

The SHORT WAVE Magazine

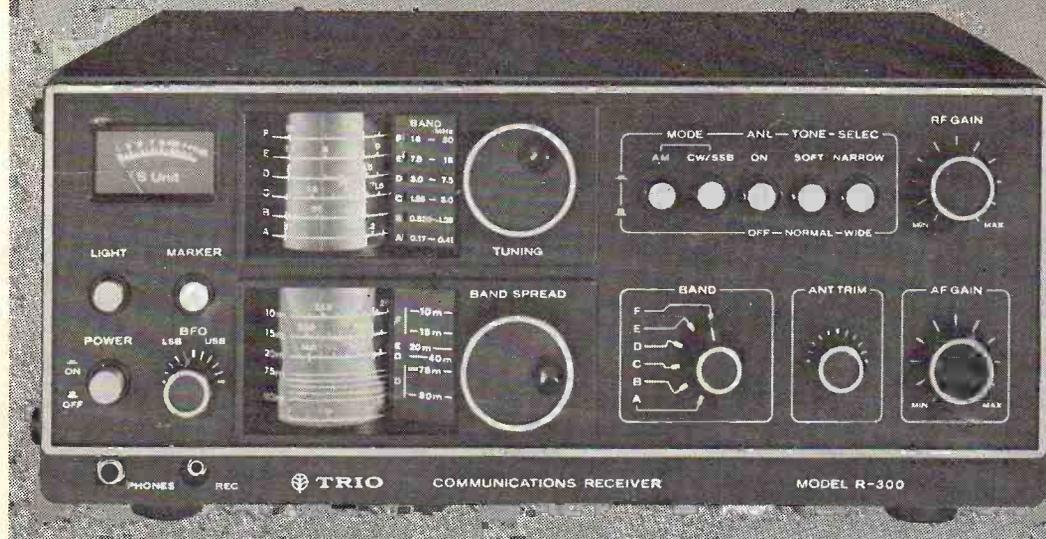
VOL. XXXV

AUGUST 1977

NUMBER 6

TRIO R-300

Eavesdrop on the world



LISTEN TO THE WORLD

Short wave radio is by far the fastest and most convenient type of communications for spreading the news about what is going on in the world. And for this reason TRIO's R300 is the right rig for those who'd like to listen to a live report of the Indianapolis Grand Prix, to Radio Peking or to follow the progress of a Himalayan expedition. The R-300 is the invisible bridge to other countries and continents and the bridge to the home country for many journalists, engineers and technical representatives working abroad. They all want a reliable and sturdy multiband receiver for home use and travel, a receiver working from mains voltage or batteries. And just such a receiver is TRIO's new R-300.

Six Wavebands—LW (710-410 kHz), BC (525-1250 kHz), 4 x SW (160-10m). The four shortwave bands continuously cover the frequency range from 1.25—30 MHz with separate calibration for the commercial (75—11m.) and radio amateur bands (80—10m.) of the large drum-type main tuning and bandsread dials.

Outstanding Input Sensitivity—The dual-gate MOSFET front end assures excellent cross-modulation and spurious characteristics, as well as high input sensitivity. Between 18 and 30 MHz the R-300 operates as a double superhet, giving sensitivity of 1 μ V for AM and 0.5 μ V for SSB. For full details, contact the sole importers of the exciting TRIO range.



NEW. CL22 Antenna Coupler
for the SWL.

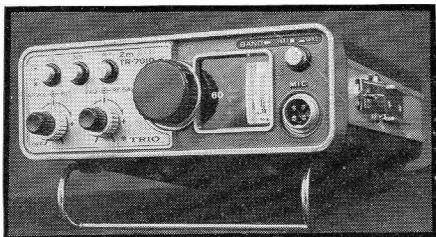
Only £14 inc. VAT and postage

FULL CATALOGUE 50p from

LOWE ELECTRONICS
Cavendish Road,
Matlock,
Derbyshire

LOWE ELECTRONICS LTD

LONDON, LEEDS, BIRMINGHAM, SOUTH WALES, GLASGOW and SUSSEX



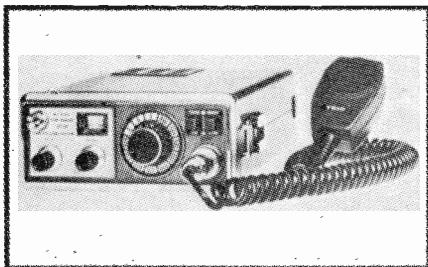
TR7010

PRICE : £175 inc. VAT. Ex stock.

Work real DX with ease on 2 metre SSB and CW. The TR7010 combines a high performance receiver with a 10 Watt transmitter and provides mobile or fixed station capability at low cost. Supplied ready to operate from 144.1-144.34 MHz, the TR 7010 covers all CW, SSB and beacon activity. 48 channels with 5 kHz spacing plus VXO and RIT provide continuous coverage. Operation in any other part of the 2 metre band can be carried out by a simple crystal change and no re alignment is required.

Single conversion using an IF of 10.7 MHz with a first class crystal filter gives outstanding selectivity. Wide range amplified AGC and newly developed FET devices in the RF and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. The single conversion transmitter using fully balanced mixers generates a beautifully clean signal with crisp audio quality.

Join the SSB gang and work real DX for £175. Send for full details now.



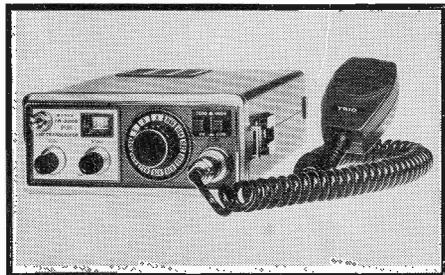
TR2200GX

PRICE : £130 (3 ch.), £160 (12 ch.) inc. VAT. Ex stock.

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W. transmitter output with switched reduction to 400 mW for local contacts. High gain receiver with double IF filtering at 10.7 MHz and 455 kHz for razor sharp selectivity.

The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only £160 inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only £130. With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them.

Also available are a mobile mounting bracket at £9.45, a matching 10 Watt amplifier for £45 and a flexible antenna. Send for full details now.

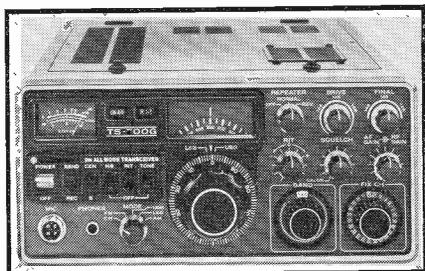


TR3200

PRICE : £171 inc. VAT. Ex stock.

The newest FM handy transceiver from the ever expanding TRIO range. Superb performance for the 70 cm. operator with all the advantages of portability and TRIO reliability. 12 channel capability in the range 432-436 MHz with three channels fitted (SU8, I8, 20). Transmitter output switched 2W/400 mW and incorporating the exclusive TRIO 1750 Hz tuning fork access tone generator (does that mean you can ring for credit?) High gain 5/8 wave antenna for enhanced performance on transmit and receive. Supplied complete with all accessories as for the TR2200 GX and including the all important battery charger.

We have just received the first shipment of the VB 3200 10W amplifier for the TR3200. Rather more complex than the VB 2200, the VB3200 also includes a switchable receive preamplifier. Price £95 inv. VAT. Send for details now.



TS700G

PRICE : £392 inc. VAT (also including the matching VOX-3). Ex stock.

Say what you will, the TS700G set the standard for all other 2 metre all mode transceivers. A very high standard which has yet to be surpassed. Full 2 metre coverage, VFO or 22 crystal channels, all mode operation AM, FM, USB, LSB and CW. Mains or battery supply. Normal and reverse repeater facilities at the turn of a switch. Trio exclusive tuning fork access tone generator with fully auto tone burst. Best quality signal on the band thanks to TRIO design excellence in low intermod amplifiers. It's simply the best rig that you can buy, and it's backed by the combined reputations of TRIO and Lowe Electronics.

15 Watts output; 0.25 microvolt sensitivity; first class strong signal handling receiver; European standard selectivity. If you haven't yet handled the TS700G, rush to one of our branches and be prepared to be impressed. Send for full details now.

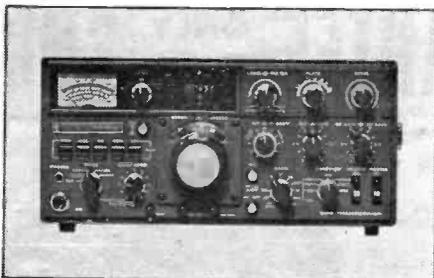
SECONDHAND EQUIPMENT

We always carry a wide range of fully guaranteed trade in equipment. Since we make it a policy not to deal in miscellaneous scrap, we can offer an extended warranty on many of the used items and you can be certain that it will be right up to the mark. A small selection from our current stock. All prices include VAT but not carriage. TR2000G with battery pack, etc., £100; TR7010, £140; T599, £165; FL400, £175; HQ170A, £135; QR666, £115; Liner 2, £100; TS520, £350; TR700G, £135; SB303 all filters, £165; Uniden 2020, £405; TS700, £295; Line 430, £195; TV502, £110; Venus SS2, £195; 9R59DS, £55; JR500S, £60; LA106, £150; Hallcrafters FPM300 (new) £265.

Since the second-hand equipment turns around at a fast rate, please ring us before driving 100 miles to collect a rig that was sold the previous day. If you are looking for something special in the second-hand line, our Maid Marion at Matlock will be happy to put your name into our "wanted" file for two months and will inform you if we find just the rig you wanted.

LOWE ELECTRONICS LTD

LONDON, LEEDS, BIRMINGHAM, SOUTH WALES, GLASGOW and SUSSEX



TS820

PRICE : £625 inc. VAT. (DGI £126). Ex stock.

The ultimate transceiver . . . TRIO's TS-820. No matter what you own now, a move to the TS-820 is your best move. It offers a degree of quality and dependability second to none, and as the owner of this superb unit, you will have at your fingertips the combination of controls and features that, even under the toughest operating conditions, make the TS-820 the leader that it is.

Unprecedented demand plus the painstaking care TRIO lavishes on each TS-820 has created a back-log of orders, but rest assured, it's well worth waiting for. Once you have operated the TS-820 you will not be satisfied with anything else.



TS520

PRICE : £432 inc. VAT. (£405 without dc inverter). Ex stock.

As a TS-520 owner, you go on the air with a sense of pride and confidence. Thousands of these precision-built beauties are in operation all over the world . . . in ham shacks, field day sites, in DX and contest stations and in countless mobile installations. No other rig has ever offered the performance, dependability, versatility and value that is built into every TRIO TS-520.

The TS520 covers 80-10 metres and combines a first class receiver with a 200W. PEP transmitter. A full range of matching accessories is available including a 2 metre transverter.

You have certainly heard the TS-520s clean signal on the air and have probably heard a lot of glowing praise by other hams. So if you don't already own a 520, maybe it's time you did.

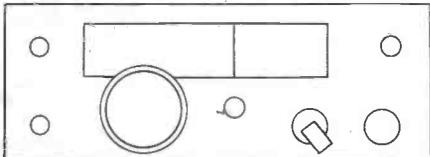
Send for full details right now.



TR8300

PRICE : £230 inc. VAT

New from TRIO, the TR8300 offers the discerning 70 cm. operator the best possible FM rig for his ever expanding activity band. Incorporating the rugged reliability that makes the TR7200G the 2 metre favourite, the TR8300 is a welcome addition to the TRIO range. Over 10 watts output and a sensitive receiver, fitted with 8 channels with facilities for a total of 22, automatic tone burst and all matching accessories, the TR8300 represents an opportunity to obtain the highest quality equipment at a realistic price. It is backed of course by the combined reputations of TRIO and Lowe Electronics and is available this month. See it soon.



TR???

PRICE : £225 inc. VAT

Another addition to the TRIO range will soon be available. NB. said addition, not replacement. Next month folks.

Many more good things are on the way from TRIO—and from all the other manufacturers whose products we stock. Remember that we carry the widest ranges of equipment and accessories available today and although it is clearly impossible to list them all in the limited advertising space, you only have to send 48p in stamps to receive catalogues, price lists and the famous antenna book.

If you wish to spread the purchase load, we offer short term (easy) credit as well as long term (ouch) facilities. Details in our price list.

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

Communications House, Wallington Square, Wallington, Surrey. Tel. 01-669 6700

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27 Cookridge Street, Leeds. Tel. 0532 452657

AGENTS

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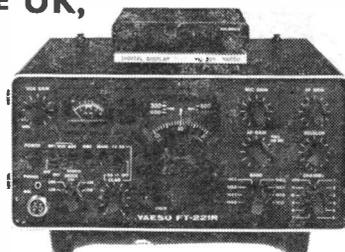
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The FT221R complete 2m. station ex-stock

The FT221R. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m. transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v. (3A) operation, excellent selectivity SSB 2-4 kHz (1-7 : S.F.) or FM 12 kHz. Front panel adjustable VOX and mic gain, a calibrator (1 MHz \pm 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blander, serviceable plug in boards all contained in 11 1/2" (14") x 5" x 11 1/2", 22 lb. rigid package. 600 kHz and possible 1-6 MHz shifts over 4 MHz.



FT221R

Now the YC221 digital readout unit for about £75



THE FRG7, GENERAL COVERAGE RECEIVER Ex-Stock UNPARALLELED IN ITS CLASS AND ONLY £145 (VAT 12 1/2%)

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley triple mix drift cancelling loop for continuous, spin tuned, inclusive coverage of 0.5 to 30 MHz with calibration accuracy better than 5 kHz. Frequency selection is accomplished by setting the RF (pre-selector and range switch), dialling up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0.5uV for 10dB, S + NN (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with AM, SSB and CW modes catered for, A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

The FT101E complete HF station — ex stock.

The FT-101E a complete mains or 12v. DC station contained in a compact 30 lb. package, 260W. P.I.P. of SSB (with in-built R.F. speech processor) 180V., CW and 80V. of AM 10 to 160m. (incl. 10 MHz RX). The sensitive and selective (permeability tuned RF stages and 8 pole crystal filter) receiver offers : threshold adjustable noise blander, switchable 25 and 100 kHz calibrator, \pm 5k clarifier (with separate on/off switch), etc., etc.

The VFO is stable and linear (readout to 1 kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for : tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed is of a high order. Linear and transverter provisions are made with sockets for : relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.

New service manual for the '101 series in stock £12.00

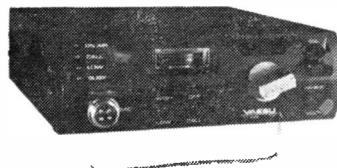


FT101E

FT223 THE 2M-FM TRANSCEIVER

£139.50, 3 crystal pairs ; £152.50, 8 crystal pairs (+ VAT 12 1/2%)

The FT223 is an FM transceiver operating on 23 crystal controlled channels (or by external VFO) across 144 to 148 MHz. For mobile use it is safe, illuminated; meter (Rx "S" and TX out) and main dial (when crystal up), LED's indicate : squelch open, high 10w. or low 1w operation, or air, or if the special frequency is selected. Housed in heavy metal case and supplied complete with mounting bracket cables, connectors, microphone, etc., it is equally at home as a compact (7" x 2 1/2" (3") x 8 1/2" (10")) base station with a 12v. PSU, (0.45A RX, 1.2A LTX, 2.3A HTX). The dual conversion receiver is sensitive (mosfet RF and mixer), and selective, (12 kHz at 6 dB) delivering 2w. to the internal 3" or an external 4 Ω speaker. A switchable repeater access tone burst and a tone squelch option (sub audible selective calling tone T/RX) are all features of this new high quality, low price, transceiver.



Crystal Filters and Crystals only £3.75 a pair !! (£2 singles) (p. p. 20p VAT 12 1/2%)

YAESU

FT2F, FT2FB, FT2 AUTO, FT224, FT223 (6, 12, 18 MHz Tx, 14, 44, 52 MHz Rx).

SIMPLEX S (0, 12, 16, 19, 20-24).

DUPLEX R (0-9) and IR (0-9) T & R.

FT200B, FT301(S), FT221(R), FT101(£X), FT75(B), FR101(S) all £2.20 each.

OTHERS

TR2200(GX), C146A, C826MB, M52, MR2 (12 MHz Tx and inc. 44 MHz Rx).

SIMPLEX S (0, 20-24)

DUPLEX R(3-7) at least. A large selection of inverse receive crystals.

CONVERTER CRYSTALS £2-20 38-666(2m.), 42(4m.), 50-5 (70cm.).

YF30F350	350Hz	F*101	CW 6pl	£18-00
YF30H350	350Hz	F*101	CW 8pl	£20-75
YF30F600	600Hz	F*101	CW 6pl	£18-00
YF30H12	12kHz	F*101	FM, 8pl	£20-75
YF90H600	600Hz	9MHz	CW 8pl	£16-00
YF90F-4	2-4kHz	9MHz	SSB 6pl	£16-00
YF90H12	12kHz	9MHz	FM 8pl	£18-00
YF107H600	600Hz	10-7MHz	CW 8pl	£16-00
YF107H2-4	2-4kHz	10-7MHz	SSB 8pl	£16-00
YF107H12	12kHz	10-7MHz	FM 8pl	£18-00

Carrier crystals (9 or 10-7MHz) HC18/U ea. £2



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G13WVWY	Tandragee	(0763)	840656 Mervyn Anderson

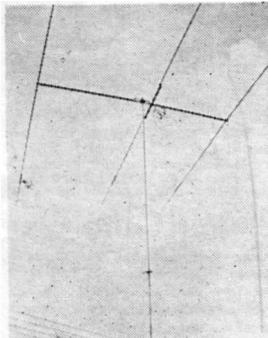
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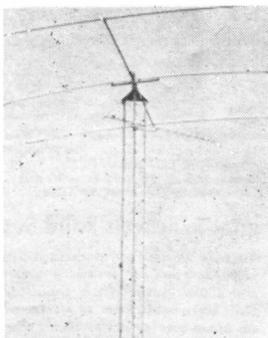
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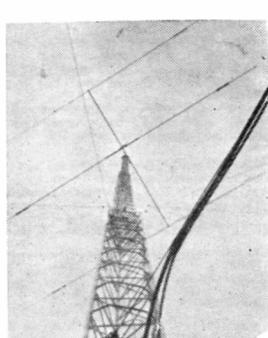
10' telescopic heavily galvanised steel mast supplied with guy rings etc. or c/w full rigging kit. Carriage £2-£7 ex stock VAT 8% 30' £25-00 or £43-85 c/w rigging 40' £32-50 or £56-85 c/w rigging 50' £42-00 or £74-50 c/w rigging

HAMTOWER with TH3 Jnr. SELF SUPPORTING



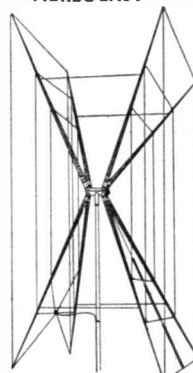
Galvanised lattice 10' sections. Free standing with climbing steps. Carriage £3-£20 ex stock 8% VAT 30' c/w base grillage £192-35 40' c/w base grillage. ... P.O.A

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Carriage and rigging (RX) extra 42' ... £121-00 (RK £28) 57' ... £174-00 (RK £28) 79' ... £224-50 (RK £49) 101' ... £303-50 (RK £76)

GEM QUAD FIBREGLASS



10-20m., 2, 3, or 4 ele. F/B ratio 25dB low radiation angle. Tri-dectic fibre glass preaders withstanding 100m.p.h. winds yet weighing only 21 lbs.

