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THE SHORT WAVE MAGAZINE

WORLD WIDE COMMUNICATION

FOR THE RADIO AMATEUR AND AMATEUR RADIO

TRIO

5 Band SSB/CW Transceiver TS520

The transceiver with everything

The TS520 System
TRIO have now completed the first stage of the total system concept for amateur radio equipment. With the TS520 and its associated accessories, the amateur radio operator can assemble a station to suit any or all requirements for his hobby enjoyment. All modes and all bands, fixed and mobile/portable are provided by the TS520 system.

SSB/CW Transceiver TS-520
A real "compact"; powerful, rugged and reliable. It has everything which otherwise is available only as an accessory at extra cost; built-in power supply for fixed-station use, transistorized DC/AC power converter for mobile operation, loudspeaker, fixed-channel provisions, VOX control, etc. And these are the TS-520's special features in short format:

Versatile Transmit- and Receive Operations—USB, LSB and CW on all radio amateur bands from 80m. to 10m., and—with the aid of the 2m.-Transverter TV-502—also on the VHF-band from 144 to 145·7 MHz, as well as fixed frequency operation on four channels. The TS-520 also allows reception of WWV stations on 10 MHz for dial calibration. By adding the External VFO-520 (optional) the TS-520 demonstrates utmost versatility: independent RX- and TX operation with different frequencies, transceive operation with slightly variable RX frequency by means of the built-in RIT circuit (Receiver Incremental Tuning) plus fixed channel operation totalling nine different combinations.

Advanced Circuitry—With the exception of the transmitter driver and final stage which are equipped with blower-cooled vacuum valves of type 12BY7A and 2 x S2001 the TS-520 is fully transistorized. The semiconductor complement consists of 44 transistors, 18 FETs, 1 IC and 84 diodes. The reliability and stability of this circuit has been substantiated by numerous contests and during rugged mobile operation.

Outstanding Receive and Transmit Performance—The transmitter section of the TS-520 features separate driver, plate and final tuning, a 2-stage ALC circuit for local and DX operation, thus assuring undistorted clearly legible TX signals even after hours of continuous operation. Provisions for linear amplifiers, such as ALC input, antenna relay switching output, etc., are available and ready for use. Dual-gate MOSFETs are employed in all critical receiver circuits to improve the input sensitivity, cross-modulation response and spurious rejection. An 8-pole SSB crystal filter in the IF amplifier provides exceptional selectivity and stability. An optional 500Hz CW filter is available as an accessory and can be installed at any time. The switch-selectable time constant of the AGC assures perfect reception of SSB and CW signals.

Precision-type VFO—a feature of all TRIO receivers, transmitters and receivers also contributes to the supreme performance of the TS-520. The VFO is fully encapsulated and is controlled by a meshedgear dial drive (reduction ratio 4 : 1). Dial accuracy is better than ± 1 kHz, frequency drift will not exceed ±100Hz per hour. Dial calibration is accomplished by means of a built-in 25 kHz crystal marker oscillator.

Built-in Power Supplies—for fixed station use with 120/240 VAC 50-60Hz line voltage or for mobile operation with 12-13·8 VDC by means of the built-in DC/AC converter.

Loaded with Extra Features: threshold-type RF gain control; semi-break-in circuit with sidetone; VOX/PTT/MOX-control; RIT; TUNE switch; LED function indicators for RIT, VFO and FIX channel operation; WWV receive pushbutton; 4-position fixed channel selector switch; built-in 25 kHz crystal marker oscillator; two-stage AGC; multi-function meter; terminals for optional accessories such as: 2m.-Transverter TV-502, External VFO-520, External Speaker SP-520, linear amplifier, headphone, microphone and key.

OPTIONAL ACCESSORIES
EXTERNAL VFO-520
Developed exclusively for the TS-520, this external VFO fulfils the same functions as a separate transceiver due to its numerous cross-operation and split frequency features. Design and specs. of the VFO-520 are identical to those of the TS-520's built-in VFO. It operates on ocilllator frequencies between 4·9 and 5·5 MHz. Remote control and power supply are furnished by the TS-520 by means of a special interconnecting cable. In conjunction with the transceiver the VFO-520 provides a total of nine different operating modes, including RX or TX operation with continuously tunable frequencies and fixed-channel operation.

2m. TRANSVERTER TV-502
This new addition to the TS-520 accessory line extends the transceiver's scope of application to include the 2m.-VHF range which is becoming more popular every day. The TV-502 transverts the 10m.-band to 144-145·7 MHz for SSB and CW operation. By installing an optional 39 MHz crystal, the TV-502 will also cover the range between 145·0 and 146·0 MHz, thus making the entire 2m. band available for the shortwave radio amateur. The unit features preselector tuning on the antenna side and IF tuning by means of a multi-gang capacitor, utilizing the TS-520's ALC meter for tuning control. The TV-502's transmitter is controlled by the ALC voltage supplied by the transceiver and provides 10 watts RF output power. The highly sensitive receiver section responds to input signals of less than 0·5μV. Like the TS-520, this transverter can also be used for fixed or mobile stations, operating either from 120/240 VAC, 50-60Hz line voltage, or 12-13·8 VDC supplied by a car battery.

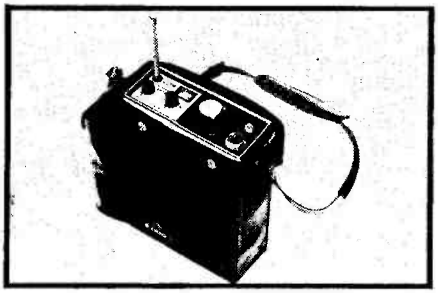
EXTERNAL SPEAKER SP-520
Styled to match the TS-520 accessory line, this 5in-speaker will greatly improve the readability of RX signals, especially in DX operation. Voice coil impedance is 8 ohms, frequency response from 100 to 5,000Hz.

Sole Importers: LOWE ELECTRONICS
119 Cavendish Road, Matlock, Derbyshire
Tel.: Matlock 2817/2430

TS520 £318 VAT Exc.

TRIO

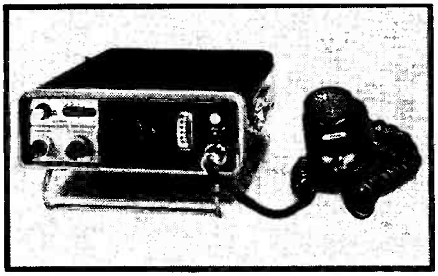
LOWE ELECTRONICS



TR2200G

The most popular 2 metre handy transceiver in the world. 12 Channels 144-146 MHz. 1W Tx. O/P. Tuning fork 1750 Hz access tone. Complete with carrying case, microphone, battery charger and fitted S20, S22, R7 crystals.

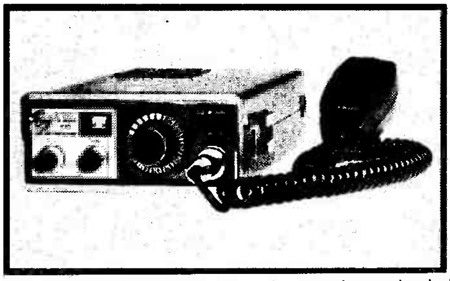
£80 VAT EXC.



TR7200G

The finest mobile FM transceiver at any price. 22 Channels 144-146 MHz. 10W/1W O/P. Tuning fork 1750 Hz access tone. VFO available. Complete with mounting bracket, microphone, power leads and fitted S20, S21, S22, R6 and R7.

£130 VAT EXC.



TR3200

The newest FM handy transceiver. 12 Channels 430-434 MHz. 2W/400mW Tx. O/P. Tuning fork 1750 Hz access tone. Complete with all accessories as TR2200 and fitted 3 channels.

£130 VAT EXC.

How does the average chap know how to choose the dealer from whom to buy his equipment ? Let me quote below the opening page of our catalogue for 1966 which was written by Bill when he laid down the basic rules by which we still run the business.
The ensuing blah is designed specifically to get between you and your wallet—which, let's face it, is the object of advertising. Just how successful I will be rather depends on whether you believe the aforesaid blah or not. After all, why on earth should you buy from me—my prices are in general about the same as anyone elses (although some things are cheaper), I don't allow any discounts nor do I cut prices, nor give fabulous allowances on trade-ins. On the face of it, I'm a dead loss and you'd be much better with "Honest Sam" who gives a good discount. However, I differ from "Honest Sam" in one or two small points. Firstly, I never, under any circumstances, ever sell anything I am not convinced in good value for money. Many's the time I've been asked for equipment which I know to be inferior and had to turn good money away because I refuse to sell it. Many's the time a chap has wanted to trade inferior equipment for new, recommended stuff. I've lost the sale because I refuse to accept inferior stuff in the trade. Even though I know I could easily sell it to some poor mug. This means that you can come to me confident that you'll not get "sold a pup." Secondly, everything I sell has an unconditional money back guarantee—if you don't think it is good value for money, you get your money back without question ! Thirdly, everything I sell carries a guarantee and I have the service facilities to back it up. If you're buying fairly complex gear, by all means buy it from Honest Sam and get a quid or two off for cash, but what happens when it goes on the blink ? I'd like to bet Honest Sam just doesn't want to know. I am the actual importer of virtually everything I sell and I carry spares and what I haven't got I can soon get through our Agent in Japan. (Oh yes, we actually have an Agent on the spot.) In the few years I have been in business I have built up a reputation for only supplying excellent, fully tested, trouble-free gear at a reasonable price and it is a reputation I'm not anxious to lose because it's my bread and butter. The defence rests. Whether or not you believe me is up to you, but you can perhaps check by talking to someone who has bought something from me (there are one or two kicking about !).
Finally, do beware of "fabulous bargains"—I've yet to see one !

HEAD OFFICE — **119 Cavendish Road, Matlock, Derbyshire. Tel. 2817 or 2430 9 a.m. to 9 p.m.**

BRANCH OFFICES — 39 Pound Street, Carshalton, Surrey. Tel. 01-669 6822
Soho House, 362-4 Soho Road, Handsworth, Birmingham Tel. 021-554 0708

AGENTS (Evenings & Weekend) — Alan GW3YSA, 35 Pen-Y-Waun, Efail Isaf, Nr. Pontypridd. Tel. Newton Llantwit 3809
John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071
Sim GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364

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UNIDEN

MODEL 2020

SSB/CW/AM TRANSCEIVER

We are proud to introduce the very newest in all band, all mode transceivers—the UNIDEN Model 2020. This is an all new rig with a refreshing new approach to amateur radio operating. Fully self-contained for operation on Ac mains or 12v. DC mobile the 2020 uses the very latest design techniques to give superlative performance. Plug-in modules for reliability, optimum circuit isolation and easy servicing.

★ **FULLY SELF CONTAINED** The 2020 has built-in AC/DC power supplies, CW filter, noise blanker, marker oscillator and PA blower.

★ **NEW DIAL READOUT** An original combination of digital and analogue displays giving direct readout without counter noise problems.

★ **RUGGED PA** Uses a pair of 6146B tubes with stabilised screen supply and amplified ALC system.

★ **SUPERB CROSS MODULATION AND IMAGE REJECTION** Receiver is pre-mixed single conversion using a phase locked loop oscillator circuit. It has excellent signal handling characteristics and uses three filters for USB, LSB and CW.

★ **INDEPENDENT RF CIRCUITS** Transmitter and receiver RF circuits are electrically separate providing no-compromise performance.

★ **DUAL RIT CONTROL** Giving two tuning rates for quick scanning or very precise fine tuning—a UNIDEN exclusive feature.

See the **UNIDEN 2020** at your local amateur radio stockists. You will have to admire the thought that went into its design. Price **£380** (VAT excluded). External VFO **£82** (VAT excluded)

OTHER PRODUCTS As well as the exciting new **UNIDEN** range of equipment we offer the complete **NIHON DENGYO** line of SSB and FM, amateur and marine transceivers and receivers; **HALLICRAFTERS** products; **TONO** linears; valves; crystals, filters; station accessories; **HY-GAIN** antennas; **RAK** antennas; plugs, sockets and cable; in fact everything that a radio amateur may require.

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G3MCN
G3TYE

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47 WARRINGTON ROAD, LEIGH, LANCS. WN7 3EA

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Ft101E Transceiver ... £493·00
FT101EE Transceiver ... £468·75
FT221 VHF Transceiver £398·12
FT200 Transceiver ... £326·00
FT401B Transceiver ... £412·50
FR101S Receiver ... £337·50
FR101S Receiver (Digi'l) £431·50
FR101D Receiver ... £437·00
FR101DD Receiver (Di'l) £531·00
FL101L Transmitter ... £343·00
SP101 Speaker ... ... £18·75
YO-100 Monitorscope ... £131·00
YP-150 Wattmeter ... £55·00
YC355d Freq. Meter ... £146·00

Drake
R4C Receiver ... ... £380·00
T4X Transmitter ... £395·00
TR4C Transceiver ... £410·00
AC-4 AC power unit ... £80·00
MS4 Speaker ... ... £18·75
SSR-1 Receiver ... ... £225·00
TV-1000 Low Pass Filter £15·00

Decca Communications
KW204 Transmitter ... £312·50
KW107 Tuning Unit ... £85·00
KW109 Tuning Unit ... £97·50
KW104 VSWR Meter ... £20·00

Belcom
Liner 2 Transceiver ... £181·25
LA106 Linear Amplifier £206·50
R11EE psu for Liner 2 ... £31·25

Hy-Gain Antenna Range
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CDR Rotators
AR22 ... ... £40·00
AR30 ... ... £31·25
AR40 ... ... £37·50
CD44 ... ... £75·00
HAM-2 ... ... £112·50

Uniden
2020 Transceiver ... £537·50
8010 VFO ... ... £102·50
8120 Speaker ... ... £30·00

Omega
TE-701 Ant. Noise Br.... £22·50
TE-702 Ant. Noise Br.... £30·00

SWR Meters
ReacE/Hansen type single meter ... ... £6·60
AEC10 Single meter ... £6·20
AEC50 Twin meter ... £11·20
Oskerbloc Twin Power meter ... ... £25·92

Barlow Wadley
XCR-30 Solid State Rec. £160·00

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Tech 15 G D.O.... ... £21·50
2-way Coaxial switch ... £9·35
Morse Keys ... ... £6·25
Katsumi Elec. Keyer ... £40·00
Spacemark ETM-3b Key'r £49·98
Bauer Keying unit lever £6·97
Planet Speech Compres'r £35·00

Technical Associates
Audio Filter ... ... £32·50
Audio Compressor ... £28·12
G-Whips mobile antenna range. Full range in stock, send for leaflets. SAE please.

Jaybeam. Full range of beams, quads, masts, clamps, couplers, etc. Send SAE for catalogue.

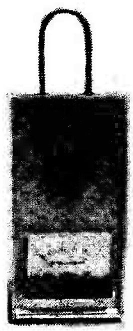
Secondhand Equipment
Swan 500 Transceiver ... £320·00
Eddystone 940 Rx ... £150·00
Swan 300B with D.C. psu £300·00
Eddystone 730/6 Rx ... £135·00
Codar T28 Rx ... ... £16·00
Yaesu FR101D Rx and speaker ... ... £375·00
FDK Multi 2000 Transceiver ... ... £250·00

Accessories
PL259 Plugs **46p**, SO259 Sockets **40p**, Cable reducers **15p**, In Line Connectors **75p**, Elbows **95p**, 4 pin plugs **65p**, Sockets **60p**.

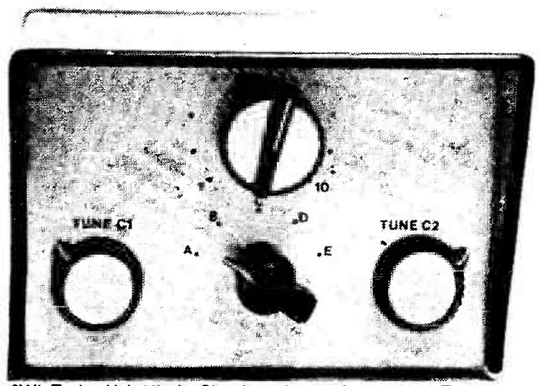
ALL PRICES INCLUDE VAT

Electronic Developments MAGNUM 2 and 4 Metre Transverters. 28 MHz low drive input, CW, SSB, AM and FM. Inclusive of relays and power lead, size 10" x 6" x 7". PRICE **£110·00**, post £1·00.

Electronic Developments MAGNUM 2 metre LINEAR AMPLIFIER. MICROWAVE MODULES, Rx Pre-amp, RF switched. Self contained power supply. Full input and output relay switching. Up to 100 watts SSB output. PRICE **£105·00**, post £1·00.



VHF Absorption Wavemeter. 65-230 MHz. PRICE **£16·00**, post free.

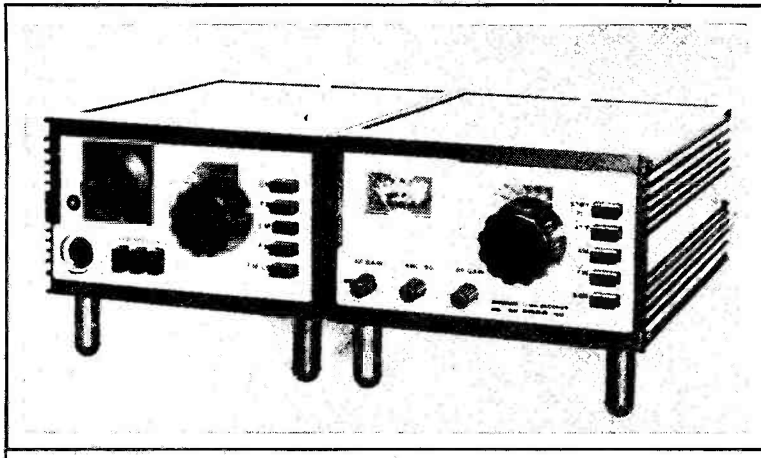


SWL Tuning Unit Mk. I. 50 switchable tunable positions. Two inputs single feed or co-ax. Suitable for any antenna over 15ft. long on 2-30 MHz. Produced in demand to many requests. Hundreds now in use. PRICE **£15·00**, post free.

Instant HP and Credit Facilities available. Barclaycard and Access facilities. After sales service on all equipment. Part exchanges welcome. items sold on commission basis. Saves you advertising costs and assures you of good price. Spot cash paid for clean equipment. SAE with all enquiries please. Postage extra. Minimum postal charge 20p on small items. Carriage by arrangement. Free in some areas.

SHOP HOURS 9.30 TO 5.30 MONDAY TO SATURDAY NO PARKING PROBLEMS

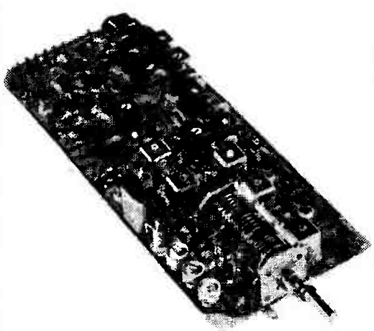
S.T.E. MILAN VHF EQUIPMENT



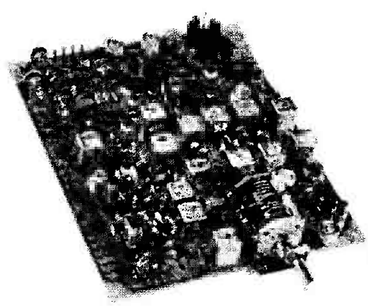
During the last twelve months the popularity of the range of equipment by S.T.E. has been growing. The ARAC 102 receiver has been a "Best Seller" (have you seen any second-hand?). Later in the year the Atal Transmitter came into stock and all reports have been good. Now we are offering the complete range of modules for the D.I.Y. enthusiasts. Transmitters, receivers, etc. The construction of these modules are first class — the P.C.B's are the finest we have ever seen.

Price List (*includes postage*)

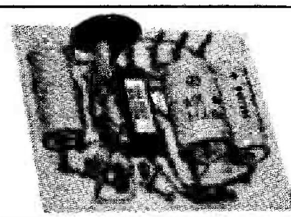
ARAC 102 Receiver ...	**£108·00**
Atal 228 Transmitter ...	**£147·00**
AR10 Receiver Module ...	**£37·50**
AA1 Audio Amplifier ...	**£4·40**
AD4 FM Discriminator ...	**£4·86**
AL8 Linear Amplifier ...	**£29·00**
AT22 Transmitter	**£55·50**
AR20 C.C. Receiver ...	**£57·50**
AT23 C.C. Transmitter ...	**£39·00**
AS 15 Stabilised psu D.C. ...	**£10·00**
AG 10 Tone Generator ...	**£4·75**
AC2A Convertor 28·30 MHz	**£23·00**



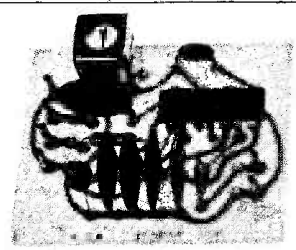
AR10 Mosfet receiver. 28–30 MHz Double conversion superhet. RF and amplifiers stages are gate protected mosfets for good sensitivity and low intermodulation. Noise limiter and squelch circuit. AM, SSB and CW reception. 12v. DC.



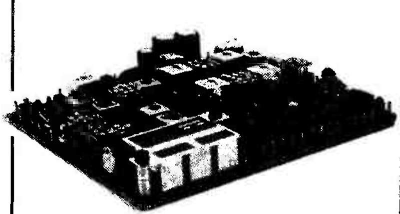
AT 222. A complete transmitter exciter unit for 144–146 MHz on AM or FM. VFO controlled or fixed channel operation. Complete with microphone pre-amp., speech processor including active audio filter. 1 watt output. FM. ·25 watt AM. Output impedance 50–75 ohm adjustable. Frequency deviation 3–10 kHz adjustable.



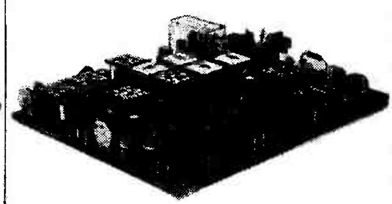
Audio Frequency Amplifier. Output power 1·5 watt at 12v. Output impedence 8 ohm. Frequency response 100-15,000 Hz within 3 dB. Sensitivity 12mV.



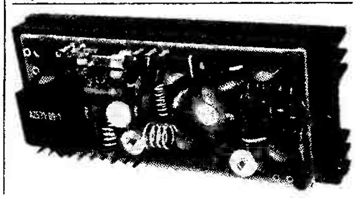
455 kHz FM Discriminator Amplifier. Limiting threshold 100uV. Amplitude modulation rejection 40dB. Audio output voltage at 1 kHz 200-300mV frequency deviation + or — 3 kHz.



AR20. 12 channel FM receiver 144-146 MHz. Input impedance 50–75 ohm. AM-FM modes. Sensitivity 0·2uV AF output 3 watts. 12v. DC operation.



AT23. 12 Channel FM Transmitter. 3 watts. 144–146 MHz. Frequency deviation 3–10 kHz adjustable. 12v. DC operated AF input sensitivity 2mV adjustable to 50 mV.



Linear Amplifier. Frequency 144-146 MHz output 10 watts FM, 8 watt PEP SSB, 8 watt AM. Input power 1 watt FM, ·25 watt AM-SSB. Input impedence 50 ohm output impedence 50-75 ohm. 12v. DC.

STEPHENS-JAMES LTD.

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Western

SAVE £'s £'s £'s BUY FROM 'WESTERN'

HELP US AND HELP YOURSELF!!

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We have so much stock that we do not reallyl ook orward to having to load it all into several vehicles when we transfer our Head Office to Lincolnshire in April, so we thought it made much better sense to give you a SPECIAL PRICE REDUCTION to reduce our stock, rather than line the pockets of the removal company! Naturally, this is a "once in lifetime" occurrence, so do not miss this unique opportunity to get yourself a bargain! All items sold at reduced prices will carry the manufacturer's warranty, but not our free collection and delivery service on warranty claims.

SPECIAL OFFERS ON THE FOLLOWING ITEMS **ONLY:**

ANTENNAS: JAYBEAM NEWTRONICS WILSON. **ANTENNA ROTORS:** CDE

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MASTS: ALIMASTS AND TELOMASTS. **TOWERS:** TELETOWERS

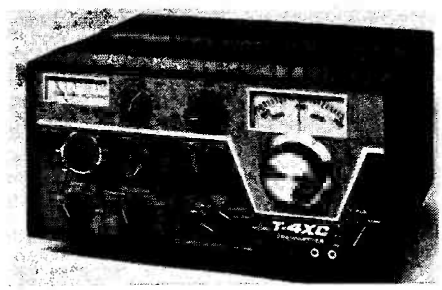
BUY IN CONFIDENCE FROM 'WESTERN' . . .

