later and was only running 10 watts to a 10-ele. beam. DM2CPA (GO61f) was a good signal at 1350. Manfred was running 200 watts to a 20-ele. affair. The sole new square was FM thanks to DC6ZZ in Celle.

Your conductor had a brief listen to the repeater part of the band. As expected, it was utter chaos with half-a-dozen repeaters on each channel during this opening. Few operators seemed to know which machine they had accessed and one wonders what enjoyment or satisfaction anyone can possibly derive. Surely the obvious thing to do during a major lift is to switch repeaters *off*, thereby giving people a chance to work direct. Even those with poor QTH's were working long distances in the DX part of the band, and on low power too. Any support for this idea?

Unfortunately, these exceptional conditions were not enjoyed by all G stations. The more Northerly folk missed out. Typically, GD2HDZ wrote;—"All I could hear were G's giving 5×9-plus to continentals which were virtually inaudible here!" Likewise, GM4CXP only heard a few, weak F's on SSB on the 28th. Ah, well. You folk usually get the best of the *Auroras*, but then Derrick complains at the paucity of these lately!

It has to be reported that this fine opening was marred by some very poor operating. Many people were using SSB well into the exclusive CW part of the band and the PA's appeared to be the most numerous here. PA0HIP was calling "CQ South of France" on 144.100; OS7EH was on .115 and G3NLF and G4DME were also operating below .150, using SSB. Some of the ill-mannered and deliberate interference was reminiscent of the DX-pedition-chasing antics on 20m.

More Super-DX on 2m.

In one of the 50 MHz openings, KP4EOR in Puerto Rico, mentioned he had worked LU1DVT in Mar del Plata, Argentina *via* TEP mode, on

2m. SSB on Dec. 3. The distance was stated as just under 4,000 miles so is nowhere near the record established in Region 1.

Seventy Centimetres

The temperature inversion of Nov. 27-29 sparked off a great deal of DX activity on 70 cm. Syd Harden, G2AXI, (Hants.) was only able to put half a watt out managed to work GU8FBO and G8ADC (Beds.) but his prize catch was DC2BM (DM50d). G3BTO's CW reached PE1ANE (BL)

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3POI	—	—	278	278
I4EAT	—	25	238	263
G8HVV	12	73	130	215
G8GML	11	74	122	207
G3IMV	—	—	198	198
G3JXN	34	70	93	197
DK3UZ	—	—	195	195
GJ4ICD	—	48	145	193
9H1CD	—	13	178	191
G8LEF	22	62	101	185
G3CHN	—	—	183	183
G3SEK	—	—	179	179
G3COJ	24	66	85	175
9H1BT	—	11	163	174
G4CMV	—	30	140	170
G3VYF	—	31	133	164
GM4CXP	—	25	134	159
G3FPK	—	—	158	158
G2AXI	2	54	93	149
GJ8KNV	—	34	115	149
G4ERG	—	—	148	148
G4BWG	—	29	118	147
GM4COK	—	12	135	147
G3OHC	4	33	104	141
G4IJW	1	30	108	139
EA3LL	—	15	124	139
G3BW	3	25	108	136
G8LHT	3	37	94	134
G8ATK	—	38	93	131
GD2HDZ	12	37	74	123
G4HYD	—	40	83	123
G4IJE	—	—	118	118
G3SPJ	10	36	71	117
G4IGO	—	—	112	112

G4AWU	—	1	105	106
G8OPR	—	25	80	105
G3KPU	—	21	84	105
G8IXG	—	—	104	104
G4ERX	1	32	69	102
G8KGF	—	16	85	101
G4FBK	—	5	94	99
G8KAX	—	36	62	98
G8LGL	—	12	84	96
GM8NCM	—	12	84	96
G8IFT	7	18	68	93
G4AEZ	3	29	61	93
G3FIJ	—	27	66	93
GJ3RAX	1	24	67	92
G8KPL	—	7	84	91
G4GEE	—	28	60	88
G6UW	—	—	88	88
G18EWM	—	22	63	85
G8JAG	—	7	78	85
G8GXE	—	28	53	81
G8LFJ	—	—	81	81
G4DEZ	—	—	80	80
G8JJR	—	—	80	80
G8KSP	—	2	76	78
G8MFJ	—	11	65	76
G8ITS	—	16	56	72
G4GET	—	—	72	72
G8KUC	—	7	60	67
G4GHA	—	—	67	67
G3PBV	—	12	48	60
G4GSA	—	1	50	51
G8JGK	—	—	50	50
G4GXT	—	—	43	43
G8PRG	—	—	30	30

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 23m.

and ON5UI (BL), the latter Derek's first Belgian on the band. Nothing was heard to the South.

G3PBV found conditions for the third leg of the *Cumulatives* on Nov. 21 had picked up well with high activity. From Devon, Dave worked G4FXW (S. Yorks.); G8DKV (Derby); G8AYN (Kent) and G8DKK (Beds.). During the lift on the 28th and 29th a further six new squares were added: F1FJM (AH); F1CVU (AJ); PE1CNP (CN); F2TU (DI); DL8SF (DJ) and DK1IE (DL).