ALIMASTS

ALIMAST LIGHTWEIGHT

1-5, 2 or 3m; Quick Lock Sections 13 versions. 6 to 21m. from stock. Rigging extra. Carriage £2-£4. VAT 8% 7 x 2m £38-75 6 x 3m £42-50 4 x 3m £28-50 7 x 3m £55-75

TELESCOPIC TILTING

Telescopic (20' sections) with full tilting facility allowing for easy antenna maintenance and alterations. The relatively low unit weight and superior design of ground post allows easy and cheap installation often without resorting to concrete. Large scale efficient product on offers you a wide range of towers at minimum cost (+ VAT, EX WORKS) e.g.: Standard P40 ... £212-00 Heavy Duty P40 ... £286-00 Standard P60 ... £252-00 Heavy duty P60 ... £333-00

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ALL YOU NEED

Terylene, galv. or stainless steel ropes, shackles nylon or steel thimbles, steel or aluminium sleeves bracket, cable ties, turn buckles, earth stakes, etc., etc.

Coax Slide Switches

Up to : 1kW, 1-5 GHz, 0-3dB loss, 1:2 : 1 VSWR, 50dB isolation, 50 ohm "N" or "PL" fittings. Ex-Stock P. & P. 30p (VAT + 8%)

TWS120	1 in 2 out nickel SO239	... £5-40
TWS150	1 in 5 out nickel SO239	... £11-50
TWS220	2 in 4 out nickel SO239	... £11-50



Coax Relays

12v. DC 50 ohm Silver plated. 4 weeks. P. and P. 30p (VAT + 8%)

Power crossstalk (at 500 MHz)	
CX120	50W 35dB Cable entry £9-50
CX230	300W 40dB BNC sockets £17-90
CX600N	600W 40dB N sockets £21-50

G WHIP

HF MOBILE (Carriage 90p) VAT 12½%

Tribander 10-20m. (+LF)	£16-10	LF40, 80 or 160 ...	£4-87
Multimobile 10/20+MM	£19-00	MM40, 80 or 160 ...	£4-87
Flexiwhip 10m. (+FF)	£12-42	FF15, 20, 40, 80 or 160 ...	£5-04
Basemount ½" hole mount	£2-65	Telescopic whip for coils	£1-85

TAVASU HF MOBILE

(Carriage 90p) VAT 12½%

Whip Chrome 2 sect. 60"	£3-88	Base heavy duty ...	£5-18
Base section chrome 16"	£1-94	Complete monobander ...	£14-95
Resonators 160-15m.	£3-88	Complete 5 bander ...	£25-92
Adaptor 24 to 20 thread...	55p		

GEM QUAD FIBREGLASS

(Carriage £2-69) VAT 12½%

GQ2E 2 element	... £119-00	GQ4E 4 element	... £238-00
GQ3E 3 element	... £178-00	CKIQ 1 ele. Conv. kit	... £66-00

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(Carriage Extra) VAT 8%

14SWG hard drawn Cu....	yd. 11p	7/-036 cad cu standard	... yd. 14p
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CABLES RF FEEDERS

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UR67 50 ohm Heavy	... yd. 36p	UR39 75 ohm Medium	... yd. 24p
UR57 75 ohm Heavy	... yd. 42p	T3278 ohm Distribution	... yd. 20p
75 ohm Flat twin	... yd. 10p	UR43 50 ohm Solid Cent.	... yd. 16p
300 ohm Ribbon	... yd. 12p	UR76 50 ohm Strand Cent.	... yd. 16p

HY GAIN HF RANGE

(Carr. extra) VAT 12½%

BN86 1:1 ferrite Balun	£12-00	TH2MKIII 10-20m, 2 ele...	£94-00
103BA 10m. 3 element	... £43-50	TH3JNR 10-20m, 3 ele...	£96-00
153BA 15m. 3 element	... £34-50	TH3MKIII 10-20m, 3 ele...	£137-00
203BA 20m. 4 element	... £103-40	TH6DXX 10-20m, 6 ele...	£164-50
402BA 40m. 2 element	... £146-00	HY QUAD 10-20m, 2 ele...	£151-80
18V 10-80 Load Vert.	... £24-50	DB1015A 10-15m, 3 ele...	£99-00
12AVQ 10-20, Trap Vert.	£33-50	18AVT/WB 10-80m, Vert.	£64-50
14AVQ 10-40m, Trap Vert.	£47-50	HY TOWER Vert.	£162-80

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S500W P.I.P. 14 SWG	... £19-60	P500W P.I.P. Cu/Terylene	
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MOSLEY TRI-BAND BEAMS

(Carriage £2-50) VAT 12½%

TA33 3 ele. 200W R.M.S.	£85-00	TA32 2 ele. 300W A.M.	... £58-00
MUSTANG 3 ele.	£108-00	MUSTANG 2 ele. 1kW	... £87-00

ROPES

(Carriage Extra) VAT 8%

3mm. HT steel	... yd. 15p	X150 Rustproof 150m.	... £10-85
5mm. HT steel	... yd. 22p	7 x 18g. Galvanised 100'	... £2-90

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(Post Extra) VAT 12½%

2½ Polyprop ribbed	... 16p	SMCPI 8" carbon polyprop	95p
NTI 4½" polyprop ribbed	45p	3" porcelain ribbed	35p

A major fire gutted two of our storage sheds at Totton during the night of July 19th and severely damaged some of our stocks of aerials, masts and fittings; we have already ordered new supplies which should arrive shortly. But in the meantime we are endeavouring to maintain our normal service by calling goods back from our other branches. Please bear with us.

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South Midlands

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S M C The name founded on Service



DIGITAL II from KYOKUTO SCANNER AND CRYSTAL T.B. OPTIONS

The Digital II offers complete 5 kHz step coverage across 2 metres and now with the Scanner 33, 25 kHz channels from 145 MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a selected channel for 7 seconds, then unless locked moves on. The bright digital readout comes from 6 seven segment LEDs.

Selectable 10 or 1 watt output for simplex or duplex (up and down shifts), across 144-146 (rx to 149 MHz) from a tiny 6 1/2" x 2" x 7 1/2". Easily undershad mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

For strong handling, and low noise the R.F. mixer, first IF (16.9 MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole ± 8 kHz at -60dB ± 15 kHz at -70 dB Ceramic filter. LED lamps indicate if the P.L.L. is unlocked or the squelch open. The V.C.O. is directly modulated (for exceedingly linear deviation) Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket.



DIGITAL II £235; CRYSTAL T.B. £10.00; SCANNER £49.50
All prices exclude VAT at 12 1/2%

The New Revolutionary ASTRO 200. Full Digital Synthesis Solid State 200W H.F. Transceiver



To pack an entirely modular construction, 10-80m., digital readout transceiver in a box 2-8" x 12-3" is remarkable enough, but with a 0.2V sensitivity and 100W. output from transistors with the boost of -stability better than 20Hz hour, from an electronically tuned (biased Toggle switches with no other moving parts) 100Hz step digital synthesiser, good Rx front end filtering, Tx TXI proofing, unwanted sideband at -60dB, carrier at -50dB-RIT clarifier (+50Hz), inbuilt SWR bridge, semi break in CW with side tones, etc., etc. is almost unbelievable.

An all Solid State Mobile Kilowatt !!

The MA1000 produces up to 600W. output, with 10dB gain, across a 2 to 30 MHz from 4 hybridised push pull stripline linear transistor pairs. No tuning is required but 5, 5 section tchbycheff L.P.F. may be manually or remotely switched in. The unit uses devices rated to withstand infinite VSWR, a large heatsink, a high speed magnetic circuit breaker, best quality components, reverse polarity protection and a thermostatic "switch through" control.



Boom Microphone "Headset"

600 ohms magnetic lightweight boom mic. Ideal for mobile or contests, etc. (Post free but VAT + 12 1/2%)



- MD35 complete £14.75
- Microphone only £9.75
- Footswitch only £5.95

Microwave Modules Transverters

From Ten, Six or Two Metres (a '101, etc., a '620B or a '221R). 10W output, balanced Tx mixers, low spurious content, high sensitivity with dynamic range. Full converter range stocked S.A.E. details (VAT + 12 1/2%).



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- MMT432/28 or 50 70 centimetres £97.00
- MMT432/144 Double conversion £133.00

Solid State Mobile Linears (UHF and VHF) from KLM and Ampere



2 metre, SSB/CW/FM, RF sensing with manual override, "microstripline" 12v. D.C. 10W drive. 2" x 6.5" x 10" (11") (Over 15 different models—S.A.E. details) (VAT 12 1/2%).

PA10/160/BL 145 MHz 160W. out. £160.00



2 or 70. Superb RF sensing and DC bias arrangements for all modes. C/w mounting bracket 12v. DC 10W. drive 2.5" x 5.2" x 7.5" (8.5") (+ VAT at 12 1/2%).

- APB82A 145 MHz 80W out. ... £99.00
- APB87A 432 MHz 45W out. ... £99.00
- APB87A 432 MHz 80W out. ... £214.00

VHF HANDHELD

KEN KP202 TRANSCEIVER (+ VAT)

144 MHz, FM, 2W of RF and 1/2W of audio. Immunity to image and IF breakthrough and performance to rival all walkie-talkies and many a mobile set.

C/w F plug, leather handle/whip case and telescopic whip.

Fitted 6 channels S20 & S21 + choice of

S (21, 23, 24, 0) R (3, 4, 5, 6, 7) ... £109.50

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F to UHF adaptor £1.65 N Cads £8.50

Base charger KCP2 £11.75

(ALL + VAT)

VHF Monitor Receiver

SEIWA MR2 AND MS2 (+ VAT prices)

Ideal for the SWL, the YL or even the XYL as the monitor receiver to keep you in touch. Tiny (2 1/2" x 1 1/2" x 4 1/2") and light (8 ozs.) slip into your pocket or onto your belt with the optional case. Sensitive double conversion superhet with 12 kHz band width, auto squelch, and generous audio output c/w Nicads, Mains Charger, Earpiece, Antenna.

MR2(4) 70 MHz 12 switched channels £53.00

MR5 144 MHz 12 switched channels £53.00

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Leather Case £1.90 Crystals each £2.00



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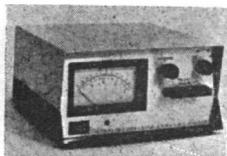
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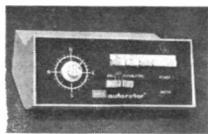
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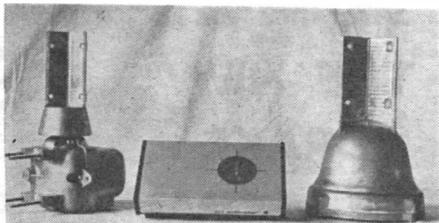
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CD44/HAND II



CDE AR33



AR20/30

AR30/40

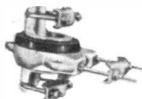
AR22/40/33

ROTATORS

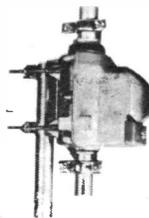
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2010/220 and Cont. Box STOLLE

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 5C ohms, 10 & 100W. F.S.D. SO239 connectors.

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Twin meter (100uA) Up to 160 MHz. Calibrated to 3:1 SWR SO239 connectors.

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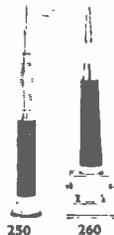
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 Audio to audio, via 10-7 MHz, mains powered, illuminated meter, FT-101 FT2 plugs suitable all phone modes superb on FM

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¼A, effective DC short snap mount matching transformer shock spring, tapered whip, c/w 12ft. cable and PL259 plug.	
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High gain, gutter mount. Tapered coil and whip, 90° spring fold over joint.	
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12v. DC from 240v. AC 3 amps.
 (5A peak) 3½ lbs. 3" x 4" x 6".
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With 500Hz Crystal Filter included

While operating CW you may receive with either the 2.1 KHz or the 500Hz Crystal Filter—They are front panel selectable!

The Drake TR-4CW is a product of years of transceiver experience and design improvements. The resulting performance makes it one of the finest transceivers available. Its operating handiness is not only evident in circuit design, but also in packaging. Compact and lightweight, it is ideal for mobile use, portable excursions, and vacations. USB, LSB, CW or AM operation is at your finger tips with 300 watts P.E.P. of communications power.

INCLUDED FEATURES :

- 300 Watts PEP input on SSB, 260 watts input on CW.
- Complete Amateur Band Coverage; 80 through 15 metre bands complete and 28.5-29.1 MHz of 10 metres. Rest of 10 metre band obtained with accessory crystals.
- Separate Sideband Filters; separate USB and LSB filters eliminate oscillator shifting and insure long term carrier vs filter alignment.
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- Heavy Irridated Cadmium Plated Chassis.
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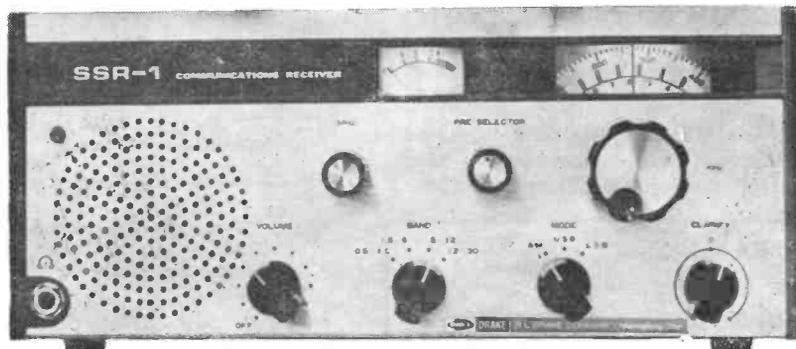
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The new Drake directional, through line, wattmeters represent a significant advance in wattmeter design. The use of printed circuits, toroids, and state of the art techniques permits versatile performance and higher accuracy than units selling for more than twice the price.

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—well, not quite, as both are a little out of our line — HOWEVER . . . If you don't like cornflakes, how about a

FREE FT101E?

(That's right—THE original and genuine YAESU MUSEN, world-renowned all-band HF transceiver to full specification).

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- ★ PEAK ENVELOPE POWER ON SSB
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- PRICE £48.60 (WITHOUT FT101E !)

BUT, you may say :
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Us : "Fork out £399 plus VAT (£448.87) for a PM2000 (see below left) and we'll send you that and a brand new, fully guaranteed FT101E as well!"

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AT £448.87 inc. VAT (£399 exc) Limited period
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 - ★ Earths antennas not in use.
 - ★ Fitted YAESU style knob.
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. . . AND HERE'S ANOTHER OFFER YOU CANNOT MISS . . .

THE FDK MULTI-2000

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

- * Full cover 144-6 MHz.
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Electronics (UK) Ltd

We have to agree

. our competitors are right!

That is why the **Westower** is in
Worldwide Use!

Let us explain! According to one of our customers, a competitor claimed that the Westower did not equal their particular tower. We had to agree . . . they're dead right! We never had any intention of merely "equaling it"! Our design was evolved to give you a stronger tower as shown in our specification. Fortunately the "scare-mongers" tactics of our worried competitors have been spotted by our discerning customers.

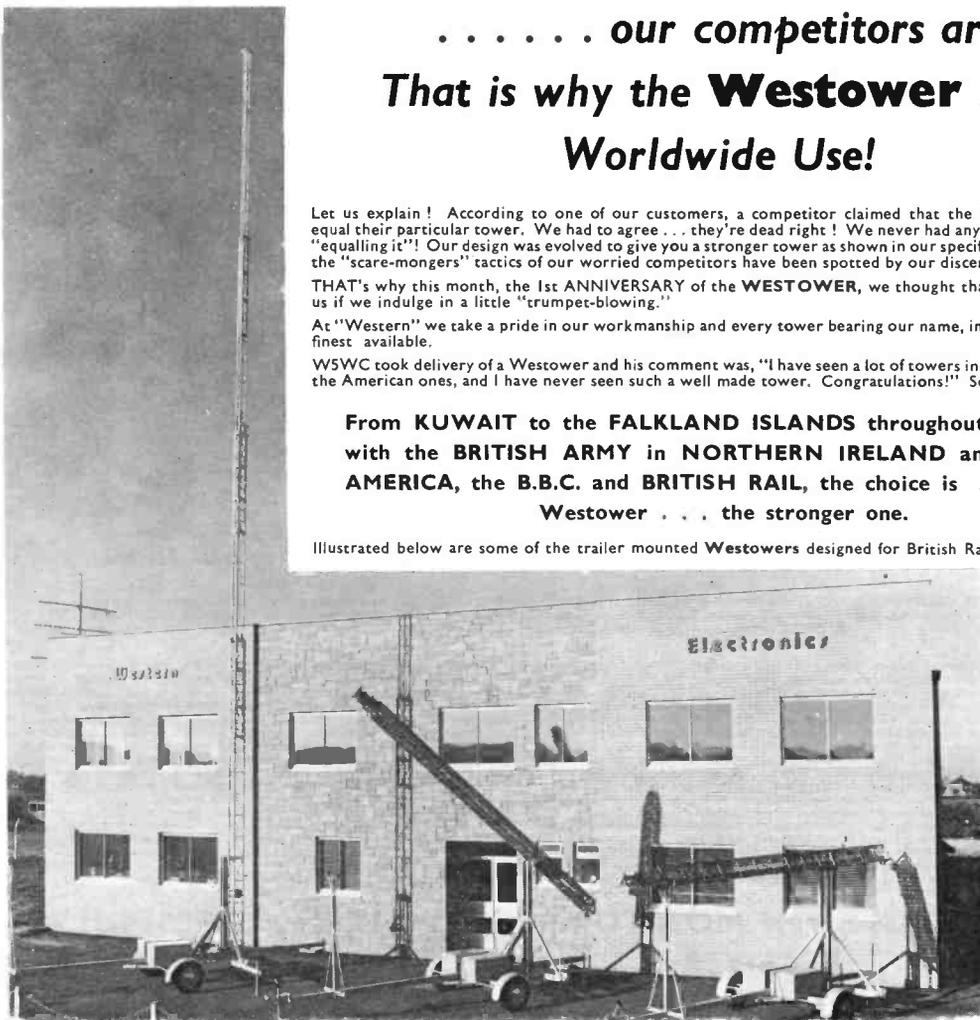
THAT's why this month, the 1st ANNIVERSARY of the WESTOWER, we thought that you would forgive us if we indulge in a little "trumpet-blowing."

At "Western" we take a pride in our workmanship and every tower bearing our name, including yours, is the finest available.

WSWC took delivery of a Westower and his comment was, "I have seen a lot of towers in my life, including all the American ones, and I have never seen such a well made tower. Congratulations!" So that's why . . .

From KUWAIT to the FALKLAND ISLANDS throughout EUROPE,
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AMERICA, the B.B.C. and BRITISH RAIL, the choice is . . .
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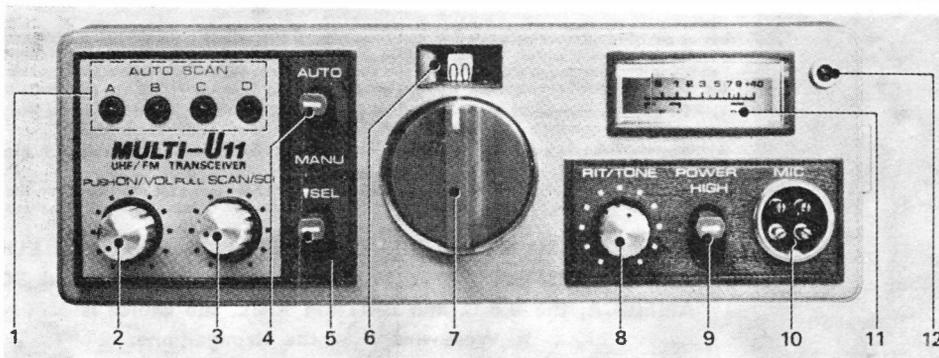
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70cms MULTI-UII

HEAD & SHOULDERS ABOVE ALL OTHERS
IN STOCK NOW



LATEST VERSION! FOR UK MARKET NOW WITH 1750HZ T/B—ENGLISH HANDBOOK—9 CHANNELS FITTED—
£249 inc. VAT.