We carry extensive stocks of spares for CDE and YAESU, so when you buyf rom us, you will have the peace of mind that goes with knowing that your supplier can provide an efficient after-sales service.

DRAKE C LINE — for excellent performance

R4C

T4XC



DRAKE PRICES (INC. VAT) FREE DELIVERY

R4C Receiver	£380·00
T4XC Transmitter	£395·00
AC4 AC psu for T4XC	£80·00
M54 Speaker for R4B	£18·75
SSR1 Receiver	£225·00
TR4C Transceiver	£410·00

HERE IS ONE BARGAIN YOU SHOULDN'T MISS!

THE FDK MULTI-2000

2m. SSB/FM, CW 200 Ch. SYNTHESISED AC/DC TRANSCEIVER

* Full cover 144–6 MHz.
* VXO gives full coverage between 10 kHz spacing.
* Rapid change of frequency and mode is possible.
* RIT (Receiver Incremental Tuning) allows receiver to be tuned without moving the transmit frequency.
* 600 kHz Repeater shift works on all frequencies.
* Tone access built-in.
* Fitted narrow FM Filter.

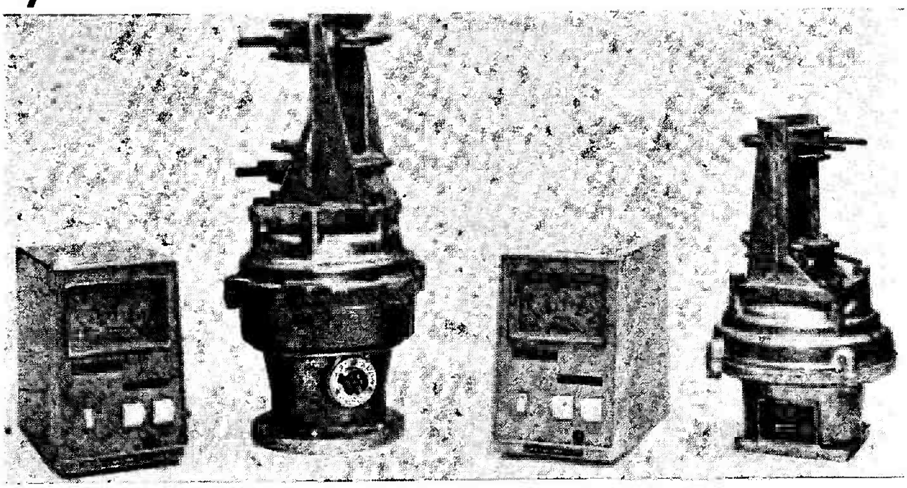
SUPERB VALUE AT **£325** inc. carriage (Securicor) and VAT

VISIT OUR NEW BRANCH AT LEICESTER

WHY NOT PAY A VISIT TO OUR BRANCH WHICH IS NOW OPEN AND HAS STOCK OF THE MAJOR ITEMS? WE ARE LOCATED INSIDE THE LARGE NEW MAY'S AUDIO AND HI-FI CENTRE, CHURCHGATE, LEICESTER.

Electronics (UK) ltd

WE are pleased to announce . . .
. . . an exciting new range of ANTENNA ROTORS
by EMOTO ANTENNA CO.



COMPARISON OF ROTOR BRAKE TORQUE FIGURES (kg. cm.

CDE Model	Torque
AR30	575
AR40	920
CD44	1,152
HAM-2	4,025

EMOTO Model	Torque
102LBX	1,500
1100MXX	10,000

1100MXX £115 plus VAT 102LBX £55 plus VAT

DOES YOUR ANTENNA TURN IN THE WIND?
DOES YOUR CONTROL UNIT "CUT-OUT" AFTER ONLY A FEW REVOLUTIONS?
. . . THEN STEP-UP TO A RELIABLE EMOTO ROTOR

We have been in the business long enough to know your requirements for a first-class antenna rotor, and we have gone "over-board" for the EMOTO range There are many brands of antenna rotors, some of them completely unsuitable for the majority of amateur applications, and for this reason we do not stock them

Most likely your present antenna rotor will turn your antenna and hold satisfactorily, but it just will not hold it stationary under strong wind conditions, i.e. YOUR ROTOR LACKS SUFFICIENT BRAKE TORQUE, the ability to hold the antenna still whilst a gale is blowing.

HERE IS WHERE THE EMOTO SCORES—Take a close look at the comparison figures above. Then compare the prices of all the rotors and you will have to agree that the EMOTO 102 LBX and EMOTO 1100 MXX are the best value.

Finally, EMOTO ANTENNA CO. is not a new company. They have been making rotors for many years. So have no fears about this being a new and untried product.

Having obtained samples (all rotors are individually tested by EMOTO before despatch) and had them tested by an independent authority, SOUTHAMPTON UNIVERSITY, we are now confident to recommend them as THE FINEST ROTORS AVAILABLE. The 1100 MXX received the following comment from the University : "Very rigid. NO SLACK, WELL MADE, GOOD DESIGN." NEED WE SAY MORE!

WESTERN FOR TEST EQUIPMENT

SEE OCTOBER ADVT. FOR FULLER DETAILS

VALVE VOLTMETER, TE-65

- With new 6" full-view meter
- Compare it to any peak-to-peak V.T.V.M. made by any other manufacturer at any price.

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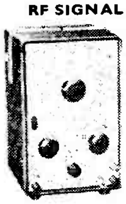
RF SIGNAL GENERATOR, TE,-20D



- Factory calibrated and tested
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Specification: Freq. range : 120 kHz-500 MHz (7 bands). Freq. accuracy : ±2%. Audio output : to 8 volt. Internal modulation : 400Hz approx. Tube : 12BH7A, 6AR5. Power source : 105-125v., 220-240v. AC. 50/60 Hz. 12 watts. Employs a Xtal socket and can be used as below : (a) Self-calibration. (b) Marker generator.

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TE-22D A.F. Generator ...	£35·64
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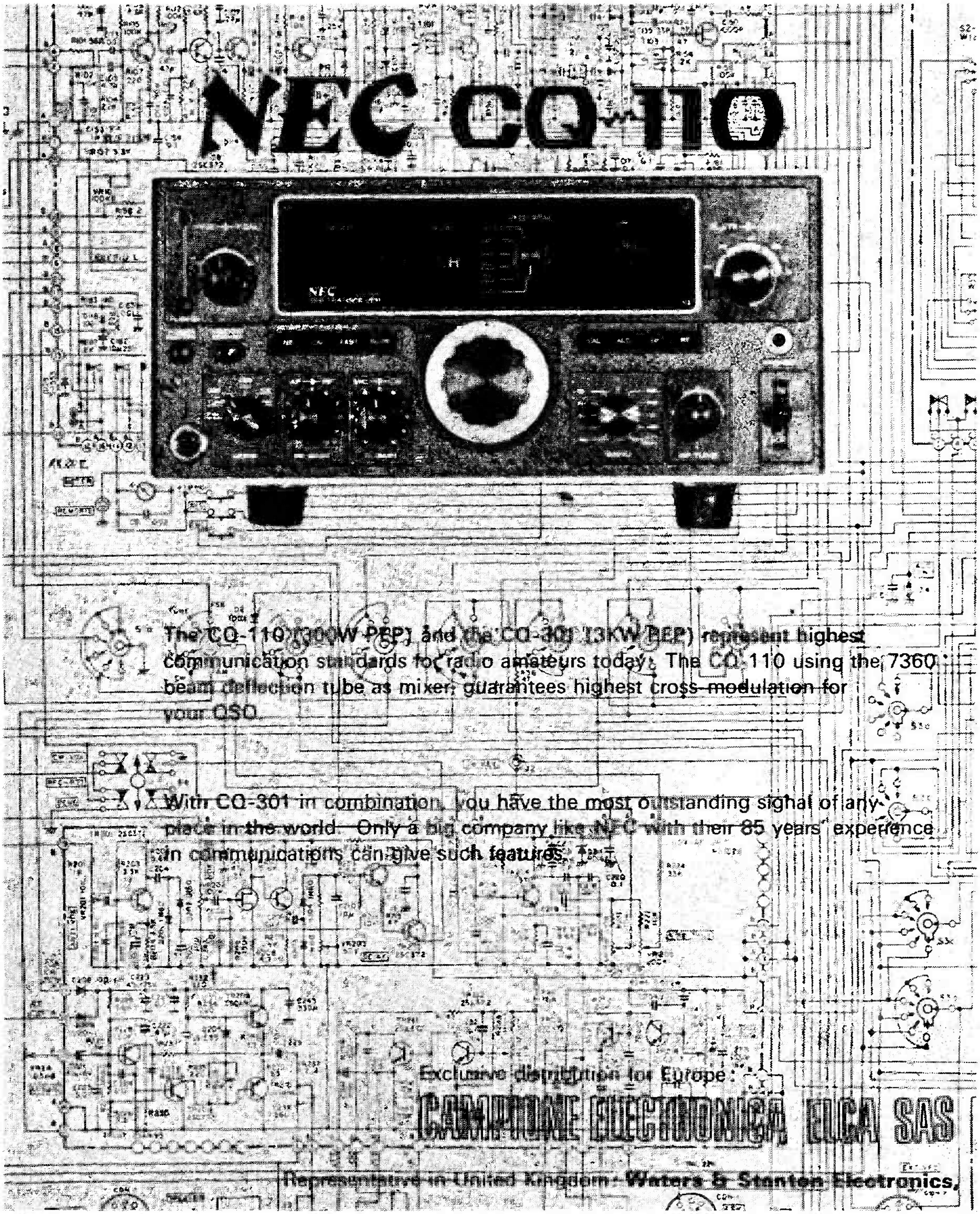
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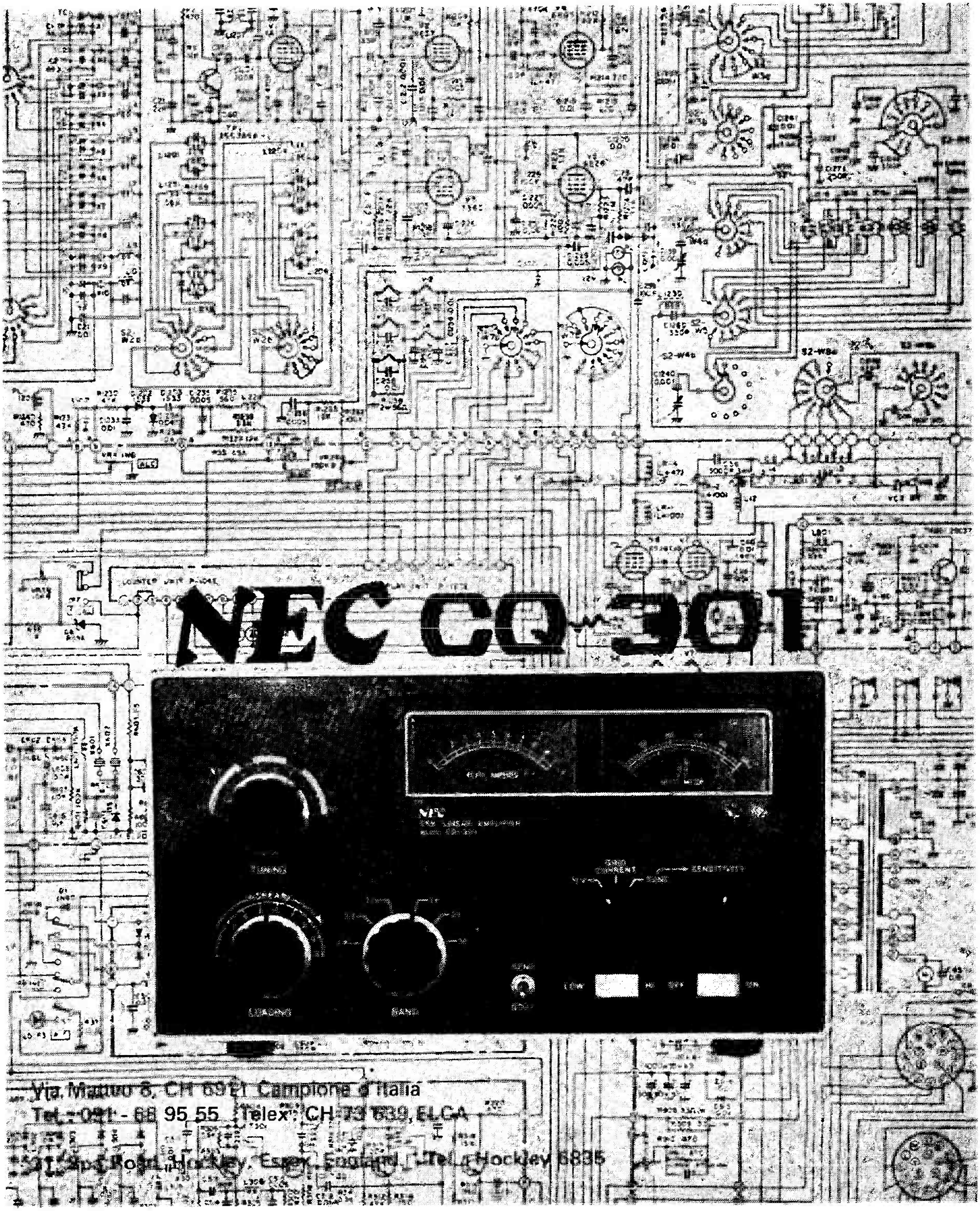
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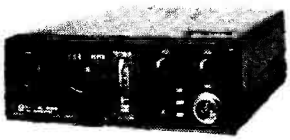

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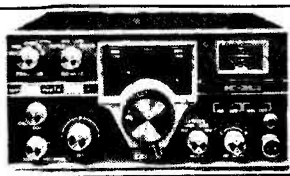

The all-mode 2 metre transceiver. FM/LSB/USB/CW, vfo or 'xtal centre zero meter, 600 kHz repeater and reverse repeater shift, tone-burst, two-speed tuning, vox/cw break-in, cw monitor, noise blanker, rf gain, mic gain, stable vfo, calibrator, squelch, swr meter, 12v. DC or 240v. AC. This compact rig is the ideal base station or mobile unit for the amateur who insists on the best—it's ICOM of course!

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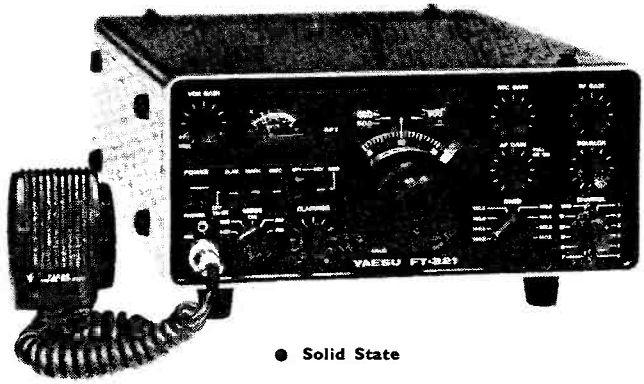

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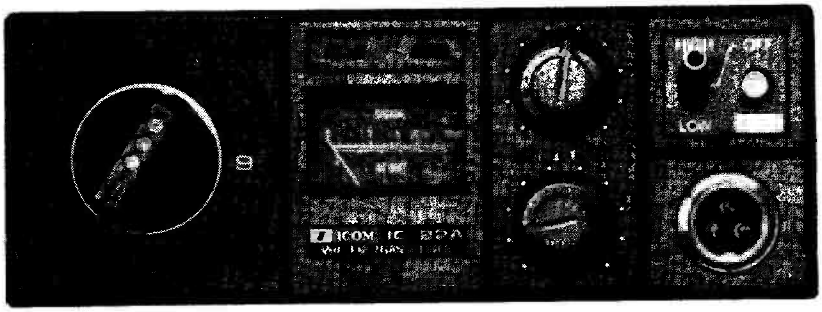

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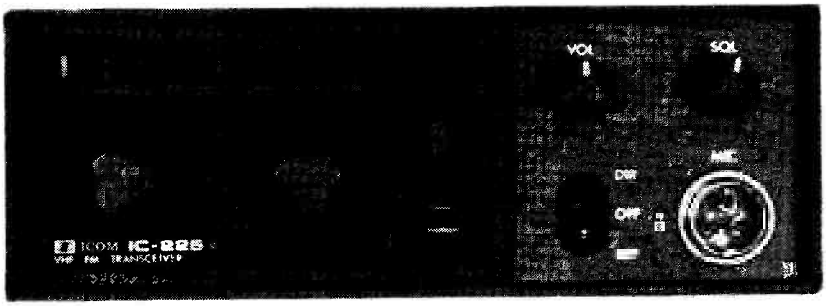

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◀ **IC-22A**

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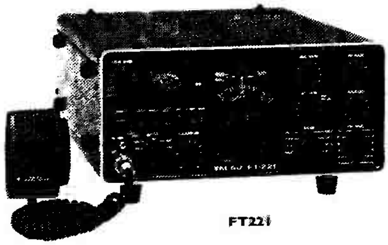

FT221

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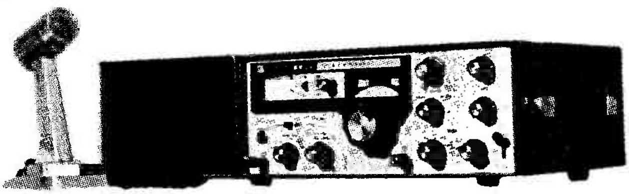

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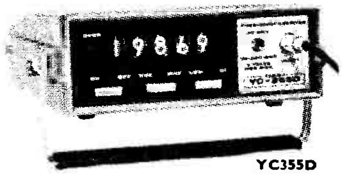

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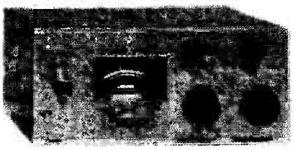

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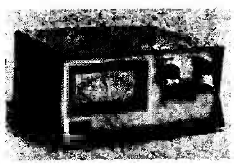

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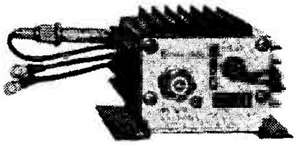

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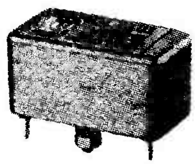

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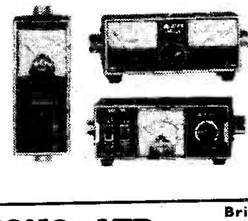

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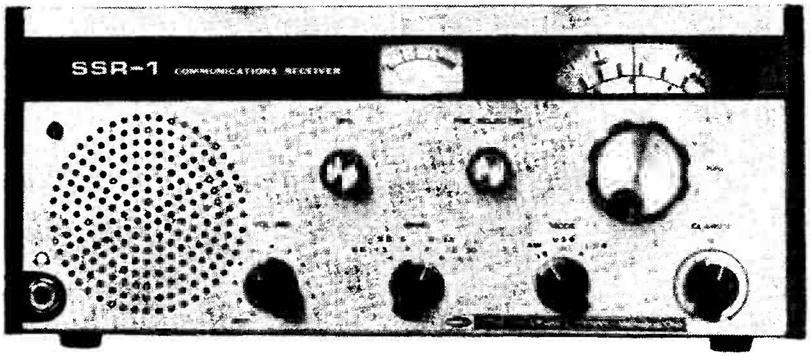

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SHORT WAVE MAGAZINE

(GB3SWM)

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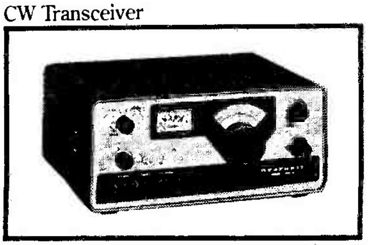

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The SHORT-WAVE Magazine

EDITORIAL

Pollution

The current national and international concern with the problems of pollution covers a wide field—there is even talk of a condition described as people-pollution, and we all know what that implies.

Nevertheless, not yet touched upon are the phenomena which are of considerable importance to all interested in radio communication—and those are the many ways in which the ether has been polluted, and is becoming steadily more so.

All over the country, there are overhead power systems, working at voltages from 6 kV to 400 kV, spewing out sharsh and causing severe interference over wide frequency areas, from LF to VHF. Much of this trouble is due to faulty jointing or ineffective insulation, the medium-voltage lines apparently causing most of the trouble, because of having been built with insulators not suitable for all conditions of weather.

But there are plenty of other sources of ether-pollution—from the main-line electric trains with their shoe-collectors, or pantographs fizzing and spluttering against the 25 kV overhead conductors, to next-door's latest electric drill-set (complete with accessories) used with great enthusiasm on Sunday mornings. Between these two extremes are innumerable rotary machines of every sort, size and description, many with dirty commutators of faulty slip-rings; a vast display of flashing electric signs; and many millions of cunning thermo or relay-controlled devices—all totally unsuppressed.

The end-product of all this activity is that the country as a whole is subjected to a general level of electrical noise which tends to rise and fall as the weather changes, affecting telecommunication circuits of all sorts—including, of course, the amateur bands.

This situation tends to get worse and a great deal needs to be done to improve the present state of affairs even marginally. It is evident that pollution of the ether needs to be looked at just as closely and treated quite as seriously as any other sort of pollution of our environment.

Most of this has been said before—but it needs to be said again and again, and repeated with emphasis. While obviously we can never hope for a totally noise-free ether, all authorities should have measures in hand to alleviate those conditions for which they can be held responsible. The Post Office Interference Branch already do a wonderful job in this context, involving much painstaking investigation of individual cases—but the point is that the situation should never have been allowed to arise in the first place.

Austin Forsyth
G6FO

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

NO doubt for many of us this month, the preoccupation is with the repair of aerials after the gale of January 2, the evening after which produced some amusement hearing someone enquiring "Who's the only station in the county with his aerial farm intact?"—if that was the picture inland one shudders to think of the coastal areas' aerial problems in such winds even without the heavy tides and flooding.

However, chez 'KFE, the aerial arrangements all withstood the test (though one was a bit surprised at the 28g. Top-Band half-wave surviving—luckily the gale was from the South-West which favoured its chances); the 14 AVQ which has been up six years waved about like corn in a breeze but nothing more, and the others are all indoors. And the gale with the accompanying rain did one useful service in revealing at last to human gaze a hole in the roof which had for long eluded this one's bleary old eye; this gave us reason to latch on to the son-in-law and send him aloft for repairs, and to advise him that all the 14AVQ radials could be renewed while he was about it.

The Bands

Still the sad slide to the bottom of the sunspot cycle goes on; when W4UMF says "High Normal" things are tolerable, but when he says "Low Normal" (which seems to be most of the time!) the only applicable word, at HF anyway, is "Ugh!" But still things go on, in a quiet sort of way, and people with initiative "do things" to their aerial systems in the hopes of radiating a compensatorily beefed-up signal whenever signs of life are apparent in the favoured bands. And of course, down on Top Band and Eighty the evenings are not devoid of event for those who are paid-up members of the Order of Boiled Owls, that being what they look like next morning!

Eighty

The CW end, when the writer inspected it occasionally, seemed to be largely its own inscrutable self; as for the Phone section, G3KFE just didn't have the nerve to look at it! In terms of QSO's, however, it was largely a question of noting that DX was about, but working Europeans only, the long-wire being such that its major lobes on Eighty all seem to be in the wrong directions, and the DX so weak as to be almost uncopiable.

GW4BLE (Newport, Gwent) makes a welcome return to the scene, he having moved QTH with the resulting QRT for all but a year while things were sorted out, at least as far as our bands of interest were concerned. The planning permission came through in a couple of months with no fuss whatever (a bit different to the ado over this at the old place!) and now there is a TH3 Mk. III atop a Versatower at 70 feet, which can be cranked down to 28 feet when necessary, and also dipoles strung up inverted-Vee fashion with the apex at about 60 feet. The 80m. one has not been all that good so far, it seeming to prefer U.K. and Europe instead of the low-angle radiation for DX. Nonetheless, SSB raised A4XVI, OX3OO, VE1AIH, VP1BJ, VP9G, VP9HX/MM (off CN8), YV5ANS and ZL2BT, with JA's heard, long-path, around 0820z but not actually raised.

G2BY (Wroxall, I.o.W.) remarks bitterly that his earlier prediction of more sunspots was indeed premature; but at least it showed faith and optimism! As far as Eighty is concerned, the log shows the odd CW QSO with "the regulars" but nothing in the way of DX either worked or heard.