"I worked 31 QTH squares on 70 cms. during my first week on the band." So starts Mike Lee's, G3VYF, note. He is running 6 watts to a 21-ele. Yagi. David Butler, G4ASR, (Hereford) using a *Trio* TS-120V, with *Microwave Modules* transverter and amplifier, worked into EM square on the 28th, a QRB of 750 kms. He found the signals on the band very strong.

G8GXE heard nothing at all on the band on the 27th. At 1400 the following day there was nothing either but when Tony switched on again at 1630, there was DD3AW (EI) on 2m. so he quickly QSY-ed to 70 cm. and worked into CM. At 2030 he worked DJ6GQ (EI) followed by several "local" DL's, PA's and ON's. Early in the morning of the 29th, the best signals were from the Northeast and DF3XU and DK2NH in FN were contacted. They had both just worked EA1CR who was inaudible in Berkshire, around 0300. At 0900, the best conditions were still towards the NE with some Dutch stations worked in DM and DN. From early afternoon, Tony reports that things swung round to the East through Southeast. He singles out the enormous signal at 2040 from F5ZA (YI) who was still S5 when running only 50 milliwatts. A long FM and SSB contact with PE1BUS rounded off the proceedings. By 0120 on the 30th. signals were back to normal.

John Lemay, G8KAX, (Essex) worked EA1CR (XD32d) on the 27th, followed by other F's in CH, ZE, ZH and YI. He reckons he has never heard the band so busy. From Hampshire, Dave Cox, G8OPR, also worked EA1CR, plus DJ7YP (EN) and several Dutchmen.

Twenty-three Centimetres

Chris Reed, G8MFP, near Rugby, now has FM on the band from a *Trio* TR-2200GX driver with VFO. The 2m. signal is transverted *via* a homebrew rig driving a 2C39A amplifier giving 50 watts output to a 15-over-15 Yagi. Tests with Glen Ross, G8MWR, indicate all is well with the set-up.

During the lift on Nov. 28, G8MWR worked Bill Green, G3TDG, at Biggin Hill. With the aid of precision attenuators, Glen in Coventry reduced power to 0.002 milliwatts to his 15-over-15 array and was still RS51 in Kent. Then Bill progressively switched off his PA,

driver and mixer stages and was *still* R5 in Coventry. G3TDG was the only 23 cm. signal heard by GD2HDZ but Arthur's QRP failed to attract Bill's attention. "In short, a dead loss," writes Arthur.

Meteor Scatter

G4IJE is now firmly hooked on this aspect of the hobby. During November, *via* random meteors, Paul completed CW skeds with DJ5MS (GI); SM5CNQ (HS); DF3RU (FJ); YU7NWN (KF); LA3VU (FT); HG8CE (KG) and YU3ES (GF) and all were subsequently confirmed over the 20m. VHF net. He particularly mentions the cooperative attitude of most MS exponents who seem very willing to keep skeds, even though

they have probably worked many stations in the "common" squares.

The reliable *Geminids* shower is just starting as this is being compiled so your reports of successes will be very welcomed.

Final Miscellany

GM4CXP has bought a memory keyer and promises to put out automatic "CQ" calls on 144.05, etc. G8MFP reckons he has come to positive results concerning the mysterious "sweepers" we hear on all bands. Chris figures they are all man-made signals mixing together and that they only appear when the 10, 15 and 20m. bands are all open. He suggests we hear unwanted sweepers, deliberate

ones and "sillies," which are professionals, "playing around." Thinking way ahead to next summer, the Jersey Convention is scheduled for June 28/29 and anyone thinking of attending is advised to contact Geoff Brown, GJ4ICD, as soon as possible.

Next month the final placings in the Three Band Annual Table will be published and with the March issue the first entries in the 1980 table will appear.

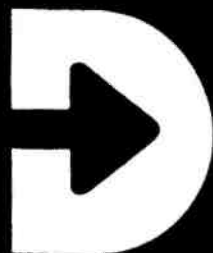
Deadlines

An early deadline for the Feb. issue - Jan. 2. For the March issue it is Feb. 6. Everything to;— "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. *A Happy New Year de G3FPK.*



Above left, a general view of the A.R.R.A. Exhibition, held in Leicester on the 8th, 9th and 10th November; above right, some visitors even brought their own beer—l. to r., G8MZA, G3ZYC, G8CNB and SWL Chris. Below left, John Birkett in action on his ever-popular components stand; below right, G4EWD (centre) and G8GUS (right) of *Amateur Electronics UK* explain a rig to G4BFA.





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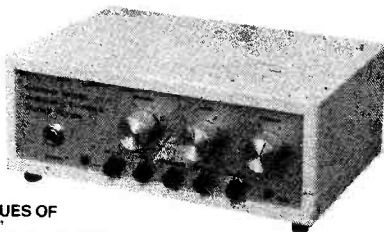
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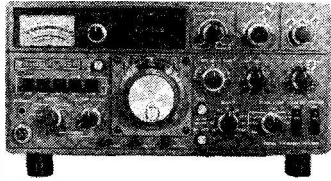
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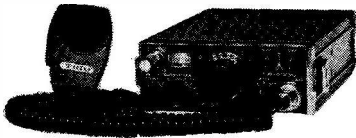
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R820 RECEIVER

... THE ULTIMATE IN RECEIVERS ...