KEY TO CONTROLS: 1. Auto-scan channel indicator. 2. On-off/Volume control. 3. Scan-squelch switch. 4. Auto/Manual switch. 5. Manual scan switch. 6. Fixed channel indicator. 7. Manual channel selector. 8. Receiver incremental tuning control. 9. High/low power switch. 10. Microphone socket. 11. S-meter, centre zero, rf indicator. 12. Transmit indicator.

The FDK-UII is a borne leader. 70cms. is a demanding band, requiring the highest standard of engineering and electronic design. The FDK-UII is designed to meet this high specification. It is the only 70cms. transceiver to have stood the test of an independent RSGB review in *Radio Communication* (December 1976) and is now the most widely used 70cms. transceiver in use today. A look at its basic specification and design will confirm its supreme leadership in 70cms. FM.

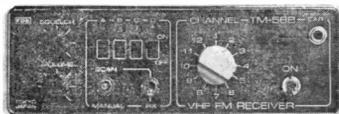
The receiver employs a triple conversion superhet with a first IF of 45 MHz to ensure high image rejection. (Other rigs employing a first IF of 10.7 MHz at 70 cms. really do have image problems!) Triple conversion also facilitates the use of much lower frequency conversion crystals resulting in superior frequency stability. The signal from antenna passes through a 2 stage RF amplifier and mixer housed in a completely screened box. This is one of the hottest front ends we have come across and confirmed by the RSGB review -4 uv gives better than 20dB quieting. The signal then passes through a 2 stage 10.7 MHz crystal filter (a nice design point this!) and on to the main 455 kHz IF chain embodying

6 stages and switchable wide and narrow filters. This ensures really hard limiting and superb adjacent channel selectivity not realised in other models. The receive channel crystals operate a back lighted dial so that only channels loaded with crystals are illuminated. And of course the now famous priority channel scan ensures continued monitoring of the main simplex channels. (Beware of rigs boasting channel scan adaptors—they simply lock onto the local repeater and stay there!) But perhaps one of its most essential features not included in any other rig is the receiver incremental tuning. On 70cms. this really is essential.

The transmitter section employs a highly stable oscillator chain and is phase modulated by a well tailored audio section for that distinctive, fully deviated signal now so familiar from the many U-II's operating through the U.K. and continental repeaters. The driver and PA stages are completely enclosed in a metal box together with a very sophisticated filter section producing a signal so free of spurious output that it meets commercial specifications! The PA is fully protected and normally gives 12-13 watts output. £249 inc. VAT.



TM56-B VHF MONITOR RECEIVER IN STOCK NOW



AMAZING VALUE!

12 Manual Channels, 4 Scan Channels, 12v. DC/230v. AC, Built-in Speaker Channels Fitted, £85 inc. VAT and delivery.
NEW! Matching desk top VHF aerial, £2.50.



FOR 2 METRES MULTI-II Complete with Autoscan for safer driving! Fitted 7 channels plus tone burst £209.00 inc. VAT. In stock now

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MULTI-2700 MK II THE FAST SELLING 2 METRE RIG MULTIMODE WITH 'OSCAR' FACILITY USB/LSB/FM_N/FM_w/CW/AM/'OSCAR'

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- VOX/IRT/Calibrator
- DX Speech Clipper
- High/Low Power
- Noise Blanker



- 10W/1W Output
- 12v./230v. Supply
- Dual VFO Control
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C TYPE Ni-Cads. A set of nine "C" type (U11) rechargeable cells £22.00 +75p p. & p.).

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Flexible antenna for IC-215 £4.75.

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**£198
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DIMENSIONS
156mm. wide
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IC-240 THE WORLDBEATER FOR FM MOBILE

**THERE ARE SEVERAL CHEAPER ALTERNATIVES BUT IF YOU LOOK CAREFULLY INTO IT
YOU WILL FIND THAT TO BUY ONE IS FALSE ECONOMY**

- ★ Can be easily programmed to any channel of your choice. The IC-240 contains a synthesiser instead of banks of crystals. This contains a programmable divider which can be programmed by YOU for each of the 22 channel positions merely by putting diodes in the appropriate places as indicated by a chart provided in the handbook.
- ★ Quick, easy selection of channels. The IC-240 has a single knob, 22 position, channel selector. Anyone who drives in traffic and wants to change from one popular channel to another knows the problems of channel changing when this involves several knobs or even a single one when it has to be used in conjunction with a digital display which requires peering at.
- ★ Instant facility for listening on all repeater input channels at the flick of a switch. It is a tremendous advantage to be able to listen on the INPUT channel of a repeater in order to determine whether a direct QSO is possible. With the IC-240 this is possible merely by flicking the control switch on the front panel from DUP to SIM.
- ★ Built in tone burst which can be completely automatic. The tone burst is easily made automatic so that the tone is placed at the beginning of each transmission when on Duplex. This is a necessary feature while some UK repeaters need feeding with a tone at the beginning of each over rather than only for initial opening as recommended by the RSGB. We do this mod for you if you buy from a THANET agent or shop.
- ★ Second-to-none receiver. The receiver on the IC-240 is really sensitive. Simply comparing maker's specs will not give you the true picture. The re-designed discriminator circuit makes the 240 by far one of the best receivers on the market. Ask someone who has one!
- ★ Excellent modulation and clipping. The modulation and clipping on the IC-240 are designed to provide a high quality, easy to read, signal without over deviating. Many sets neglect this point with the result that you either have to turn up the mod to be read at all, and then find that you over-deviate on peaks, or you keep the deviation down and are accused of mumbling! The ICOM quality of modulation is well known and is hard to beat.
- ★ Really Solid construction. There is nothing cheap and nasty about the IC-240. It is a really solidly built piece of gear which is highly reliable. Of the hundreds already sold very few had to come back for repair under warranty, their record in this respect being much better than many crystal controlled sets.
- ★ Automatic PA protection. The PA has a continuously variable PA protection system which gradually cuts down the output power as the set is fed into a worse VSWR.
- ★ Very adaptable for adding a cheaply constructed scanner to cover the whole fm band. The greatest asset of the IC-240 is the way it lends itself to the experimenter in digital logic. It is easy to design peripheral equipment to do interesting things such as scan the band or provide other frequencies which are not programmed into the set already. Several circuits for scanners will no doubt be published shortly and we hope to be able to offer a kit for a scanner with six digit frequency display for something in the region of £20. You can soon spend this on crystals!

**IT WILL HAVE TO BE AN IC-240 FROM THANET—YOUR ICOM SUPPLIERS
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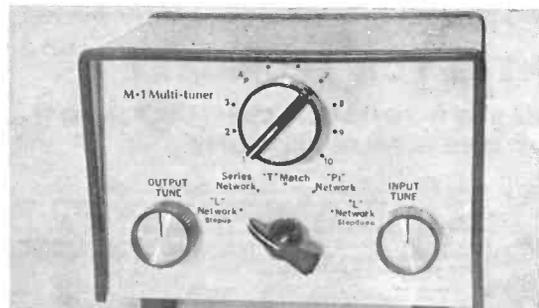


Midland and North West distributors for the XCR30 unique crystal controlled receiver. This receiver is designed to provide precision frequency tuning over the full short wave spectrum up to 30 MHz with exceptional frequency stability for both AM and SSB. Separate tuned whip antenna.

£145.00 inc. VAT
XCR-30 FM Receiver with FM band 87-5 to 101 MHz.
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UNIDEN 2030. 144-146 MHz FM Transceiver. 12 channels. 12w. DC operation. 10 watt or 1 watt output. Antenna impedance 50 ohm. Complete with microphone and mounting bracket. Price £178-74



Mk. 1 MULTI TUNER. Designed and manufactured by us. 50 tunable switched positions for antenna lengths over 5 metres in the 2-30 MHz range. Five different circuits to give an excellent match between your receiver and antenna. Now in use in over 35 countries. Price £17-50. Including VAT and Postage.
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YAESU FRG-7 RECEIVER. Mains and battery operated receiver 0.5 to 30 MHz. Solid state. Advance circuitry offers excellent performance for the DX listener at a moderate price.

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Omega TE-701 Antenna Noise Bridge ... (post 25p) £21-00
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UR43 Co-ax 18p metre; UR76 45p metre, post 2p metre; 75 and 300 ohm twin feeder 10p metre, post 1p metre; Heavy duty 75 ohm twin feeder 26p metre. PL269 50p SO239 46p, cable reducers 16p

We carry a substantial stock of equipment and probably a larger variety of models than most dealers. Having established ourselves as the North Wests leading supplier of Amateur Radio equipment for over 11 years. We are a totally independent company and have no retail outlets through any agents or any other establishment in the North West. We can supply and mostly from stock, equipment from the worlds leading manufacturers. We import some items direct, and we export and manufacture equipment of our own design.

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Send us a large S.A.E. or 20p in stamps and we will forward you all the latest details and prices. All our prices include VAT at the current rate at the time of going to Press. S.A.E. with all general enquiries please. H.P. and Credit facilities. Barclaycard and Access facilities. Trade-ins always welcome. We would be pleased to sell your unwanted equipment on a commission basis.

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ARAC102 Receiver ...	£85-00
ARAC 22R Transmitter with AC PSU ...	£115-00
Belcom AMR 104 Receiver ...	£70-00
Grundig 1000 Satellit Receiver ...	£90-00
Heathkit HW202 Transceiver ...	£100-00
Eddystone 730/4 Receiver ...	£25-00
Trio 9R59D Receiver ...	£50-00
Uniden 2030 FM Transceiver ...	£130-00
Drake MS4 Speaker ...	£15-00
Trio TS1010 Transceiver ...	£135-00
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Heathkit HX10 Transmitter ...	£125-00
Heathkit RF-1U Sig. Gen. ...	£20-00
TR 220G Transceiver with amplifier and battery pack charger ...	£165-00
Inoue IC121 VHF FM Transceiver ...	£125-00
KW103 SWR Meter ...	£13-00
KW107 Antenna Matching Unit ...	£75-00
Liner 2 Transceiver ...	£135-00
Sony CRF160 Receiver ...	£95-00
Telfor TC7 IF and TC10 Transmitter ...	£110-00
Yaesu FT221 Transceiver ...	£295-00

As you can see we have a substantial turn over in secondhand equipment. If you require a specific model let us know and we will inform you when we have it available.

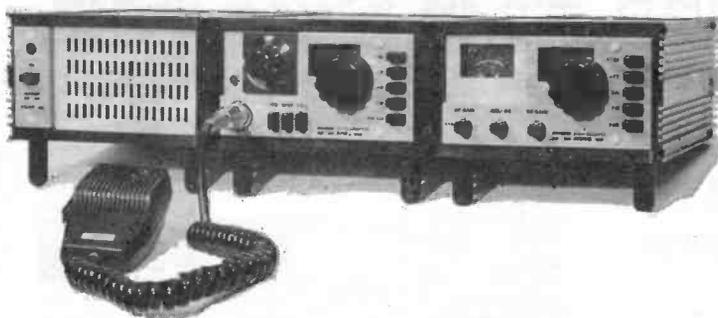
S.T.E. MILAN VHF EQUIPMENT

We enter our third year as sole distributors for the S.T.E. range in the U.K. The popularity of this equipment is growing all the time. With the kind help of the Directors of S.T.E. we have managed to keep the prices stable for the past three years. This equipment sell for about 20% in some of the ECC countries and to keep cost to the customer down we have not sold to the trade and therefore you get the benefit of lower prices. The quality of these P.C.B.'s are the finest we have ever seen. Following on from the ARAC 102 receiver for 28-30 MHz and 144-146 MHz fully tunable we now have the ARAC 107 28-30 and 430-440 MHz with AM FM and SSB Facilities. The base station AK20 transceiver is now supplied with mobile mount and also available in kit form. We also look forward to many new models from S.T.E. in the next year.

ASP 154

ATAL 228

ARAC 102



**SPEAKER
AC POWER SUPPLY UNIT**

**144 - 146 MHz
AM FM TRANSMITTER
with Microphone**

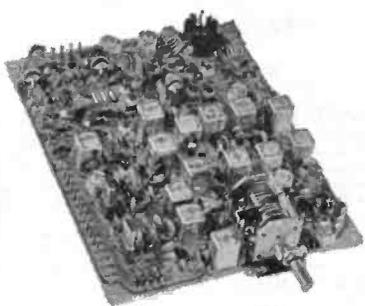
**28-30 MHz 144-146 MHz
AM-FM-SSB RECEIVER**

Price List (including postage)

AK20 FM Transceiver	... ..	£170-00
ARAC 102 Receiver	... ..	£100-00
Atal 228 Transmitter	... ..	£126-00
ASAP 154 AC PSU with speaker	... ..	£35-00
AR10 Receiver Module	... ..	£37-50
AA1 Audio Amplifier	... ..	£4-10
AD4 FM Discriminator	... ..	£5-00
AL8 Linear Amplifier	... ..	£27-00
AT22 Transmitter	... ..	£50-00
AR20 C.C. Receiver	... ..	£45-00
AT23 C.C. Transmitter	... ..	£45-00
AS 15 Stabilised psu D.C.	... ..	£10-00
AG 10 Tone Generator	... ..	£4-50
AC2A Converter 28-30 MHz	... ..	£20-00
AK20 Transceiver Kit	... ..	£110-00



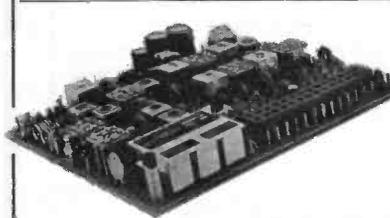
AR10 Mosfet receiver. 28-30 MHz Double conversion superhet. RF and amplifiers stages are gate protected mosfets for good sensitivity and low intermodulation. Noise limiter and squelch circuit. AM, SSB and CW reception. 12v. DC.



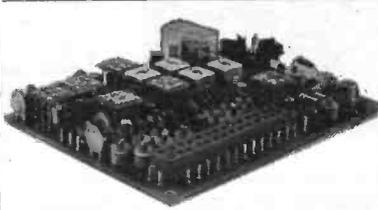
AT 222. A complete transmitter exciter unit for 144-146 MHz on AM or FM. VFO controlled or fixed channel operation. Complete with microphone pre-amp, speech processor including active audio filter. 1 watt output. FM. 25 watt AM. Output impedance 50-75 ohm adjustable. Frequency deviation 3-10 kHz adjustable.



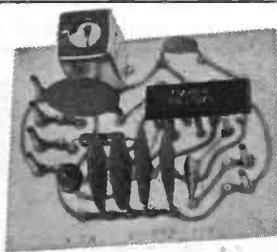
AK20 STE: Latest model from the famous STE Milan range of equipment. 12 channel operation in the 144-146 MHz range. 11-15v DC operation. 3 watts output. Sensitivity 0.2 uv R.I.T. tone burst. Complete with microphone, and mobile bracket.
Price £170-00



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.



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.



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Jambic operation—Weighted transmission—
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FT-221R

FRG-7

FT-223 AND MUCH MORE — EX STOCK!



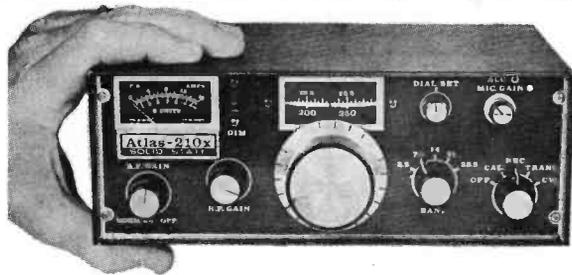
HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

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

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

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

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SHORT WAVE MAGAZINE

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The
SHORT-WAVE
Magazine

EDITORIAL

Politics

There are many who deprecate the advent of FM and the spread of repeaters on 144 and 432 MHz. However, it should be noticed that the commercial low-band, mid-band and high-band "business radio" allocations on which the pressures are greatest are, respectively, right alongside our own 70 MHz, 144 MHz and 432 MHz bands; if we can "pull" an ex-commercial unit on to one of these bands without significant modification, it follows that the business-radio makers *do not need to modify their gear to take it into territory taken from our bands*. Whether or not we like black boxes and repeaters (and the writer finds it hard to justify approval himself!) there can be no doubt that the enormous increase in activity on these bands is the very best possible manner in which we can defend ourselves against those who would take our bands from us. In a similar manner the activities of AMSAT world-wide (the Russians may well have an *Oscar* next) are helping to hold our HF bands against many pressures.

It follows that anyone who yearns for a return to the days of a "regional" rather than a "modal" bandplan for 144 MHz—or, indeed any other band—is implying, firstly, that VHF signals in some mysterious manner stop dead when they reach the limits of the U.K. and, secondly, that in their desire to put the clock back to admittedly happier times on the VHF bands, they are prepared to put at risk our continued use of the bands after WARC 79.

Ed Stacey
W3KFE

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

WE seem to have chosen the first dry sunny day for years to make a start on the piece this time round. Naturally, this is the work of the great Murphy himself! However while it must be admitted that any attempt on the garden, particularly in the damp state of the past few weeks, has been done in the face of a strong pull from the shack—there can be no doubt at all that the sunspot count is now on the way up, up, up. Which means, of course, more and better DX, by and large. More life on 21 MHz, and even DX openings on 28 MHz are taking the pressure off 14 MHz, while on the other hand 3.5 MHz and 7 MHz can be expected to be rather down on last year—and Top Band will be its own inscrutable self, providing results in direct proportion to the effort expended on the aerial, the earth, and the operating skill. So—lets all go round the bands!

1.8 MHz

The only report noted is from G2HKU (Minster) who had his usual contacts with PAØPN and PA9AQG on SSB. As for your scribe, he has the aerial back up again after getting back from a (very damp) boating holiday and finding some kind soul had wound the part of the aerial outside the garden into a coil by the front garage door, while the far-end string and insulator seemed to have sprung upwards and sideways so as to become, rather more than inaccessible. However, as always, the ways-and-means club came into play; so now all we need is a Top Band transmitter, so if anyone has such an animal lurking in the dust, and wishes to dispose of it, please pass the word—an old AM/CW box would suit, so long as it has its own power supply, built-in or outboard. As a matter of interest the band, considering the season and the weather, has not been at all bad. All that is wanted is a little more activity, lest this also becomes a victim of the WARC 79 arguments.

Eighty

Some CW DX is about, and people trying to work SSB DX through a stream of obscenities—one would have thought a co-operative effort by the gang could have dealt with this clown; plus QRP operations, and SSB rag-chewers, and, of course the pundits, these being the guys long on opinions and short on facts who in pub or club would be classed as "bores."

F9UO's log is quite interesting, and certainly there can be no doubt of the usefulness of this method of logging with different colours for each band. He uses a Joystick umpteen stories up in a block of flats—which would seem to indicate a steel-framed building—but the signal certainly gets around. On this band F9UO worked G3VMK, G5ADE, G3KFB and G3FAS together, DJ1DA, G3KFB and G3VMK again, G5ADE again, and G4EHS, most of the effort having gone into the higher frequencies.