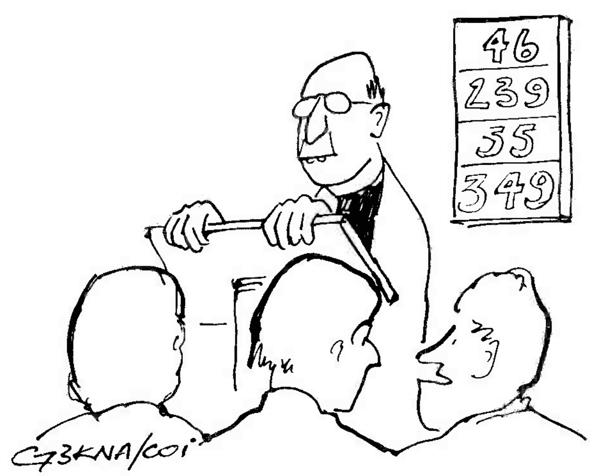
G2HLU (Reading) is yet another to return to the fold; for him Eighty has been mainly CW although, as he says, he is using SSB for about 20% of his contacts but as yet doesn't feel quite ready to apply it to the DX chase after so many years of all-CW. Thus, most activity was working the regular U.K. crowd, albeit not so many QRP types as usual. DX was also looked for, and QSO's made with UA9WS, VP2MKJ, XN1KE and EA9EU for a new country on the band. Harold collected his second DXCC during 1975 (his first one was as ZD4AM), and now has started all over again to go after the new CW-only DXCC, which is a bit sad when one reflects that G2HLU's previous efforts were both in fact CW-only! On a different tack again, the Trio TS-520 has so pleased him that in 1975 G2HLU made more QSO's than in any previous year; and to go with the rig, there is now an el-bug—the el-bug has now house-trained G2HLU in using it competently, and it is proving to be a pleasure to drive.

Eighty for G2NJ is mainly the QRP scene these days, as it is indeed for so many of us; an interesting one—and a bit of a rarity at that was a *CW* QSO with DL6FU/M who was in Hamburg, time around midnight. Another one was G3GET in Sittingbourne, who, it appears, has a garden 30 feet square and a mast nineteen feet high; within this unpromising constraint, G3GET has 70 feet of wire bent to a triangle shape with which he gets out well in accordance with his call; it appears that just about anywhere within a radius of 200 miles is workable with one watt from an ECO-PA arrangement; although G3GET is both modest and truthful when he remarks that a lot seems to depend on the chap at the other end of the QSO.

Nice to hear again from GM3RFR (Baltasound, Shetland) who has been launching out and now has five watts to offer the aerial on all bands, both CW and SSB, which was used on Eighty to get down into mainland GM; Sam is very much of the opinion that we ought to run a table based on countries worked with QRP as an incentive to some more activity, he himself having so far worked thirty countries, mainly on 14 and 21 MHz. There is also a QRO rig in the shack, by way of a Swan 350, with which other DX is chased.

G3CED (Broadstairs) has a note about the old adage "It's an ill wind . . . " referring to the Big Blow. It seems that the mast at the G3VFA station whipped rather a lot and as a result removed the feeder from the Joystick up top and created the necessity for dropping the mast completely. As a result, the attempt was made to use the Joystick *horizontal* on top of something-or-other in the shack, with which George frankly expected nothing but fruitless calling, considering his three hundred milliwatts. Instead he was surprised to receive reports of 599 from UK2WAF and 559 from DK7BI on Twenty although, as he says, Eighty and Forty may be a different tale—but at least this should give some heart to the council tenants and others in all-aerials-banned situations. Prior to the gale, George had sent in quite a long log, but this time we noticed he had more or less deserted Eighty in favour of the HF bands, save for the semi-local ragchew type of QSO.

The note about G5DX/P last time prompted G5DX himself—or, rather GI5DX (Holywood) to drop a line and let us know what it was all about. Seems he and his XYL were summoned for "domestic duties" when the third grandchild was due to make an appearance; having arrived, he was dismissed to play with his radio while the distaff side got on with the more important business—said important business duly arrived and already has QRO lung-power (though maybe not quite T9x?). Anyhow, the gear was the 62 Set in a Maxi, either to an inverted-Vee or a very low end-fed 66-footer, from a site at the side of the road about 7 kilometres NNE of Ponteland, Northumberland. Three photographs were enclosed—sadly not contrastly enough to reproduce—showing the gear as it was set up on a previous (similar) occasion; interestingly enough, the station then



". . . he'd get better reports if he used an ATU . . ."

The well-equipped station of Archie MacConnachie, GM4ECL, 24 Meteor Row, Leuchars, Fife, who was licensed in May 1975 and has gear for all bands—and a Morse key as well as a microphone! To check it all out, and himself, he spent the whole Christmas holiday on the air, working 42 countries.

was at the site of a *Roman* signal station at Vindolanda on Hadrians Wall, where a call was received from G3TWG.

Forty

Things still seem to be happening on this band, though few people write about their goings-on. It is very noticeable at G3KFE that when the Top Band end-fed half-wave is energised on Forty, it yields far less in the way of DX CW signals than the 14AVQ even when the latter has only one radial operational for Forty; indeed, the L/W could be said to be utterly useless on this band for other than European QSO's, and even then not at good strengths; the feed point of the 14AVQ is at the same height within a couple of inches as the span of the end-fed, which latter runs East-West as near as makes no odds.

G2HKU (Sheppey) is still building gear—however, Ted did find some little time on the air, and on Forty there was a CW contact with YV1AVO.

GW4BLE hasn't worked anything on Forty for the very simple reason that he hasn't operated the band! The problem here is with the inverted-Vee, of which the balun is playing up and producing a 2·5 : 1 VSWR—naughty! However, a listen round on a couple of mornings just before Christmas showed JA's with fair signal strength at about 0745, long-path.

For G2HLU the only activity mentioned on the band was during the Spanish contest, during which the EA's were notable for their massive absence. However some EA8's were hooked, plus EA9EU for a new one on both Eighty and Forty.

G2BY found that, by and large, conditions have fallen off rather badly on 7 MHz, although early-morning activity raised JA, W6, W7, VK and ZL, even though their signal strengths were down.

One—Sixty

One minor snag about the Trio rig at G3KFE is the lack of Top Band, although there is a QRP job on the operating table and an Eddystone 888 to receive the signals with. An interesting sidelight on that old black-box is that at the local Club, for December, the writer and G8AZM did a demonstration of receiver alignment using 'scope, marker generator, counter, and laboratory signal generator. We were able to show the response curve and the sensitivity of the 888. The IF's had been "tweaked up" for maximum selectivity by ear at some time in it's life (*nothing* of any consequence has been done to it for ten years since it has been at G3KFE!) and we opened it out to within a cycle or so of the curve shown in the data-sheet for the receiver, and then checked the sensitivity—and found it better than the claimed spec. for the receiver when new. That is not bad for a receiver which is probably about twenty years old and equally probably had no fundamental re-alignment since new, but which has had as hard a thrashing as any receiver can be expected to get in the shack of an active amateur, throughout those twenty years. Anyhow, that is the rig at 'KFE, along with the end-fed half-wave, although thoughts are going towards VFO control for the little rig, and a direct-conversion receiver to run off the same set of dry batteries—a sort of "separates" version of the HW-7, in fact.

G2HKU reports CW contacts with DK3YD, DL7QIA, DL8AX, EI9BG, GM4DGT, GW5TW, HB9AOD and OK1JJ, while SSB yielded the usual QSO's with PAØPN.

On now to G3ORP (Maidstone) who stuck fairly solidly to 160m. and makes some comments on the "DX Window" as seen from the U.K. end. As Peter says, our transmitting area of 1800-1806 kHz is getting a little bit fraught; there is an AØ signal on 1801·7 kHz, and S9 plus RTTY on 1804 kHz, leaving 1802-1803 as the clear frequencies with, occasionally, 1801 and 1805-1806 as possibles. It does seem as if those W's with clean signals, stable, good fists and the ability to measure their frequencies accurately, also have the happy knack of sending just at the right moment on a clear channel, which is fine; but many of the newcomers on the U.S. side—and there are a *lot* of First-Timere this year—are getting on with homebrew transmitters or transverters, which are either pulling badly or chirpy—0·047 μF capacitors on HT and heater lines would be a help here, as the usual 1000 pF is not enough for Top Band; and for the transverter wallahs, enough selectivity at the injection frequency to ensure one radiates all the RF on *one* frequency is a help! By way of actual QSO's, Peter worked W1, W2, W3, W4, W5, W8, W9, and WØ, VE1, XJ1ASJ, XJ1MX, and around 0620 on December 31 heard PY1RO, HKØBKX, HP2, YN1, and about a dozen others but couldn't raise a peep out of 'em.

A last report for some time comes in from G4CBQ (Derby), this being due to the return to Southampton and matters academic (which means getting prepared for those darned exams.). The 50-foot mast stayed up through the gales, with just a little bit of a wobble in the top section even though previous guying arrangements had seen a kink develop in the Big Stick from lesser winds. Down below there is a home-brew CW/SSB transceiver but now, alas, no second receiver for split-frequency working, the HA-350 having been sold. In addition there has been a holiday job involving working nights and so the operating sessions have been either 0530-0730, or midnight to 0230z Prior to the second receiver departing, the former times found XN1KE, XJ1ASJ, W8LRL, W8IJI, WB2URU, K8CCV and K1PBW, while the small-hours sessions managed K1PBW, DL2AA/W1, W1HGT and W1BB, all these being on CW, while a lone SSB contact was with K1PBW who was a solid 59 while G4CBQ was struggling to get his "gen" over. Since the receiver went, such goodies as YN1 have been heard but not, of course, worked, using the transceiver receive section.

A new correspondent to the Top Band scene is GW3WMY (Cyncoed), who offers a nice first entry to the Counties Ladder; Steve is on with a K.W. Vanguard, ten watts of AM or CW, into 160 feet of wire, end-fed, averaging about fifteen feet high—it begins to look as though the 1976 running is going to be made, as it was last time, by someone who would appear to be under quite a handicap—and that should surely encourage the majority to "have a go."

Since his picture appeared, GM3YOR (Kirkcaldy) has had to take a deal of good-natured ribbing about it. As a matter of fact, what was shown was not just the mobile set-up but was the actual operating position used by Drew and G3OLK in the Western Isles last summer. Top Band saw contacts with EA8CR on both CW and SSB, while the key managed DJ6QT/CT3, W8LRL, W1HGT, K1PBW twice, W1BB, W2DEO, XNIKE, XJ1ASJ, WA8IJI, VE1AXT and WB6YB/VE1.

Ten Metres

Sliding now from the lowest frequency to the highest, 28 MHz has, naturally enough, been a little "flat" as a DX allocation.

G2BY didn't strike lucky at all—although he checked the band on occasion, he didn't hear a thing beyond the receiver hash, which one has to admit is not DX!

GW4BLE was a mite luckier as his looks managed to coincide with bouts of short-skip. W8DMY and WB8BNV were both a true meter S6 on the direct path during the ARRL 10m. contest, and W2, W3 and W4 were heard weakly, calling ZS stations.

We hear that OZ5KF checked Ten during the Aurora event on January 10; Ten was wide-open from 2200 through till 0100z, during which time 42 QSO's were made, 35 with U.S.A. although no W6 or W7. This is a *very* interesting item, indicating that when the VHF boys have their alerts, some of the HF gang should also be brought into the system, to check whether the ten-metre band also displays any form of anomalous propagation like this.

Odds & Bobs

GM3YOR mentions that he may do another trip to the Highlands and Islands later on in 1976, and he would therefore like to hear from anyone having marked preferences for any particular area—drop Drew a line direct, *QTHR*.

We mustn't forget to mention the CQ WW WPX Contest over the 48 hours of March 27-28. If you enter as a single-operator you can only be on for 30 hours, the remaining 18 hours being taken in up to five periods, clearly marked as such in the log. All bands, Top to Ten, SSB only allowed, and the contest exchange is to be RS plus serial number starting from 001, going on to a four-digit serial number when you pass the first 1000 contacts. Now points: Between stations in different continents, three points on 14/21/28 MHz, and six points on the low bands; between stations in the same continent but a different country one point on 14/21/28 MHz, and two on the low bands unless you are in North American continent in which case you count them as respectively two and four points. Stations in the same country are permissible for multiplier but *not* for QSO points. The multiplier is the total number of different prefixes worked, saving that for this year only the American Bicentennial prefixes (AA1, AB2, and so on) will each count for two multiplier points. Final score, QSO points times multiplier. Apart from the usual, very fine, trophies for the various continental and World winners, there is thought that this year, if enough *Club* entries are received, there may well be a special trophy for a Club award. Use the *CQ Magazine* official log sheets if you can get them in time, or alternatively make up your own at a 40 QSO's per page. Contest log forms, and entries, the latter postmarked May 10 latest, go to *CQ WW WPX SSB Contest*, 14 *Vanderventer Avenue, Port Washington, NY* 11050, *U.S.A.*

Incidentally, these 1976 U.S. prefixes are being used as a base for an Award by *CQ* in connection with the WPX game. Work 200 stations using the special Bicentenary prefixes, among which there are at least 35 different ones. All the gen from the WPX Award Manager, Bernie Welch, W8IMA, 7735 Reedbank Lane, Dayton, Ohio, 45424, U.S.A.

G2HKU notes that this year for some reason there has been a drastic change in the morning ZL skeds; *every* morning this winter, N. Island has been better than S. Island. For example, ZL1VN comes through at 0800, but nothing is heard of the South Island ZL's on the sked till 0820 or later, and even then the signal is weak by comparison. An odd effect, indeed.

G3IAD's station appeared last time, and Neville now is pleased to be able to report that he has received the first European WAS on Slow-Scan TV, duly endorsed as such; and as if the WAS is not enough to be going on with, the SS/TV *Countries* score is up to 98, so, who knows, within a short time G3IAD may well be the first SS/TV DXCC in Europe.

Addicts of The Box may have looked in on "Nation-Wide" on January 5, and seen G3SCW featured, at his home which once was Tavistock North Station—he was station-master when it was operational—and showing his radio station. Ron Hooper, G3SCW is quite an active type not just on the air but in other Amateur Radio activities.

G3YRR (Grimsby) has been silent for quite a while now thanks to the QRM from the Salt-Mines, but he did sneak up to the shack and have a dust-down of the Swan 500, and made the shack more habitable by throwing out lots of old components, old 78 recordings and an old TV, plus much paper music; Twenty was found to be dead (not really surprising at 2030) but Charles was foxed by a weird noise occurring at regular intervals up the band; from the details he gives it sounds rather as though someone has bought a colour TV locally which has a strong line-timebase output! Hard luck indeed to be landed with one of these; perhaps the proper answer would be for each and every licensed amateur and SWL in the country to write to his M.P. calling for stricter standards to be enforced on TV set-makers—our own standards are *abysmal* by comparison with other countries.

Anybody know anything about *Rockall*, asks WA4WME/DA1VH, who rather fancies the idea of mounting a DX-pedition there, particularly if it could be shown to be eligible as a new country for DXCC purposes, there being a whisper going round that the "governing authority" may have changed sufficiently to make this a possibility. If you have any knowledge which could help to add to the store, on any relevant aspect of Rockall, please contact Hugh G. Vandegrift, via Aircraft Division, Hqs. USAMME, APO New York 09052, U.S.A. If there is sufficient interest and the criteria can be met, Rockall

9V1SN, Michael Farmer, of Singapore, is from Fishponds in Bristol, and has been serving in the R.A.F. for 15 years, his work being connected with the maintenance of radio and navigational aids. During his service, as well as Singapore, he has had postings to Masirah, Cyprus and Gan.

Meetings at the Torbay Mobile Rally were (left) G3NOF and G4CXM, both well-known to CDXN readers as keen exponents of the DX art.

may yet be activated. (One slight snag might be that the only way to land on Rockall is by helicopter! *Editor.*)

Among all the references to QRP activity in this piece, we don't seem to have found space recently to mention that the QRP chaps have got together into the G-QRP Club, with G3RJV as the "spark-plug"— at the last count 176 members were on the books, which is really quite something. If you are interested in QRP, or even just home-brewing gear, this is the Club for you, so get in touch with G3RJV at 8 Redgates Court, Main Street, Calverton, Notts., (*not* the 1976 *Call-Book* QTH). By the time this comes to print, G3RJV may well be kitted up with the Big Aerial for which he is aiming, but meantime, he is having fun, just like G3CED, with QRP into a Joystick, and getting out to his satisfaction on Eighty.

Fifteen Metres

For most of us, 21 MHz is really only to be considered as of any use at weekends; this because it is usually dead by the time we can expect to have reached home, fed, and sneaked off into the shack. However, this is not to say one can't, on occasion, find the odd item of interest. For example, G2BY managed only to work the first-hop stuff, into Europe, with nary a contact worth calling DX.

On the other hand, G3CED got his 300 milliwatts into Atlanta, Georgia (K4JFF) using the Joystick, W1ECA in Boston, 9H1CH, W1TW, W1AZK, ZE8JN and the usual crop of Europeans, largely as a result of his different operating times.

GW4BLE offers some odd assorted W's, plus a new country in YS1JWD, who was 59 one afternoon.

The aerials at GM3RFR are a little more ambitious than most of us can run to in the way of acreage, with phased verticals plus a rhombic; the QRP CW produced CT, DL, LZ, HA, W, and EA, while low-powered SSB gave LZ, DL, HA, UA3, YU, UB5, CT3 and IS0. Sam is the only G station known to the writer who uses QRP Phone to any extent on the HF bands.

The activity at GM3YOR has been generally lower over the recent past, what between Christmas and New Year, not to mention other matters, but the odd look was taken at most bands, with 21 MHz CW showing W8TFB.

Now Twenty

This, of course, is where we find most of the action, as always, but even here things have not been exactly brilliant. Those who have either WCDXB or Geoff Watts' DXNS drop through their letterboxes each week will be able to confirm that when the propagation forecast for a given date says "Low Normal" the word *low* should be in capital letters, with "High Normal" just a shade better!

We have already commented on G2HKU's ZL skeds and the odd way the propagation has been behaving; nevertheless, ZL1VN, ZL1AAE, ZL3RS and ZL3SE were all contacted on SSB at sked times.

Twenty was poorer than Fifteen in the view of G2HLU; Harold at least found the odd European and South American on 21 MHz but 14 MHz was distinctly uninteresting.

It was pretty poor, too, for your old scribe, as far as Twenty went, so much of the time was spent with the TS-520 just listening at the CW end, the while contriving a rather complex set-up of switchery to enable all bands to be covered at the flip of a switch, and so arranging things that the same switchery permits the 888 to be automatically available for split-frequency operation on the HF bands, or with the Top Band QRP, without any changing over of plugs and sockets at the operating position. The next step is to consolidate the same position as far as the HF aerials are concerned so as to be able to use beam, or vertical, or long wire without fuss, there being at the moment two ATU's to cover this requirement so that one has to recall which of the "matched" aerials one is on, as well as to remember to detune or ground the unused ones.

G2BY found the early mornings pretty punk, but late afternoon was much more like it, with W6, W7, JA and ZS; although the W7's were around S8 both ways, generally the noise level on the band was very high.

GM4DZX (Glasgow) drops a line with some QSL addresses of stuff heard and worked on Twenty; he has an FT-DX500 to a ground-plane with which he rang the bell with VQ9, CT2, TU2, 9K2 and EL8. Of the QSL addresses more anon.

It was rather a coincidence that G2DRT (High Wycombe) should read our note about VP2EEA last time; he went straight out into the shack and worked VP2EEG!

VP2EEG, along with 9H1R, fell to the GM3YOR sideband, while CW managed to cope with PY1HQ; Drew now has a total of 65 countries up in 1975 which is fair going considering his late start at HF activities.

Twenty for GM3RFR is a matter of either a long-wire or the rhombic, and with this as the "exhaler" powered by five watts or less, CW managed YU, DL, G, HA, UB, W, ON, SP, UR and UA, while SSB accounted for I, LX, F, DL, HA, HB, UB, UC, OX and LZ. This brings up an interesting question—could a G contact from Baltasound in truth be called short-skip? A look at the map and some rough work with a ruler suggests the distance from this QTH to Baltasound is 750-plus miles which would be normal first hop for any mildly high-angle radiation—this U.K. is bigger than one thinks at first!

Twenty was where GW4BLE spent most of his operating time, particularly over the holiday break. The operating pattern was to have a session around 0830-1000, an hour or so at noon, and then have a dabble in the evenings up to around 2000, by which time the band was generally dead. Most of the stuff worked was in the Central and South American areas, plus W/VE, and the morning ZL/JA's. QSO's were obtained with CX7BV, FG7TD, FG7XE, FR7BE, FM7AQ, HK4DEG, long path JA's, PY's, PZ1AR, TI2CAP, VP1BJ,

VP2DM, VP2KF, VR4DX, YS1SC, ZL1, ZL2, ZL3, 8P6CC, 8P6FU, 9Y4OK, 9Y4VP, PJ2CW, KC4AAC, TG9QK, YN1MAB/VP9, YN1WB and KP4EBQ; the FM7 and the VR4 were both new countries to go on the list.

Then there is G3CED and his flea-power; George rang up dozens of QSO's on Twenty, both before and after the Big Blow which knocked his mast out of action. To this writer the amazing part of the G3CED loggings (he sends Xerox copies of the pages in each month) is that with such a set-up as his, he is able on occasion to callCQ and get people to come back, rather than calling other CQ-ers himself; and also the fact that the log timings show long ragchews of up to an hour on CW—one would have thought the tiny signal would have drowned under QRM from one of the Clots who abound on the band long before one could complete a long natter.

G3YRR does not record a QSO on Twenty, but he does mention a certain Grimsby cabbie who stops him every so often and says, "Did you know the VK's and ZL's were good this morning" to which the reply would probably be at least pale pink!

QSL Addresses

G2DRT offers *VP2EEG*, *via* W3HNK, while GM4DZX mentions *A2CBW*, to DK3KD; *CT2BB*, to W1EP; *CT4AT*, to W1YRC; *EL8O* to OE6MWG; *EP2FR* to W3YMB; *FC2CH* to *DK4EB*, *HP1KC* to WØGX; *HZ1AB* to DJ9ZB; *PZ8DR* to P.O. Box 396, Paramaribo; *TU2FI* to P.O. Box 1745, Abidjan, Ivory Coast Republic; *VP2SV* to K3GYD; *VP2LBR* to K2IGW; *VQ9Z* to WA6HNQ; *6Y5GB* to VE3GMT; *9K2DR* to P.O. Box 2, Kuwait; and *9Y4OK*, K. Barkley, P.O. Box 714, Port-of-Spain, Trinidad.

A Look at the Future

From 2100z on February 1 to 2359z February 8 PY7PO and PY7BXC will, all being well, knocking off the contacts on all bands from Fernado da Noronha—all CW, 25 kHz from the lower band-edge saving on Ten where they will be around 28100, listening 5 kHz up the band. There is the possibility of some 160-metre operation if the old Viking can be carried within the weight restrictions.

Papua/New Guinea will be represented on all bands over the February 13/14 period, signing P29PNG on CW and SSB, for some sort of special-event activity.

The Tavulu operation by Lloyd and Iris Colvin will almost certainly have been secured by now, so if you haven't worked them you will have to look out for VR8A on Eighty. The earlier VR1Z for the same area, activated by the Colvins during December, made some 4000 QSO's. Cards for the VR1Z and VR8B operations go to Yasme, Box 2025, Castro Valley, California 94546, U.S.A.

Some there be who have indicated Bouvet activity, by way of "3Y1DX" and "3Y1BL" signals—the indications are that both are true-blue (stinkers) Likewise Phoney Phred seems to have been signing "W6UAD/YI."

Look out for some action from South Georgia late in February; VP8MS and VP8OT should arrive around that time. All through the month you can keep an ear lifted and flapping for any signals from Niue, although it *may* have happened before this reaches you. St. Brandon looks possible for March or April, the spark-plug on this one being 3B8DA; indications are that it will be a 14-day affair. Baja Nuevo may also appear during the Spring.

Further ahead—a year ahead, in fact—is the likelihood of a DX-pedition to South Sandwich, for which the support of the Argentine Navy would be necessary. This plot looks quite healthy at the time of writing. Meantime, you may have heard LU2XR, on Thule, the operator being LU5ADU/MM of the ice-breaker *San Martin*.

VQ9HCS is for the time being, at least, more or less history; a hurricane practically removed Astove Island, levelled the VQ9HCS home and set fire to it and sent Harry back to Mahé in consequence. A sad business indeed.

If you should happen across a VU7, remember the prefix covers Andaman, Nicobar and the Laccadives; VU2ANI is now on as VU7ANI and we also have noted VU7GV, both operating sideband on Twenty.

Finally, we hear that the Venezuelan Club have raised a protest formally with ARRL regarding the station signing YV8AL/YVØ from Aves. Basically, their contention is that the YV8AL call expired back in 1960, and no authorisation from their Ministry of Telecommunications has been given either to reactivate it, or for *any* operation from Aves Is. since the YVØAA event back in January 1973. We have no news of any reaction from ARRL or anywhere else at the time of writing.