Frequency coverage 160-10m plus SW Broadcast Bands. All modes CW-USB-LSB-RTTY. Digital Readout. Noise Blanker. Fully variable. I.F. Bandwidth, plus Bandpass tuning, plus rejection notch filter. **£790.00**



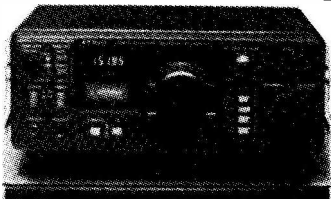
TR2300

TR2300 2m Synthesised Portable Transceiver. We have lost count of the number of this model we have sold over the last 12 months. Hikers, campers, climbers, you can hear them all over the country and reliability which is the essence of TRIO equipment. **£199.00**

JAYBEAM

5Y/2M 5 element yagi	£8.86
8Y/2M 8 Element yagi	£11.50
10Y/2M 10 Element	£25.13
PBM/14/2m. 14 element Parabeam	£35.78
5XY/2m. 5 element crossed yagi	£18.40
8XY/2m. 8 element crossed yagi	£23.00
10XY/2m. 10 element crossed yagi	£30.48
Q4/2m. 4 element Quad	£19.08
Q6/2m. element Quad	£25.30
D5/2m. 5 over 5 slot fed yagi	£15.86
D8/2m. 8 over 8 slot fed yagi	£21.16
UGP/2m. ground plane	£7.96
MBM48/70cms. Multibeam	£25.06
MBM88/70cms. Multibeam	£33.35
TAS 2m. Whip mobile	£14.37
C5/m. Colinear	£35.65
C8/70cm. Colinear	£45.42
D15/1296 23cm. Antenna	£26.90

Carriage on Antennas £3.00



TRIO R1000

BANTEX	
Bantex Magnetic Base Mount	£10.40
3/8" glass fibre Whip	£8.44
3/8" stainless steel Whip	£9.40
UHF stainless steel Whip	£8.63
Standard base mount	£2.70

TR7600-TR7625



The new TR-7600 is a high performance 2m FM Transceiver with memory, designed to permit multi-channel (400 channel) operation. Featuring the ability of repeater operation. This transceiver brings you all the convenience and versatility in both mobile and fixed station operation.

The TR-7600 has provision for connection of optional remote control unit (with built-in microcomputer) for added versatility. **£247.00**

TRIO	
R820 Receiver	£790.00
TS820 Transceiver	£710.00
Digital readout for TS820	£122.67
VFO820	£123.70
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SM220 Monitorscope	£246.00
TL922 Linear Amplifier	£797.50
TS520S Transceiver	£541.78
VFO520S	£103.25
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DG5 Digital readout for TS520S	£119.60
TS120V 80-10m. Mobile Transceiver	£408.00
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MB100 Mobile mounting bracket	£17.00
TS700S 2m. All mode digital transceiver	£548.98
SP70 Speaker	£20.45
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HS4 Headphones	£10.73
MC50 Desk Microphones	£27.60
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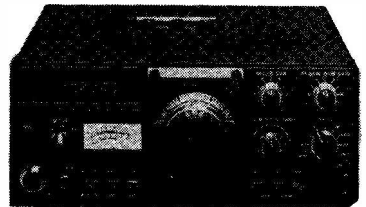
Crystals and accessories in stock



The Mk. 2 Multituner was designed by us to many requests who found our Mk. 1 the finest they had ever used but required a wider frequency range. This covers 550 kHz to 30 MHz. The circuitry gives 50 switchable, tunable positions to match any antenna over 5 metres in length to practically all communication receivers. Our "Multituners" are designed and manufactured by ourselves and have been exported to over 50 Countries. Many operators use them for QRP Transmitting also. See the February edition 1977 of the "Short Wave Magazine" or send SAE for details. **£27.50 inc. VAT and postage**

NEW ANTENNA MODELS

H.S. HFS Vertical 10.80m	£41.40
HF R. Ground Plane Kit	£23.00
GDX 2 Discone Antenna 50-460MHz	£36.80



TRIO TS120 TRANSCIVER

ALL SOLID STATE HF BAND TRANSCIVER

Freq. 3.5-30 MHz Amateur Bands and WWV. I.F. Shift System, Noise Blanker, Vox, Single conversion system using PLL circuit. Digital display dial.

TS 120V 10 watts PEP	£408.00
TS 120S 200 watts PEP	£495.00



TS 180S

TS 180s. HF Transceiver. An all solid state Transceiver with Digital Frequency Control. A rig that has the facilities that DXer, Contest operator or any Amateur would desire for maximum flexibility on the 160 through 10 metre bands. Up to 200 watts PEP input. No tune final amplifier. With digital readout. **£825.00**

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AMR217B Scanner Receiver. AC or DC operation	£113.50
R512 Aircraft Band Scanning Receiver	£135.00
AR240. 800 Channel Hand Held 2m. FM Transceiver	£195.00
Regency Digital Flight Scan Synthesised Aircraft Band Receiver	£230.00
Phillips FM321 70cms FM Transceiver	£264.00
Yaesu FRG7 Transceiver	£214.00
Yaesu FRG7000 Receiver	£375.00
FDK Multi 700E Transceiver	£195.00
FDK TM563 Scanning 2m Receiver	£109.00