For G3CED/G3VFA (Broadstairs) the pull of the higher bands has reduced the 3.5 MHz stuff to contacts with local G4EVO, G6AB, and GE4DNC. As for G4EVO, who is also a Broadstairs type, he also has been pulled HF although he did find time to go on SSB and work the Windsor Castle station GE3WIR.

G2NJ (Peterborough) is still enjoying playing with his HW-8, working G5NX, G3ZNF/M who was at Beacon Hill, Loughborough, G3ERC/P of Macclesfield area who had one watt, and a reserve 100 milli-watt rig at home!

GM3CFS (East Mey) seems to have used most bands on CW, plus a little SSB to season; on 3.5 MHz CW we see contacts with K1EA, LU8AHW, PY2FCF, and ZE2KV.

G2HLU (Earley) wonders whether some of the others who write in ever get any sleep—a good question to which we will expect a good answer next time! Harold has for years been a CW-only merchant, and the saga of his recent (relatively) acquisition of a microphone and of

his trying it out has been hinted at in this piece, but now we find he actually made his Bromsgrove Silver Jubilee award QSO with SSB, all twenty-five of them—and the key contact with GE3VGG for the award just happened to be his second GE contact without really trying for it!

G4DMN (Parkgate) found Eighty quite good as long as the QRN and QRM stayed away; at such times, SSB contacts were registered in the logs of FPØCJ, TF3HP, TF3SE, UA9's, UFGVAG, UL7IBC, UL7LA, VEØMBM, ZD8EW and 9G1JX.

"CDXN" deadlines for the next three months:—

September issue—August 4th

October issue—September 1st

November issue—October 6th

Please be sure to note these dates!

Forty

As usual, a few reports, but quite a lot of DX being worked; a good listen round showed us that quite a few G's have the way of it, but for some reason there are never many reports of it. For example, we have G4DMN, who had just the one contact with YV40W/P/7, on Margarita Is.

GM3CFS is one of the few with a longish list—most of the people who have over the years done much work on 7 MHz and reported it, have been either GM or GW—one wonders why? Jim stuck to CW, for contacts with CM6PM, CX8DT, FGØDDV/FS7, HI7JM, HKØBKX, KV4IH, LU8DQ, PP5CO, VP8JT, TI2PZ, VK2AHH, VK3XU, YV2BE, YVAEO, ZL3ABN, ZL3LM and ZP5AL.

QRP is at a bit of a disadvantage on Forty, but the F9UO log shows a good operator can do all right on the band. Oddly enough, F9UO remarks that the band has been in odd shape with no Africans heard whatever, more JA's and fewer W's. The 7 MHz log shows most of Europe worked, and—annoying this

for F9UO—ZL4HA who faded down in the noise before F9UO could get his report back.

G3CED/G3VFA shows just one contact on the band with G3WAU in Cheltenham before he like most of the others galloped off to the higher bands; as indeed did G4EVO.

Again, just a single QSO is reported by G2HKU, his being with UH8HCE.

Scatterings

Just too late for last time, in came a letter from EI4BK which gave us the picture and story on their EJØA expedition to Aran Is. which had *lots* of people puzzled. For a start your scribe would hazard a guess that they were being confused for Arran which is GM territory, and then the EJ prefix being a novelty would have led to all sorts of hang-ups. Aran Is. are in fact a group of three which guard the entrance to Galway Bay on the West coast of Ireland. As for the EJ, this was granted after long negotiations with the Posts and Telegraphs people, because the EIØ prefix had lost its rarity value by being put in general issue. 3000 QSO's were in fact made in 53 hours with 85 countries represented on all the continents. All QSL chores will be handled by EI5BX, 10 Derravaragh Road, Catherdavin, Limerick.

A letter arrived from Jock Perrett who was 7Q7DW until the authorities decided it was in the national interest—God knows why—that all 7Q7's be forcibly made QRT by the powers-that-be "impounding" (equals "stealing" in more civilised parts!) their gear and taking away their licences. One feels that with the possible exception of China, the closing down of Amateur radio stations wholesale is a sure sign that the country is getting out of control. It may be *fashionable* to give all these places independence, although more sensible counsels would call it a simple shirking of responsibilities. After all Russia, which has every political reason for a "no amateur radio" policy, not only has thousands of amateurs, and the Box 88 set-up, but also reciprocal licensing arrangements as well! On a different tack, the absence of 7Q7's has led to a rash of pirates; anyone working a 7Q7 should not waste time on a QSL, as the 7Q7's are getting a bit

fed up with sending 'em back! Meantime, 7Q7DW asks us to pass on his 73's to old friends.

Oddly enough, during the past month we had a visit here from A4XGQ, just back from his tour in Masirah and bringing the card direct—how's that for service? Alan noted the 7Q7 problem, and was thankful that he had finished his tour and left the place before his rig could be taken; so he had a ball in Masirah. The only snag is that his next trip will be—very likely—to a country which does not give foreigners amateur radio licences.

The real hard-luck story for this month, though, comes from G8DI, who years ago used to grace this column pretty regularly. The Liverpool locals seem to be getting a bit out of hand, in that firstly some kind soul cut both ends of the KW trap dipole away from their support and *then cut the feeder at the window!* Were that not enough, Bert took his eyes off his second bicycle for some thirty seconds and in that time it had been stolen! So—G8DI now has his new trap dipole wrapped right round the house; result, no DX so far, but still hoping!

Twenty

At least, seems to be the consensus of opinion, things are beginning to show definite signs of looking up.

G2HKU made one SSB contact, with W7OX in Nevada, but CW managed JA5CP, UA9BHI, UA9ADQ, UD6DHC, UAØSY, UI8ADN, VE6CCM, YV1AD, K7EF, W7IWy (Arizona), and W5XZ/7 in Oregon. This being said, Ted remarks that he is still searching for Wyoming for his WAS, and enquires whether anyone at all lives there!

G2HLU stuck to the CW, for contacts with EL2ET, JA's, OH2BDA/OHØ, UAØADN, VE7's, W7's, and VP8PM.

G4CCQ (Lamberhurst) had a couple of weeks holiday, but, of course, Murphy made sure Mervyn didn't get all the air-time he had hoped for. Nevertheless, Twenty CW managed to account for SM1FPE/4U (Sinai), VK3MR, N7NG in Wyoming (G2HKU to note!), UAØ's, JA, VU2LB, EP2SV, CJ6CGC, 3AØBS, FGØDDV/FS7, C31NN, ZL1AB; plus some 600 contacts with the GE prefix, in 57

countries, among the best of which were CO2OM, ZD8RF, 7X4AN, LX1ML, S79DF, A9XS, 9K2DR, XE10M, ZE1CR, ZL4AW, VK3BHN, VK3BZ, VK3VF, VK6WT, KP4EEEX, KP4CM, VE6LU, W7LNG, W7DY (Idaho), WA7JRL (Arizona), all *W* call areas, 4X4's, lots of UAØ's, about 36 JA's, 15 UA9's, and a few each of LU, PY, UD6, UH8, UL7, U18, with U6ØTLN, and U6ØUNK thrown or good measure.

For some long time now G4EAN (Nottingham) has been threatening to chase DX, and this last month he carried out his threat, with a vengeance! A total of 590 stations went into the log despite a late start and a hold-up while a rotator problem was resolved. Obviously we have to do some selection from the total, but there are some points of interest as well, for instance *W*'s heard between 0500 and 0600z, *i.e.* right through the night, which gives them 18 hours out of the twenty-four to work Europe; and a weirdie WA4SEZ-interim-AT, who apparently represented the new "instant upgrade" method over there. Imagine using that on CW! On a different tack, the 18AVT/WB problem would appear to be resolved thanks to a letter from G4BZP written after we mentioned Ian's problem in the June piece.

G4EVO and his QRP seem to have managed to get all over Europe despite the short-skip conditions which tend to cause the QRP types not to be able to get out to DX.

In comparison, it is interesting to notice how F9UO gets out, he being very high above ground level; W1, W2, W3, W4, W9, WØ, all appear, VE1-3, JA's, UA9's, UAØ, 9M2FK, and JR6RRD on Okinawa.

A third station similarly equipped is G3CED/G3VFA, but George seems to have had little real luck on Twenty, only Europeans appearing in his log until he turned to Fifteen.

GM3CFS seems to have had quite a large bag, into which went CO2OM, C31NN, EJØA, KG6JH, KH6CD, 'CF, 'HC, KP6AL (Palmyra), OD5LN, FOØPJM, 5W1AAD/MM off Liberia, VE8YE (Baffin Is.), VU2KMK, TU4FOC, YA1YB, UWØMF in Zone 19, ZL2ALJ and ZL1NW, all taken on CW, while the SSB managed

HK4BSV, KH6BTD, KH6JHU, WA4FNO/KH6, LU2AFH, KP6BD (Kingman Reef), KG4OO, KL7IAK, KL7IDE, and KL7IYL.

G4DMN found the band in pretty good shape, and worked CE3RY, EP2SV, FO8DF, HH2MC, HS1WR, KJ6BZ, KA6ML, JA's, UAØNM, VK5LC, VK2's, VP8PC, all W call areas, ZF1MA, ZF2AC, ZS4MAG, 6Y5HJ and 6Y5RL.

G3RCA (Wigan) next, with an all-SSB, all-14 MHz entry, at least on the first page! Tom managed A6XN, VU2TN, 3V8BZ, CO2FRC, YN1EGW, 5U7AG, XE2BBO, W7FPX/SU, XE1YS, F7AT, TU2HA, VP2GAH, XR1QW, KH6IPE, KV4IH, VE3HYU/SU, ZF1AK, FGØDDV/FS7, VP2MC, TT8SM, P29JS, C21AA, C21NI, FO8EC, VR3AK, VR6TC, FOØRS, JY1/JY25, VS6GG, VS6GT, 5H3KS, FPØCJ, HM1IE, S79R, 5X5NK, TJ1BB, 7X2LS, HS1WR, FG7AX, 9U5CA, 9M8HG, 9J2LM, FL8OM, KP6BD, YN1CCA, YN5JAR, KG4OO, JW9ANT, FPØDE, and KH6RM. Just to show that CW isn't quite unknown, KP6BD and 9M8HG were also worked on the key. Commenting on this, Tom obviously must have spent time "in the queue" for the Kingman Reef expedition, and he was told by an Italian station that much of the QRM on KP6BD was by a station claiming to be an I6, with a call that hasn't been issued, and a Central European accent—and the same operator and rig was also jamming the 1976 HKØAA expedition.

Now to G3NOF (Yeovil) who found lots of short skip G and GM stations, but under all, the band was in pretty fine shape. Disappointments were FO8EX, KP6BD, W6OG/KS6, and ZK1BA, but SSB contacts were made with AP5HQ, CO2HT, EP2TY, FOØRS, FPØCJ, FPØDE, HC1BU, HS1WR, IBØBXN, IE9DMK, JA9YCO, JR3IIR, JY25EM, JY25IA, JY25HH, JY25MK, JY25YJ, K5UA, K6IR at 1103, K6OYE, K7VIC, KA6ML, KH6IJ, N6BB, N6MB, PJ2FR, TF3BV, VE4JI, VE7AZA, VE7DFS, VK7RX, VE2AQS/TG9, VE3QL/VE8, VP2SG, VP9IB/P, VR3AK, VU2DK, VU2HI, VU2XX, W5DE, W5EFA, W5NA, W5SNU, W5YCB, W6OWM, W6VG/KL7, W6AOA, W6TEZ, W7CJY,

WA6GTT, WA6NGJ, W7's, W7OX (Colorado), XF3B, and XE2AX. Don heard the Kingman expedition just once, for about 1½ hours on June 18 from 0700z, although Europeans were heard calling them at various other times.

Notes

BARTG sent us results of their 1977 contest; the winner was CT1EQ, with 9H1EL as the runner-up. The entry was up by 40%, and the pattern of largely 14 MHz operation in previous years showed a significant change in that far more stations were using 21 MHz. 31 stations made contacts with all continents, although Africa was the hard one as only ZS6BLV and a couple of EA8's appeared in the logs. On a sad note, we understand PJ3AR, who was in many calls, was killed in an accident when leaving the Dayton Hamvention.

Another of the unusual modes comes to be mentioned now; the SS/TV chaps have their Albatross Contest, 1500 to 2100z September 10, and 0700-1400z on September 11. Logs go to 14LCF, Via Dallolion, 19 Bologna, Italy, to be received not later than October 30.

Operation from Marcus Is. looks to be possible during August, with the likely dates 18th to 25th; the group is a combination of HL and KA stations. Operation will be mainly at HF, as there is a 1.5 megawatt Loran station to make life tricky on the lower bands.

21 MHz

This was a good place to hide from the QRM on 14 MHz, and it is certainly showing more life than for a long while past. G2HLU offers CW with CE3BF, UI8CB, and UM8MCA.

G4CCQ took a little time off from his marathon on Twenty, to root out CW to HV3SJ and CN8CW, while the SSB dealt with EL2FY, YV5TK, JY25YJ, LU4AIW, and JW7FD.

G4EAN seems to have very largely filled in his score of Europeans on this band, but he did connect with 9K2DR, KP4EY, LU4AL, VP9IF, and WA3WRD as well, all taken during the GE week.

G4EVO next; many contacts were made, but almost all were the

short-skip ones, only UL7IH being outside Europe.

F9UO only went on the band once, to work YU1ADO, with the comment in the log "Only station in a lonely deserted band!"

Now to G3CED/G3VFA; George seems to have spent some time on the band, and we notice, aside from the Europeans, UM8MAD, UK9ADT, and ZE1NFD, amid lots and lots of the GM Field Day station. All these last three commentators were QRP and Joystick operators.

GM3CFS comes next, with CW to EP2YK, FGODDV/FS7, C31NN, JA's, TU4FOC, PY's, ZS6EB, and VE2DQC/4X4 on the Golan Heights.

Not at all bad, thinks G4DMN, he having found activity on the band at unwonted hours, the results in his log being A9XBD, EA6DE, HC1FR, JA's, JH1LVQ, JH3VKT, JG1ULJ, JR1SYA, JR3VJC, JY25YJ, K5AX in New Mexico, VP2MVP, ZF2AC, ZF2AC, ZP5AL, ZD8DB, and 4Z4UH.

Don of G3NOF operates with 100 watts output on this band, into a Mosley Mustang, and he found that short-skip was a bit of a nuisance, although the GE prefix certainly made for popularity—A9XBD, JY25YJ, A9XBE, CN8CW, KP4EFP, K5MBE, VP2AZB, VP2MVP, VP2SQ and numerous W's including WBSRNC, W5NAA, W5OGJ, W5SBX, W5VJP, WD5BXP, not to forget ZD7SD, ZS1IB, ZS1JE, 8P6AJ, 8R1J, 9J2CB and 9L1NP.

Ten Metres

Seems to have opened up quite regularly, not just locally but to DX as well; G2HLU mentions that he worked plenty of Europeans on CW plus K3ZO; and G4CCQ says that the only station he worked was CX8DT. In a similar vein, G4EAN comments on going on to a dead band, save for a 7X station calling "CQ No Europe." Being a kindly sort, Ian respected the call, only to find the 7X go back to an Italian station! That's adding insult to injury!

The openings of the band seem to have caught G4EVO on the hop, and doubtless many others who heard Russian stations with R at the beginning of their call in place of U—these are the Russian VHF licences, who have use of 28 MHz.

RQ2GFM was the cause of all the puzzlement.

G3VFA was testing out a new ATU, and so his business was to get contacts on each band regardless of their DX nature or lack of it; and some 20 contacts all round proved to be Europeans—George will have to change his operating times a bit!

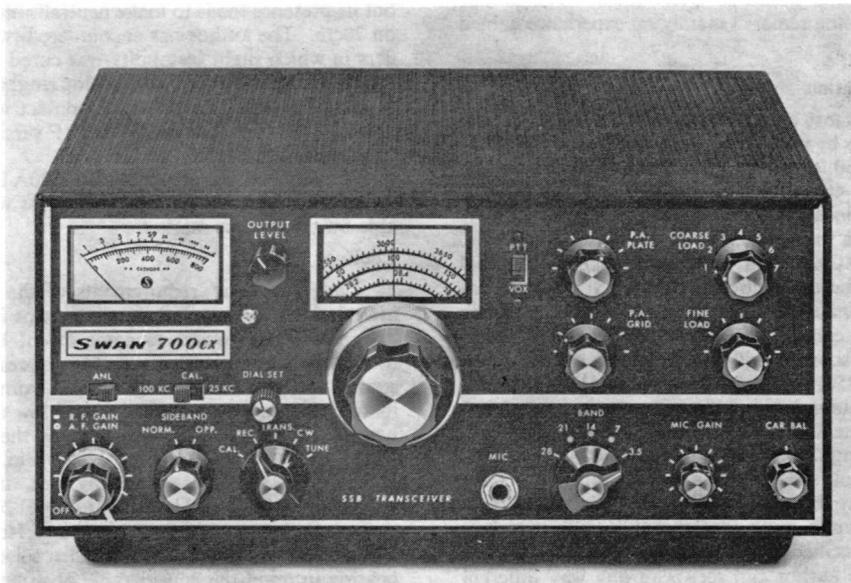
GM3CFS offers as his contribution CW QSO's to D2AAI, C31NN, TF3CB, VE1CD, *W1*, *W2*, *W3*, *W4*, *W8*, LU6EF, 6W8EX, 9J2BO, and UA9SEE; the *W* opening was between 2100 and 2330z on June 10.

On to G4DMN who remarks that

on the band, but, as G2ADZ remarks, the June openings have been nice long ones to everyone can get in. His own collection included EA9FH, JA1PIG/PZ, ZP5AO, 6W8GA, CX4JK, LU8DQ, VE1CD, U6OTLN, UL7AAQ, TF3KM/P, who was running five watts, KP4DJE, G3TZL/MM, EA8IR, *UA9's*, *PY's*, *W/K* areas 1, 2, 3, 4, 8. Heard K5KLA who wouldn't play in the G2ADZ garden!

Another specialist report this month on Ten is from G4BHE who worked 58 countries under the GE

seasonal conditions quite apart, there is no doubt that we have well and truly seen the back of the old cycle of sunspots—there are even predictions that it will hit the top as soon as 1978! Certainly the Good Days are beginning to show, and it's high time we looked for some real DX activity; something like the Bill Rindone affair last year would really "cut the mustard" this year. Perhaps too we could get DXCC decisions on the STØ and Transkei status so those who go there or reside there can have the benefit of country status. It certainly



The Swan 700CX SSB transceiver, which features up to 10 channels for MARS operation.

there were some excellent openings to the States, some 50 assorted *W's* being booked in over the fortnight prior to his letter, not to mention C31NM, 4Z4UH, ZF2AC, ZP5AL, and ZD8DB.

G3NOF remarks on the evening openings from around 2100 onwards to *W's* and South America—he worked K1CPF, K2HVN, VE2AQS/TG9, and W4QQN, all of course SSB.

Now to G2ADZ (Chessington) who is the all-28 MHz artist; in summary, Bill found signals on the band every day in June, with DX outside Europe on 20 days, and contacts with *W* on fifteen days; so far 61 countries have been worked

callsign, with only two Gotaways; the addition of a further director to the beam no doubt helped. So far this year the score for the band is 80 countries, which is five more than were worked during the whole of 1976. June DX aside from the GE activity included KV4CI, ZP9AC, LU6DRB, PY5ATL, YV4BDB, PY2EGM, ZP5SD, *W1-4*, TU2HA, PJ2AAX, ZE1AN, ZE4JW, 9G1JX, C31NM, C31NO, UK9ADT, *PY's*, ZP5KB, VO1NA, YV1BJY, ZS6BNU, OY1A, 9J2WR, and 8P6GG.