Conclusion

That's it for this month again; deadline for February will be **February 10** latest arrival, addressed as ever to: "CDXN," *SHORT WAVE MAGAZINE, BUCKINGHAM, MK18 1RQ. Adios, amigos!*

The new Redifon "Sealand 66" can be operated as main equipment on deep-sea ships. It is fully solid-state and an additional feature is a local distribution system enabling crew-members to make their own shore-calls by VHF.

R.A.E., Q. & A.

SUBJECT No. 765, MAY 1975— ANSWERING ALL QUESTIONS

THE Radio Amateur's Examination, 1975, May paper (Subject No. 765. City & Guilds of London Institute) was, as usual, a combination of the "old faithfuls" and the inevitable odd and unexpected breaking of new ground. However, that was no reason why the well-prepared candidate should, as they say, come unstuck, this being so, may we offer a few points on failure, in the hope that candidates will thereby save themselves toil and tears.

First, and *very* important, the more so for the chap who has not taken an exam for twenty years, or/and has a working environment wherein it is seldom if ever necessary to resort to putting words on paper, is to make sure what you *write down* says the same thing as what you *mean to say*. One can just hear 30,000 snorts of derision! But it happens! Consider this answer, given to the writer on this very day by a candidate for the December 1975 exam. The chap concerned is a design draughtsman and nobody's idiot—but in answer to the question "What is a permanent magnet?" he wrote down that "A permanent magnet is a material that is naturally magnetic." Soft Swedish iron, used for relay cores is most definitely naturally magnetic, but it isn't a *permanent* magnet. What he meant to say was that a permanent magnet retains magnetism after it has been magnetised—a very different statement altogether! Again, in answer to the question: What is an electromagnet, he came back with this—"A piece of metal which, when a current of wire is passed through it becomes magnetic." He could make a fortune—he's made copper wire magnetic! What he meant to say was that the coil of wire wrapped round the iron core incudes magnetic effects when a current is passed through the coil—again a sight different! And—this is the vital point—careful questioning of the chap by the writer made it quite clear he had the *right idea in his mind* at the time he wrote the words down on the paper!

Here we had a chap who lives in a "high-technology" scientific environment and earns a living by precise thinking—how much harder can the problem be for the chap from the shop floor or the unskilled man or woman; and yet they often can be heard on the air having obtained their ticket and by implication passed the exam: How so?

Some have a natural flair for putting words to paper which they didn't (and maybe still don't) know they had. Others are plain lucky, but the majority realised they had a problem and set themselves to do something about it, by writing 20-minute answers to lots of questions which their friends "marked" for them, or which they gave to the course instructor to mark, or which they compared with the truth as written in the "good book" in their possession. Whatever way, they were, maybe without realising it, practising the art of saying what they *meant* to say.

And all this is not to say that your spelling and syntax must be perfect. Far from it—so long as it says what's in your mind to say and it ain't ambiguous!

What else? Preparation, of course. Adequate revision. Enter the examination room fully equipped with gear that can last the course—the guy who's pen dries up half-way and hasn't brought some more ink deserves to fail.

Try and relax, and to be fresh and alert when you arrive—early, of course. Fill in the front of the answer book, and when the battle starts spend a few moments sorting out the easiest question regardless of where it lies in the paper—you can answer the questions in any order. Tackling the easy one first gives you time to gain confidence and get your second wind after that initial (everyone gets it) reaction of "Blimey, there's only one question I have a clue about!"—which is just *panic*. Answering that first question gives time for panic to subside naturally; once you are "stuck in" you forget your fears in concentrated effort.

Answer the exact number of questions you are required to, in each part; and if you make crossing-out anywhere do so with a single line so the crossing-out can still be read, lest there be a clue for the examiner and a mark picked up underneath the crossing-out!

Finally, ten minutes to dot the i's and cross the t's. Then hand your effort in, and pray!

RADIO AMATEUR'S EXAMINATION, MAY 1975

This examination is divided into two parts; failure in either part will carry with it failure in the examination as a whole.

Each question in Part I carries 15 marks; each question in Part II carries 10 marks.

Answer *eight* of the following ten questions as follows: Both questions in Part I and *Six* questions in Part II.

Part I—*Answer Both questions in this part. Each question in this part carries 15 marks.*

Q.1. (*a*) State the *three* purposes for which an amateur sending and receiving station may be used,
(*b*) State *four* types of emission or message which may *not* be sent by or from an amateur station.

Answer 1

(a) (1) Reception of standard-frequency service transmissions.

(2) Reception or transmission of third-party messages at the request of and for the St. John Ambulance Brigade, the Red Cross or the Police, in connection with disaster-relief operations or exercises in this context.

(3) Communication with other amateur stations.

(*b*) (1) Spark transmissions.

(2) Messages of a grossly offensive, obscene or indecent nature.

(3) Broadcasts to amateur stations in general.

(4) Signals not having a satisfactory method of frequency stabilisation.

Q.2. (*a*) What are harmonics of a radio frequency emission?
(*b*) Why is it important that they be sup-

pressed as far as possible?

(*c*) Describe carefully, with the air of diagrams, *four* measures which can be taken in the construction and installation of an amateur sound transmitter to reduce harmonic radiation to a minimum.

Answer 2

(*a*) Harmonics of a transmission frequency are multiples thereof, *i.e.*, the second harmonic of a 7 MHz signal is at 14 MHz, the third harmonic at 21 MHz and so on.

(*b*) Harmonics of an RF signal can and do cause interference with reception by other services or receivers; the situation is complicated by the fact that some harmonics of an amateur transmission may lie outside the amateur bands, and into some other service band, *e.g.* the second harmonic of a 21 MHz signal is at 42 MHz, in the passband of a Channel I TV transmission.

(*c*) (1) Careful screening of the transmitter, and in particular the PA stage into its own compartment, with RF only allowed to excape through the (usually coaxial) aerial socket. *See* Fig. 1A.

(2) Operation of the transmitter into a properly matched transmission line, to enable,

(3) Installation of a low-pass filter (which works best in a matched transmission line) in the output of the transmitter. *See* Fig. 1.B.

(4) Provision of anti-parasitic stoppers in all stages of the transmitter needing them, and certainly in the PA. *See* Fig. 1.C.

Note to Candidates: Two more measures which could have been mentioned are (*a*) Neutralisation of the PA, and (*b*) the provision of RF key-click filtering and over-modulation indication. *See* Fig. 1 D, E. F.

Part II—*Answer any Six questions in this part. Each question in this part carries 10 marks.*

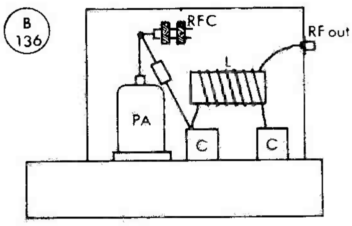
Q.3. (*a*) Describe a variable capacitor suitable for use as the tuning capacitor in an HF tuned circuit.

(*b*) What are the differences between a tuning capacitor for a variable frequency oscillator and that for the tank circuit of a power amplifier stage.

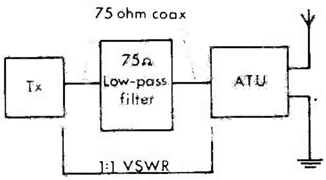
Answer 3

(*a*) See Fig. 2. In a metal frame are fitted the stator plates, suitably joined together but all insulated from the frame. The rotor plates are fitted to a shaft rotating in a bearing in the frame at each end; one end of the shaft protrudes from the frame to enable it to be coupled to

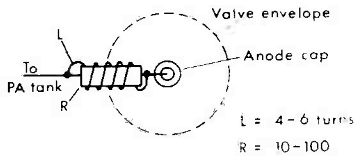
Fig. 1, to go with Q.2. (A) shows a pi-network PA, using a 6146 or similar valve. HT feed to the RF choke should be screened and decoupled as it passes through the chassis, under which the grid components would be mounted. (D) This is the capacity-bridge, the only convenient method of neutralising a pi-net PA. C is about 500-1000 pF, Cg-a and Cg-c are the valve capacities, and Cn the neutralising condenser. (E) shows cathode-keying of a valve stage. L is a low-resistance 1-5 Hy. choke, R1 250K, R2 100 ohms, C1 0.5-2.0 mF, adjusted by test, C2 1000 pF. L is adjusted for "rise time" and C1 for "fall". (F) Showing the principle of obtaining the trapezoid pattern on a 'scope having X and Y plate connections. The pattern at 100% modulation is a cone on its side. For less than 100% the cone is truncated, and for over-modulation the cone develops into a spike.



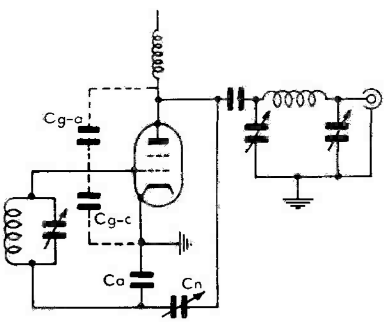
(a) PA Stage Screening



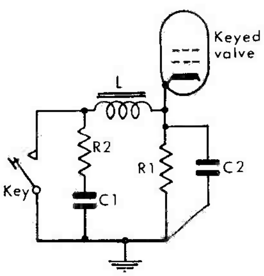
(b) Installation of Low-pass filter



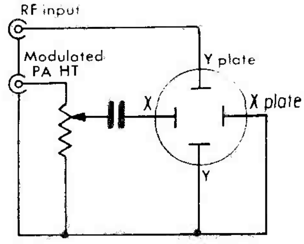
(c) Anti-parasitic stoppers



(d) Neutralising a pi-network PA



(e) RF key-click filter



(f) Over-modulation indicator using oscilloscope

Fig. 1

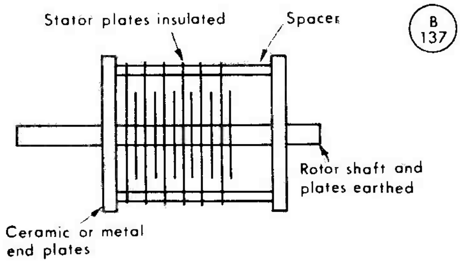


Fig. 2 Construction of a variable capacitor

Fig. 2, to go with Q.3. The essential details of a variable capacitor are shown, consisting of a set of stator and rotor plates, along a shaft, with the two sets insulated from one another.

a knob or shaft coupler, and the shaft is solidly grounded to the frame of the capacitor by some spring mechanism. The frame itself is normally grounded to the equipment chassis by its mechanical fixings; the stator plates have a solder tag provided, so fitted as to obtain the connection without earthing the stator plates. The size and shape of rotor and stator plates and their number is determined by the maximum capacitance and the "law" desired, consistent with a spacing between plates suitable for the voltages involved.

(*b*) For a VFO capacitor, one would look for a design having brass rather than aluminium plates, of robust design such that neither stator nor, particularly, rotor plates can vibrate unnecessarily; other things being equal, a design where the end plates of the frame are ceramic would be preferred, and having tags conveniently placed to enable good solid connections to be made both to the stator and the rotor without placing reliance on chassis-fixings. On the other hand, the prime consideration in the transmitter PA tank would be that the capacitor should have adequate plate spacing for the full voltage impressed across it, AC peak-to-peak plus DC; and that for a multi-band arrangement, the maximum and minimum capacitances are suitable. A further consideration is that the capacitor will have very heavy circulating currents, and hence should be of materials which can cope with this.

Q.4 (*a*) In describing an alternating current circuit what is meant by (i) frequency, (ii) cycle, (iii) Root Mean Square (RMS) Voltage?

(*b*) Describe how an e.m.f. is induced in a loop of wire rotated at a constant speed in a uniform magnetic field.

Answer 4

(*a*) (*i*) The rate at which an alternating current repeats itself, usually measured in hertz, where the hertz equals one cycle per second.

(*ii*) A cycle of an alternating (repetitive) waveform is one complete wave form; for example, for a sinewave, from 0 to 360 degrees. *See* Fig. 3A.

(*iii*) The RMS value of an alternating voltage is the equivalent DC voltage. For example, household mains of 240 volts (the power company quote the RMS value) applied to an electric fire, will give the same amount of heat as 240 volts DC. Root Mean Square is the method of obtaining this equivalent mathematically for a sine-wave form; RMS volts are 0·707 of the peak voltage, and thus the peak-to-peak voltage is 2·828 times the RMS voltage.

(*b*) *See* Fig. 3B. Induction of an e.m.f. into a length of wire is achieved by causing the wire to thread through a magnetic field by its movement, or alternatively to cause the magnetic field to move relative to the wire. The effect is found to be proportional to the strength of the magnetic field and the rate of movement of the wire relative to the field.

Turning now to the end view shown in Fig. 3B, we may notice that the rate of movement relative to the uniform magnetic field is greatest when it is at that instant when the wire is at right angles to the magnetic lines of force, and zero when, ninety degrees of rotation later, the turn is in effect momentarily sliding along a line of force. A little consideration will show that the rate of cutting lines of force will, in the specified example, follow a sine law over each 360 degrees of rotation. In practice the output would deviate from uniformity largely by the degree to which the magnetic field deviated from uniformity; and it is explicit in the above argument that the peak amplitude would depend on the speed of rotation of the wire loop.

(over

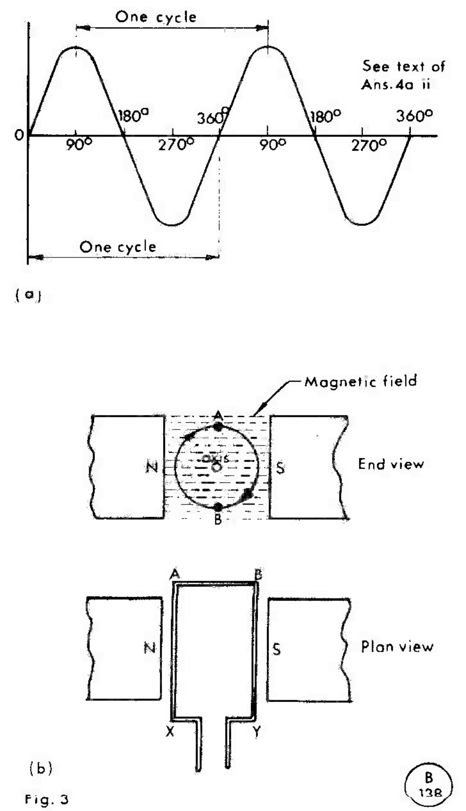


Fig. 3

Fig. 3, to go with Q.4. (A) showing definition of one cycle. (B) shows a one-turn loop of wire rotating in a magnetic field.

Q.5. (*a*) Why is it necessary to use different frequencies at different times of the day if twenty-four hour contact between the same two stations is to be maintained, on high frequencies over long distances?

(*b*) How is the choice of such frequencies affected by

(*i*) The season of the year,
(*ii*) The sunspot cycle?

Answer 5

(*a*) In order to meet the requirement, communication at HF must be *via* ionospheric propagation. The reflecting layer is the F (or, if it is present, the F2) layer of the ionosphere, and there will be some Maximum Usable Frequency (MUF) for a path above which signals will not be refracted from the ionosphere but instead will pass through it and escape into outer space. Below the F-layer lie the D and E layers, which are largely absorbers of HF energy; they will cause there to be a Lowest Usable High Frequency (LUHF) for a path which is also dependent on transmitter power, aerial gain, and local noise level. All the layers, D, E and F, are generated by the action of the Sun, weakening or disappearing at nights; the absorption effect of the lower layers varies inversely with frequency. Thus, when the path is in daylight, a higher frequency will be used to avoid absorption in the D and E layers, and a low frequency when the path is in darkness, when first the MUF falls and secondly the D and E layers largely disappear. An Optimum Working Frequency is normally chosen, preferably about 15% below the MUF, allowing for perturbations in MUF; in amateur practice one would choose the band nearest the OWF.

(*b*) (*i*) In general, it can be shown that daytime MUF's show a peak in February and November, this peak being more noticeable at sunspot maxima.

(*ii*) The level of the MUF is directly related to the amount of sunspot activity, being highest at maxima and lowest at minima of the nominally 11-year sunspot cycle. Typically, at maxima, noon MUF's for a path may rise as high as 50 MHz, while noon MUF's for the same path at sunspot minima may drop below 14 MHz.

Q.6. Answer *either* (a) or (b).

(*a*) With the aid of a circuit diagram describe how the following may be measured in the case of a triode valve:

(*i*) Mutual conductance
(*ii*) Amplification factor
(*iii*) AC resistance or impedance.

(*b*) With the aid of a circuit diagram describe how the collector current (I_c)/collector to emitter voltage (Ve) curves can be plotted for a transistor in the common-emitter configuration.

Answer 6

(*a*) *See* Fig. 4A. It will be noted that the circuit enables any one of the three variables, namely grid

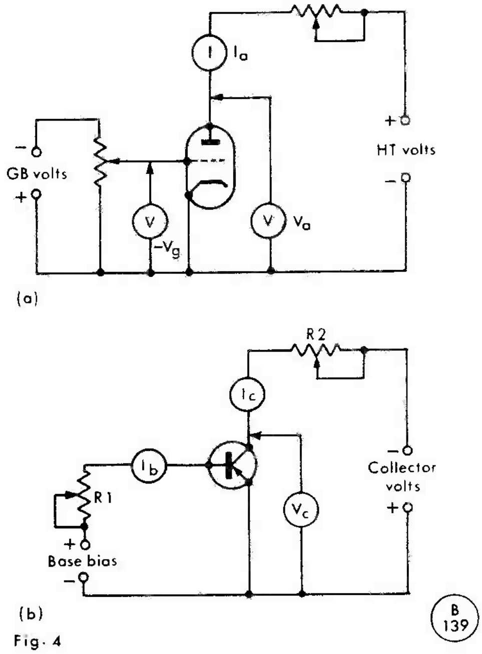


Fig. 4, to go with Q.6. Either sketch (a) or (b) would answer the Question, as chosen by the candidate.

voltage, anode voltage and anode current, to be held constant, while varying a second and noting the reaction of the third. Mutual conductance is defined as the change of anode current for change of grid volts; similarly, the amplification factor μ and the AC resistance, where in each case the remaining variable of the three, V_a, V_g and I_a is held at some constant value. A graph can be drawn from the results, and where necessary a family of curves taken, where each curve in the family is drawn for a specified value of the non-varied parameter. An example of this is the drawing of a family of V_a/I_a curves for values of Vg varying from zero to cut-off voltage in one-volt steps, on to which a "load line" can be superimposed to indicate the dynamic operation of the valve.

(*b*) *See* Fig. 4B. In the given circuit, adjustment of the base bias by R1 will produce some desired base current I_b. Adjustment of V_c to a specified value is by resistor R2 in series with the collector; these being set up I_b is measured. Note that the value of I_c is adjusted to be the same at each step. The results when plotted constitute the curve required.

Q.7. (*a*) Draw the circuit diagram of a frequency changer stage of a superheterodyne receiver and describe its action.

(*b*) Explain briefly how the frequency difference between the signal frequency and the

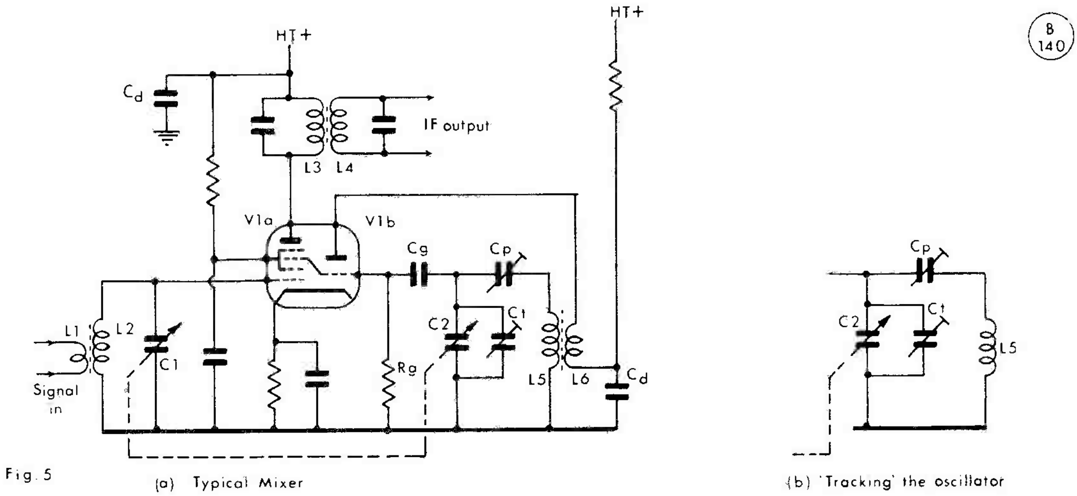


Fig. 5, to go with Q.7. (A) triode-hexode mixer-oscillator, as explained in the text. The parts of the circuit involved in tracking the oscillator with the signal frequency are shown at (right).

local oscillator frequency is kept constant across the tuning range of the input signal circuit.

Answer 7

(*a*) *See* Fig. 5A for a typical circuit; it should be noted that any non-linear element supplied with signal frequency and local-oscillator signals will act as a mixer. Output of the mixer will be, not only the input signals and their harmonics, but additionally their sums and differences, *e.g.* $F_S + F_{LO}$, $F_S - F_{LO}$, $2F_{LO} + F_S$, $2F_S + F_{LO}$, and many others. One of these, usually $F_{LO}-F_S$ is arranged always to have a constant frequency no matter what the position of the tuning gang, and this is known as the Intermediate Frequency; this is selected by a tuned circuit (the IF transformer) and the other, unwanted, outputs decoupled way to ground.

In our circuit, a triode-hexode is used; consider first the triode section, which is a simple tickler oscillator, with feedback from L6 to L5. The hexode is the mixer proper with signal on g_1 and local oscillator on g_3, while the second and fourth grids are at DC HT potential and RF earth. Thus, both the first and third grids can modulate the electron stream, while the other two grids provide isolation. Cathode bias is provided, plus, in the case of the oscillator, that due to C_g and R_g. The two capacitors marked C_d will be seen to be decoupling the HT lines.

(*b*) If, as is normal good practice, the oscillator is higher in frequency than the signal, the oscillator frequency swing will be less than the signal frequency swing: for example, with an IF of 500 kHz, and signal swing of 500 kHz to 1·5 MHz, the oscillator will need to swing between 1 MHz and 2 MHz—signal frequency range 3 : 1 and oscillator range 2 : 1. Therefore, in order to gang-tune, we must either (1) Make the oscillator section of the gang capacitor of a different capacitance to the signal section, or (2) Use a standard two-gang capacitor and artificially modify its capacitance range. (2) is usually chosen, and the method is shown at Fig. 5B which extracts the relevant parts of Fig. 5A. Cp is adjusted to give correct tracking at the low frequency end of the band, and Ct at the high-frequency end; if all is correct there will be a third tracking point at the middle of the band, and over the whole range the tracking will be "near enough" when the bandwidth of the signal frequency tuned circuits is taken into account. It should be noted that in modern practice, Cp is usually fixed at a calculated value and the inductance tuned by a suitable slug.

Q.8. In amplitude modulation, what is meant by

(*a*) depth of modulation,
(b) modulation envelope,
(*c*) sidebands?

Answer 8

See Fig. 6A, B and C. At Fig. 6A is shown a pure CW carrier, at B the same carrier partially (less than 100%) modulated, and at C the same carrier modulated to 100%. Depth of modulation is expressed as a percentage, where depth of modulation (%) $= \dfrac{R - S}{S} \times 100$, R being the height of the peak of modulation, and S the height of an unmodulated (CW) moment of the transmission.

(*b*) Modulation envelope is the area bounded by a line joining all the positive peaks of RF, and a line joining all the negative peaks of RF. Each line should reproduce faithfully the shape of the modulating waveform. The envelopes are shown in Fig. 6A, B and C.

(*c*) The diagram of Fig. 6C shows the display on an oscilloscope of a 100% modulated carrier with sine-wave modulation. The same signal waveform, applied to a spectrum analyser would give the display shown in Fig. 6D. The centre, tallest line, is the carrier, the smaller

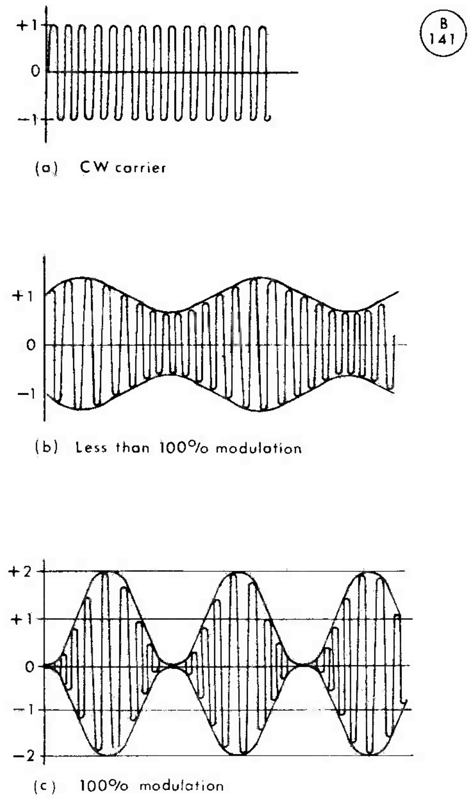


Fig. 6

Fig. 6, to go with Q.8, and discussed in text.

line to the carrier's right the upper sideband, and the smaller line to the left of the carrier the lower sideband. Measurement will show that the sidebands are spaced from the carrier modulating frequency. For example, carrier at 1·9 MHz, with 1 kHz modulating tone, then lower sideband is at 1·899 MHz and the upper at 1·901 MHz. At 100% modulation each sideband pip will be half the height of the carrier pip.