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Instant HP service

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 80-40-20-15-10 metres. 50 ohm feed. 23 metres in length. This is complete, not a kit. High quality Traps and wire. 2kW PEP rating
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 Single Meter SWR Desk type £11.00
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 DL50 50 watt 50ohm Dummy Load £7.50
 DL120 100 watt 50ohm Dummy Load £12.50
 DL-1000 1 kW Dummy Load 50ohm £31.00
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MULTIFILTER

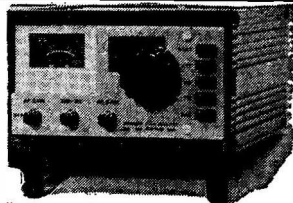
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 ATAL 2m AM-FM Tx £129.00

STANDARD

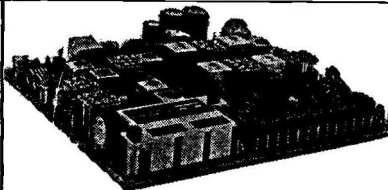
C8800 2M FM Mobile Transceiver £252.00

G-WHIP

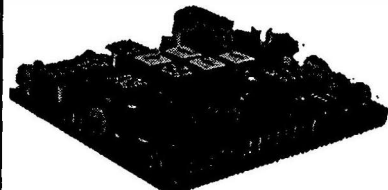
Tribander Helical 10-15-20m £23.00
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DRAKE

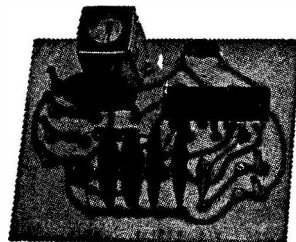
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 TR7 Transceiver and AC psu £1021.00
 MN7 ATU/RF Wattmeter £126.50



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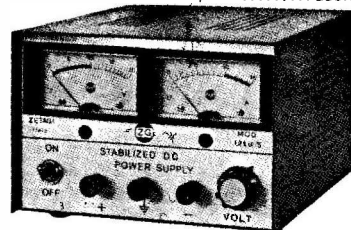
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Mod. 1210 S

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FT101Z Transceiver Analogue £500.00
Count Analogue/Dig kit £80.00
DC-DC 12V inverter kit £30.00
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FT7B £375

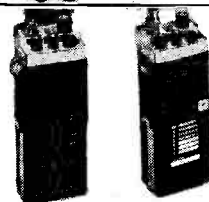
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10W FM 2-metre Synthesized
'Single-knob' tuning. 10kHz
(+ 5 up) Transceiver up/down
and scan from mics.
As FT227RB less mic control
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Communications Rx 250kHz-
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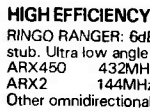
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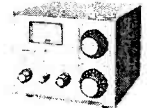


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FT301	10-160M Tx/Rx 100W	£592.25	£470.00	FT101E	Tx/Rx 10-160M 240 + 12V	£592.25	£499.00
FT301D	As 301 but Digital	676.20	575.00	FT101EE	E less RF processor	578.45	459.00
FT301S	10-160M Tx/Rx 10W	454.25	405.00	FT101EX	EE less inverter etc	541.65	429.00
FT301SD	As 301S but Digital	607.20	475.00	FV101B	External VFO	98.33	78.00
FP301D	Power Supply 20A at 12V	187.88	145.00	YO100	Monitorscope	166.75	125.00
FC301	Antenna Tuner	124.20	110.00	YO101	Monitorscope	194.93	175.00
LL301	Phone Patch	33.93	30.00	YC601	Digital readout	129.95	97.00
FV301	External VFO	98.00	69.00	YC601B	Digital readout	154.68	135.00
YO301	Monitorscope	192.05	163.00	FTV250	2m Transvertor	212.78	149.00
FR101D	Deluxe Rx 160-10 + 2 + 4M + BC	603.75	545.00	YC221	Digital readout	83.87	50.00
FR101S	Standard Rx 160-10M	454.25	410.00	FT223	23 channel 10W FM 2m	160.42	150.00
FR101DD	Digital Deluxe	707.25	635.00	FT224	23 channel 10W FM 2m	169.62	145.00
FR101DS	Digital Standard	592.25	535.00	FL110	HF 100W PEP Linear	149.50	119.00
FL101	10-160 Tx	500.25	450.00	FT75B	8-10M VXO Tx/Rx	201.25	180.00
FL101(P)	FL101 with processor	547.98	490.00	FP75B	AC PSU for FT75B	50.02	45.00
				DC75B	DC PSU for FT75B	50.02	45.00

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GM8GEC Jack Edinburgh (031665) 2420
G13WVY Mervyn Tandraage (0762) 840656
GW3TMP Howarth Pontybodkin (035287) 846/324
GW4GSW Alan Swansea (0792) 24140

Communications Ltd



A VERY HAPPY NEW YEAR

CDE and STOLLE

ROTATORS — SMC for CHOICE


AR40

 £52 + VAT
 Post and packing Free


AR30


 £41 + VAT


Accurate, silent self-calibrating control box. Dial up desired beam heading, push knob motor rotates to that position and then switches off AR30 UHF QRP VHF AR40 VHF QRP HF

BT1

 £79.50 + VAT
 Post and packing Free

Four position pre-set plus normal manual controls. Handles aerials up to 5 sq ft of wind area. Supplied (as AR40) with lower mast fit casting etc.