Summary

What it all boils down to is that,

seems to everyone that S8-land is truly a country, with a lot more independence than have many other countries traditionally accepted as DXCC countries.

Finale

That's it for another month—you already have the deadline date for the next few months in the "box" set in to the body of the piece, so it only remains to remind you that it should be, as always, addressed to your scribe, CDXN, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Meantime, enjoy what sun you can!

A PLAIN MAN'S GUIDE TO USE OF THE 4CX250 SERIES AT VHF AND UHF

JOHN H. NELSON, B.A., G4FRX

WITH the ready availability of valves and components, more and more stations are preparing to run the full legal limit for SSB and CW on 2m. and 70cm. using, in most cases, valves in the 4CX250 series. This article looks at some points concerning correct operation of valves of this class and will seek to clarify some of the difficulties which, to judge from what one hears on the bands, beset some would-be QRO users. The author bases the following remarks mainly on experience gained the hard way!

General information

By far the most common valves of the class generically referred to by amateurs as "4CX250" are the glass-insulated 4X150 and 250 and the ceramic-insulated 4CX250B and 4CX250R and 4CX350A; the latter is intended for linear service only. There are sundry variants such as the 4CX250F, which possesses a 26.5v. heater and the 4CX250BM, which is intended for coaxial use, and also the conduction-cooled CCS series. These seem rare in amateur use, presumably because of the scarcity of the conduction cooling and mounting hardware. So this discussion will concentrate on the 4CX250B and the 4CX350A—the glass-insulated 4X- variants differ only in minor details from the ceramic equivalents. The upper frequency limit for the 4X- variant is however not so high, being 150 MHz as opposed to 500 MHz for the others. Manufacturer's data for the '250B and '350A can be found at the end of this article as an appendix.

It is a common myth that the 4CX250R, which is occasionally specified in amplifier designs for no good reason that the author can see, is in any way different from the 4CX240B electrically—it isn't! The only difference is that the internal structure of the valve is mechanically "ruggedised" for greater reliability in arduous use such as in avionics and mobile work. Its new cost is about 30% greater than the '250B but it will *not* produce any more output power. Neither has it, as some believe, greater anode dissipation; it is the 150, 250, or 350 of the type number which indicate the specified anode dissipation in watts.

The author's amplifier employs two valves in push-pull with a quarter-wave brass anode line; it is fairly typical of VHF and UHF published designs (see Bibliography I). It has utilised at various times all of the '250 series of valves and currently employs a pair of '350As, for no better reason than a personal preference for running well within specification limits at 400W. p.e.p. The exciter for 2m. operation is a TS-700, so it can be seen that the station is not unusual as high-power stations go. The experience gained from this set-up will in most cases apply equally at 70cm., although the author's experience at UHF is mostly of a "semi-professional" nature.

Valveholders

We begin, mundanely enough, with the valve base. There are over 20 different types of bases available for 4CX250 series valves at HF, VHF and UHF, and they are difficult and often expensive to obtain. Much anguish seems to arise on the subject of whether one's base newly acquired at the junk sale or wherever will be of any use. The points to look at for VHF and UHF use are: (a) the base insulation structure, which should be *ptfe* or, in rare cases, ceramic; (b) the presence of the built-in screen bypass capacitor inside the outer mounting ring. There may be a value, often 2700 pF, stamped on it but otherwise it is recognisable as a thick ring which is quite different from the thin flange of the HF base; (c) the presence of a raised screening ring which prevents the grid spigot from "seeing," electrically, the valve terminals. The absence of this need not matter very much at 2m. but its presence tends to make neutralisation rather easier on 70cm. The author has encountered two UHF amplifiers in which slight instability was cured by a change of base to that possessing the screening ring; (d) the presence of the "fingering" which makes contact with the screen-grid annulus of the valve. In the HF versions, the screen connexion is not made in this way.

Given the option, the Eimac SK 620A base is excellent for amateur use, as are some AEI bases which are available on the surplus market.

Cooling

The cooling air requirements of the 4CX250 series are relatively modest, but there are traps for the unwary. All centrifugal blowers to some extent lose the ability to do their job in the presence of back-pressure, and what seems to be a healthy enough output from the blower on its own can turn into a dismayingly low dribble when it has passed through the valve base and the anode cooling finds. The author's blower has a 3in. diameter fan turning at 3000 rpm. Running free, it produced an output of 96cfm, but this falls to just over 20cfm measured at the valve anodes; this is not unusual. Hence a generous safety margin must be allowed when selecting a blower, bearing in mind the considerable obstruction to the airflow presented by the valve anode structure. It is far better to put up with a noisy blower doing a good job than a small, quiet and inefficient one allowing overheating. (Editor's note: *Valve life in hours is very closely related to envelope temperature. Readers should take to heart the corollary to G4FRX's proposition, which is that the only reliable way of assessing the effectiveness of the cooling is to note the quantity and the temperature of the outgoing air—which has little or nothing to do with the air pressure at the point of ingress! Thus it may well be found that the valves need to be removed and the anode fin-structure brushed clean at regular intervals.*)

Cooling air *must* be applied to the valve whenever any voltage, even the heater, is switched, and it is essential to ensure that in the event of blower failure the amplifier will shut down straight away. The author uses a relay in the blower feed line which will remove the mains feed to the amplifier power supply should the blower motor go open-circuit, and another set of contacts on the same relay ensure that heater and bias voltages cannot be applied until the blower is running. Usually, the fan itself is secured to the motor shaft by grub screws, and it

is a sound idea to remove the fan, apply a liberal quantity of *Araldite*, or similar, to the shaft and then replace the fan. This ensures that, should the grub screws work loose, as can happen, the valves will not be endangered.

The temperature limits of the valves are given in the maker's data, and temperature-sensitive paints and crayons are available from *Optimum Heat Control Ltd.*, Station Works, Dedmere Road, Marlow, Buckinghamshire for those wishing to measure the valve temperature under operational conditions.

"Dear Marje . . ."

By far the most common causes of problems in amplifiers employing these valves seem to lie in what takes place in the screen and control-grid circuits. Run-away anode current, inability to sustain a given setting of standing bias, LF parasitics and, in the case of push-pull amplifiers, difficulties in neutralisation, frequently stem from something awry here. In particular, many people are puzzled by an apparent inability to reconcile the readings of the screen-current meter(s) with what the manufacturer says should really be there. Let us examine the screen circuit in more detail.

Secondary emission and all that

The manufacturers specify a maximum screen voltage of 400 for both the '250B and the '350A, and the screen current under various conditions of operation is given in the appendix. Now, for operational convenience, the author would strongly recommend individual meters in the screen supply to each valve, and for preference that they are of the centre-zero type to cater for possible reversals in the screen current under some conditions of operation. But having put them there, quite often the meter readings bear little relation to what might be expected!

This is due to the phenomenon of *secondary emission*. For a full explanation of the effect, the reader is referred to the appropriate chapter of *Foundations of Wireless and Electronics* by M. G. Scroggie which deals very thoroughly with it, but basically in any tetrode the screen grid intercepts some of the electrons which flow from cathode to anode when the valve is conducting. This results in the grid itself emitting electrons, and the resulting flow of current is referred to as "secondary emission." In the 4CX250 series of valves, it is important to be aware of this phenomenon, since certain of its effects can baffle the unwary.

First of all, the screen grid bypass capacitor (built into the special valve base) can be charged up by the secondary emission current when, ostensibly, the valve is biased beyond cut-off by the application of a heavy negative voltage to its control grid. This is the case, for example, during "receive" or "standby" periods. In this condition, the valve can begin to conduct assuming, as is usual, that the anode supply is not switched. The effect is cumulative and the anode current, apparently defying the laws of thermionic physics, rises rapidly despite the cut-off bias. The cure is to earth the screen grid during "receive" periods, the most convenient way being *via* a spare contact on the transmit-receive relay, thereby cutting the valve off completely. This will solve the mystery of the strangely blowing anode current fuse thirty seconds after you went to "receive," and will also

mean that the valve will no longer generate shot noise and mask weak signals.

Secondary emission is also primarily responsible for the widely differing readings on the screen current meter(s) under single-tone, two-tone or speech conditions. In a push-pull amplifier, the readings may be very different for the two valves and bear little relationship to published data. Many reputable sources, and indeed the published constant-current curves for the valves, suggest that at resonance the screen current is always positive, by a matter of a few milliamperes. At VHF and UHF, however, secondary emission effects tend to make the screen current *negative*, by an amount which depends on how heavily the valve is loaded and how hard it is driven. It is important to realise that nothing whatsoever can be deduced about the screen dissipation when the screen current is negative: this is because the indication on the meter consists of what might be called an "incident" component, resulting from normal operation, and a "secondarily emitted" component, and they cannot be separated. Some authors have claimed that "screen current in a tetrode is a good indicator of loading" but in practice secondary emission effects can mask such indications. It is not always true either that "a peak in screen current is a good indicator of resonance." Since a tetrode tends to act as a constant-current device, it is a fact that the usual dip in anode current at resonance is not pronounced, but quite often the screen current *will* dip, by an amount which depends on drive and loading and also the presence of secondary emission. And also, in a push-pull amplifier, the two valves may have very different secondary emission characteristics even if brand-new, so that one may indicate -4mA, and the other 2mA. (Editor's note: *Although, as G4FRX says, secondary emission can affect any tetrode, there is no doubt at all that in the 4CX250 series of valves the effect is more marked than in others, regardless of maker.*)

A lack of balance, therefore, in the screen current meter readings in a push-pull amplifier should not necessarily be taken as a sign that anything is amiss. The two-tone test is probably the nearest thing to the manufacturer's methods of deriving values for the screen current, but his ratings do not take into account such factors as the amount of loading on the amplifier and how hard it is being driven. As a rough rule-of-thumb, as long as the meter does not read greater than 8mA or -10mA under single-tone (carrier) conditions, there should not be much wrong with the valves or their loading, but having said that it is worth noting that the screen current of the 4CX350A at UHF can perform some very strange gyrations according to drive level and as long as the 8W. screen dissipation level is not exceeded the author would turn his namesake's blind eye to it!

An extremely important point in connexion with the screen grid is to ensure that the supply voltage on it is removed immediately in the event of a failure of the anode supply. Otherwise, the valve will self-destruct in seconds. A very simple way of arranging a fail-safe system is shown at Fig. 1.

A 60mA fuse in the screen supply lead gives protection in the event of flashover, which can occasionally happen in a well-used '250B with full voltage on its anode. Second-hand, "used" valves of this class have a tendency to flash over in this way or to have an inordinately heavy

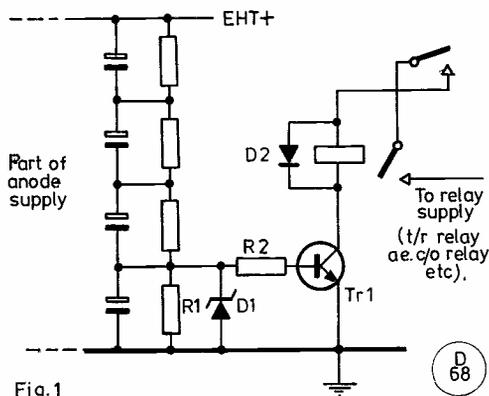


Fig. 1

Table of Values—Fig. 1

R1 = 1K, 2W.	D2 = OA200 etc.
R2 = 2.7K, 1W.	TR1 = BSX28, or any
D1 = OAZ202	npn switching transistor

(100mA. or so) value of negative screen current, so that the appropriate fuse can save components such as the screen feed resistor or screen current meter in the case of valve failure. But be warned—the fuse will *not* save the valve if the anode supply fails and the screen supply is not removed.

The screen voltage must be stabilised and preferably restricted to about 300v. More can lead to excessive screen current under conditions of light loading and high drive, especially if CW is in use. The screen supply must present a low impedance and if gaseous shunt-stabiliser valves are not incorporated, a bleeder resistor arranged to pass about 15 MHz per valve must be connected across the screen supply.

The control grid and biasing

In the last section, one cause of runaway anode current was examined. A related effect—the inability to sustain a given value of standing current—seems to have two common causes. In the case of a newly built amplifier, the author would suspect that the bias supply has too high an impedance (especially with regard to some of the weird and wonderful bias circuits recommended in the past). The circuit published by GW3ZTH and GW8EHK has the merit of simplicity, and is reproduced in Fig. 2. The bias line must be well decoupled, and the resistors feeding the grid coil or line in the usual type of circuit should be of a non-inductive nature such as tin oxide on glass, decoupled with very short leads. Any excess inductance here can lead to LF parasitic oscillation and/or difficulties in neutralisation.

A poor or dry joint in the cathode circuit can give rise to similar problems. Each cathode tag on the valveholder must be solidly earthed, preferably *via* copper strip or braid. Nothing else should use this path as an earth return, otherwise all sorts of insidious instability problems can arise. In a case known to the author, several hours were spent tracing the cause of an intermittent “twitch” in the standing anode current and a

transmitted signal some 30 kHz wide, to an oxidised solder tag connecting a cathode lead to the chassis. Silver plated tags can be of assistance here in avoiding this kind of problem, and meticulous construction will save much trouble at a later stage.

Other power supply points

About 30 μ F of smoothing capacitance in the anode supply seems to be an absolute minimum to avoid such ills as flat-topping. It is sensible to arrange interlocking in the power supply switching so that the blower comes on first, followed by the heaters and bias, then the anode supply and the screen supply, in that order, and this can be done either with double-pole switches or with relays, according to taste. Finally, and most important, *high voltage is lethal. If you run high power, your power supply, particularly the anode supply, is lethal. Do not attempt any adjustments without switching off, isolating the supply, discharging the capacitors and earthing the anode supply* (remember the mnemonic S.I.D.E.)

Neutralisation

Neutralisation is generally straightforward. Any of the recommended ways should work, and the *ARRL* arrangement has the merit of being very simple to adjust. A quick way to check on the neutralisation is to remove the anode and screen supplies and apply enough RF drive to show about 3-5mA. grid current per valve (and check that both valves are receiving equal drive, *i.e.* that that the grid circuit is in balance). Rotating the anode tuning capacitor should cause no deflection whatsoever on the grid current meters. With only slightly incorrect settings, the grid current will flick up either side of resonance. Note that the right type of valveholder will make some difference. Also ensure that there is not more than 6.0v. on the heaters: excess heater voltage, even the usual 6.3v., can cause an apparently correctly neutralised amplifier to act as though it isn't, especially on 70cm., an effect encountered more than once! Other effects of excess heater voltage include overheating, drift of tuning and a shortening of the valve life by about 50 per cent. 5.8v. is really ample, since back-bombardment of the valve cathode occurs when the amplifier is operational, causing a rise in cathode temperature and a consequent increase in emission.

Adjustment and setting-up

There are many designs for amplifiers in the 4CX250 series, but their designers rarely seem to give much information as to how to get the best out of them. The following notes offer some suggestions; they refer mainly to amplifiers employing two valves in push-pull.

Before applying any voltages, ensure that the grid and anode circuits are roughly resonant, using a GDO, and that the input and output coupling arrangements are reasonably optimised. The first job then is to check the neutralisation. The grid circuit in a push-pull amplifier should have been roughly balanced by adjustment of the appropriate capacitors, and it is as well to forestall later problems by applying enough RF drive to show about 2mA. on the grid current meters, without anode or screen volts applied, and adjusting for as close a balance as possible. Neglect of this point can lead to one valve working much harder than the other, a major cause of

non-linearity and splatter.

Unless the available exciter has relatively low output, it is unnecessary to spend time attempting to adjust the amplifier input VSWR to precisely 1 : 1. In the interests of reasonable bandwidth and equality of grid drive, the author's amplifier has an input VSWR of about 3 : 1 and no problems result. Contrary to some belief, distortion and splatter on the transmitted signal rarely results from this cause, unless the input VSWR is ridiculously high.

Still without anode and screen voltages applied, switch on the bias supply and adjust it to its highest (i.e. most negative) setting. Then connect a dummy load to the amplifier output and, ensuring that the anode supply has a fuse of about 500mA. in circuit, switch on the anode and screen voltages. No drive should be applied at this stage. If all is well, the anode current meter will still be reading zero. If a high anode current, possibly high enough to blow the fuse, occurs, one of two possibilities exist—a faulty valve or valves, most commonly an internal short-circuit or, less likely, grossly incorrect neutralisation. It is worth noting that quite often, valves advertised as "ex-equipment and tested" have only been tested with an ohmmeter.

If all is well so far, the next stage is to switch on a receiver which covers the amplifiers's intended band. This will indicate any tendency that the amplifier may have to turn into an oscillator during the following tests. Adjust the bias so that the anode current rises to about 200mA. Keeping your hands well away from the anodes, check that the exhaust air is at about the same temperature for each valve. This is an indication that the valves have similar emission, and can save problems later.

Leaving the above current at the 200mA. level, apply enough RF drive to cause the anode current meter to rise slightly, and tune the grid circuit for a maximum reading. Then increase the drive to the point where the anode current meter indicates about 300mA. A wattmeter connected in the output circuit should begin to read something at this stage. Swing the anode tuning capacitor through resonance; the wattmeter reading should rise to a peak in a smooth fashion at resonance and then decrease. If it tends to jump, or if the anode current meter readings fluctuate wildly, the amplifier is probably "taking off" and this may be heard in the receiver as a plop or a burst of white noise. The usual cause at this stage is the amount of loading, and the remedy is to adjust the loading capacitor or the output coupling system (Pawsey stub or coupling loop, or whatever). The only other possibility is RF feedback of one form or another, usually due to a lack of screening between input and output circuits. Check the tightness of all bolts securing screens or parts of the amplifier enclosure, correct connexion and termination of input and output cables, correct shielding of anode and grid compartments, etc., but *do not do so with the anode supply connected. Switch off before adjusting.*

It should now be possible to tune the amplifier up for a smooth peak in output power of somewhere between 100 and 300W. depending on the anode voltage, with 300mA. or so anode current, and it can now be tested on the air. With a newly-built amplifier, the author would strongly recommend arranging a sked with a local station who knows what to look for and whose judgment you trust. Not all stations have spectrum analysers or other

elaborate test gear lying around in the shack, and it is *not* possible to deduce anything about the linearity of the amplifier from the behaviour of the anode, screen or grid current meters. Nevertheless, there are some points which can be checked on the meters. Under SSB conditions, the standing anode current for two valves in push-pull should be around 200mA. At no time should there be any indication on the grid-current meters—these should be regarded as being aids to setting-up only. And, as we have seen, the screen current is not a reliable indicator of very much at all: under average dynamic conditions it will probably be a few milliamps negative, flicking rather more negative on speech peaks or, occasionally, positive.

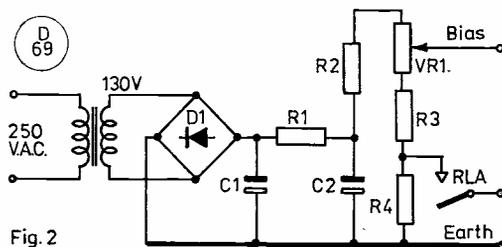


Fig. 2

Table of Values—Fig. 2

R1 = 1K, 2W.	C1 = 16 μ F, 350v.
R2 = 15K, 2W.	C2 = 16 μ F, 350v.
R3 = 2.2K, 2W.	D1 = Bridge, 400 piv 1A
R4 = 10K, 2W.	RLA = Contact on t/v
VR1 = 10K lin. w/w	relay

So, lacking adequate test equipment, the alternative is on-air testing with a reasonably local station, preferably equipped with a receiver possessing good selectivity, high-grade filters with good stopband rejection and skirt selectivity and having first-class front-end performance not suffering from cross- and intermodulation problems. An experienced operator, listening with and without AGC can tell you all that you need to know about the signal. A common trap for the unwary is the report of distortion arising out of front-end overloading and the effects of AGC action. A step attenuator and oscilloscope are useful adjuncts to the receiving station.