Sidebands can be considered in another way: Accept that the spectrum analyser display is correct, and consider the *phase* relationship between the three signals; they will be seen to be "rotating" vectorially, such that at some instant the three signals will all be in phase, and half an audio cycle later both sidebands together will be in phase opposition to the carrier, so giving a *null;* thus the oscilloscope display is shown to be the same information as the spectrum analyser display.

Q.9. Describe, with the aid of block diagrams, how a cathode-ray oscilloscope can be used to examine the wave form of the radio-frequency output of a transmitter.

(*b*) How could this arrangement be used to check the depth of modulation of an amplitude-modulated wave.

Answer 9

(*a*) There are various ways of using the 'scope in this application. Given that the Y-amplifier bandwidth is equal to or greater than the RF carrier frequency to be looked at, and a timebase is available, a suitable scheme is shown at Fig. 7.

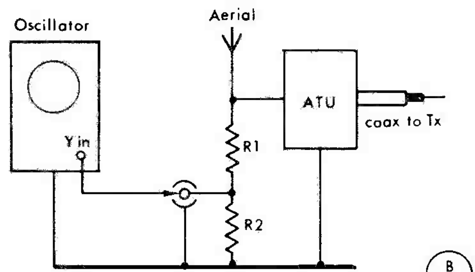


Fig. 7

Fig. 7, to go with Q.9. It should be noted that, if X and Y plates can be directly connected, the 'scope can be used, without time-base or amplifiers, as shown at Fig. 1F, to obtain a trapezoid pattern.

The oscilloscope should be set to give an RF envelope pattern to fill nicely the screen by adjustment of the input attenuator (Y-Amp gain) and timebase frequency; some adjustment to the relative values of R1 and R2 may be required to achieve this, and if a 10 : 1 probe is available this should be used to avoid stray RF pick-up between these resistors and the 'scope lead being applied as shown. The display will be the envelope pattern already shown at Figs. 6A-C, and if sine wave modulation is used, percentage modulation can be calculated from the formula already quoted, deriving R and S from the trace.

If now a CW carrier is put up, and two lines to show the envelope on the 'scope face are drawn with china-graph pencil, two more lines can be drawn which will indicate the peak levels at 100% modulation. Now modulate the carrier with speech, and positive modulation in excess of 100% will show by the peaks being beyond the outer lines; overmodulation in the opposite direction will show up as bright spots at the central (zero-signal) line and are the result of the momentary loss of RF output. These can be drawn out to the lines usually produced by expansion of the trace in the X-direction.

Q.10 (*a*) What is meant by
(*i*) A half-wave dipole aerial
(*ii*) A full-wave dipole aerial?

(*b*) With the aid of diagrams describe suitable coupling circuits and feeder arrangements for each type of aerial.

Answer 10

(*a*) (*i*) A half-wave dipole aerial is half-wave length long at the frequency in question, less a small factor for "end effects." Thus, current maximum and voltage minimum will occur at the centre: the aerial may be excited at the centre or the end, usually.

(ii) A full-wave dipole aerial is one full wavelength long at the required frequency, less the small factor for end-effect, and again may be end or centre fed. At the centre of the full wave dipole, voltage is at a maximum and current at a minimum.

(*b*) *See* Fig. 8A. This shows how a half-wave dipole may be fed at the centre; the feed impedance in free space will be about 73 ohms resistive, and it is usual to feed it with 75-ohm coaxial cable, preferably through a 1 : 1 balun which is however usually in practice omitted, as shown. (The balun if used would be inserted at X.) This arrangement could be coupled directly to the output of a transmitter which is capable of feeding a 75-ohm coaxial line.

Now *see* Fig. 8B. The full-wave dipole fed at the centre will have a very high impedance and so there will be high standing waves with *any* kind of feeder system. This dictates the use of, preferably, an open-wire balanced transmission line of 600-800 ohms characteristic impedance, and length suitable to couple the aerial tuner or coupler to the aerial feed point. The impedance "seen" at the coupler will depend on the electrical length of the line at the frequency in question and may be high or low resistive, plus positive or negative reactance. Fig. 8C shows a wide-range coupler circuit for such a feedline, with coax feed from the coupler to the transmitter. Most impedances can be matched by adjustment of tapping points X-X, symmetrically about the centre of the coil—always as near the outer ends as possible—to obtain maximum transfer of power, shown by maximum and equal currents in each feeder for given RF PA input and 1 : 1 VSWR on the coaxial feeder to the transmitter. The method is to load the transmitter for the desired PA input into a dummy load. Transfer from dummy load to aerial coupler, set taps to some arbitrary setting, and attempt to obtain 1 : 1 VSWR on the coaxial line by adjustment of Ct and C_L. Note RF current in each feeder. (Do *not* make any alteration to the transmitter PA tuning and loading during the exercise, once set on the dummy load.) Move taps and repeat, until maximum RF current occurs in the feeder at 1 : 1 VSWR, and transmitter PA input tuning should not have moved. Should the feeder be a quarter-wave long at the operating frequency, then the series arrangement with no feeder tapping also shown on the diagram may be resorted to. Occasionally, a line length on a given frequency may be such that neither of these expedients serves, in which case the feeder length may be adjusted to give a more amenable impedance at the coupler end—this last will *not* alter the VSWR, which is determined entirely by the aerial/feeder impedance relationship.

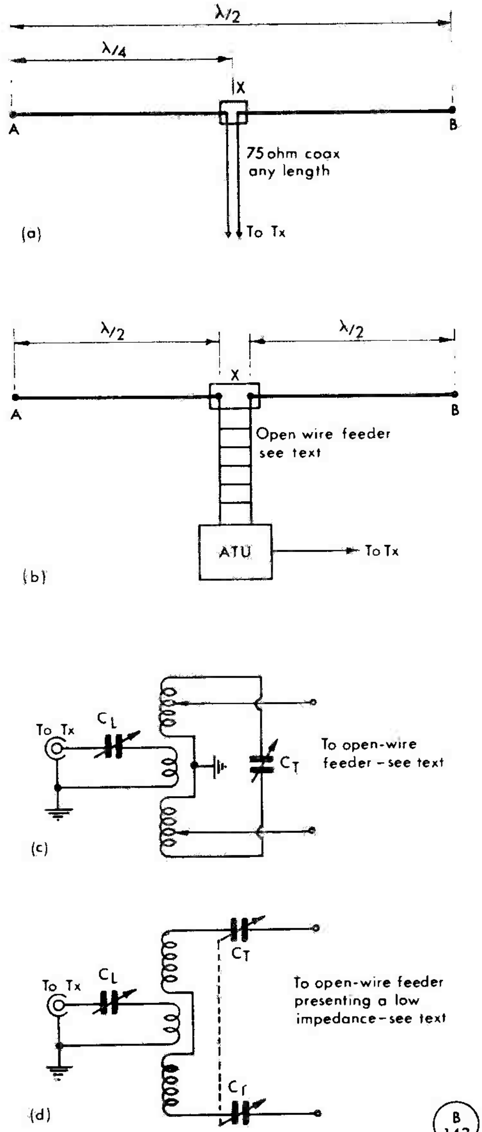


Fig. 8

Fig. 8, to go with Q.10. (A) half-wave dipole, fed with coax. (B) full-wave dipole, centre-fed with open-wire matched line. (C) a normal ATU (aerial tuning unit) configuration. (D) ATU circuitry when a low impedance appears at the bottom of the feeder line.

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SIMPLE FILTER FOR SEVENTYCEMS

CONSTRUCTIONAL DETAILS AND APPLICATION

A. H. DORMER, C.Eng., M.I.E.R.E. (G3DAH)

THE output of a 70 cm. transverter will contain, as well as the desired frequency, elements of the injection frequency and various spurious products. With a correct level of 28 MHz input and linear post-mixer stages, the most significant unwanted output will be at the injection frequency of 404 MHz, harmonics of both this and the signal frequency being so remote from the signal frequency as to be adequately reduced by the transverter tuned circuits.

It is highly desirable, therefore, to instal a filter or Hi-Q break at the transverter output to reduce this and any other by-products of the mixing process. Such a device, if multi-section, can be large, mechanically difficult to construct and, without suitable filter response curve display apparatus, not easy to align correctly.

It was decided to see what a simple resonant filter would do and the design which follows shows an insertion loss of a mere 1 dB for a bandwidth of ± 6 MHz with a response at 404 MHz 15 dB down or, if the particular application permits, a higher insertion loss, a bandwidth of 2 MHz and a response at 404 MHz better than 40 dB down—all as measured on a Polyskop.

Construction See Fig. 1

The 9in. long, $\frac{5}{8}$in. o.d. copper tube is soldered to both ends of a 9 x 2 x 2in. tin-plate box which has a tight fitting lid, soldered into place after the final adjustments have been made. The input and output coupling loops are of 12g. silvered copper wire $1\frac{3}{4}$in. long, also soldered to the box ends and the BNC connectors. The $1\frac{1}{4}$in. diameter tuning discs are turned up from $\frac{1}{8}$in. brass sheet, the fixed plate being bolted and soldered to the centre of the line and the moving plate soldered to a length of 2BA studding which passes through a tapped bush in the side of the box and locked in position after final adjustment by a 2BA nut. There would be a slight advantage if the loops were positioned on opposite sides of the line to reduce mutual coupling but the particular layout with which the prototype is associated made this impracticable.

For a 2·5 dB insertion loss and a 2 MHz bandwidth the loops are spaced $\frac{3}{8}$in. from the line and at $\frac{1}{16}$in. for a ± 6 MHz bandwidth and an insertion loss of 1 dB.

The dimensions given are correct for an input and output impedance of ground 75 ohms. If other impedances are required dimensions may be calculated from the formula

$$Z_0 = 138 \log \frac{D1}{D2}$$

where D1 is the length of the short side of the box, and D2 is the o.d. of the resonant line.

Tuning

The filter should be connected in as shown in Fig. 2. It should be tuned for minimum reflected power indication and thereafter the transverter plate and output coupling circuits and amplifier input circuit for maximum power transfer. Do *not* retune the filter once minimum SWR has been established. It may be noted that, although this filter introduces a loss, it can give improved matching between transverter output and amplifier input which should more than compensate for this.

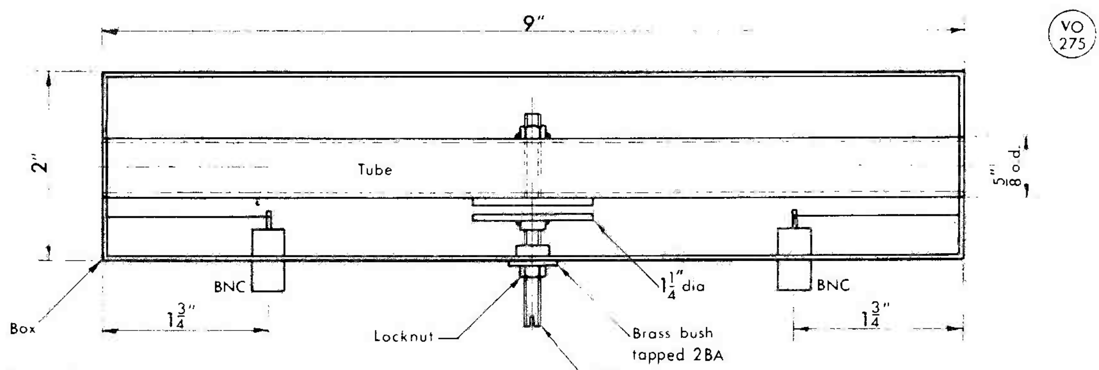


Fig. 1 Filter construction

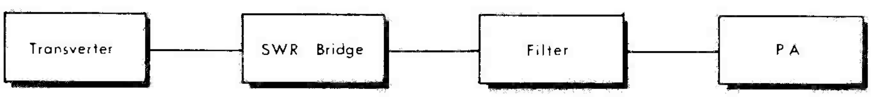


Fig. 2 Filter connection

KW-77 MONITOR MUTING

RECEIVER MODIFICATION

MOST CW and SSB operators like to be able to monitor their transmitted signals without having to fiddle with receiver controls after each change-over operation. In most instances this is easily effected by having a pre-set resistor somewhere in the receiver RF/IF gain circuit, to reduce greatly receiver sensitivity during transmission.

Owners of the KW-77 receiver will have discovered that such a check on transmission can be made only on 80m. and that on all the other bands the muting is such that the receiver is completely dead. Muting in the KW-77 is achieved by switching out the screen-grid HT feed to the RF stage, first mixer and IF amplifier. The HT to the anode of the crystal controlled first oscillator is also switched off. This oscillator is not used when the receiver tunes 80m. so the muting does not completely "kill" the receiver on this band. On all the other bands the crystal oscillator is essential to the operation of the receiver and it must be working if a listen-through facility is desired.

Modification

When a KW-77 was acquired the first thing was to explore the possibility of modifying the muting system without making involved changes in wiring, which might reduce the re-sale value of the receiver. Examination of the circuit diagram and the underside of the receiver showed that the job could be done in less than five minutes, and that the original circuit could be put back in about the same length of time.

Fig. 1 shows the original muting circuit with the wiring identified and circuit references as in the KW-77 manual. Fig. 2 explains the modified version. The crystal oscillator HT supply is no longer switched but comes directly from the 150-volt stabilised line; and an external relay which closes when receiving is energised by the station push-to-talk or change-over switch. It was found that the sensitivity of the receiver during transmission was inadequate, so a 270K 2-watt resistor was wired across the relay contacts to provide a little HT for the screen grids.

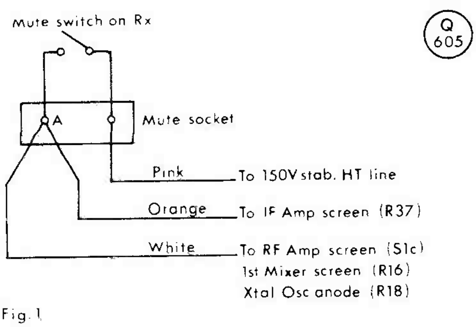


Fig. 1. Sketch to show the original muting circuit in the KW-77 receiver. This gives sidetone on 80 metres only.

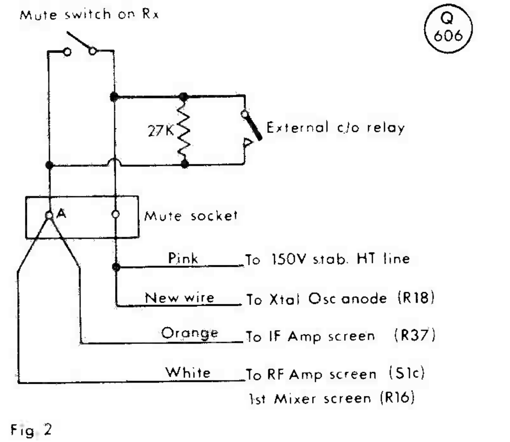
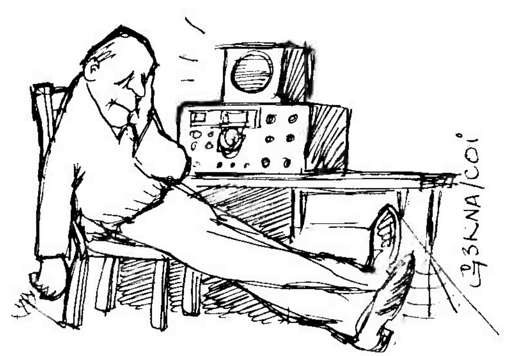


Fig. 2. The modified muting circuit. It provides for listen-through (monitoring) on all bands and, being easy to apply, is well worth incorporating.

The actual modification involves the unsoldering of the two white plastic covered wires from the lower of the three feed-through insulators located on the central screen beneath the chassis adjacent to V2 (first mixer/oscillator). The two white wires are soldered together and the joint is protected by a strip of insulating tape. The feed-through they came from connects to the anode of the crystal oscillator *via* R18, and a new lead is soldered to it and taken to the 150-volt stabilised line; a convenient point is the lug of C90a (a metal cased electrolytic capacitor) carrying three pink wires. No other internal changes are necessary if an external relay is used for muting. Should the front panel muting switch be needed to function as a control, the 270K resistor can be wired across the mute socket at the back of the receiver.

Many amateurs hesitate to make any modifications to commercial equipment—but the changes outlined here will be in no way detrimental to the operation or the value of the receiver, and will prove to be the answer for CW, and SSB, operators who normally wear phones and like to know how they sound and that they are dead on frequency.



". . . . Now for the final-final-final—as I was saying . . . ."

LEARNING MORSE

GUIDANCE FOR SELF-TEACHING

WHETHER we like it or not, a pre-requisite for obtaining a U.K. amateur transmitting licence is the ability to "send and receive plain-language text at a speed of not less than 12 words per minute." Thus, one of the first problems facing most beginners is "How can I learn Morse, quickly and easily?"

First of all, there are the excellent courses designed for learning at home and enabling a high standard of proficiency to be reached. There is also the possibility of local tuition, either at a radio club or by some kind friend who is already a competent operator. If no Club exists locally and no personal contact can be made with a qualified operator, a beginner still without his helping hand can—strange as it may seem—learn Morse perfectly well all by himself! The first thing to do is to memorise the Code, in terms of dots and dashes buzzed vocally, simply remembering that the length of a dash, *dah*, is equal in time value to three dots *dit-dit-dit*.

This should be practised until any letter of the alphabet can be buzzed instantly, on sight, without having to sort it out in terms of *dits* and *dahs*. For example, the letter "Q" should sound like *dah-dah-dit-dah*, in the same way as it looks like "Q," as printed here, without having consciously to analyse its shape.

Having got thus far, and the alphabet memorised with confidence tune round on the short wave bands —in the BC and amateur frequency areas—till you hear some powerful station sending repetition signals in Morse. There are many of them, fast and slow and between the sending of actual traffic, they hold the channel open by idling on the call-signs. These are the repetition signals, and what is being sent may be something like "VVV de WSC," or "ABC de OHX," (On Top Band DHJ is a prime example). For some little time, you may not be able to make much of this, especially if the repetition suddenly breaks into high-speed sending; then, you leave him, and tune on to some other station transmitting repetition signals. At first, when listening to these signals, all you will grasp is that it *is* repetition, because your ear will pick up the *rhythm*. After carefully listening, you will start getting a letter here and there, finally you have the whole sequence complete "VVV de WSC."

This will be your first big thrill—you have picked up something in Morse, entirely by your own efforts!

Now the factor of rhythm will assume its true importance. For if you have been lucky enough to pick out a steady, well-keyed repetition signal you will automatically begin to get your time values right. Your "VVV de WSC" begins to sort itself out neatly, because there is a definite timing between the letters of each group and between the groups themselves.

Practice

Having learnt the Code by its sound values and appreciated the importance of rhythm which really means spacing, exactly as print is spaced in this sentence you are reading—the next thing is *practice*, and yet more practice.

Apart from the help your receiver will afford you in finding stations to which to listen, you can also practice continuously, almost anywhere and any time, without even a receiver! How is this possible? It is by buzzing over to yourself in Morse such phrases as newspaper headings, advertisement posters, car numbers—in fact, any piece of print that happens to catch your eye. By this process you get the *sound* value of each letter and figure impressed on your brain. Remember, it is by *sound* that you read Morse, not by analysing each group of dots and dashes into their letter-meanings. The importance of this cannot be over-stressed, for if you can acquire it, you cut out the one mental process which is every beginner's difficulty in acquiring speed and accurate reading, or "copying" as it is called by CW operators. "Q" must mean (buzz it) *dah-dah-dit-dah* to you, and nothing else. The aim must be to get the sound of each character impressed on your brain, so that you read by ear in the same way as your eye reads print, without having to analyse the shape of each letter, or even the letters of a word.

General Guidance

There are no snags whatever in this process—except perhaps that your family and friends may begin to look at you a bit oddly when they hear the buzzing noises!

Do not be discouraged by what may seem slow progress—in the preliminary stage. Some people can learn the Code, letter by letter, very quickly. Others take much longer, especially if, as they should, the Code is learnt not in alphabetical order (which involves another mental process) but by putting letters and numbers down at random. Avoid anything in the nature of "memory aids"—that "A" is opposite to "N," or that "U" is "D" the other way round, or that "6" has one more dot than "B." These are not aids at all; they slow you up by giving your brain something else to remember and work out!

The time factor in learning is only important insofar as you should not overdo it and tire your brain; one hour's practice a day is usually quite enough, unless you feel you really want to give more. A good check on your own progress by this standard is that you may find yourself able to read callsigns and previously-unheard repetition signals in about three weeks. The rest comes with continued practice, and you will probably be reading pretty confidently on the amateur bands in about two months. If you can do better than this, you are doing well. Remember, you are learning for the fun of it, so don't wear yourself out, or allow yourself to be influenced or discouraged by those who tell you either that it took *them* three weeks, or three years, or that they never could get on with it at all.

All sorts of nonsense is talked about learning Morse, and the fact is that each case is individual.

No Key or Buzzer!

Having decided to learn on your own by the method described here—which is, of course, only recommended where there is no expert tuition available—the one thing to avoid is practice with a friend who is at the same stage as you are! The worst and most difficult way in which to learn Morse is to sit down, with buzzer and key, with somebody who also has no idea, and then proceed to make unintelligible noises at one another. Unless one partner is an operator with a good knowledge of how properly-sent Morse should sound, the whole business will take very much longer and will almost certainly mean that much will have to be *un*learnt.

In the early stages, the CW station that you find on your receiver, sending repetition signals, is your partner sending to you all the time perfect Morse over which you can spend as long as you like.

What is suggested here is a self-help approach to the problem of learning to read Morse. It is a method which assumes no outside aids (beyond a receiver) and if practised as explained above, will enable almost anyone to master the Code—we have to say "almost" because apparently there *are* some people who find it impossible to learn Morse, however they may be taught. On the other hand, those who may be doubtful about their own ability can be assured that over the years a great many amateurs have taught themselves Morse by the method advocated in this article.

Indeed by now there should be some readers, at least, who can read well enough to be thinking about learning to send. But here again it must be emphasised: Until you can read with some confidence and fluency, you should not even think about sending! This is a subject for later discussion.

BASIC AUTO KEY

GIVING ELECTRONIC DOTS WITH MECHANICAL DASHES

THOUGH expert manipulators can do very well on a pump-handle key—still the recognised instrument commercially—there are easier ways of sending Morse. These vary from the elegant, automatic electronic keyer, complete with variable speed control and panel meter, down to the humble side-swiper, made from Meccano strip and old razor blades. Described here is a key which lies somewhere between these two extremes —it works sideways, for thumb-and-forefinger action, and the dots come automatically.

This article is to enable those operators who are interested in CW, and who still do not possess a bug key, to construct one at low cost and with the minimum of mechanical skill. The current list price of the latest commercial mechanical bug keys is not inconsiderable. The simple key described here will be found to compare very favourably with the commercial mechanical bug.

Severe band interference (and TVI) can be caused by electronic keys. The instrument to be described is completely free of this trouble. Fig. 1 shows the basic circuit. However, if the key were actually to be used in this form serious interference would be caused and, further, the key clicks and thumps will be heavy. It seems that few amateurs realise the importance of correct key-click filtering. With this key, a suitable click filter and supply leads filtering should be used, as shown in Fig. 2.

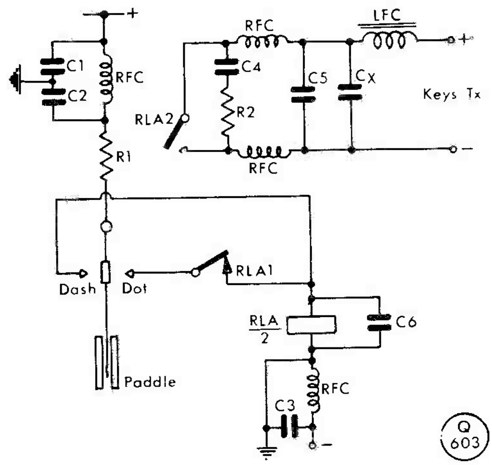


Fig. 2. The keyer circuit complete. Capacitors C1-C5 are all .001 μF ; C6 is 2 μF ; the value of Cx depends upon several factors —see text. R1 is 10,000 ohms for a 240v. DC supply and a relay of 10,000 ohms ; R2 is 1000 ohms. All RF chokes are standard 2.5 mH. C6 can be varied (by switching) from 0.5-2 μF to change the dot speed. LFC is a 30-Hy. choke and the relay should be a G.P.O. type having one set of contacts closed (A1) and one pair open (A2) in the "rest" position.