T2X

 £99 + VAT
 Carriage by Securicor Free (UK Mainland)

HAM IV

 £145 + VAT

CD45

 £199 + VAT

Large illuminated meter gives read-out of antenna heading at all times. Superior brake mechanism. Low voltage motor. CD45 to 8½ sq ft HAM IV to 15 sq ft. T2X to 30 sq ft.

January Sales • ROTATOR BARGAINS • Carriage Free

AR10 For small VHF/UHF Antennas. Solenoid controlled £26.22
 AR22 For VHF/UHF, small HF Ants. Bell type. Solenoid £43.00
 AR33 As AR40 but 4 pre-set/man control (DRRP £57.00) £45.22
 2030 Memomatic, moving indicator through type (DRRP £57.60) £00.00
 2021 Sensor, 7 pre-set/man touch optn (DRRP £117.60) £60.00
 2031 Programmatic, 7 pre-set/man, set control (DRRP £102.60) £00.00

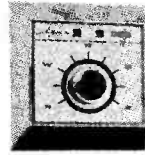
ROTATOR ACCESSORIES

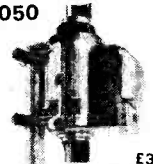
RZ100 Alignment bearing for Stolle models 20** (60p) £10.00
 CD562 Alignment bearing for CDE AR (10-20-30) (60p) £6.75
 4 Core AR10, AR20, AR22 (p&p extra) yd 20p
 5 Core AR30, AR40, AR33, BT1 20(10/21/30/31) (p&p extra) yd 24p
 8 Core TR44, CD (44, 45) Ham (M/2/3/4) T2X (p&p extra) yd 36p
 AK121 CDE bell Rotator to Versatower head unit (40p) £3.60

2010

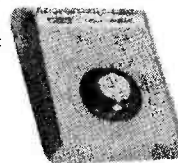
 £45.83 + VAT
 Post and packing Free

Automatic control box. Dial desired direction and the rotator turns to the position and stops. Turning shaft (up to 1½") passes through rotator.



2050

 £35 + VAT
 Post and packing Free

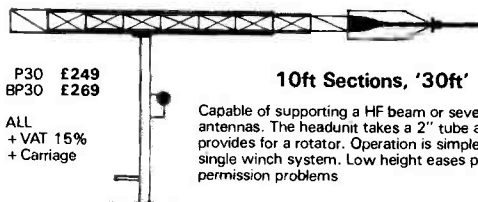
Memomatic control with moving light. That gives beam heading during rotation. Rotor is similar to 2010. Uses inexpensive 3 core cable.



VERSATOWERS

Telescopic for planning permission, and tiltover for antenna installation and maintenance. 12 years of development — 50 models: 25-120 ft, post, wall, base plate or fixed base.
 Contact SMC for further details of the range.

P40 £276.75 P60 £335.90 P40HD £416.20 P60HD £472.50



10ft Sections, '30ft'

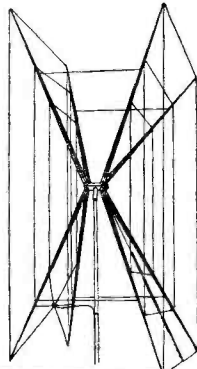
Capable of supporting a HF beam or several VHF antennas. The headunit takes a 2" tube and provides for a rotator. Operation is simple with single winch system. Low height eases planning permission problems

P30 £249
 BP30 £269

ALL + VAT 15% + Carriage

GEM QUAD

A glass-fibre, boomless, quad antenna covering 10-15-20 metres. The centre spider is aluminium and the spreader arms (13.6' and 2.2 lbs) are of a tri-detic construction. (11th rods forming a triangle with tape criss-crossing for light, rigid, low wind resistance structure.)



GQ2E 18' x 18' x 9.5' 8dB Gain
 GQ3E As 2 ele plus 6.5' Boom
 GQ4E As 2 ele plus 13' Boom

GQ2E 2 element quad (£5) £124.00
 GQ3E 3 element quad (£7) £187.00
 GQ4E 4 element quad (£9) £249.00

CK1Q Conversion kit (£5) £63.00
 CK2Q Conversion kit (£7) £125.00
 SPD Spider (Spare) (£1) £26.25
 ARMS Spreader arms (£3) £9.85

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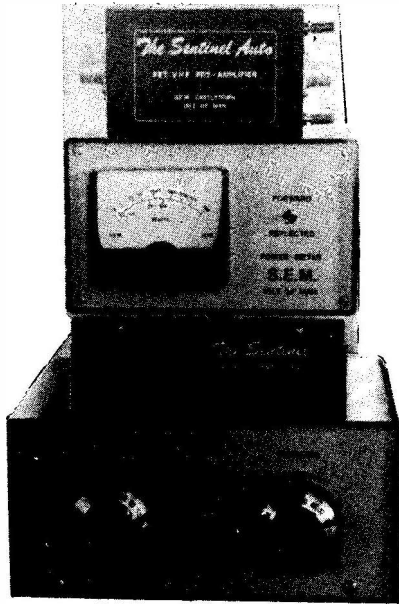
Jack Tweedy, G3ZY
 150 Horncastle Road,
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THREE SENTINEL 2 METRE POWER/PRE-AMPLIFIERS

All are linear, ALL MODES. Switch straight THROUGH on receive. R.F. switching switches at .1 watt. Latest SWR protected power transistors. Receive J FET selected for 1dB N.F. 18dB gain, same circuit as Sentinel V.H.F. pre-amp (see below) SO239 sockets.