Reverting to the transmitting end, a severe test is to alternate between the exciter on its own and the exciter plus the amplifier—the only discernible difference should be the strength of the signal. If the amplifier is functioning correctly and with linearity, there should be no increase in the "width" of the signal from intermodulation products and splatter.

Reports of excessive width or other untoward qualities of the signal should be investigated. Excessive drive is a common cause of splatter; under SSB conditions, an amplifier of this configuration should only require about 2-4W. p.e.p. of driving power. "Flat-topping," which will manifest itself as excessive signal width on peaks, is another frequent failing; its cause is usually excessive AF or RF drive from the exciter and/or deficiencies in the anode supply regulation. It can be noted, however, that the duty cycle for SSB is relatively

undemanding and the continuous rating for the anode supply transformer need be no more than 30% of the peak current drawn.

The anode efficiency of this class of amplifier is typically around 40-50%, assuming optimum output coupling and loading. The cost-effectiveness of silver-plating the anode inductor in terms of increased efficiency, bearing in mind that the amplifier is probably capable of supplying power in excess of the legal limit, is dubious at 2m. and rather arguable at 70cm. However, the long-term effects of plating are probably beneficial, since at VHF and UHF most of the current flow is concentrated in the outer surface of the metal, and metallic oxides reduce conductivity to a high degree. Silver, however, is an exception, its oxide conducting almost as well as the base metal, and it is for this reason alone that most UHF apparatus is plated.

Conclusions

Valves in the 4CX250 series form an excellent basis for a VHF or UHF power amplifier, provided that care and attention is given to details. It is not possible to cover all eventualities in one article but merely to provide some guidelines to obtaining a clean signal. The most important point is that 400W. p.e.p. into an antenna of moderate gain can represent several kilowatts e.r.p. and with the many stations active these days an impeccably clean signal is of paramount importance for serious DX working or contest operation. A badly adjusted amplifier can cause havoc to one's amateur neighbours, as well as encouraging the misguided and all too frequently heard assertion that high power is unnecessary and antisocial. And having achieved one's high power, clean signal, a highly desirable adjunct is a high performance receiver because, as has always been said "if you can't hear them, you can't work them."

APPENDIX—Maker's Data For 4CX250B and 4CX350A Valves.

4CX250B

Heater voltage 6·0v, heater current 2·6A

Maximum ratings:

Anode voltage	2000	V
Screen voltage	400	V
Grid voltage	—250	V
Anode current	250	mA
Anode dissipation	250	W
Screen dissipation	12	W
Grid dissipation	2	W
Heater-cathode volts	250	V
Rg-k	100	K
Seal temperature	225	degrees C

Typical operation; RF linear amplifier class AB1, single-sideband suppressed-carrier operation, two-tone input.

Anode voltage	1	1·5	2	kV
Screen voltage	350	350	350	V
No-signal anode current	100	100	100	mA

Peak grid voltage approx.	50	50	50	V
Max. signal anode current	250	250	250	mA
Approx. screen current	10	8	5	mA
Mean output power	60	108	150	W
p.e.p. output	120	215	300	W
Anode current (2 tone)	190	190	190	mA
Screen current (2 tone)	2	1	—2	mA
Cooling requirements:				
Anode dissipation		200	250	W
Required airflow (sea level)		5·0	6·4	cfm
Required airflow (10,000 ft.)		7·3	9·3	cfm

4CX350A

Heater voltage 6·0v, heater current 3·3A

Maximum ratings:

Anode voltage	2500	V
Screen voltage	400	V
Anode current	300	mA
Anode dissipation	350	W
Screen dissipation	8	W
Grid dissipation	zero	
Heater-cathode volts	150	V
Seal temperature	225	degrees C

Typical operation; RF linear amplifier class AB1, single-sideband suppressed-carrier operation, two-tone input.

Anode voltage	1	1·5	2·2	kV
Screen voltage	400	400	400	V
Anode current (no signal)	100	100	100	mA
Peak grid voltage	21	21	25	V
Max-signal anode current	260	265	290	mA
Approx. screen current	—4	—5	—3	mA
p.e.p. output	95	200	385	W
Anode current (2 tone)	210	215	195	mA
Screen current (2 tone)	—7	—8	—3	mA
Cooling requirements:				
Anode dissipation	250	300	350	W
Required airflow (sea level)	5·3	6·5	7·8	cfm
Required airflow (10,000ft.)	7·7	9·5	12·0	cfm

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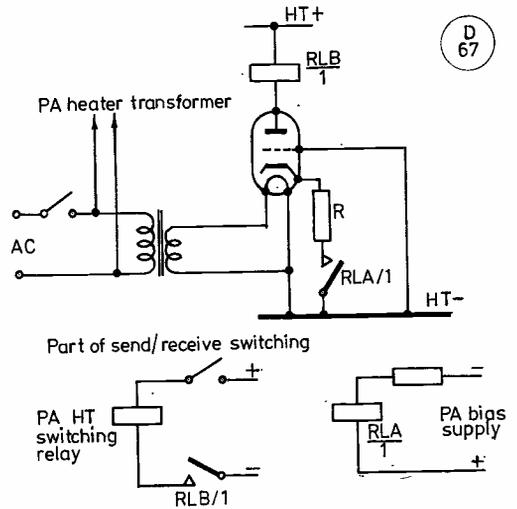
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The author would like to acknowledge the assistance of G8ITS and G3FPK in the preparation of this article.

TRIODE 3-INPUT AND-GATE FOR TRANSMITTER POWER SUPPLY SEQUENTIAL SWITCHING

A. D. TAYLOR, GW8PG

To protect a high power PA from damage it is necessary to switch on the power supplies in the correct order; heaters first, then bias, then HT. There must be sufficient delay to allow the heaters to warm up before the HT is applied. The diagram shows how a triode can be connected to perform these functions. Its heater transformer is fed from the same AC input as the PA heater transformer, and its cathode return circuit is only completed if the bias supply is present to operate relay "A". Thus, if the heaters are switched on, *and* bias is present, *and* the cathode of the triode has reached its correct operating temperature the current through the triode will operate relay "B," the contacts of which complete the operating path for the PA HT switching relay. Relay "B" must be suitable for operating at the anode current passed by the triode, and resistor "R" of a value which will allow this current to flow. The circuit is fail-safe; if the heater of the triode is not hot, or the bias voltage is not present, it is impossible to operate relay "B." There are other uses for the circuit. One is in a CW transmitter where the



PA bias is derived from grid current flow. If relay "A" is operated from the exciter power supply in such a transmitter, the PA HT cannot be switched on unless there is power on the exciter and the PA heaters are warmed up.

Amateur Radio Exchange was one of several trade stands at the RNARS Mobile Rally held on 19th June. Despite unexciting weather for most of the day, the attendance was the best-ever with over 800 people turning up to witness the day's attractions; visitors from overseas included VE3EMU and several French amateurs.



AN INTERESTING NEW CONSTRUCTION AID

Reviewed by
G. C. DOBBS, G3RJV

IT is all too rare to come across a new product for the electronics home constructor which also has many varied applications for the radio amateur. So it was with pleasure that I stumbled across a new form of printed circuit material called "Plain P.A.K. Strip."

To put it simply, "Plain P.A.K. Strip" is a very thin flexible printed-circuit board with self adhesive backing. Interesting, but not fantastic, you might say—but it does have a few other useful properties.

Because it is thin, it is very easy to cut with finely pointed scissors. This means that almost any shape can be cut out with speed; the paper backing peels off to reveal an adhesive back which may be used to stick the strip to Paxolin or plastic. The strip is tinned ready for solder and between the copper and the adhesive back is a layer of very thin insulating material.

Obviously "Plain P.A.K. Strip" is useful for P.C.B. prototyping, but in the few weeks I have been using it I have found quite a number of useful applications.

(1) Building P.C.B. prototypes. I have used the strip with 0.1in. matrix perforated board for simulated P.C.B. layouts, the component mounting holes can even be made with a sharp pin.

(2) Simulated P.C.B. work. The makers claim it can be used on cardboard. I tried this with my practical electronics evening class pupils; we cut out the required tracks and stuck them down on a post card. The holes were made with a scriber point and a very successful, if flimsy, P.C.B. was the result.

(3) Screening. It is simple to purchase quite a range of small plastic boxes from most component stockists, but these, being unscreened are not very suitable for some RF applications. The "Plain P.A.K. Strip" which comes in 6in. x 4in. sheets, can be cut to shape and stuck either on the inside or outside of such boxes to provide a screened container. In practice it was found that the material responds well to butt-end soldering to complete the screening.

(4) Contact pads. A couple of square or round piece of the strip could be used either side of a plastic or Paxolin strip to provide touch pads for CMOS circuit keying. One of my evening class students used it as a contact pad for a touch switch project.

There must be lots of other application for the amateur constructor. When the strip is stuck down to metal it is insulated from the metal, and this might suggest capacitive ideas. I think a couple of strips either side of a window pane could provide a simple capacitive aerial coupling which does not require holes to be made in the window frame. The makers suggest its use in repairing damaged P.C.B. tracks.

Apart from the plain type, Types "A" and "B" are made with DIL patterns, which allow the use of IC's with the material. The basic "Plain P.A.K. Strip" is sold in 6in. x 4in. strips at 39p including postage. Details of all types may be had for an *s.a.e.* from Electronic Supplies, 408 Sharrowdale Road, Sheffield, who are the only suppliers I know of at the moment. I reckon its useful stuff and worth a try.

ANOTHER MAST IDEA

J. F. PIMLOTT, G8IDE

SCAFFOLD PARTS USED —
EASILY MADE

IN the first instance, like many others, I made tilt-over towers but finding them rather awkward to raise and lower in adverse weather conditions, the telescopic mast shown at Fig. 1 was constructed and has proved very efficient.

It consists simply of two lengths of builders scaffold joined by two adjustable swivel clips. The aerial can be raised or lowered merely by adding or removing jointed lengths of aluminium tubing (rather like tent poles) which can be fitted with locating pins on all joints to enable the aerial to be rotated. Guy ropes can be fitted if desired, and the top scaffold pole lowered for aerial adjustment by simply slackening the clips and sliding the tube down; a house ladder will provided access to the aerial up top. If so desired, a rotator could be fitted at the base of the mast. In my case the bottom tube is bolted to the side of my garage.

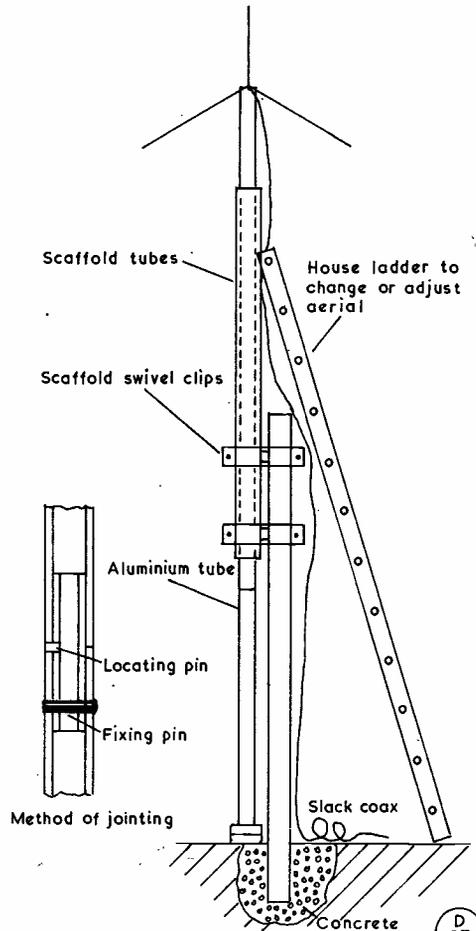


Fig. 1 Telescopic aerial mast

GETTING STARTED IN AMATEUR RADIO

A large proportion of the many letters received here at SHORT WAVE MAGAZINE offices come from people anxious to know exactly *how to begin* on their newly-chosen interest of Amateur Radio—either as an SWL or as a licensed operator.

A few years ago, in response to this perpetual situation, we ran a competition amongst readers for advice to the would-be beginner because it is a question to which there are many possible answers. The winning letter, from R. C. Ray G2TA, was published and as its content is still entirely relevant, we reproduce it here again as an offering to all our current enquirers:—

BEGINNER QUERY

“Dear OM,

Thank you for your enquiry. Here is my two-year plan for getting you on the air.

The first year should be spent acquiring some background knowledge of the hobby, and this can best be done by becoming a short wave listener. You should not at this stage attempt to build a receiver, but rather obtain either an old broadcast receiver with a short-wave band covering amateur wavelengths, or alternatively make a judicious purchase from among the many Government surplus receivers available. This will put you in touch and you will learn much about the game by just listening to amateurs talking to one another.

If you know a local amateur cultivate him; if there is a Club in your district, join it; if you have a friend who is also interested, so much the better. Failing all these you must rely on the written word, and here you would do well to read SHORT WAVE MAGAZINE regularly and also you should purchase one or two books dealing with the subject, such as the *Guide to Amateur Radio*.

It is important that you get some experience in constructional work at this stage, and you should begin by building some simple test gear such as a multi-range meter and a grid dip oscillator. Follow this up as your technical abilities develop with a few receiving aids such as a crystal calibrator and a converter to extend the coverage of your receiver. Eventually you should be able to build a simple receiver for “stand-by” purposes or perhaps for main station use.

Because it is necessary to pass an examination in radio theory and Morse code before you can have a licence, your second year must be devoted to getting your “ticket.” If you can enrol at a local school for formal training so much the better, but it is quite possible to reach the necessary standard by private study. The Morse code need not prove a difficulty especially if you can find someone to help you with regular practice. If not I strongly recommend one of the advertised recorded courses which will permit regular practice over a range of speeds suitable for the beginner. During this year you must continue with your listening and your constructional work, the aim being to build up a simple transmitter to get you on the air when your licence arrives. By that time you will find that you can answer the questions you have put to me today far better than I can!”

G2TA

COURSES FOR THE R.A.E.

TO qualify for a U.K. amateur transmitting licence, it is necessary to pass the Radio Amateur Examination, held in December and May each year. It is Subject No. 765 in the syllabus of the City & Guilds of London Institute, 76 Portland Place, London, W1N 4AA, from whom can be obtained a set of question papers for recent years, with the current syllabus.

Following is the First List of Courses as notified to us in time for this issue. Further lists will be published as notifications are received.

Notices should be set out in the form shown here, and addressed to: “R.A.E.,” SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

Barry (Glam.): At the College of Further Education, Colcot Road, Tuesday evenings 6.30 p.m., starting Sept. 20, enrolment Sept. 12-14. Course fee £6.50, or £5.50 (under 18). Lecturer in charge, D. H. Adams, GW3VBP.

Beckenham: At the Adult Education Centre, 28 Beckenham Road, Beckenham, Wednesday evenings 7.30 p.m., starting Sept. 21, enrolment (by post) Aug. 30 to Sept. 9 (in person) Sept. 7-9 and Sept. 12, 13th, or 15th. Enrolment forms from The Principal, 244 Croydon Road, Beckenham BR3 4DA. Instructor J. M. Tripp, G3YWO.

Blackburn: At the College of Technology and Design, Feilden Street, Blackburn. Instructor H. Leeming, G3LLL. Enquiries to The Principal at the above address.

Eltham: At the Adult Education Institute, Eltham Hill School, Eltham, London S.E.9, Tuesday evenings 7.30 p.m., commencing Sept. 20, enrolment Sept. 12-14. Course tutor J. M. Tripp, G3YWO.

Farnborough: At the North and West Farnborough Further Education Centre, starting Sept. 22 at 7.30 p.m. Also a Morse Proficiency course beginning Sept. 19 at 7.30 p.m. Tutor John Hardy, G3KND. Enquiries to The Principal at the above address.

High Wycombe: At the Bucks. College of Higher Education, Queen Alexandra Road, High Wycombe, enrolment Sept. 5-6. Lecturer R. A. Stringer, G3IOZ, to whom all enquiries should also be made—addressed to the School of Engineering.

Liverpool: At the Riversdale College of Technology, Riversdale Road, Liverpool, enrolment Sept. 12-14. For details apply Head of Department, Dept. of Electronic and Radio Engineering, at the above address.

Northampton: At the Adult Education Centre, Duston Upper School, Duston, Northampton, Tuesday evenings 7.00 p.m., starting Sept. 27, enrolment week commencing Sept. 12. Course fee £12. Instructor D. F. Watton, G4AYZ, QTHR.

Oxford: At the Oxford College of Further Education, starting Sept. 27. Details from A. E. Dennard, G4BHR, 31 Netherwoods Road, Headington, Oxford OX3 8HF.

Weybridge: At Brooklands Technical College, Heath Road, Weybridge, enrolment Sept. 12-14. Enquiries to Head of Department, Dept. of Technology, at the above address.

FM—SOME BASIC PRINCIPLES, PART II

by "DEVIATOR"

Audio Processing in NBFM

YOU will have heard some stations who have strong carriers but are relatively difficult to copy because their modulation is very weak; likewise you will have heard stations who are only just audible but excellent copy. Also you may have been unfortunate enough to suffer interference from a station on an adjacent channel through over-enthusiastic deviation. Proper understanding of the functions of the "Mic Gain" and "Deviation" controls on your transmitter will help you avoid causing these problems.

Channelling

The adoption of channels for most FM working eases mobile operational problems. European channel spacing is 25 kHz and the deviation usable in such a system is ± 5 kHz, as the bandwidth occupied by the transmission is then about 20 kHz at a 3 kHz modulation frequency (read up your Bessel functions if you don't believe this!). Hence the 5 kHz is not so much a Gentlemen's Agreement, but a very real limit for the interference-free use of our channels. Just as in an AM transmitter where modulation exceeding 100% must be prevented, deviation exceeding 5 kHz must not occur.

Limiters

Various types of limiter circuit are found, those with series diodes being quite popular; the output from the limiter will consist of a defined voltage excursion whose amplitude must be adjusted to produce 5 kHz deviation.

The control which achieves this is usually labelled "Deviation", and is set by feeding in a large audio signal and measuring the resulting deviation. For those without a deviation meter either ask someone who has or, using a selective SSB receiver, *not* a wide AM one, set the control so that the majority of the energy is contained within ± 5 kHz, but with "whiskers" out to ± 8.9 kHz on occasional sybillants. For these adjustments the "Mic. Gain" must be set to maximum.

Low Pass Filter

The limiter produces an output which approaches a square wave, rich in harmonics. Consequently it is essential to filter the post-limiter audio with a fairly sharp low-pass filter. Whilst such a filter will exist in a commercial rig, it may not be in converted AM equipment; suitable circuits may be found in the usual publications, and a three-section filter, parallel C, series L, parallel C, working between well defined impedances will suffice.

Mic. Preamplifier

Having limited our transmitter to 5 kHz deviation, we make the observation that for a given RF signal level, recovered audio at the receiver will depend on the deviation at the transmitter. Thus for any situation where audio is important, weak signal working, mobile or repeater operation, deviation as close as possible to 5 kHz is desired.