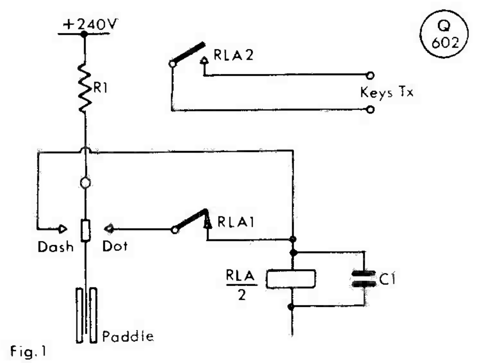


Fig. 1. Basic circuit for the auto-keyer. Dots are made automatically, depending upon the value of R1 and the capacity of C1. The relay can be a standard G.P.O. type of about 10,000 ohms resistance.

If monitoring is required (a "must" in the case of bug keys), then this filter is the minimum that should be fitted, to all keys—straight or bug—where cathode or plate keying is employed.

Construction

The instrument is built on a small chassis, and all parts except the paddle and LFC are mounted below chassis, with the paddle and audio choke on top. A small tin, suitably camouflaged, is cut down to cover and screen completely the paddle mechanism.

The lid of the tin is secured to the chassis top and the box is slotted over the top of the paddle, for easy access and adjustment and a hole is cut in the end of the box to allow the paddle handle to protude.

A simple paddle can be easily constructed, as shown in Fig. 3. It will be found that this paddle, for all its simplicity, is quite efficient and capable of sending good Morse. However, those who require a really first-class paddle should use adjustable-compression springs, but this does call for some mechanical ingenuity.

The construction of the paddle shown here could be best explained as follows: If one end of four inches of hacksaw blade is secured firmly in a vice and a paxolin handle fitted to the other end—with two contacts—the paddle is complete: the shaft provides its own spring. This is the principle of its operation; the vice is, of course, replaced by two holding angles, as shown in Fig. 3.

It will be noted that with this type of key, as compared with the mechanical bug, paddle construction is very simple, because no "ditherer" is necessary. The dots are produced electronically by the circuit shown in Fig. 2. Dashes are made manually, as with a Vibroplex type of key.

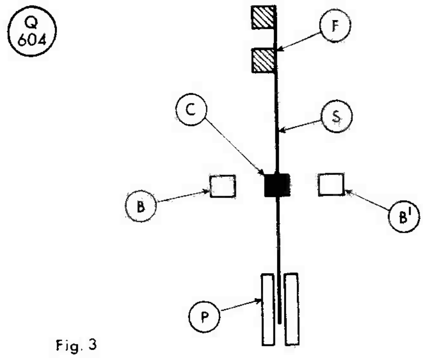


Fig. 3

Fig. 3. Paddle for the auto-key. F, angle brackets securing arm at one end ; S, 4 in. of ½in. strip steel, or phosphor bronze ; C, contacts fitted to paddle arm ; B, dash contact ; B', dot contact ; B'B are mounted on angle brackets to register with contacts C ; P, paddle handle, two pieces of paxolin fitted on paddle arm. and shaped to taste. For the circuit of Fig. 2, holding the paddle to the right, closing B'C, will make automatic dots ; dashes are made manually, against contact B. The spacing B-C-B', the clearrnce of the relay contacts A1, A2 (see Fig. 2) and the spring tension will have to be adjusted for correct mark-space ratio on dots.

Adjustment

A 30-Henry choke is used in the main keying lead (*see* Fig. 2), and this will be found ample to cover a wide range of key stages, from PA to buffer amplifiers. LFC will be large, possibly the full 30 Henry, in the case of a stage taking small current. However, the inductance can be reduced by shunting the choke with a 10K-20K resistor if a larger current is to be keyed.

The value of Cx likewise will depend on the current keyed, and will be between 0·1 and 2 μF. The network C4, R2, C5, Cx and LFC will affect the quality of the note, and it is possible to make the note sound "hard," "soft" or chirpy.

The key has been used for years with entirely satisfactory results, and there is no possibility of returning to the old pump-handle. Power supply requirements are very small and depend upon the relay used.

THE TUNNEL DIODE

THEORY AND APPLICATION

BRIEFLY the Tunnel Diode is a two-terminal (diode) oscillator in the transistor category—but it is unaffected by transit-time as we know it in valves and transistors—the Barkhausen effect. The tunnel diode will function at frequencies up to tens of GHz. It is unaffected by temperature over a very wide range, and is virtually indestructible. And, of particular significance, the tunnel diode is easier and cheaper to produce than the transistor. All this added together means that tunnel diodes have become of immediate and fundamental importance in the world of radionics and computery.

The tunnel diode is especially useful in very high frequency work where compactness, reliability, simplicity and low power consumption are important.

The name "tunnel diode" is derived from the way in which the electrons tunnel their path through an energy barrier which exists between *p* and *n* types of semi-conductors. Various semi-conductors such as germanium, silicon and indium antimonide have been used, but gallium arsenide appears to be the best material which has yet been investigated for tunnel diode manufacture.

The voltage-current curve of the tunnel diode (Fig. 1) enables its basic performance to be understood. The most important region is that between A and B in Fig. 1, in which an increase of applied voltage produces a decrease in the value of the current flowing through the device. The incremental resistance is therefore negative in this region; this enables the tunnel diode to amplify, oscillate, act as a frequency converter, and function in other RF applications.

Although signals take an appreciable (but very short) time to travel through a valve or transistor, there are, for all practical purposes, no such transit-time effects in the tunnel diode. The signal passes through it at about the speed of light and consequently the *maximum operating frequency of the tunnel diode is very high*—certainly above 10 GHz—and is probably limited only by the capacitance of the *p-n* junction of the diode and by the inductance of the diode leads. The passage of a current through a tunnel diode is a majority carrier effect; conduction through transistors depends on minority carriers (holes or electrons) with consequent frequency and other limitations.

Tunnel diodes are essentially low-power, low-voltage, very high frequency devices.

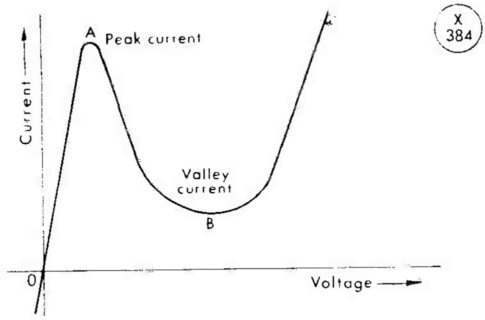


Fig. 1

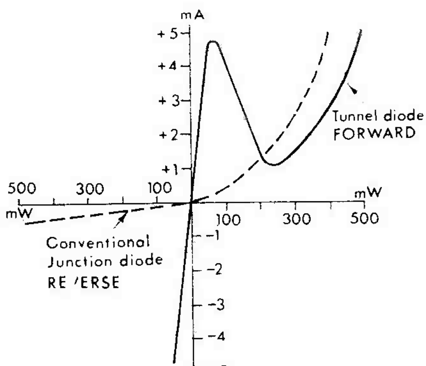


Fig. 1a

Fig. 1. Characteristic curve of a typical Tunnel Diode.

Fig. 1A. The static characteristics of a typical Tunnel Diode, compared with a conventional diode. It shows a marked negative-resistance condition; this phenomenon was first noted in 1958, and is the basis of Tunnel Diode development.

Basic Theory

The tunnel diode consists of a semi-conductor *p-n* junction, but the semi-conductor materials contain about a million times as many impurity atoms as those which are contained in the same volume of the ordinary *p* and *n* types of semi-conductors employed in the manufacture of transistors and the normal type of semi-conductor diodes. The junction between *p* and *n* types must be very abrupt. Under such conditions, electrons in the conduction energy band of the *n* type material come opposite, *i.e.* have the same energy as, certain empty energy levels in the *p* type material.

From a consideration of the Laws of Physics, it would be expected that no movement of electrons or holes between the *p* and *n* types of semi-conductor materials would be possible owing to the very large electrostatic energy barrier across the junction. The electrostatic field strength in a typical tunnel diode across the very narrow junction region is of the order of one million volts per centimetre. According to the Laws of Classical Physics, an electron striking such a barrier will always be reflected, as it will not have enough energy to pass over the barrier.

Modern Quantum Mechanics approaches the problem in a rather different manner, however. In 1928, Quantum Mechanical calculations were undertaken on the probability of the ejection of an *alpha* particle from an atom during radioactive decomposition. It was shown that there is a certain probability that an *alpha* particle which does not possess enough energy to leave an atomic nucleus (owing to the energy barrier over which it would have to climb) can leave the nucleus by a process, which, in ordinary non-quantum mechanical language, can be called "tunnelling underneath the energy barrier." It has been shown that the same kind of process can operate under certain conditions at the barrier between the *p* and *n* junctions of a semi-conductor device—hence the name "tunnel diode."

An electron, according to Quantum Mechanical ideas, consists of a kind of probability wave—a mathematical idea which merely conveys information about the probability of finding an electron at various places. This probability becomes extremely slight at places which are even a small distance away from the electron, but there is always a certain finite probability of finding any particular electron at any stated place in the universe —however small that probability may be. Therefore,

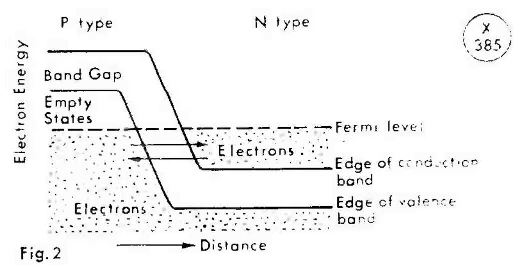


Fig. 2

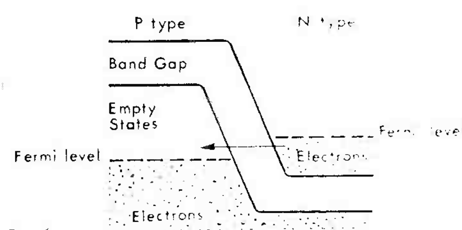


Fig. 3

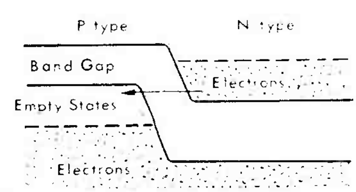


Fig. 4

Fig. 2. Electron energy level diagram for an unbiased Tunnel Diode.

Fig. 3. Energy level diagram for a Tunnel Diode having a small forward bias (region 0-A in Fig. 1.)

Fig. 4. Energy diagram for a Tunnel Diode biased in its negative resistance region.

for an electron approaching a *p-n* junction, there is a certain probability that it will be found on the other side of the barrier, although it does not have enough energy to pass over the barrier. The more abrupt the barrier, the greater is the probability that the electron will be able to tunnel through it.

If it is assumed that tunnelling can take place, it is not difficult to explain the shape of the current-voltage curve shown in Fig. 1 by means of electron energy level diagrams.

Fig. 2 shows an energy level diagram for the electrons in an unbiased tunnel diode. The dotted lines in the *p* and *n* materials are the Fermi levels—a sort of reference level of electron energies; there are as many vacant states below the Fermi level as there are states which are filled with electrons above it. At zero bias the Fermi levels in the *p* and *n* types of semi-conductor materials line up as shown in Fig. 2. Electron tunnelling currents occur to the same extent in each direction and therefore no net current passes at zero bias.

A small forward bias (*p* type positive) will cause a current to flow in the forward direction as shown in Fig. 3. Fermi levels are no longer at the same height in the two materials and the bias helps the forward current to flow.

A further increase of bias leads to the energy states shown in Fig. 4. Here the AC resistance of the device is negative, and this region is the most important one, in which the operating point of the tunnel diode can be situated. It can be seen from Fig.4 that the number of electrons in the *n* type material which are opposite to vacant energy states in the *p* type material will become less as the bias increases further. The tunnelling current therefore becomes smaller with increasing forward bias when the diode is biased in this region; this causes the negative resistance effect.

A larger forward bias causes the current to move into the valley region of Fig. 1 where it is a minimum. This can be explained by the electron energy level diagram shown in Fig. 5. No electrons in the *n* type material are opposite vacant states in the *p* type material, and therefore no tunnelling current can flow. The valley current is not quite zero, however.

Yet a further increase of the forward bias leads to the energy level diagram of Fig. 6. The electrons in the *n* type material are then raised far enough for them to spill over the barrier into the *p* type semi-conductor. A large current can therefore flow without any tunnelling taking place.

If the junction is given a backward bias (*p* type negative), the diagram of the electron energy levels is as shown in Fig. 7. A large tunnelling current flows in the reverse direction.

The various parts of the current-voltage curve shown in Fig. 1 can thus be explained by the electron energy level diagrams for the semi-conductor junction. The whole of the forward region shown occurs at a bias of less than 1 volt.

In actual practice the picture as described is complicated by the existence of very high frequency ultrasonic vibrations of the crystal ("phonons") which can assist the tunnelling process.

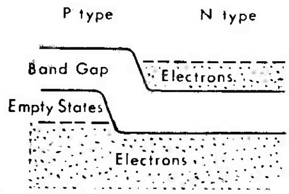


Fig. 5

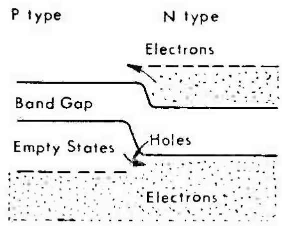


Fig. 6

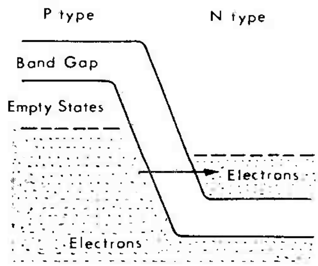


Fig 7

Fig. 5. When a Tunnel Diode is biased in the valley region, little current flows — this is the energy diagram.

Fig. 6. A large current flows when a Tunnel Diode is biased with a greater forward voltage than that required to reach the valley region.

Fig. 7. Energy diagram for a reverse-biased Tunnel Diode.

Special Features

The tunnel diode is much smaller than the transistor and is, in fact, the *smallest known device which is capable of oscillating or of giving amplification.* Tunnel diodes are extremely reliable, and some silicon types can operate at any temperature, from a few degrees above absolute zero to over 400°C. Transistors are much more sensitive to changes of temperature.

The only amplifiers which generate less noise than the tunnel diode are the complicated maser and parametric types. The valve and the transistor generate much more noise than the tunnel diode Tunnel diodes can operate on a power input of about a microwatt and therefore produce little heat. As they are much less sensitive to nuclear radiation than are transistors, they may find a useful application in atomic physics research.

The part of the voltage-current curve on which the tunnel diode operates is determined by the bias voltages and the circuit impedances. As an amplifier or oscillator, the DC working point must be on the negative resistance part of the curve. In addition, the total AC resistance (including the negative resistance of the tunnel diode) must be negative for oscillator operation and positive for working as an amplifier.

If the DC circuit resistance is greater than the negative resistance of the tunnel diode, the circuit will function as a switch. Switching times of less than a thousand millionth of a second are possible—which is nearly a hundred times faster than the best transistors yet made. This fast switching capability is leading to the use of tunnel diodes in many new computer designs.

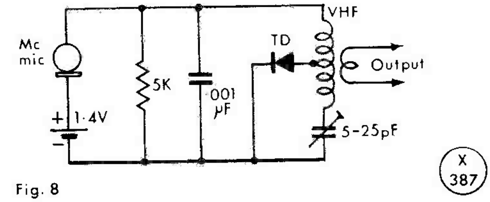


Fig. 8. An FM transmitter circuit at VHF constructed round a Tunnel Diode.—see text.

Practical Uses

Using a tunnel diode, an FM transmitter about an inch square has a range of nearly a mile. (Fig. 8). The resistance of the tuned circuit is cancelled by the negative resistance of the tunnel diode. The audio frequency voltage from the microphone affects the frequency of oscillation by altering the working point of the diode on its characteristic curve. Such circuits are extremely useful in short-range "walkie-talkie" equipment. No doubt they also find their way into the miniature radio transmitters which espionage agents place in the clothing of unsuspecting diplomats or under the blotting pad in their embassies!

The wide frequency response of most tunnel diode circuits allows one diode to perform several functions at once. For example, a single tunnel diode has been used simultaneously as an RF amplifier, mixer and oscillator—all for a very minute power consumption.

One of the main disadvantages of the tunnel diode is the difficulty of devising circuits which will enable them to be used in several successive stages operating at the same frequency, *e.g.*, a high gain IF amplifier. This difficulty derives from the fact that the device has only two terminals, whereas most other amplifiers such as the triode and transistor have a separate control electrode.

Tunnel diode characteristics are usually expressed in terms of peak current and of peak-to-valley current ratio, as the voltages at which the peak and valley currents occur are virtually constant for all diodes made from the same semi-conductor material. The negative resistance can be decreased by increasing the area of the junction; this will also increase the peak and valley currents whilst leaving the peak-to-valley current ratio unchanged. A value of the maximum permissible current is usually quoted for each type of tunnel diode.

Tunnel diodes are simple devices and will probably become quite cheap, as it is expected that they will eventually be much easier to manufacture than the transistor!

It has been reported that ZL1AAX has a microwatt tunnel diode transmitter radiating on the 80-metre band, powered by solar (photo-electric) cells. On this, he has succeeded in working ZL1AOF over a distance of about 160 miles. In this sort of context, it is worth recalling that the first solar-powered milliwatt transistor transmitter results (over distances up to 30 miles or so) were obtained by G3HMO/G6FO in 1954, as reported in the October-November-December issues of SHORT WAVE MAGAZINE of that year. The ZL results, of course, represent a greater distance covered with even lower power, and using a newer "semi-conductor device".

The latest Redifon HF Portable/Mobile station Type TM400 is all solid-state and runs up to 400 watts, channel switched in 100-cycle steps from 1·5 to 30 MHz. All modes CW/DSB/MCW/SSB can be worked and if required the whole rig can be remote-controlled by cable. It is shown here mounted in a Land Rover. The whole set-up is air-transportable. Output control is by either p-t-t, Morse key or Vox. The Rx has full front end protection and the rig will load into any aerial.

VHF BANDS

NORMAN FITCH, G3FPK

VHFCC Awards

TWO of the VHF Century Club Awards, gained this month are for 70 cm. work Certificate No. 20 goes to G8BKR, John Woodham from Westbury-on-Trym, Avon. The present 70 cm. station comprises a TS-700 into a *Microwave Modules* varactor tripler, whilst a BF180 preamplifier into a G8ABP converter feeding a *Hammarlund* HQ170a, tuning 28-30 MHz takes care of the receive side. The aerial is a 46-ele. Multibeam at 46ft. the QTH being 190ft. a.s.l. G8BKR acknowledges the help and encouragement to himself and other Bristol amateurs given by G8AII, to get going on both 70 cm. and 23 cm.

G8GED, Dave Richardson from Southall in Greater London, receives certificate No. 21. He first got going on 70 cm. about 18 months ago with two watts of AM to a dipole. Shortly afterwards the power was increased to 10 watts of FM and a Multibeam installed. Present activity is the building of an SSB rig for 2m. for subsequent use on 70 cm. and 23 cm. At G3FPK we heard the fruits of G8GED's labours when we copied his 20 mW of 2m. SSB recently. Dave mentions those few amateurs who never QSL, even when sent a prepaid, prepared card. Anyone's ears burning?

G8IMF is the recipient of 2m. certificate No. 249. Malcolm Connah operates from Highworth in Wiltshire and started in February, 1974 with 10 watts of FM using a *Telford* TC7/TC9 combination and crossed dipole aerial. The present equipment comprises the popular TS-700 into an 8-ele. Yagi. In only three months of operation from his new QTH, G8IMF has worked 66 counties and 16 countries with just 10 watts of SSB.

During 1975, 21 VHFCC's were awarded to readers, 18 for 2m., two for 70 cm. and only one for 4m. The rules are very simple. Just send a list of QSL cards you hold from 100 stations worked on the band for which you are claiming, showing callsigns, dates and locations to "VHF Bands," *SHORT WAVE MAGAZINE, BUCKINGHAM, MK18 1RQ.* Please include some station details with a potted history of your Amateur Radio career. We will then ask you to send six cards picked at random from your list for verification. If all is in order, you will get your VHFCC award.

Contests

Last month we could only mention briefly the 144 MHz Fixed Station contest which took place on the weekend when the January column was started. We understand that G4BPO, the station of the Martlesham Radio Society in Suffolk, achieved some 280 QSO's and that G8PY, the Pye Telecomms Group in Nottingham, managed about 260 contacts. G4BWG (Peckham) opted for FM only, actually phase-modulation, which can be received perfectly on SSB receivers. Steve's best DX was G4CZP plus a couple of GC's and a Cornish station in his 121 QSO's. From his first floor flat in London's Barbican, G8ITS made 40 QSO's including one F using his 8-ele. Yagi on the balcony, aimed South. Other reports over the air on conditions during the contest confirm our initial assessment last month. The next main event is the 432 MHz Open Contest from 1000-1500 GMT on February 8, followed by the 2m. Open and Listeners' event on March 6/7.

Tabular Matter

Congratulations to GD2HDZ, Arthur Breese, (Laxey) who heads the Annual Three-Band table with a fine total of 205, thus repeating his success of 1972. G3ZMD, John Reed of Luton, was a worthy runner up with exactly 200 points. Third place was achieved by your previous conductor Mike Dormer, G3DAH, who clocked up 171 in well balanced operation on the three bands. G3ZMD turned the tables on GD2HDZ by one point in leading the 4m. list with a total of 64. Joint second with GD2HDZ was G4BYP, Alan Scott of Liverpool. The 2m. listing is quite remarkable in that the 100 points barrier has been broken for the first time—by no less than *four* readers: GM8FFX, Graham Knight from Aberdeen, managed 110 points, followed by G4CMV. Clive Morton of Pudsey, W. Yorks with 104. Third place went to another Scot, Derrick Dance, GM4CXP (Maxton, Borders) with 102, the fourth "ton-up" type being G4CZP, Richard Crossley from Carnforth, Lancs, who just made the 100.

New ideas usually take a little time to get off the ground so we are pleased that already there are 20 entries for the QTH Squares Table. The starting date for this new departure is 1-1-*1975* and it will be an on-going affair covering 23 cm., 70 cm. and 2m. The QTH Squares—previously known as QRA squares—are the main, primary ones, such as ZL, AM, etc. This month, the total determines your position in the table and next issue it will be the 2m. score only, and so on. The Three-Band Annual table started again on January 1, the main difference being that you now count the twelve new Scottish Regions instead of the previous 33 counties. There are nine Regions, Borders, Central, Dumfries & Galloway; Fife, Grampian, Highland, Lothian, Strathclyde and Tayside, plus three Areas: Orkney Islands, Shetland Islands and Western Isles Islands.

There seems to be some uncertainty as to whether you count the Irish Republic counties in your table score. The answer is, "Yes." Incidentally, a very useful map showing all the old and new counties/regions of the British Isles is published by *Geographia Ltd.*, at 40p. This also shows the parallels and meridians enabling you to mark on the QTH squares.

Scottish VHF Notes

GM6XI (Edinburgh) has sent the following resumé of GM-VHF news. On 70 cm. GM8ARV (Edinburgh) has made history by introducing 625-line A/TV. Good pictures have been received in Edinburgh and Glasgow. GM3BQA, GM3PQU and GM8DOX are active on the band and G3BW is having his infinite patience rewarded by regular contacts with GM3BQA in North Berwick. GM4DIJ is building an SSB rig for 23 cm. and hopes others will follow suit. On 2m. there is a steady increase in FM activity and, on the whole, operating discipline seems good. SSB activity is also on the increase, newcomers including GM3CPC and GM8KIE (Invergowrie), GM3AEY and GM3IVZ (Kirkcaldy) and GM3NIO in Edinburgh. GM6XI has installed a ground plane for 2m. which has greatly improved his coverage to mobiles. Scots amateurs are very pleased that microwave activities were recognized by his being awarded the Courtney Price Trophy. Now, with the cooperation of GM8GEC, he is working on the problem of improved frequency stability at 10 GHz.