Sentinel 30 — Ten times power gain, e.g. 3W in 30W out up to 5 watts input. **£50.00.** Sentinel 40 — Four times power gain, e.g. 10W in 40W out up to 16 watts drive. **£66.70.** Sentinel 100 — Ten times power gain, e.g. 10W in 100W out up to 16W input. **£126.50.** All in stock.

SENTINEL 2 METRE PRE-AMPLIFIERS

The 2 metre units use a neutralised J. FET circuit rather than the more common MOSFET or grounded gate J FET. This gives lower noise figures and higher gain. We select the J FETs for a 1dB noise figure and 18dB gain.

The noise figure of 2 metre receivers is usually 7-8dB and to overcome this noise we find the 18dB is necessary. We use 18 s.w.g. (1.22 mm) air spaced coils for high Q. These are both efficient and selective.

We have three models for your choice.

1. SENTINEL AUTO 2 METRE PRE-AMPLIFIER

For connection straight into the aerial lead and the r.f. switch changes over automatically between transmit and receive on any mode. See above for more detail. 12V nominal. Size: $1\frac{1}{2} \times 2\frac{1}{2} \times 4'$. Price: **£17.83* ex. stock.** 70 cm version **£20.90* ex. stock.**

2. PA5 AUTOMATIC 2 METRE PRE-AMPLIFIER

Same as the Sentinel Auto but for 240V mains operations in a pretty little case. Size: $3\frac{1}{4} \times 6\frac{1}{4}$ front panel, $2\frac{1}{4}$ deep. SO239 sockets. Price: **£28.75 ex. stock.**

3. SENTINEL STANDARD 2 METRE PRE-AMPLIFIER

Same performance as the Sentinel Auto but no r.f. switching. Price: **£13.22* ex. stock.** 70 cms version **£20.90* ex. stock.**

PA3 DUAL GATE MOSFET 2 METRE PRE-AMPLIFIER

Mini 2 metre pre-amp. Size 1 cubic inch to fit inside transceivers. N.F. 2dB gain 18dB. 9-15V. **£8.00 ex stock.** 70 cm version **£10.00 ex. stock.**

S.E.M. Z MATCH

This circuit is generally accepted as being the most VERSATILE transmatch system.

It will match aeriols of 15-5000 Ohms, to your equipment. BALANCED or UNBALANCED at up to 1kW. SO 239 and 4 mm terminals for co-ax or wire aeriols, both end fed and open wire. Ex stock. Price: **£45.00.**

SENTINEL H.F. WIDEBAND PRE-AMPLIFIERS

2-40MHz, 15dB gain. Ideal units for pepping up receivers on 15 and 10, for OSCAR reception and as an ACTIVE AERIAL. 9-12V supply. Size: $2\frac{1}{4} \times 1\frac{1}{2} \times 3'$. We make the following two versions:

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Performance as above. **£10.00* ex. stock.**

SENTINEL AUTO H.F. PRE-AMPLIFIERS

Same performance as above with a change over relay operated by your transceiver relay for direct connection in your aerial co-ax. **£14.95* ex stock.**

S.E.M. FORWARD/REFLECTED POWER METER

500W 1-30 MHz. Separate pick up unit **£29.17 ex stock.** Separate pick up unit **£29.17 ex. stock.**

S.E.M. EUROPA C 2 METRE TRANSVERTER

200W input. 2dB N.F. Plugs straight into Yaesu equipment for any mode 2 metre use. **£126.65.** Repeater shift **£15.00.** CPS10 for use with other equipment, **£57.57 ex stock.**

CONVERTERS

SENTINEL 2 metre converters: IFs, 28-30MHz, 4-6MHz, 2-4MHz. 2dB N.F. 30dB gain. **£23.00 ex stock.**

SENTINEL X 2 metre converters — same as above with internal mains supply — **£26.50 ex stock.**

SEM 70 70 cms to 2 metres — **£23.00.**

SENTINEL TOP BAND CONVERTER — **£20.80.**

Prices include VAT and delivery. * Belling Lee sockets standard, SO239s £1.73 extra. 12 months guarantee. To order: C.W.O. or credit card. Phone your credit card number for same day service. Belling Lee Plugs 25p. PL259 plug and reducer 75p.

Need more info? Ring or write.



FOR QUALITY CRYSTALS—AT COMPETITIVE PRICES
POPULAR FREQUENCIES IN STOCK
MADE TO ORDER 10 kHz to 225 MHz

QSL leads the field in supplying crystals world wide to major communications companies, broadcasting authorities and posts and telecommunications administrations. As a result we can supply the amateur with a high quality, competitively priced product over a frequency range from 10 kHz to 225 MHz. Get the power of the professionals in crystal supply behind you!