Audio clipping is the best way to make use of a certain RF signal level, and has been shown to markedly improve intelligibility. The limiter in an FM transmitter can be used as an audio clipper with great effect. To take advantage of this it is only necessary to ensure that there is adequate "Mic. Gain" available, and to speak quite close to the mic., across rather than into it.

To make best use of the clipping, it is undesirable to present audio frequencies lower than 300 Hz to the clipper. Hence audio amplifiers should be designed to have two high pass filter sections cutting off at 300 Hz. A slightly rising response is also desirable, but owing partially to the lack of standardisation of pre-emphasis/de-emphasis characteristics and partially to the differences between individual voices, no specific recommendation can be given here.

As discussed last time, a phase modulator will have a low frequency limit below which full modulation cannot be achieved. The low frequency tailoring in the modulator will prevent any distortion occurring. Note that the integrator will only need a falling response above 300Hz as we are not interested in lower frequencies, and they will not be passed by the modulator.

Summary

To obtain best utilisation of our FM channels, deviation must be as near as possible to 5 kHz, without exceeding it. A filter must follow the limiter to remove the sharp edges thus created, but audio clipping may then be used without additional circuitry. Signals so processed will be readable down to the lowest levels.

(Concluded)

AN OUTLINE OF THE QUARTZ CRYSTAL

INCLUDING A USEFUL CIRCUIT

I. D. POOLE, B.Sc.(Eng.), G3YWX

TODAY many crystals are used in a great variety of applications both in amateur radio and in industry, for frequency control in such varying situations as communications, watches, computers, and colour television. Considering the extent of their use comparatively little has been seen in print about them as the author discovered when tackling a rather obscure problem with a crystal oscillator.

Basic Theory

The complex electromechanical system that forms a vibrating quartz resonator can be described by the somewhat familiar equivalent circuit (Fig. 1). The crystal can vibrate in several modes simultaneously, one of which is designed to be the dominant one. The mechanical vibration of the crystal is coupled through the piezo-electric effect to the electrical system; the vibrating mass of the crystal is equivalent to a series inductance L_s , and mechanical losses of the system appear as a resistance R_s because power can only be dissipated in a resistor

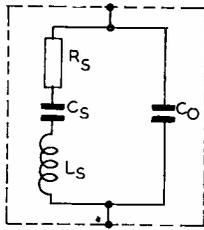


Fig. 1

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and not in either a pure inductor or capacitor. Also the mechanical elasticity is equivalent to a series capacitor C_s ; this is in practice found to be only small, which is hardly surprising in view of the nature of quartz.

There is also a parallel capacitance which appears between the crystal holder terminals. This is caused by the capacitance between the electrodes of the crystal together with any stray capacitances, C_o . In addition, there is the capacitance due to the external wiring plus a crystal load capacitance which is accounted for in the design.

Crystals are designed to operate in one of two modes, either parallel or series resonance, the parallel resonant frequency being slightly higher than the series one. At series resonance the reactances of the series capacitor C_s , and the series inductor L_s are equal and opposite. The circuit is then equivalent to R_s in parallel with C_o , and owing to the fact that the resistance of R_s is much smaller than the reactance of C_o there is negligible phase shift.

At a frequency slightly higher than the series resonant point the inductive reactance increases whilst the capacitive reactance decreases. The capacitance C_o then forms a parallel resonant circuit with the inductance L_s , and as this is a parallel resonant circuit it has a very high impedance. Any external capacitance such as the load capacitance will become part of the frequency determining network and the actual working frequency becomes slightly decreased from the anti-resonant frequency. This is taken into consideration by the manufacturer and the frequency stated will be that when operating into the load capacitance. This mode of operation is to be preferred when the frequency of the oscillator needs to be trimmed.

Practical Example

In many instances a crystal oscillator will be needed to drive a TTL circuit of some description. The easiest

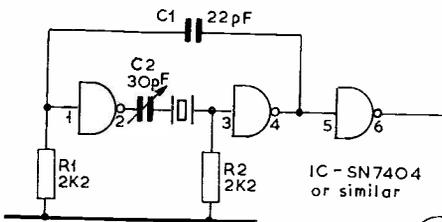
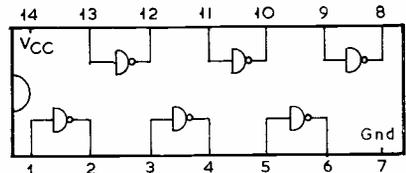


Fig. 2

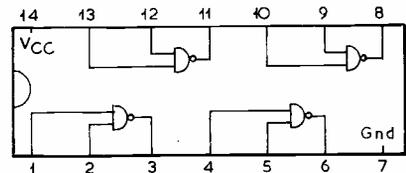
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way of making the oscillator compatible is to actually use a TTL integrated circuit in the first place. This will ensure that the output has fast edges which are necessary when driving counters such as the 7490, and are desirable for many other applications.

The circuit (Fig. 2) consists basically of two inverters in the oscillator itself and one further inverter to act as a buffer. The crystal is operated in the series mode and is placed in the feedback loop of the inverters which are biased into their operating region for this application by two 2.2K resistors. The variable capacitor is used to trim the crystal to the exact frequency; the integrated circuit used is a 7404, although it is possible to use a 7400 *nand* gate in its place by connecting the extra input up to the supply rail.



Top view 7404



Top view 7400

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The power rail should be free from ripple and be between 4.5 and 5.5 volts: it should on no account be allowed to rise above 7 volts otherwise the chip may be destroyed. Owing to the high speed of TTL the supply should be well decoupled to earth otherwise spikes will be found on the rail which may affect other circuitry fed from the same supply.

The circuit was found to operate over a wide range of frequencies, a 2.0 MHz being used most often. The output from the oscillator gave a fairly good square-wave output but the buffer improved it and also prevented any loading effects. Care is necessary when constructing the oscillator as far as layout is concerned to prevent any spurious outputs. The circuit has proved to be an easy and reliable way of generating a signal from the minimum of components, and the output is rich in harmonics making it useable as a calibrator.

Conclusion

Just one example is given here as there are many other designs using both transistors and valves in textbooks. Few have been seen using TTL gates and for this reason it is given here.

AFLOAT ON 28 MHz—AND OTHER MATTERS

HANDIE - TALKIES ARE HANDY!

THERE must still be many of those cheap-and-cheerful single channel transceivers about which were originally designed for the Citizens Band in U.S.A. and were flooding on to the U.K. market until the authorities stepped in some years ago. G3MWF has a pair of these, converted to tune to 28.186; super-regenerative "rush-boxes" to receive, turned into simple transmitters when the red button is pressed, and when he and the writer took our spring cruise along the Oxford canal this year, the little boxes came too, as well as the "big rig" which helps to flatten the battery if we feel we want to talk to the world.

The writer has, he must admit, always regarded these simple little boxes as toys—but on several occasions it was possible to decipher Italian speech, indicating that the band was open to first-hop signals rather more often than we had thought likely. As for the outgoing signal, there is not much of it (500 milliwatts) and what there is is not very heavily modulated. The range, though, is surprisingly good as long as one is line-of-sight. During wet weather with the cockpit canopy up, the operation of canal locks proved to be much easier, the radio contact taking the place of the usual waving of arms and loud shouting between the tow-path party and the steerer, who was able to stay out of sight in the dry, until the level of water in the locks brought the ground party into sight who then could come back aboard to a steaming brew of tea.

Such use, of course, is very much along the lines of the stated objectives of Citizens Band; on the other hand, it had its educational value—for example, one often hears about the disadvantages of indoor aerials, but at ten metres, how much attenuation really does occur? We found out, the hard way, that a 200-year-old canal bridge, entirely brick as far as could be seen, would result in a complete wipe-out at a range of 100 yards—from S9 right down to the point where there was no carrier resolvable, let alone modulation, in either direction, while the bridge remained in the path . . . but just let one aerial peep out at the other, and we were back in business!

Another purpose for a pair of these appeared when we arrived back home. Even before we had parked the boat and its trailer we noticed that the end-fed long-wire for the LF bands was down, it apparently having tangled with the new growth on a tree which was barely head-high when the long-wire first went up. This particular wire is never an easy one to get up and in-the-clear, as there are buildings in the way of the span to impede the view, not to mention a boat and trailer, from the halyard. In this case, the handie-talkie box was found very useful indeed, cutting the time required for re-erection and clearing-up from an afternoon's work to a few minutes.

While the writer has in fact never tried them, one possible use is in the case of an attack of TVI or BCI; there is nothing more time-wasting and annoying to both viewer and operator than the business of dashing back and forth, while the TV owner struggles to describe

what has happened while the operator is driving the rig; how much easier to have one transceiver at the shack and one at the TV set, with a fellow amateur to do whatever is required in the shack while one watches the effect on the TV set of the complainant. Again, a case of TVI should be turned into a few minutes task, as against several hours or a careful exercise in timing and synchronising without the little talk-boxes.

Most of them are very simple indeed to modify, and they are quite economical on battery power—which is not to say that battery power is ever as cheap as the mains power supplies!

This writer is on the lookout for a pair for himself now—any offers?

AN INVESTIGATION INTO ONE-WAY PROPAGATION ON TWO-METRES

R. J. J. ATKIN, GW4DCA

Introduction

TWO-METRE working from GW4DCA in South Glamorgan has always been moderately successful during "lift" conditions, many stations in the Eastern Counties and on the Continent have been worked. Reception of GB3VHF has been a good indicator of conditions, but on many occasions when the Wrotham beacon has been heard at above average strength no replies have been received to what seemed to be endless calls of CQ. London stations when specifically called failed to reply.

It appeared that a one-way propagation effect occurred from time to time. To investigate whether such a phenomenon occurred a series of tests were made with G3NRT at Harpenden—a distance of 206 km.

Both stations attempted to make contact on CW every night over a period of several months, and succeeded more often than either station thought possible, but the main object was to note any occasion when propagation conditions seemed to favour one direction more than the other.

The Procedure

Before starting the tests a procedure had to be worked out: since neither station was equipped with a receiver calibrated in any absolute unit of signal strength, nor any proven method of checking receiver gain each time it was used, a subjective assessment of the received signal had to be used.

It was decided that the conventional RST code was not suitable for this purpose and a "reliability" rating was used instead. Both operators at the end of the evening's test assessed the overall reliability of the signal; if the received signal peaked S9 but faded into the noise frequently—thus requiring repeats from the other station—the overall reliability of the signal might be rated at 30%. A weak but steady signal would rate 100%.

The main objection to this was that it still remained subjective, a signal heard at G3NRT might be rated 50% and the same signal 30% by GW4DCA. This

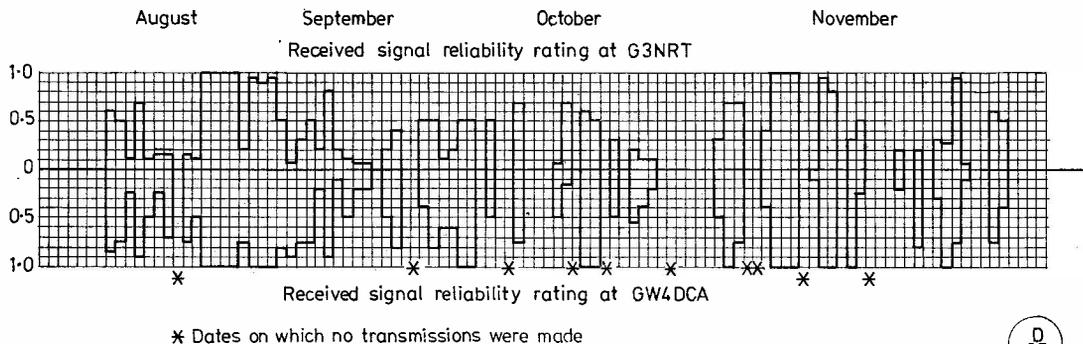


Fig. 1

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problem was overcome by plotting the Reliability Rating on a graph (Fig. 1). The rating of the received signal heard at G3NRT is shown positively, the rating of the signal heard at GW4DCA negatively. Any bias then shows up over a number of days as a shift in the symmetry about the time axis. Having arrived at a suitable procedure for the tests thoughts turned to any other data which should be recorded. The most obvious was the state of the weather, so barometric pressure and a brief note of the conditions, e.g., "wet," "dry" were added to the daily recordings.

For a period of four months with a few exceptions attempts were made to communicate on 144.14 MHz at 22.00 each day. At the start of the period barometric pressure was high and daily communication was maintained, but as Winter set in the reliability fell. It was surprising how often good signal reports were exchanged during this period. At the end of November the tests ceased; it would have been interesting to have carried on but for a variety of reasons the experiment had to stop.

The Results

Examination of the reliability graph for the period showed no clear repetition of GW4DCA's previous experience of one-way propagation. There were several instances where the reliability of the signal was better at the Welsh end of the link: could this be partial support for the phenomenon? Sifting data without some tentative

idea of what might be significant is a wasteful pursuit, and so a tentative hypothesis was made up. The data was then examined to see if the hypothesis was supported.

The Hypothesis

If a low pressure weather system exists over the eastern part of the country and a high pressure area moves in from the West, then signals transmitted from West to East will be totally reflected at the high-low boundary (Fig. 2). Signals from East to West will be refracted at the high-low boundary and received at the western station. This hypothesis is based on established optical theory and assumes that the two-metre signal behaves in a similar way to a light ray travelling through a glass/air boundary. Weather maps for days when reception at GW4DCA appeared better than at G3NRT were examined to see if a high-low pressure boundary lay across the East-West path. Examination of synoptic charts revealed no fronts across the East-West path.

It is possible that the synoptic charts gave insufficient information since the charts show air pressure only at ground level. A weather front can extend a considerable distance horizontally from its "top" in the atmosphere to its base at ground level.

Conclusions

Although no clear evidence of one-way propagation was obtained, a few occasions occurred when propagation was apparently better in one direction, but this could be due to operator bias in assessing the received signal. The tests showed clearly that communication on two-metres over a non-optical path could be accomplished more often than one might expect with modest equipment. Both operators ran 15w. input with an eight-over-eight at GW4DCA and an eight-element Yagi at G3NRT.

Epilogue

Although the tests failed to record any evidence of one-way propagation it is hoped that this account will encourage others to search for the phenomenon and that the procedure used to record the data may be of assistance.

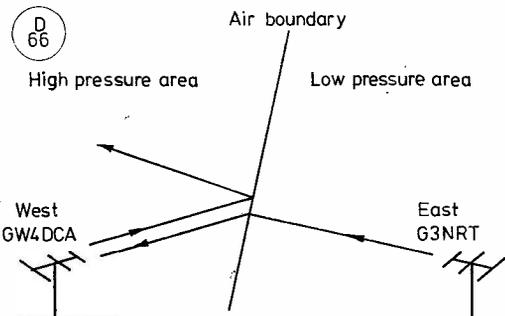


Fig. 2

Signals from the West are totally reflected at the boundary of the high and low pressure systems. Signals from the East are refracted and received at the western station.

Daily Weather Reports providing synoptic charts of weather at six-hourly intervals for the UK and Western Europe can be obtained from the Meteorological Office, Bracknell, Berks.

THE MONTH WITH THE CLUBS

By "Club Secretary"

OUR first "Clubs" with the new deadline advertised, and coming right in the middle of "summer" we expect a combination of weather, holidays, and the new short deadline to make us, between them, low on material this time. Let us see!

Our starter this time is **Cheltenham (RSGB)** who were missed last time in effect, since they had a late change which just missed the bus. The group get together at the Old Bakery, Chester Walk, at the rear of the Public Library in Clarence Street, on the first Thursday in the month, which looks to be August 4. No doubt the Hon. Sec. will be pleased to get you up on the programme details which at the time of writing are not known here. The address of the Hon. Sec. is as shown in the Panel on p.358.

On to **Milton Keynes**, where **G8HUH** is going to talk about "Telly Bashing" which we hope does not entail any blunt instruments; but then a look at the covering letter indicates that he has given place to **G8CXT** who will be discussing the Milton Keynes repeater on August 8; and that the venue is Lovat Hall, Silver Street, Newport Pagnell. No doubt **G8HUH** will not escape unscathed—he will be shotgunned into the next vacancy for a speaker!

B.A.T.C. is the initials under which hide the British Amateur Television Club; and they write to give advance warning of their convention to be held in Birmingham's University of Aston on Saturday November 19, where they have invited all known suppliers of amateur SS/TV gear to exhibit, and would like everyone to bring their own homebrew SS/TV tackle and show it; in addition there will be lectures in the afternoon. Free car parking is available at the University, albeit food involves nipping into the centre of Brum. For all the details on this Slow Scan TV Convention, contact: Mike Crampton, **G8DLX**, 16 Pervical Road, Rugby, Warwickshire CV22 5JS.

Now **Peterborough**, who suffered oblivion last time round in the filing system here; not so this time, as **G2NJ** is *determined* we won't do it again! He tells us they are booked in on Friday August 19 for a talk on **RAEN**, at the Scout Hut, Occupation Road, Peterborough.

A noticeably altered layout appears in the **Reigate** Newsletter, and from it we gather they have August 2 for their informal at the Marquis of Granby in Redhill, which gives August 16 as the date for the "main" meeting at the upstairs Meeting Room at the Constitutional Centre, Warwick Road, Redhill, starting at 2000.

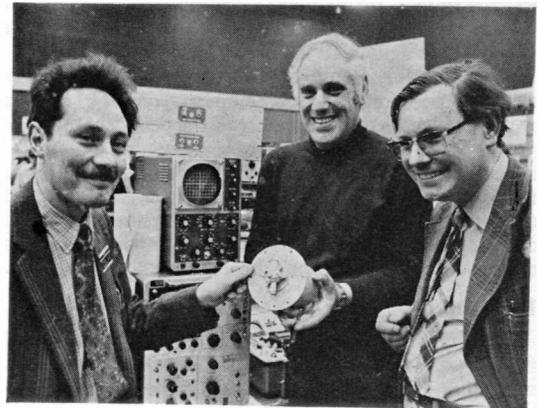
Verulam have their main "do" each month in the Market Hall, St. Albans, the current one being August 25, when **G2YS**, late of the Coventry club, will be giving a talk and showing slides; and there is also an informal session at Salisbury Hall, London Colney, for the date of which we have to refer you to the Hon. Sec. Looking forward to September 22, they have called upon the services of our Editor; they do not as yet know what he

will be talking about—neither, we suspect, does he . . .

Up North now, to **Lothians**; this group are in recess during the summer, but will again be operational and active in "early autumn" which we presume means the end of the holiday season around mid-September—but the new Hon. Sec. is bursting to tell you all the details if you will contact him at the address in the Panel.

Just about every group, at one time or another, seems to have a fit of the doldrums; some die of it, while others hang on in a sort of suspended animation, and others for no apparent reason completely recover and swing up to new heights. At **Crystal Palace** they had years of steady success under the hands of **G3FZL** as Hon. Sec., but when he had to give up for business reasons, they seemed to begin to go into a decline—but the committee spotted it, and are going into action to bring them back on to an upward trend—the first part of which is to co-opt **G3FZL** back on to the committee, along with **G8JUG**. On August 20, they have a Measuring Evening, at which **G300U** and **G4BWG** will bring along equipment on which to "look at" anything members may care to bring to the meeting. Hq. address is, as for so long, Emmanuel Church Hall, Barry Road, Dulwich.

Acton, Brentford & Chiswick assemble at 66 High



Visitors to the Kelghley Park Rally held on 22nd May in the Victoria Leisure Centre, included (l. to r.) Phil Broadhurst **G8LXX**, Ivor Shaw **G3KWT** and Don Nappin **G3MLS**, who are here discussing the relative merits of some of the gear on sale. Below, general view of the hall and stands.