Satellite News

Having recently acquired the necessary crystals to provide complete coverage of the 2m. and 10m. bands by the Hallicrafters Tx/Rx at G3FPK, the first faltering staps in the Oscar world were taken on December 20. The 2m. aerial is the main, 10-ele. long Yagi, fixed horizontally, consequently, whilst both satellites can be accessed at extreme range, an indoor, 3-ele. Yagi mounted in a vice placed on a table in the shack and rotated and elevated by hand, has been successful on overhead passes. First priority must be to improve the 10m. receiving system for the

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2m.	Total
G8FUF	—	63	138	201
G3POI	—	—	127	127
G4BWG	—	17	102	119
G3COJ	10	45	54	109
G3FPK	—	—	107	107
G4DGU	—	30	59	89
GM4CXP	—	9	80	89
G6UW	—	—	78	78
G8BKR	—	?	?	74
GD2HDZ	6	19	41	66
G4CIK	—	—	61	61
OZ9IY	—	—	52	52
G8KSP	—	—	51	51
GW8HVP	—	—	48	48
G8IFT	1	11	29	41
G3FIJ	—	6	34	40
G8JEF/A	—	—	38	38
G8JEF	—	—	25	25
G8JAJ	—	—	23	23
G8JKA	—	—	21	21

Starting Date January 1, 1975

crude, crossed wire dipoles in the loft are not very good and a 40673-type preamplifier would doubtless prove most beneficial. First reactions are that it is nice to be able to have DX QSO's on 2m. "by proxy" when the band is flat, tropospherically speaking. The signals from *Oscar VI* are much stronger than those from *Oscar VII* on the 10m. downlink. Occasional decoding of the telemetry from *Oscar VII* has indicated apparent full power output from the 70 cm/2m. transponder whilst operating in Mode "A". Is channel 2B kaput? The total power output of the 2/10m. transponder seems to be between 700 and 800mW which accounts for the weaker signals than *Oscar VI*. Readers wishing to get orbit predictions may like to note that on Sunday evenings at 1930, AMSAT U.K. has a net on 2m. SSB on 144·28 MHz, G8CSI in New Malden being M.C. G3COJ, G3FPK and others are regular participants.

TWO-METRE ANNUAL TABLE

Final Placings
at December 31, 1975

Station	Counties	Countries	Total
GM8FFX	93	17	110
G4CMV	88	16	104
GM3CXP	84	18	102
G4CZP	85	15	100
GD2HDZ	75	17	92
G4BWG	70	21	91
G3BW	78	13	91
G8IAT	77	13	90
G3FPK	70	19	89
G3ZMD	71	18	89
G8GML	68	17	85
G8BKR	70	15	85
GI8HXY	72	12	84
G3BHW	64	19	83
GD3YEO	67	15	82
G4CIK	65	16	81
G8INL	67	14	81
G4BYP	68	13	81
G8GLS	69	11	80
G8GII/P	62	17	79
G2AXI	54	15	69
GW8HVP	57	12	69
GI3JLA	56	12	68
G3DAH	54	10	64
G8GLS	54	10	64
G4AJE	50	13	63
G3FIJ	50	12	62
G4BKY	52	10	62
G8IFT	53	9	62
G4AEZ	45	15	60
G8KSP	47	13	60
G8GHZ	50	9	59
G8EOP	45	12	57
G8JKA	47	10	57
G8FWB	47	8	55
GM3JFG	38	15	53
G4DNJ	45	8	53
G8JAJ	44	8	52
G8ABH	40	11	51
G8KKX	34	12	46
G8ITS	32	8	40
G8FMK	31	3	34
GW8GLG	30	3	33
G4AGE	23	9	32
G3EKP	24	5	29
G4AIR	7	2	9

Rick Zwirko, K1HTV, AMSAT Vice-President Operations, has sent a letter to all Area Coordinators concerning the over-loading of *Oscar VII* by 70 cm. operators who are running *far too much power*. Only 100 watts e.r.p. is necessary, *e.g.* a 10 watt Tx with a 10dB gain aerial is sufficient. It seems that some of the E-M-E lads have been using their kilowatt finals and huge aerials. Naughty! If this practice continues, irreversible damage will be done to the space-craft's batteries resulting in *Oscar VII* becoming prematurely a useless, silent chunk of space debris.

Meteor Scatter

G3POI (Downe, Kent) reports continued successes on MS in his skeds with OE3UP and SM3BIU. Other QSO's recently concluded are EA4AO (YA41g), OH2AXH (MU65h), OH5NW (NU13e) and UT5DL (LI22f). Clive has some real DX skeds in the pipeline. GM4CXP confesses that the MS bug has bitten and Derrick has already worked I4EAT (FE60f) on December 13 at 75 1.p.m. He was determined to have a go in the *Quadrantids*. His SSB skeds with I4PWL and SMØFFS came to nought, though. Another reader who is interested in this mode is GW8HVP (Haverfordwest, Dyfed). Tim will be QRV when he has built a 4CX250B linear and should be a popular fellow from square XL. He also reports that GW3XJQ (Dyfed) is active on MS and had successful CW QSO's with SK6AB (FR30c) and SM7AED (GQ56b) during the *Geminids*, but failed to make it on SSB with DC7IT. G4DGU (Oxon.) was active for the *Quadrantids* but only concluded one QSO, with SM5LE in JT square. Best gotaway was UC2AAB (NN08j) but neither Chris, nor G3SEK, had any luck with LZ1CD in MC64d.

Auroral Opening

A telephone call from G8IYG on January 10 alerted G3FPK to the fact that an aurora was in full swing on two metres. The first QSO was with GM3BQA (YQ77j) at 1718. GI3RXV (WO18f) was a new QTH square and a number of other GM's in the new regions were worked. Best DX in the first phase was SM4ATA (HT51c), whilst the last station worked was LA3UU (FT11d) at 2006. The phenomenon ceased at just before 2030 having lasted about four hours. G3POI mentions a second phase for a while around 2200, when another three GM's were worked. Your scribe was in on the third phase from midnight and was glad to hook SM5BSZ/O (JT41f) for another new QTH square, plus SMOERR (IT50f) and LA2PT (FT13b). G3POI reports hearing GM4CXP working UR2HD (LS53e) so we look forward to receiving your reports for the next issue. As we compile this offering, a solar storm warning has been notified so there may be another aurora in the offing.

Four Metres

G4CVI (Fetcham, Surrey), in a recent QSO, asked why no 4m. news last month? Easy. Nobody sent in any reports! Richard advises of Sunday morning skeds on 70·32 MHz SSB with GM4CXP and would welcome skeds with any Northern stations—*QTHR*. Weekends preferred. Other Northerners reported active are G3JYP and G3VVT in Cumbria, whilst G4AIR (Macclesfield) puts Cheshire on the map. Please send us your reports on the CW contest, folks. G3BW (Whitehaven) now has one watt of SSB on 4m. and, " . . . with a bit of wire in the shack . . . " has worked GD2HDZ and G3JYP.

Two Metres

As expected, the "ZB2DC" worked by G4DGU montioned last month, has proved to be a phoney. G8EXX, the owner of the call, *was* in Gibraltar at the time of Chris' QSO, but confirms it was not he who was worked.

After the several aurorae in November, it seemed that December would be a dull month. However, the band went out in fine style with a good, extended tropo opening on the 27th and 28th. G3COJ (Bucks.) found two new EA's on CW. EA2LA in Bilbao runs 7 watts to a vertical 3-ele. Yagi and was up to S8 at times, but with a chirpy note. EA2LL was also worked on CW at first, then on SSB. He is situated at the TV station at Sollube, 40 km. North of Bilbao and uses 5 watts to a 9-ele. beam. Brian worked these two between 0020 and 0100 on the 28th. G4CMV (Leeds) had to battle through the QRM from the South yet managed to hear most of the French QTH squares, working CG, DF and DH. Three HB9's were worked in DG, DH and EH, plus a lot of portables in Southern Germany. A gotaway was OE2CAL/P2.

G8BKR (Bristol) only found out about the good conditions at 1515 on the 27th. John's best DX was F1BUT (AD63g) and F1DGD (ZD48j). HB9MKW/M in DH60h was a very good signal using 10 watts. G8FUF (Benfleet, Essex) worked I1BEP/P (DF15g) and I1SFG/P (DF65e) at lunch time on the 27th and heard I4BFY/P in FE64a. Keith reports—G4DML's best DX from Benfleet as IQRRP/4/P in FD56g at 0610 on the 28th, whilst F9NL passed on the news that OZ to EA6 on CW had been achieved. Other countries worked by G8FUF included DM, HB9, OE and OZ. G8KKX (Northants.) found the lift to funnel into Southern Germany, France and Switzerland at different times, although covering most of the U.K. Roy did not hear any ON, OZ, PA or Western or Northern French stations.

GD2HDZ was one of those who worked OE2CAL/P2, thus bringing the final 2m. countries total to a respectable 17. A new one for the Three-Band Annual for GI8HXY (Down) was GC2FZC Guernsey, during the lift on the 27th, whilst EI9Q in Waterford was contacted on the 15th. GW8HVP (Dyfed) mentions December 22 when ON6AT/A (BK18f) and F6CEC/P (BF21j) were bagged, the F6 being S9 all day. On the 26th, Tim worked many F's from the Northern coast down to the Paris region, whilst the 27th brought much DX during which the linear blew up (Murphy at it again?). Eventually it was repaired and DC6MY (F134a) was raised at 1170 km. During the opening 22 European QTH squares were worked with 14 DL, 22 F, three HB9 and two ON's in the log. At G3FPK, December produced 12 new QTH squares. During the period 27/28, the band was wide open to central and Southern France so it was decided to try and fill in the QTH map of France, with considerable success, eventually. Some 13 new Departments were logged. On CW, F9NL (AD71b) in 66 was worked, whilst SSB brought F1CAE (CE06g) in 26, F1DPQ/P (DF11j) in 74 and F2KE (BE33h) in 12 for the best of the bunch.

Two metres was well open to the South on January 7 and many CW users accounted for EA1AB (YD41b), another new square for G3FPK, as was F8RZ in ZF50h, Dept. 16. The same evening brought the first SSB QSO with Spain, thanks to EA1CV in Gijon. Antonio now has an FT-221 and no doubt will be in great demand. The one watt, 9-ele. CW station, EA1KC (XD32d) also in Gijon, was on during the 7th. G3CHN (Devon) had a CW contact with EA1AB during which Javier advised that he operates on CW on 144·04 MHz at 1700, " . . . all days of the year." From his excellent vantage point on Bolberry Down, G3CHN proposes to plug away on a fairly regular basis down the West coast of France towards EA and CT to ascertain how reliable propagation is over this sea path.

Seventy Centimetres

Following the Repeater Meeting in October at Brunel University, the Home Office was contacted concerning the restrictions on the use of the 430-432 MHz section of the 70 cm. band. Regrettably, we hear that these restrictions are to remain in force in their present form.

The excellent conditions over the period December 27/28 on 2m. also extended to 70 cm. with warnings flashed on UHF TV screens about interference. G3OSS (London) was very pleased to work OE2CAL/P2 and GD2HDZ for new countries on the band. For G3ZMD, Murphy's Law was dumbfounded, for once, since the day *after* John came up on SSB for the first time, there was the opening. The TS-510 and *Modular Electronics* 9 watts transverter netted F1BUT (AD63g), F2TU (DI55d), F9NL (AD71b) and OE2CAL/P2 (GH16c). A 4CX250B linear amplifier is planned for 1976. G8BKR heard F2TU but was unable to make a QSO due to a fault on the aerial relay. G8FDK (Launceston), who has given so many 2m. operators their first Cornish contact, advises that he has a 2C39A, high level mixer built and plans to use his FT-101 as a prime mover to get going on the band, with an 8-over-8 aerial. Alan certainly won't be short of customers! G8FUF was another who heard the OE-portable but with only 10 watts, due to TVI, Keith did not make a QSO. However, he did manage DL, F and HB9. The station consists of a TS-510 exciter, transistor transverter with 2N5915, 10 watts output. A linear with a pair of 4CX250B's is available and the aerial is a 36-ele. stack. G8GML (Cambridge) came on the band for the first time in mid-December with 12 watts of FM.

GD2HDZ has worked GD at last, thanks to GD3YEO, for a new 1975 country. In the past, Arthur has relied on visiting DX-Peditionaries to work his own country. He reports no Continentals being heard during the big lift. GI8HXY does not mention the lift, but did add GM and three counties to his score in the month. GW8HVP appears to be getting ready for 70 cm. operation and has a receiving converter working into the IF strip of the Liner-2. Tim writes that GW8BXQ has 9 watts of SSB from Pembroke Dock and did well in the lift.

70 CENTIMETRE ANNUAL TABLE

Final Placings
at December 31, 1975

Station	Counties	Countries	Total
G3BW	46	8	54
G3DAH	39	14	53
GD2HDZ	41	9	50
G3BHW	35	13	48
G3ZMD	35	12	47
G5DF	36	11	47
G2AXI	32	10	42
G8EOP	26	10	36
G8FMK	30	4	34
G4BWG	21	6	27
G4AEZ	18	8	26
G8ABH	21	5	26
GW8FK8	18	6	24
G4AJE	17	5	22
GM8FFX	11	10	21
G8IFT	16	4	20
GI8HXY	10	5	15
GM4CXP	11	4	15
G8BKR	12	2	14
G3FIJ	6	3	9
G4AGE	6	1	7
G8GML	6	1	7
GI3JLA	3	3	6
G8INL	2	3	5
GD3YEO	2	2	4
G8GHZ	3	1	4
G3EKP	1	1	2

FOUR-METRE ANNUAL TABLE

Final Placings
at December 31, 1975

Station	Counties	Countries	Total
G3ZMD	57	7	64
GD2HDZ	58	5	63
G4BYP	58	5	63
G5DF	51	6	57
G3DAH	49	5	54
G3FIJ	47	4	51
G2AXI	45	4	49
G4BWG	44	4	48
GM4CXP	30	5	35
G4AIR	29	4	33
G4AEZ	25	3	28
G4CIK	19	2	21
GI3JLA	14	5	19
G3EKP	10	3	13
G3BW	2	2	4

Twenty-Three

We have no reports of 23 cm. activity this month. Pressure on space precludes the inclusion of the All-Time Table but please send in your up-to-date claims for next time, adding the number of QTH squares worked, as well, all time.

The Danish Scene

A welcome letter from Julian Macassey, OZ9IY from Farum in GP12c, informs us that, "Conditions on VHF over here are terrible. Activity on SSB is almost non-existent, which means that if there is any DX around I am often the only one to bag it." OZ9IY puts the blame for this fairly and squarely on repeaters. In Copenhagen alone there are three, plus six more, including those in Sweden, within a 50 km. radius. He says that most "amateurs" have a VHF rig with a ground-plane under the roof and use the repeaters even if they are only working the fellow in the next street. Julian sums it up thus, "Great for taxi drivers, but no good for Amateur Radio." We could not agree more, OM. However, the picture does not seem to be quite so black since, in the G3FPK log, there are 20 different OZ's in all districts, except 7, on SSB. As compensation, OZ9IY has notched up 52 QTH squares since 1-1-'75 with, " . . . a Liner-2, 10-ele. Yagi and lotsa patience!"

Repeaters on Seventycems

The Repeater Working Group, formed at the Brunel University meeting last October, has proposed a compromise plan for U.K. 70 cm. repeaters, now that we know that the restrictions on the use of the 430-432 MHz section will not be lifted in the foreseeable future. In essence, it is an inverted Warsaw system in that the output frequencies would be; 433·05, 433·10, 433·15, 433·25 and 433·35 MHz, the inputs being 1·6 MHz *higher.* It is realized that this could cause interference to A/TV so the RWG has suggested that the repeaters could be switched off a couple of evenings each week from 7 p.m. to midnight. The Home Office has rejected the 2m. GB3RF proposal for a Burnley repeater due to its being much less than 100 miles from Barnsley, Pennines notwithstanding.

Final Miscellany

Several 2m. CW and MS operators have been complaining about phone stations operating in the CW band. One reader is particularly critical of a weekly net of old timers on AM around 144·12 MHz, which has ruined his MS skeds on Tuesday evenings. Others are none too happy about a net on 144·14 MHz used as a talk-back frequency for 70 cm. A/TV. Two very useful beacons, DLØPR and ZB2VHF, are clobbered by these stations. Surely the 2m. band is wide enough for these folk to QSY to a more appropriate part of the band?

G8FUF states that in France, there is a "Licence Commercial" whereby French amateur stations can run as much power as they like by quoting any special reason. This explains why one or two F's have been stating powers of one kilowatt output.

G8JEF agrees there is a difference between the German and British authorities concerning the use of -/M and -/P. His reciprocal DL licence says he must sign -/M when using the car's power supply, even if a fixed aerial is used. The "A" suffix is used only from your *own*, second QTH, without any oblique stroke, whilst anyone operating from an alternative QTH must use his own call -/P.

Deadline

February 7 for your claims and comments for the March column, please, to: "VHF Bands" *SHORT WAVE MAGAZINE, BUCKINGHAM, MK18 1RQ. 73 de G3FPK.*

THREE BAND ANNUAL VHF TABLE

Final Placings, December 1975

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL
	Counties	Countries	Counties	Countries	Counties	Countries	Points
GD2HDZ	58	5	75	17	41	9	205
G3ZMD	57	7	71	18	35	12	200
G3DAH	49	5	54	10	39	14	171
G4BWG	44	4	70	21	21	6	166
G2AXI	45	4	54	15	32	10	160
GM4CXP	30	5	84	18	11	4	152
G3BW	2	2	78	13	46	8	149
G4BYP	58	5	68	13	—	—	144
G3BHW	—	—	64	19	35	13	131
GM8FFX	—	—	93	17	11	10	131
G3FIJ	47	4	50	12	6	3	122
G4AEZ	25	3	45	15	18	8	114
G5DF	51	6	—	—	36	11	105
G4CMV	—	—	88	16	—	—	104
G4CIK	19	2	65	16	—	—	102
G4CZP	—	—	85	15	—	—	100
GI8HXY	—	—	72	12	10	5	99
G8BKR	—	—	70	15	12	2	99
GI3JLA	14	5	56	12	3	3	93
G8EOP	—	—	45	12	26	10	93
G8GML	—	—	68	17	6	1	92
G8IAT	—	—	77	13	—	—	90
G3FPK	—	—	70	19	—	—	89
GD3YEO	—	—	67	15	2	2	86
G8INL	—	—	67	14	2	3	86
G4AJE	—	—	50	13	17	5	85
G8IFT	—	—	53	9	16	4	82
G8GLS	—	—	69	11	—	—	80
G8GII/P	—	—	62	17	—	—	79
G8ABH	—	—	40	11	21	5	77
GW8HVP	—	—	57	12	—	—	69
G8FMK	—	—	31	3	30	4	68
G8GLS	—	—	54	10	—	—	64
G8GHZ	—	—	50	9	3	1	63
G4BKY	—	—	52	10	—	—	62
G8KSP	—	—	47	13	—	—	60
G8JKA	—	—	47	10	—	—	57
G8FWB	—	—	47	8	—	—	55
G4DNJ	—	—	45	8	—	—	53
GM3JFG	—	—	38	15	—	—	53
G8JAJ	—	—	44	8	—	—	52
G8KKX	—	—	34	12	—	—	46
G3EKP	10	3	24	5	1	1	44
G4AIR	29	4	7	2	—	—	42
G8ITS	—	—	32	8	—	—	40
G4AGE	—	—	23	9	6	1	39
GW8GLG	—	—	30	3	—	—	33
GW8FKB	—	—	—	—	18	6	24

For this month's Reader Small Advertisments, see pp. 729-735

RESULTS

THE 30th ANNUAL MCC
Positions and scoring

POS'N	CLUB NAME	CALLSIGN	POINTS
1	Irish Leprechaun Contest Group, Dublin	EI1AA	15,208
2	Kingsway Tech. Radio Amateur Club, Dundee	GM4AAF	14,209
3	White Rose Radio Society, Leeds	G3XEP	13,943
4	Sutton & Cheam Radio Society, "A" station	G2DMR	13,418
5	Addiscombe Amateur Radio Club, Surrey	G3WRR/A	12,972
6	South Manchester Radio Club	G3FVA	12,615
7	Royal Naval Amateur Radio Society, London Group	G4EOK	12,532
8	Maidstone YMCA Amateur Radio Society	G3TRF	12,206
9	Surrey Radio Contact Club	G3SRC	12,202
10	Oxford University Radio Society	G3OUR/A	12,115
11	Bracknell Amateur Radio Club	G4BRA/A	11,075
12	North Staffs. Amateur Radio Society	G4BEM	10,675
13	Sutton & Cheam Radio Society, "B" station	G4ADM	10,472
14	Irish Radio Transmitters' Society, Radio 1 station	EI9ONE	10,360
15	Greater Peterborough Amateur Radio Club, "A" station	G4EHW	10,226
16	Edwgare & District Radio Society, "A" station	G3ASR/A	10,116
17	Blackrock Radio Scouts, Dublin	EI2CA	10,111
18	Hereford Amateur Radio Society	G3YDD/A	9,765
19	Glenrothes & District Amateur Radio Club	GM4EJI/A	9,620
20	Leyland Hundred Amateur Radio Club	G3WYY	9,425
21	Amateur Radio Club of Nottingham	G3EKW	9,218
22	Stevenage & District Amateur Radio Society	G3SAD	8,815
23	Peterborough Radio & Electronic Society, "A" station	G3DQW	8,693
24	Mansfield Radio Society	G3GQC	8,670
25	Solway Radio Club	G4BBX/A	8,134
26	Sheffield & District Amateur Radio Society	G3FJE/A	7,196
27	Cambridge University Wireless Society	G6UW	7,186
28	Dunstable Downs Radio Club	G3USE	6,645
29	Southdown Amateur Radio Society	G3WQK/A	6,380
30	Edgware & District Radio Society, "B" station	G4AEM	6,025
31	Acton, Brentford & Chiswick Radio Club	G3IIU	5,940
32	Crystal Palace & District Amateur Radio Club	G3VCP	4,422
33	Gloucester Amateur Radio Society	G4AYM	4,356
34	West Kent Amateur Radio Society	G4CCQ	3,948
35	Silverthorn Radio Club	G3SRA	3,528
36	Gosport & District Amateur Radio Club	G3RQK/A	2,850
37	Echelford Amateur Radio Society	G3UES	2,576
38	Guildford & District Radio Society	G6GS	2,538
39	S.T.C. Amateur Radio Club, Paignton	G3RMA/A	2,329
40	Clifton (London) Amateur Radio Society	G3GHN/A	820
41	Greater Peterborough Amateur Radio Club, "B" station	G4BBA	770

Above are final corrected scores, in some cases significantly lower than totals claimed. It should be noted that only a few incorrectly claimed score points and one or two multipliers too many can make a large difference to the final score.

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 6)

YES—we know we said "no Clubs in February" but the Editor made a New Year resolution not to give old scribe *any* spare time to pollute the ether; and you chaps sent in lots of reports (or missed last month's deadline!). Out came the whips and scorpions and—Presto!

Seriously, because of the **MCC Report**, we have only a small amount of space, and so for this month only, everyone will get their mention in the form of a place in the Table herewith. Thus, for more details on any group, all you have to do is to write, ring or call on the appropriate hon. secretary at the address in the Secretaries' Panel.

Normal "Clubs" service will be resumed in the next issue, for which the deadline is **February 6**, addressed "Club Secretary," *SHORT WAVE MAGAZINE, BUCKINGHAM, MK18 1RQ.*

SHORT CLUB NOTICES

CLUB NAME	HEADQUARTERS LOCATION	DATES IN FEBRUARY
Acton, Brentford & Chiswick	66 High Road, Chiswick	17th
BARTG	*Refer to Hon. Sec.*	—
Bury	Mosses Community Centre, Cecil Street	all Tuesdays
Cheltenham RSGB	Royal Crescent Hotel	5th (AGM)
Chiltern	Castle Street, High Wycombe	25th
Cornish	SWEB Clubroom, Pool, Camborne	5th
Cray Valley	Eltham United Reformed Church Hall, 1 Court Road, S.E.9	5th and 19th
Crystal Palace	Emmanual Church Hall, Barry Road, S.E.22	21st (AGM)
Derby (Nunsfield House)	Nunsfield House, Boulton Lane, Alvaston	all Fridays
East Lancs	Blackburn YMCA	5th
Echelford	St. Martins Court, Kingston Crescent, Ashford, Middx.	9th, 26th
Harrogate & Knaresboro'	Harrogate Coll. of Art, 2 Victoria Road, Harrogate	all Mondays
Hereford	CD Hq., Gaol Street, Hereford	6th, 20th
Maidstone YMCA	Y Sportscentre, Melrose Close	all Fridays
Midland	Midland Institute, Birmingham	17th
Mid-Warwicks	61 Emscote Road, Warwick. (New QTH)	2nd, 16th
Norfolk	Crome Comm. Assn. Telegraph Lane East, Norwich	all Wednesdays
North Kent	St. Mary's Institute, 2 North Cray Road, Bexley	12th, 26th
G-QRP	*refer Hon. Sec.*	
Reigate	St. Marks Church Hall, Alma Road, Reigate	17th

The Edgware & District "B" station for MCC was operated by G4AEM (left) and G3PSP. As seen from the table opposite, they made 6,025 points for 30th position.