2 METRE STOCK CRYSTALS. Price £1.83 for one crystal. £1.74/crystal when two or more purchased.

	HC6/U 30pF TX	HC6/U 30pF TX	HC25/U 30pF and 40pF TX	HC25/U 20pF and 30pF RX	HC25/U 25pF and 20pF TX	HC6 & 25/U SR RX
R0	4.0277	8.0555	12.0833	14.9888	18.1250	44.9666
R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	45.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
S8	—	—	12.1000	14.9444	18.1500	44.8333*
S9	—	—	12.1020	14.9472	18.1531	44.8416*
S10	—	—	12.1041	14.9500	18.1562	44.8500*
S11	—	—	12.1062	14.9527	18.1593	44.8583*
S12	—	—	12.1083	14.9555	18.1625	44.8666*
S13	—	—	12.1104	14.9583	18.1656	44.8750*
S14	—	—	12.1125	14.9611	18.1687	44.8833*
S15	—	—	12.1145	14.9638	18.1718	44.8916*
S16	—	—	12.1167	14.9667	18.1750	44.9000*
S17	—	—	12.1187	14.9694	18.1781	44.9083*
S18	—	—	12.1208	14.9722	18.1812	44.9166*
S19	—	—	12.1229	14.9750	18.1843	44.9250*
S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
S23	4.0437	8.0875	12.1312	14.9861	18.1968	44.9583

SR = Series Resonance *HC25 only

MADE TO ORDER CRYSTALS SINGLE UNIT PRICING

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery A B
Fundamentals	1	200 (total)	10 to 19.999 kHz	— £23.00
	2	200 (total)	20 to 29.999 kHz	— £16.50
	3	200 (total)	30 to 99.999 kHz	— £10.50
	4	200 (total)	100 to 999.999 kHz	— £6.00
	5	50	1.00 to 1.499 Mhz	£9.00 £6.00
	6	10	1.50 to 1.999 MHz	£4.75 £4.20
	7	10	2.00 to 2.599 MHz	£4.75 £4.00
	8	10	2.60 to 3.999 MHz	£4.55 £3.70
	9	10	4.00 to 20.999 MHz	£4.55 £3.60
	10	10	21.00 to 24.000 MHz	£6.00 £5.40
3rd OVT	11	10	21.00 to 59.999 MHz	£4.55 £3.60
5th OVT	12	10	60.00 to 99.999 MHz	£5.00 £4.00
	13	10	100.00 to 124.999 MHz	£6.15 £5.20
5th, 7th & 9th OVT	14	20	125.00 to 149.999 MHz	— £6.00
	15	20	150.00 to 225.00 MHz	— £7.50

Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

HOLDERS — Please specify when ordering — 10 to 200 kHz HC13/U, 170 kHz to 170 MHz HC6 or HC33/U, 4 to 225 MHz, HC18 and HC25.

DELIVERY. Column A 3 to 4 weeks (this service is subject to availability), Column B 6 to 8 weeks.

Please note that it is not always possible to provide the A delivery service but a telephone call will confirm its availability. Any orders received for A delivery when it is not available will automatically be placed on B delivery and a credit note issued for the difference in price.

DISCOUNTS. 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency specification. Special rates for bulk purchase schemes including FREE supply of crystals used in UK repeaters.

EMERGENCY SERVICE SURCHARGES (to be added to A delivery prices). 4 working days £8, 6 working days £6, 8 working days £4, 13 working days £3 (maximum of 5 crystals on 4 day delivery).

CRYSTAL SOCKETS HC6/U and HC25/U 16p.

MINIMUM ORDER CHARGE £1.50.

COMMERCIAL USERS. Crystals can be supplied for MPU, industrial control, etc. in the range 4-21 MHz fundamental and 3rd OVT 18 to 60 MHz at £1.15 for 100 off. This is only a limited example of our capabilities. Please enquire about other quantities, frequency ranges, watch and sub-carrier crystals. We can supply crystals for marine and land mobile radio telephone use. Send for details.

TERMS. Cash with order, cheques and postal orders payable to QSL Ltd. All prices include postage to UK and Irish addresses. Please note Southern Irish cheques and postal orders are no longer acceptable. Please send bank draft in pounds Sterling.

OVERSEAS DISTRIBUTORS
 West Germany, Austria and Benelux countries — SSB Electronic, Karl Arnold Str. 23, 5860 Iserlohn, West Germany.
 Denmark — Asbjorn Jorgensen, Aabrinken 1, Tapdrup, DK800, Viborg.
 Denmark, Portugal — Sorubal SARL, Rua General Pimenta de Castro, 15-81, Lisboa 5, Portugal.
 (Enquiries invited from companies in other countries.)

Also in stock: R0 to R7 for FT221 R0 to R7 and S8 to S23 for following: Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215, Trio Kenwood 2200, 7200, Uniden 2030 and Yaesu FT2FB, FT2 Auto, FT24, FT223 and FT202.

Also in stock 4 and 8 MHz TX in HC6/U for 145.8 MHz. Icom crystals TX for 145.6 MHz (RRO). 44 MHz RX crystals in HC6 for 145.8 and 145 (RRO) and HC6 only for 145.475 MHz (S19) HC25 for 145.00. All at above price.