CLUB NAME	HEADQUARTERS LOCATION	DATES IN FEBRUARY
RAIBC	*refer Hon. Sec.*	
Scarborough	Technical College	all Fridays
South Birmingham	Hampstead House, Fairfax Road, West Heath	4th
Southdown	Victoria Hotel, Latimer Road, Eastbourne	2nd
Southgate	Scout Hut, Wilson St., Winchmore Hill	*refer Hon. Sec.*
Spalding	*refer to Hon. Sec.*	6th
Surrey	Ship Inn, Croydon	17th
Sutton & Cheam	Sutton College of Liberal Arts	17th
Torbay	Bath Lane, rear 94 Belgrave Road, Torquay	Fridays
WAMRAC	*refer to Hon. Sec.*	—
White Rose	83 Town Street, Armley, Leeds 12	Wednesdays
Wolverhampton	Neachells Cottage, Danescourt Road, Stockwell End	Mondays
Worthing	*refer to Hon. Sec.*	Tuesdays

N.B.—In each case, the Secretary's name and address appears in the Panel below.

Names and addresses of Club Secretaries reporting in this issue:

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London, W3 8LB.
B.A.R.T.G.: J. P. G. Jones, GW3IGG, Heywood, 40 Lower Quay Road, Hook, Haverfordwest, Dyfed, SA62 4LR.
BURY: J. Clifford, G4BVE, 10 Arley Avenue, Bury, Lancs. *(061-764 3466.)*
CHELTENHAM (RSGB): G. D. Lively, G3KII, 26 Priors Road, Cheltenham, Glos.
CHILTERN: *Secretary's QTH wanted.*
CORNISH: H. Webster, G3XTF, Crandale, Gillyfields, Redruth *(6905)*, Cornwall.
CRAY VALLEY: M. Tripp, G3YWO, 57 Cathcart Drive, Orpington *(38199)*, Kent.
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London, SE23 3BN. *(01-699 6940.)*
DERBY (Nunsfield House): J. Cage, G4CTZ, 25 Petersham Drive, Alvaston, Derby, DE2 0JU.
EAST LANCS.: N. Jenkin, G4CGT, 125 Lambeth Street, Blackburn *(670561)*, Lancs.
ECHELFORD: J. H. Ellis, G2FNK, 15 Georgian Close, Leacroft, Staines *(54828)*, Middlesex TW18 4NR.
HARROGATE & KNARESBOROUGH: D. Boniface, G8IBB, Holmefield Road, Ripon, Yorks.
HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford *(3237)*.
MAIDSTONE YMCA: G. H. Taylor, G4BNI, 26 Valley Drive, Loose, Maidstone *(43796)*, Kent.
MIDLAND: A. L. Walton, G3ZKQ, 243 Barnes Hill, Birmingham, B29 5UJ. *(021-427 3088.)*
MID-WARWICKSHIRE: A. C. Outhwaite, G8GDY, 7 St. Anns Close, Leamington Spa, Warwickshire.
NORFOLK: M. J. Coan, 20 Hobart Square, Norwich.
NORTH KENT: R. Wells, G4ARQ, 12 Bulbank Road, Belvedere, Kent.
QRP CLUB: Rev. G. C. Dobbs, G3RJV, 8 Redgates Court, Main Street, Calverton, Notts.
R.A.I.B.C.: Mrs. R. Shepherd, G3NOB, 59 Pantain Road, Loughborough, LE11 3LZ, Leics.
REIGATE: R. Wells, G3RIN, 5 Cronks Hill Road, Redhill, Surrey. *(Reigate 47659.)*
SCARBOROUGH: C. H. Whitaker, 1 Ryefield Close, Eastfield, Scarborough, Yorks., YO11 3DN.
SOUTH BIRMINGHAM: N. Gutteridge, G8BHE, 68 Max Road, Quinton, Birmingham, B32 1LB. *(021-422 9787.)*
SOUTHDOWN: B. Chuter, G8CVV, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex, BN20 9JG.
SOUTHGATE: B. Oughton, G4AEZ, 48 Morley Hill, Enfiled, Middx. *(01-366 7166.)*
SPALDING: R. Harrison, G3VPR, 38 Park Avenue, Spalding, Lincs., PE11 1QX.
SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, CR2 8PB, Surrey. *(01-657 3258.)*
SUTTON & CHEAM: A. Keech, G4BOX, 26 St. Albans Road, Cheam, Sutton, Surrey.
TORBAY: M. Yates, G3UIQ, Top Flat, 23 Waverley Road, Newton Abbot *(3025)*, Devon.
W.A.M.R.A.C.: L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Nr. Hull, Yorks., HU7 5XU.
WHITE ROSE: K. R. Robson, G3VTY, Flat 7, 34 Saint James Drive, Horsforth, Leeds.
WOLVERHAMPTON: D. T. Pugh, G8BSR, Brigands, 38 Applebrook, Shifnal, Salop.
WORTHING: S. G. Williams, G3LQI, 58 Grinstead Lane, Lancing *(4017)*, Sussex.

The University College of North Wales A.R.S., Bangor, fielded a strong team for VHF/NFD and here we see, left to right, SWL Jones, G3ZLL, G4BRT, GW4BGD, G8DRE, G8GSS and G8JHV. For the occasion they joined forces with the South Manchester Radio Club, to put on four stations.

NEW QTH's

This space is for the publication of the addresses of holders of new callsigns, or changes of address, in EI, G, GC, GD, GI, GM and GW of stations not already listed. All addresses published here will appear in the U.K. section of the American "CALL BOOK" in preparation. Please write clearly and address on a separate slip to QTH Section. Be sure to give correct County designation and post-code. In the case of direct subscribers needing Change of Address, please state for card index adjustment. Address items for this space to: "New QTH Page," ***SHORT WAVE MAGAZINE, BUCKINGHAM, MK18 1RQ.***

EI7CW, Mrs. C. F. Dixon (*XYL EI9AB*), 12 Bellevue Road, Glenageary, Dublin (*854391*), Eire.

G3KDQ, J. C. A. Brock, 40 Oakwood Drive, Ravenshead, Nottingham (*re-issue*).

G4EHK, D. J. Goulbourne, 8 Hill Close, Shevington Vale, Appley Bridge, Nr. Wigan, WN6 9JH, Greater Manchester.

G4EJF, H. H. Berry, 37 York Road, Bowdon, Altrincham, Cheshire, WA14 3EF. (*Tel. 061-928 0218.*)

G4EKG, M. V. Tittensor (*ex-G8IZO*), 16 Durcott Road, Evesham, Worcs., WR11 6EQ.

G4EME, D. S. Hall, 2 Linacre Road, Eccleshall (*850659*), Stafford, ST21 6DZ.

GI4EMS, D. Steele, 59 Donaghadee Road, Millisle (*418*), Newtonards, Northern Ireland.

G4ENE, D. P. Stenning, 3 Vampire Road, Manby, Nr. Louth, Lincs., LN11 8TX.

G4ENG, D. R. Horton, 53 Calstock Road, Furlongs, Willenhall, West Midlands.

GW4ENT, The Gwent Contest Group, c/o S. R. Cole, GW4BLE, 25 Fernlea, Risca, Newport, Gwent, NP1 6FW.

G4EOG, A. V. Heritage, 25 Manor Road, Lydd, Romney Marsh, Kent, TN29 9HR.

G4EOK, RNARS London Group, *H.M.S. Belfast*, Symons Wharf, Vine Lane, London, SE1.

G4EOL, M. J. Coan, 117 Ranworth Road, Norwich, Norfolk, NR5 8DY.

G4EQD, N. W. Smith (*ex-G8IYI*) 87 Lancester Road, Ashby, Scunthorpe, South Humberside, DN16 3JH.

G4EQI, L. W. Craven, Grass Moor, Radford Road, Alvechurch, Birmingham, B48 7DT. (*Tel. 021-455 1347.*)

GM4EQY, J. N. Hately (*ex-GM8HDB*), 10 Crags Road, Paisley, Renfrewshire.

G4ERD, A. D. G. Hamilton, 50 Woodbrook Road, Loughborough (*212583*), Leics., LE11 3QD.

G4ERY, D. J. Tyson, 136A Breckhill Road, Mapperley, Nottingham, NG3 5JP.

G4ESF, J. W. Munn, Bleak House, Devoran, Truro, Cornwall, TR3 6NG.

G4ESZ, A. V. George, 6 Stanley Road, Redland, Bristol 6, Avon, BS6 6NW.

G8KMF, A. Keech, 2 Mountfield Road, Irthlingborough, Northants.

G8KNR, L. W. Kenyon, Houlkers, Great Bardfield, Braintree, Essex.

G8KTP, J. C. Pearson, 31 Lindisfarne Road, Jesmond, Newcastle-on-Tyne, Tyne & Wear, NE2 2HE.

G8KUU, G. W. Sutton, 51 Belfield Road, Etwall (*2561*), Derby, DE6 6JL.

G8KWR, R. P. Killick (*DCØGK*), 58 Sevenfields, Highworth, Wilts., SN6 7NG. (*Tel. 0793 763614.*)

GW8KXT, T. Clark, 1 The Wades, Fairwater, Cwmbran, Gwent, NP4 4DJ.

G8KZY, A. J. Denison, 9 Blue Hill Crescent, Leeds 12 (*634898*), West Yorkshire, LS12 4PA.

G8LCB, S. C. Bateman, 913 Filton Avenue, Filton, Bristol, BS12 7AU. (*Tel. 0272 697962.*)

G8LCY, N. G. Roulstone, 54 Baroon, Castle Donnington, Derby, DE7 2PF.

G8LDR, D. Turner, B.Sc., 456 Whippendell Road, Watford (*22953*), Herts., WD1 7PT.

CHANGES OF ADDRESS

G3BMM, J. W. Lymer, 101 Arundel Drive, Bramcote, Beeston, Nottingham.

G3BNI, D. L. K. Coppendale, 26 Church Park, Bradenstoke, Chippenham, Wilts., SN15 4ER.

G3FYV, H. G. Gosling, 81 Alan Moss Road, Loughborough, Leics., LE11 0LS.

G3HCM, D. Dumbleton, Hillcrest, 70 St. Martins Road, Finham, Coventry, West Midlands, CV3 6EU.

GI3HHN, R. J. Armstrong, 95 Craighill, Muckamore, Co. Antrim, BT41 1PT.

G3ICH, P. N. Pitt, Broadfield, Simonsburrow, Hemyock, Cullompton, Devon, EX15 3XA.

GD3KGC, R. J. B. Morgan (*ex-G3KGC*), Plot 19, Howe Road, Onchan, Isle of Man.

G3OZU, A. A. Brind, 82A Lion Road, Bexleyheath, Kent, DA6 8PQ.

G3PQD, D. E. A. St. John, 3 Granary Close, Rainham, Gillingham, Kent.

G3RSJ, R. H. Williams, 2 Taylors Turn, Downley, High Wycombe, Bucks., HP13 5TY.

G3TML, T. H. Lloyd, B.Sc. (*ex-9L1TL*), 45 Princes Street, Pear Tree, Derby, DE3 8NR. (*Tel. 0332 366078.*)

GM3TBV, W. H. Vann, Birchwood, Emma Terrace, Blaigowrie, Perthshire, PH10 6JA.

G3TWG, P. J. Patrick, Bedford Lodge, Camden Place, Bourne End, Bucks.

G3VOF, M. G. Foster, 17 Prospect Road, Hornchurch, Essex, RM11 3TZ.

GI3XDX, G. McDowell, 15 Redford Road, Cullybackey, Ballymena, Co. Antrim, BT43 5PR.

G3XRN, Royal Naval Auxiliary Service Amateur Radio Group, RNXS London Division, *H.M.S. Discovery*, Kings Reach, London.

GM3YTS, R. W. Ferguson, 24 Braemar Avenue, Dunblane, Perthshire, FK15 9EF.

G4BSC, J. R. Wells, 23 Lichfield Drive, Warden Hill, Cheltenham, Glos., GL51 5DQ.

G4BSC/A, J. R. Wells, 96 Newhaven Road, Orford, Warrington, Lancs., WA2 0NS.

G4DKD, E. J. Pascoe, 8 Jaynes Close, Easington, Banbury, Oxon.

G8DPL, J. R. Ayers, 3 Parkside, Woodstock (*811400*), Oxon., OX7 1UR.

G8FEO, S. E. Lowe, 31 Travershes Close, Exmouth (*6091*), Devon.

G8IHH, A. McCall, 1 Farndale Court, The Meadows, Garforth (*5210*), Leeds, West Yorkshire, LS25 2DE.

G8ILW, D. V. E. Couse, 6 Reading Drive, Sale, Cheshire. (*Tel. 061-962 2217.*)

G8JLT, D. Brumbill, 3 Menson Drive, Hatfield, Doncaster, South Yorkshire, DN7 6RA.

G8JQT, C. Rycroft, 9 Orchard Close, Westford, Wellington, Somerset.

G8KNV, P. W. Johnson, The Burlington Hotel, Earls Avenue, Folkestone, Kent.

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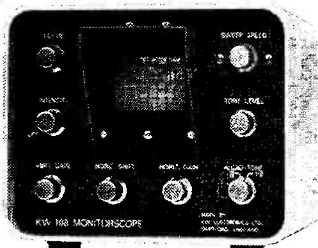

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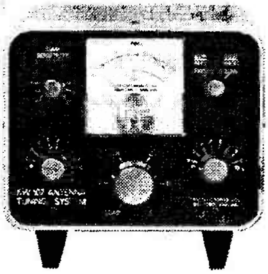

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SPECIFICATION

Sensitivity	10μW typical
Readout Accuracy	100 Hz
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Dimensions	111mm. x 60mm. x 27mm.
Connectors	50 ohm BNC and 5 DIN 270° DIN
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SPECIFICATION

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Sensitivity	100μW typical
Output Voltage	5v. logic
Power Required	11–15v. DC at 100 mA approx.
Dimensions	111mm. x 60mm. x 27mm.
Connectors	50 ohm BNC
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BC321	10p
BCY70	22p
BD131	42p
BF173	20p
BF181	28p
BF194	12p
BF195	12p
BFR79	15p
BFY50	19p
BFY51	19p
TIP29C	70p
TIP30C	75p
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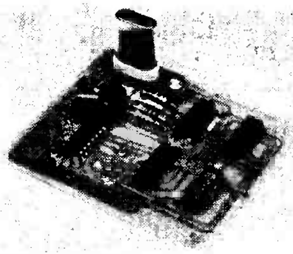

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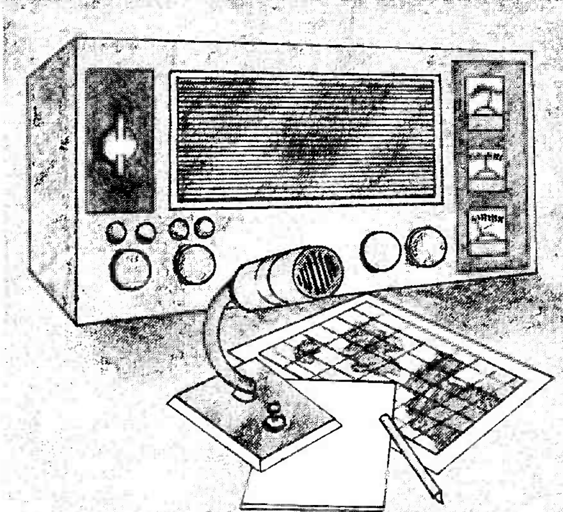

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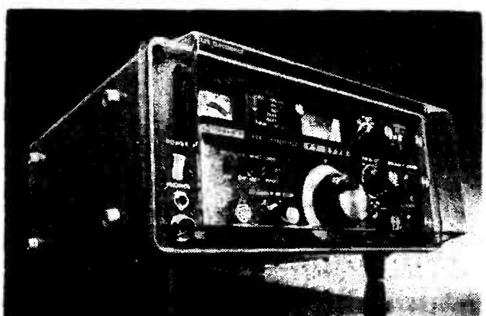

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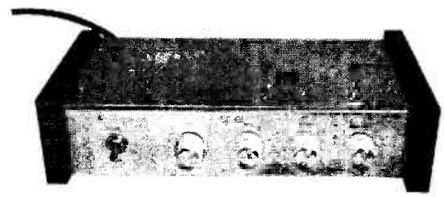

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March Issue: Due to appear February 27. Single copies at 45p post free will be sent by first-class mail for orders received by Wednesday, February 25, as available. — Circulation Dept., Short Wave Magazine, Ltd., 29 High Street, Welwyn, Herts., AL6 9EE.

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READERS

Wanted: SB-400, SB-401 or Drake T-4X/T-4XB. Also looking for SB-300. Condition of units irrelevant.—Coull, Canterbury Road, Elham, Kent, or ring Elham 244, evenings.

Sale: Heathkit HW-7, with preselector, QRP CW transceiver for 15-20-40m., £30. Heathkit GDO with all coils, £11. Both items in mint condition.—Harris, G4BWZ, 16 Shortwood View, Kingswood, Bristol.

Wanted: Sixty-foot crank-up lattice tower and Ham-M rotator.—McCallum, 15 Quarry Road, Law, Glasgow. (Tel: Carluke 70914).

Selling: FT-220 VHF Tx/Rx, reliable, one of the later models, £230 or near offer. Also an Eddystone EC-10 Mk.1 receiver, modified to Mk.II, with FM detector, £35—or free with the FT-220 as one parcel.—Ring Warren, G4BYS, Bath 29017.

Offering: Pre-War HRO, with five coil packs (three bandspread) and PSU.—Oughton, 107 Freiston Road, Boston (65975), Lincs.

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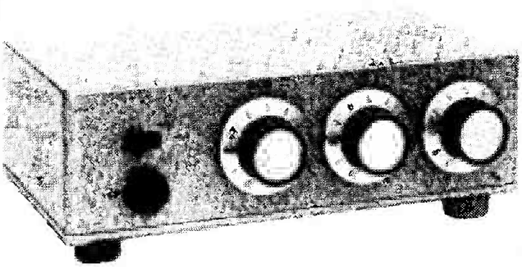

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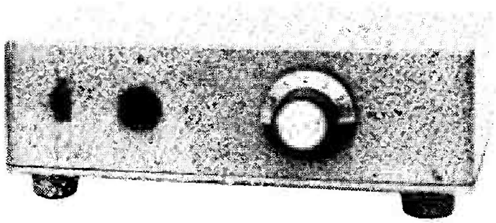

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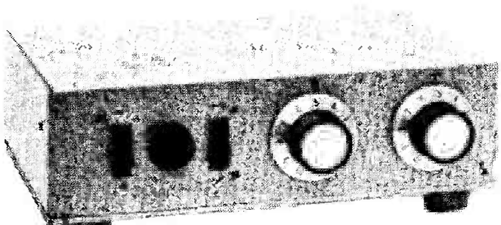

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Selling: Spacemark Keyer ETM-2B (new price £41) at £25. K.W. Q-Multiplier (sells at £16), price £12. K.W. three-way coax antenna switch for £5, sells at £7·50. Complete set G3HSC Morse records, costing £4·95, at £3. All in new condition and with manuals. —Shepherd, G4ECH, Woodfield, Priory Close, Chislehurst, Kent, BR7 5LB, or ring 01-467 2023.

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Selling: Heathkit HW-7 QRP CW Transceiver, £35. —Wild, G3GYU, QTHR, or ring Ramsbottom (Lancs.) 3191.

For sale: FT-2FB two-metre transceiver, 13 months old, xtals for channels 145·00 MHz, S22, R6, with all accessories, manual and in mint condition, price £80 includes delivery by Securicor. — Ring Backham, G8KOC, Kings Lynn 673014.

Selling: National NCX-3 Transceiver with matching PSU/Speaker, £125. Also a 40ft. lattice tower on hinged base, at £60.—Sharratt, G3XKF, QTHR, or ring Eaton Bray (Beds.) 220297.

Sale: "Microwave Modules" 432 MHz Varactor Tripler. ICOM IC-210 two-metre transceiver. ARAC-102 two-metre receiver, fitted with additional 70 cm. "Microwave Modules" converter. All perfect and little used, at half new prices.—Ring Tomkins, 021-357 3488, evenings.

For sale: New and unused parts for "G3ZVC" Tx/Rx, comprising Minikit (1) less filter, Minikit (3), also extras as listed in catalogue, £10.—Box No. 5475, Short Wave Magazine, Ltd., 29 High Street, Welwyn, Herts., AL6 9EE.

Selling: Late model FT-101 Mk.1, fitted with new "G3LLL" RF clipper, fan and SP-101. Price £250. —Stewart, GM4DHJ, 8 Somerled Avenue, Paisley, Scotland.

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Selling: Lafayette HA-600A, in excellent condition, with manual, £25. Also "Practical Wireless" home-built digital frequency counter, £25.—Ring Knowlman, Craddock (08844) 454.

Sell: HW-202 40w. FM amplifier, 13.8v. DC operation, price £35.—Denman, G3MEW, 24 Ascot Road, Copnor, Portsmouth (20315), Hants.

For sale: Liner-2 transceiver, low band, in good condition, £125.—Barwick, G8IZT, QTHR, or ring Ashford (Middlesex) 56935.

RTTY sale: Creed 7ERP teleprinter, £25. Also Creed 6S6 auto-transmitter, £10. Both in excellent order. Delivery or carriage extra, by arrangement—Michaelson, G3RDG, QTHR, 'phone 01-455 8831.

Selling: Heathkit HW-7 three-band CW transceiver, as new, £45 or near offer, or **Exchange** for HF transceiver, or W-H-Y? — Ring Coles, G4EGN/G8JRY, Steeple Aston (Oxon.) 40609 after 6.0 p.m.

Wanted: Partridge lightweight (outdoor) VFA Joystick, in mint or near mint condition. — Blanchard, 7 Bowness Street, Stretford, Nr. Manchester, M32 0EA.

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Wanted: Eddystone 730/4 receiver, unmodified, in good condition and working order. — Ring Doidge, Munderfield 608 (Herefordshire).

For sale: Heathkit Equipment: Audio generator, £20. RF generator, £18. Electronic switch for 'scope, £10. Resistance/Capacity Bridge, £12. Valve voltmeter with RF probe, £20. All in working order, some factory built. Also Geloso VFO, £5. Top Band "Command" receiver, £5. All items "or near offer". — Ring Powell, 093-586 2712 (Yeovil).

Selling: Liner-2 fitted internal preamp., £120. Vibratal 100w. p.e.p. 12-volt solid-state linear amplifier (cost £108, Nov.), bargain at £50. Hamgear valved preselector/amplifier, £5: Codar ditto, ditto, both mains operated. Microwave Modules converter for 28-144 MHz, as new, £10. Triple Tone valved stereo amplifier, 6BW6 output, £10. Eagle FM mono tuner, £7. Parabeam, 14-element, for two metres, £10. Two-metre transmitter, AM/FM, '640A PA, screen-grid modulated, internal mains PSU, £45. Large and heavy 100w. modular, ex-RAF, needs separate PSU, at £7 to be collected. — Rabjohn, G3YBG, Quarries Bungalow, Exeter (74607), Devon.

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9 x 3 x 1	42p	5 x 4 x 2	49p	2 x 6 x 2	45p
10 x 3 x 1	44p	6 x 4 x 2	52p	6 x 6 x 2	60p
2 x 3 x 2	38p	7 x 4 x 2	57p	7 x 6 x 2	64p
3 x 3 x 2	41p	8 x 4 x 2	60p	8 x 6 x 2	67p
4 x 3 x 2	42p	9 x 4 x 2	62p	9 x 6 x 2	72p
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For sale: Eimac 4-1000A valve, with filament transformer and base, £20. PSU to suit, with massive RCA transformer, £19. Spare Eimac valve, £12; 866 rectifiers, 60p; 813, £2.50. Linear panel, for "G2DAF" circuit, with B. & W. tuner, meters, capacitors, etc., £16. Heater choke for GG circuit, B. & W. type, £6. Trio JR-310, in new conditoin, with handbook, £65. **Wanted:** Pair of 572B. Prefer collect or carriage at cost. — Plant, G5CP, QTHR, or ring 024-689 253.

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Wanted: AR-8516L receiver, in excellent condition, details and price, please. **For sale:** HRO coil packs, 50 kHz to 30 MHz; also IF transformers, etc.; send s.a.e. for list. — Box No. 5477, Short Wave Magazine, Ltd., 29 High Street, Welwyn, Herts., AL6 9EE.

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