4 METRE CRYSTALS for 70.26 MHz in HC6/U at £2.25. TX 8.78250 MHz. RX 6.7466 or 29.78 MHz in stock.

70cm CRYSTALS in stock 8.0222 and 12.0333 in HC6 £1.85. Pyc Pocketfone PF1, PF2, PF70 and Wood and Douglas £4.50 a pair or TX £2.25, RX £2.50, SUB (433.2) RBO, RB2, RB4, RB6, RB10, RB11, RB13 and RB14.

CONVERTER CRYSTALS in HC18/U at £2.85. In stock 38.666, 42.000, 70.000, 96.000, 101.000, 101.500, 105.666 and 116.000 MHz.

tone BURST AND I.F. CRYSTALS in HC18/U at £2.25 in stock. 7.168 MHz for 1750 kHz and 10.245 MHz for 10.7 MHz IF's.

FREQUENCY STANDARDS in stock £2.75. HC6 200 kHz, 455 kHz, 1000 kHz, 5.000 MHz and 10.000 MHz. HC13 100 kHz, HC18 1000 kHz, 7.000 MHz, 10.700 MHz, 48.000 MHz and 100.00 MHz.

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Prices shown exclude VAT — UK Customers please add 15%.

TWO METRE — CRYSTAL RANGE

CRYSTAL FREQUENCY RANGE USE (Tx or Rx) and HOLDER	4 MHz-TX-HC6/U	6 MHz-TX-HC25/U	8 MHz-TX-HC6/U	10 MHz-RX-HC6/U	11 MHz-RX-HC6/U	12 MHz-TX-HC25/U	14 MHz-RX-HC25/U	18 MHz-TX-HC25/U	36 MHz-TX-HC6 & 25/U	44 MHz-RX-HC6/U	44 MHz-RX-HC25/U	48 MHz-TX-HC6 & 25/U	52 MHz-RX-HC25/U	72 MHz-TX-HC25/U
144.4 (433.2)	a	b	c	d	e	f	g	h	i	j	k	l	m	n
144.480	a	b	c	d	e	f	g	h	i	j	k	l	m	n
144.800	a	b	c	d	e	f	g	h	i	j	k	l	m	n
144.850	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.000/ROT	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.025/R1T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.050/R2T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.075/R3T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.100/R4T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.125/R5T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.150/R6T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.175/R7T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.200/R8T	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.300/S12	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.350/S14	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.400/S16	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.425/S17	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.450/S18	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.475/S19	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.500/S20	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.525/S21	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.550/S22	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.575/S23	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.600/ROR	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.625/R1R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.650/R2R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.675/R3R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.700/R4R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.725/R5R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.750/R6R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.775/R7R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.800/R8R	a	b	c	d	e	f	g	h	i	j	k	l	m	n
145.950/S38	a	b	c	d	e	f	g	h	i	j	k	l	m	n

S18 and S19 are now added to our stock range

PRICES: (a) £1.95; (b) £2.32; (c) £2.80; (e) £3.94.

AVAILABILITY: (a), (b), (c) stock items, normally available by return (we have over 5000 items in stock). (e) 4/6 weeks normally but it is quite possible we could be able to supply from stock.

N.B. Frequencies as listed above but in alternative holders and/or non stock loads are available as per code (e).

ORDERING: When ordering please quote (1) Channel; (2) Crystal frequency; (3) Holder; (4) Circuit conditions (load in pf). If you cannot give these, please give make and model of equipment and channel or output frequency required and we will advise if we have details.

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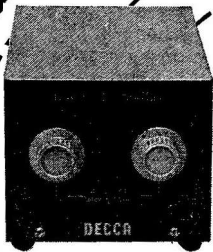
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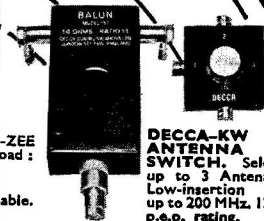


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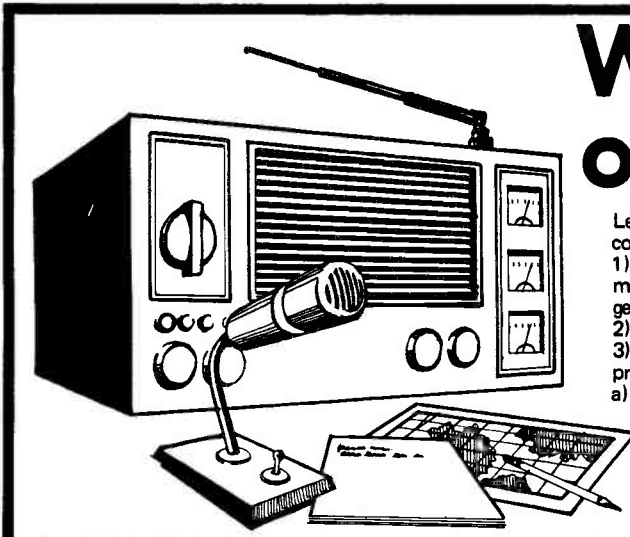
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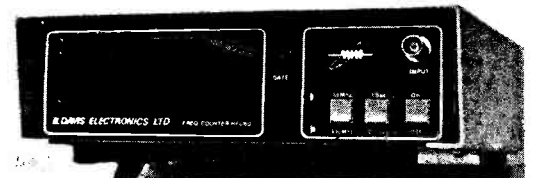
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