Road, Chiswick (The Chiswick Trades and Social Club) on August 16, for a discussion on the G6XN concept of the "Disappearing Inductance" in the context of miniaturising aerial arrays—a very interesting feat, and in this writer's opinion, one of the breakthroughs of the decade in aerial terms.

Our next port of call is at Bromsgrove where the relevant date is August 12, when it is hoped they will be hearing a talk on microwaves, at their usual Hq. at Avoncroft Art Centre.

The G-QRP Club is, as most people will know, the group who are all interested in low-power operating and simple receiver systems as well—most of the members are CW, this being the most efficient means of communication by radio available to amateurs, but quite a few are phone operators and SWL's. All the details from the Hon. Sec., at the address in the Panel.

Reading the Sutton & Cheam newsletter rather gives the impression that the group do not have a meeting in August; but as we are not certain of this, it is suggested that you contact the Hon. Sec.—see Panel.

Like many others, the Hon. Sec. of the South-East Kent YMCA gang finds it difficult to define his programme far enough ahead to meet our deadline—this problem is appreciated and we have fought long and hard to try and keep the old schedule without success, due to the problem of our printer's workload. However, any Hon. Sec. who finds himself in this position needs only to say what the dates and Hq. address are, and we can note in the column that anyone who wants the up-to-date "gen" can get in touch through the address Panel, or indeed just turn up in the knowledge that something will be arranged in time. Reverting to SE Kent, they are booked in for Every Wednesday evening at the YMCA, Godwyn



Three well-known faces at a recent meeting of the Wessex Amateur Radio Group: left to right, Ken Alford G2DX, one of the two remaining stations from the 1913 "Directory of Experimental Wireless Stations"; Frank Hicks-Arnold G6MB, WARG President and prominent in Amateur Radio activities since well before 1939; "Dud" Charman G6CJ, universally known for his 'Aerial Circus' lecture.

Street, Dover; and they stress that they welcome visitors and intending members.

It's the first and third Thursdays of each month, at the Staff Canteen of Hawker Siddeley Dynamics, in Gunnels Wood Road for Stevenage. It is understood they have formed a VHF Contest Group which holds the call G8NIY; and they intend to use it regularly.

Deadlines for "Clubs" for the next three months:—

(For September issue—July 29th)

For October issue—August 26th

For November issue—September 30th

For December issue—October 28th

Please be sure to note these dates!



Members of the White Rose Radio Society, G3XEP, pictured just before going on the air from their portable site in Roundhay Park, Leeds, in the National Field Day competition held on 11th-12th June. Left to right, Geoff. Denby G3FCW (Club President), Andrew Lillywhite G8MEM and Paul Kirby G3XUD (Contest Manager).

The East Lancs. crowd are in recess for August, but start again very promptly on September 1; the regular routine is to get together on the first Thursday of each month, at the YMCA in Blackburn. The September date is set down for a Surplus sale, which is a good way in most groups of getting a good turn-out!

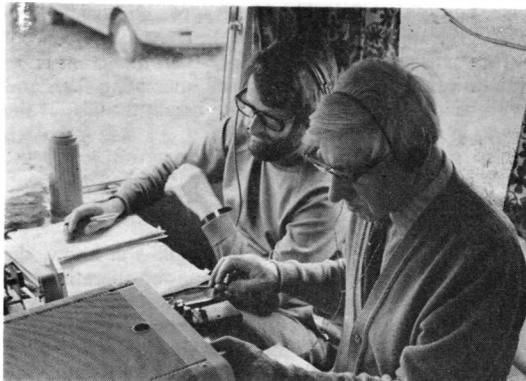
Derby (Nunsfield House) sent a report of the Elvaston Castle Rally for which there was a turn-out of about 1100 cars, helped no doubt by the fact that although the previous day was a shocker, June 12 turned out to be very pleasant until quite late in the afternoon when rain fell, although luckily the visitors mostly seemed hardy types who were not to be deterred by a spit of rain. It sounds to have been a really first-class Rally—congratulations! As to the programme, the lads foregather every Friday evening; August 5 is down for a talk

by G3YTX, and on 12th there is a Technical Film Show. A Night on the Air is set for August 19, and on 26th G3VKH has "More thoughts on Active Filters." The venue is Room 7, Nunsfield House, Boulton Lane, Elvaston, Derby, for the Friday affairs; but on Mondays they also are open, to operate the gear in the club shack at the same address or to work on some bit of equipment or to just natter the evening away.

The typewriter of the Hon. Sec. of Bristol (RSGB) group went a mite awry when he said that they have a rally on Sunday August 22 and a meeting on Monday August 22! The Rally is in fact on August 21, at Ashton Court and takes the form of a mobile picnic, while on Monday 22, at Queens Building, Clifton, starting at 7 p.m. they have a Home Construction Evening when the judges will be the members themselves.

Wessex (Bournemouth) amateur radio group have Hq. at the Dolphin Hotel, Holdenhurst Road, Bournemouth on August 5 and 19. On the first date, G6MB and G4AMW will be talking about the building and operation of transceivers based on the Plessey SL600 Series of integrated circuits, while the later date is given over to a discussion on Power Supply Units, followed by a talk aimed at anyone studying for R.A.E., on how to use one's study time. In addition they have a special-event station running on Monday August 29, signing G5NF for the New Milton Rotary Fete.

Normally the first Thursday in the month is a "Forum" at Nottingham; this routine is followed in August but the rest of the month, due to the holiday season will be devoted to informal "Activity Nights" with the possibility of a two-metre Foxhunt being put on one evening as the Activity. Hq. address is Sherwood



The Thames Valley ARTS NFD entry operated with all the home comforts of a member's caravan at Kempton Park racecourse, but had to wait until 4.45 p.m. for the last race to finish before erecting the aerial poles! Here we see G3GTX on the key, with G3OGP and the KW-2000.

Community Centre, Mansfield Road, Nottingham, every Thursday evening.

At Southdown their date is August 1, at Chaseley Home, South Cliff, Eastbourne, for a Quiz thought up by G3ZQB, and also a display of photographs of the recent visit by members of Radio Club de Normandie (and, it should be noted, the Southdown members are off to Rouen to return the visit over September 24/25); and on September 5 there is a lecture on RSGB Contests.

The first and third Thursdays of each month are the ones booked by Cray Valley, the venue being Eltham United Reformed Church, 1 Court Road, London

Names and Addresses of Club Secretaries reporting in this issue:

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London W3 8LB.
 BATC: M. Cox, G8HUA, 13 Dane Close, Broughton Brigg, South Humberside.
 BRISTOL (RSGB): B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead BS20 8NQ. (Bristol 848140).
 BROMSGROVE: R. Blacker, G4GBE, 23 Leasow Road, Rubery, Birmingham B45 9TB.
 CHELTENHAM (RSGB): G. D. Lively, G3KII, 26 Priors Road, Cheltenham (34785), Glos.
 CRAY VALLEY: J. M. B. Tripp, G3YWO, 57 Cathcart Drive, Orpington (38199), Kent.
 CRYSTAL PALACE: G. Cluer, G4AVV, 24 Patterson Road, Upper Norwood, London SE19 2LD. (01-653 4340).
 DERBY (Nunsfield House): I. Cage, G4CTZ, 25 Petersham Drive, Alvaston, Derby DE2 0JU.
 EAST LANCS.: E. A. Lomax, G4DGR/5N2ABG, West End Post Office, Accrington (34012), BB5 4NQ.
 G-QRP CLUB: Rev. G. C. Dobbs, G3RJV, 8 Redgates Court, Main Street, Calverton, Notts., NG14 6LR. (Woodborough 3920).
 HEREFORD: S. Jesson, G4CNY, 181 Kings Road, Hereford (3237).
 LOTHIAN: P. J. Dick, GM4DTH, 89 Trinity Road, Edinburgh EH5 3JX.
 MILTON KEYNES: D. Stimson, G3THC, 108 Cambridge Street, Wolverton, Milton Keynes (316730) MK12 5AH.
 NOTTINGHAM: M. C. Shaw, G4EKW, 50 White Road, Nottingham NG5 1JR.

PETERBOROUGH: L. Critchley, G3EEL, 36 Waterloo Road, Peterborough, Cambs.
 RAIBC: H. Boule, G2CLP, 14 Queens Drive, Bedford MK14 9BQ.
 SHEFFIELD: B. Nabb, G4EFZ, 32 Hallamshire Road, Sheffield 10. (304939).
 SHEFFIELD (Association of Clubs): B. Flounders, 24 Birley Spa Lane, Sheffield, S. Yorks.
 SOUTHDOWN: B. Chuter, G8CVV, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex BN20 9JG.
 S.E. KENT YMCA: P. Whattton, G4DCV, 21 High Street, Dover, Kent CT16 1EB. (0304 206320).
 SOUTHGATE: B. Oughton, G4AEZ, 48 Morley Hill, Enfield, Middx. (01-366 7166).
 STEVENAGE: T. J. Tugwell, G8KMV, 11 The Dell, Stevenage, Herts. SG1 1PH.
 SUTTON & CHEAM: J. Korndorfer, G2DMR, 19 Park Road, Banstead, Surrey.
 UK FM GROUP (LONDON): R. G. Street, G3TJA, 3 White Ledges, St. Stephens Road, London W13.
 VERULAM: B. H. Pickford, G4DUS, 130 The Drive, Rickmansworth, Herts.
 WAMRAC: L. Colley, G3AGX, "Micasa," 13 Ferry Road, Wawne, Nr. Hull, Yorks. HU7 5XU.
 WESSEX (Bournemouth): G. D. Cole, G4EMN, 6 St. Anthony's Road, Bournemouth BH2 6PD. (0202 20027).
 WORKSOP: D. L. Rush, G4CRE, 87 Rydal Drive, Worksop.



The Oxford and District ARS recently held its annual Construction Contest and here Robin Pearce-Boby G3JLE (President of the Society and second from right) presents the Ben Farmer Cup to Chairman Jeff. Jefferies G8PX for his In-Line Wattmeter; there was a tie for second-place between Tony Earle G4FTA (left) and Dick Priddy G2HMY (right).

SE9. At the time of writing we have no knowledge of the goings-on, but we can say that they always have something of interest organised. An extra activity in August is a coach trip to Woburn for the Rally. More details from the Hon. Sec. at the address in the Panel.

UK FM Group continue the high standard of their Newsletter; a good editorial, a very good technical article, and a cartoon of merit, printed in such a manner that it can be read easily—let us hope they can keep it up. For details on their next meeting, and the venue, drop a line to the Hon. Sec. at the address in the Panel.

It isn't very often that we can mention a meeting of RAIBC; by its very nature as a club whose members are invalid, bedfast or blind—and sometimes all three—the main activity is the newsletter *Radial*. However, all full members, and supporters should make a note of the date, September 25, which is set aside for another of the Romsey Picnics, on the Fairground at Broadlands. If you have an RAIBC member near you, or someone who ought to be, how about arranging to take that person to the Romsey affair? The Hon. Sec. will surely have some more details by the time we come to print; his address is in the Secretaries Panel.

At Southgate the venue is the Scout Hut, Wilson Street, which is just off Winchmore Hill Green; but we have to do a bit of extrapolation to arrive at the conclusion that the date is the second Thursday in each month. For latest details, contact the Hon. Sec.—see Panel.

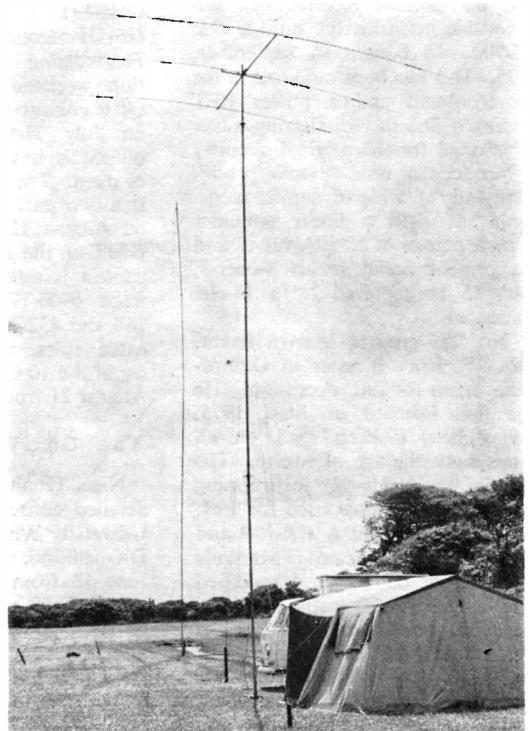
Hereford in their Newsletter indicate one of the problems that arise when using beam aerials on Field Days; but despite their difficulties they seem to have had a lot of fun with it. The Hq. address is in the Civil Defence Hq., Gaol Street, Hereford, and they are to be found there on the first and third Friday of the month: August 5 is down for a construction contest with a visiting amateur as judge, while the second meeting has yet to be settled. There is a query about the latter in

your scribe's mind insofar as we make the date 19th, while the newsletter says 15th! No doubt a quick call to the Hon. Sec. will settle the problem.

WAMRAC is theoretically a world-wide group of Methodist radio amateurs, but in practice they accept into membership members of any Christian order. Details from the Hon. Sec.—see Panel.

The several local groups in the Sheffield area have a combined organisation with a common newsletter, and occasional combined meetings to which they can attract the best speakers. From the newsletter we gather that **Workshop** are at the Anchor Inn every Thursday evening, the University gang are at the Red Deer off Mappin Street, the Polytechnic group foregather on Thursdays in term, and the Sheffield club itself is to be found at the Sheaf House Hotel on the third Monday in the month. Queries on any of these to the respective Hon. Secs.—see Panel.

Deadline dates for the forthcoming issues, it should be noted, are now given for three months ahead in a suitable "box" in the body of the piece; make a note of it in your diary, or remind your club scribe (gently, please!) about it, so that we get back to our normal size. Address it all to your *Club Secretary*, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.



The tent, 45ft. TA-33 beam and 60ft. pole aerial of the Cornwall Radio Amateur Club, pictured on their Field Day held at St. Ives.

VHF BANDS

NORMAN FITCH, G3FPK

VHFCC Awards

TWO more readers have won their VHFCC certificates this month. John Nelson, G4FRX (ex-G8HAL) receives 2m. certificate No. 284 for operation from his "hole in the ground" QTH in Hammersmith, West London. First licensed in February, 1973 as GW8HAL, initial operation was with a variety of QRP transmitters and an oriental receiver of "unbelievable insensitivity" until a *Trio TS-700* was bought in September, 1975. This has been modified in the Rx front-end and a power FET feeding a *Schottky* diode ring mixer substituted for the original circuitry to produce a near "bomb proof" front-end of wide dynamic range. John has built a linear amplifier using a pair of 4CX350A valves and the present aerial is an 8-over-8, soon to be replaced by a 14-ele. *Parabeam*.

No. 285 goes to Martyn Baker, G8KGF, from Bicester in Oxfordshire, again for 2m. operation. He was first licensed in June, 1975, having been a keen *s.w.l.* on all bands since the age of twelve. The first Tx was a *Murphy* job running 5 watts of AM, now used for FM, reception being via a *CR-100* and home made converter. Martyn's present gear comprises a modified *Liner-2* with an 80 watts amplifier, the aerial being an 8-ele. *Yagi* at 9m. rotated by the "armstrong" method. An interesting project has been research into speech processing units carried out at Southampton University as part of his B.Ed. degree. College studies now completed, Martyn commences teaching this September and now hopes to be able to operate more, improve his CW and get going on 70 cms.

Contests

Results:—The 70 MHz Open on April 3 resulted in a win for G3JYP (Cumbria) in the fixed section with G3LVP (Essex) runner up. The portable section was won by G3UUT with GW3WRA in second spot. The fixed section of the 432 MHz Open on May 15 was won by G4CVI (Surrey) with 532 points, second place going to G3OSS (London) with 286. The portable part was won by G3PMH with 820 points and GW3UCX was second with 798. This contest attracted only 27 entries.

The 1.3 GHz Open on May 14 was won by G3JXN (London) with 1046 points in the fixed section, second place going to G3FYX (Bristol) with 441. The winner of the portable half was G3PMH with 2245 points and second was G3ULT with 1858. As expected, the winners of the 144 MHz portable affair the last weekend in May were GW8BHH with 7152 points with G6HH second with 5867.

Forthcoming events:—Our publication weekend sees the 144 MHz QRP contest from 0900-1700 GMT on July 31 when maximum Tx output is limited to one watt CW of p.e.p. The 70 MHz Open contest is a two part affair from 1900-2300 on August 13 and from 0700-1500 GMT on the 14th. RSGB Region 1 contest is scheduled for August 14 from 0900-1700 GMT using 70, 144 and 432 MHz. Rather complicated rules, though. The fourth leg of the 10 GHz Cumulatives is on August 21 from 1100-2000 GMT.

The G6UW Scottish Trip

Nigel Hoult, G4CIK, has sent a detailed account of the Cambridge University Wireless Society's annual DX-pedition. Operation started on June 13 from Green Lowther Hill (Strathclyde) some 2,500ft. *a.s.l.* but no DX was worked. Next day they operated from the Mull of Galloway and managed to work south of England stations. On the 15th, there first MS QSO, with SM3BIU, was completed in 1½ hours for the best DX of the trip at 1,530 km. That evening they moved to 2 km. NE of Kilsyth arriving rather late. Apart from G3FPK, nothing south of the Midlands was worked and an MS sked with YU2CBM was a

total failure. A climb up Ben Nevis with an *IC-202* on the 16th found them above a temperature inversion with only GM8DMZ audible.

There followed two days operation from Berriedale (Highlands) in YS63j when propagation began to improve with LA, OZ and SM worked on 2m. but only GM contacts on 70cm. 4m. produced some QSO's with northern G stations. On June 19 and 20 they operated from ZR41c near Peterhead working into all G areas except the south west, plus F, DL, PA, ON, LA, OZ and SM. On 4m., G3CO (Essex) at 625 km., was their best DX. Their own 70cm. linear having failed earlier, GM8FFX came to the rescue with his enabling them to work G, GM, F, PA, DL and SM, best DX being F1CVU and DC1XC at about 880 km.

On the way back south, they stopped off in Borders region and Northumberland. On 2m., they made contact with 508 stations in 13 countries and on 70cm. they worked 11 countries. 4m. was less successful as the "prime mover" was also used for 70cm. Nigel mentioned the bad operating tactics of some stations. Persistent offenders were blacklisted and subsequently ignored!

DX Notes

The Faroes trip by the Swedish lads from Chalmers University may continue to August 17 according to information from G3POI. They will be using 500 watts on 2m. with 70cm. operation as well from either WV or WW square. Andorra seekers should note that from August 3 to 7, ON5UN and ON6UG plan to activate G31UN with a good PA and two 16-ele. *Yagis*.

Mediterranean Update

Two lengthy letters from Henry Souchet, 9H1CD, cover events from March till the beginning of July. There have been frequent periods of good tropo. conditions into Greece and Israel engendering an encouraging increase in DX activity. An interesting QSO took place in April when SV1DH used Monenvasia Castle in southern Greece (LW16e) to reflect his 2m. signal into Malta. Henry thinks his QSO with 4X10JW in Jerusalem (RR07f) may be a new European tropo. record.

The first *E's* of this season occurred

on June 7 with a few weak F and PA stations worked by 9HI's BT, CD and ED. The 11th saw some fine tropo. into Spain with signals coming in like locals. 9HIB and 9HICG made their first EA QSO's. More E's on the 18th allowed SVIAB (Athens) to work into Spain and SVIKH (Pirgos) into France. A patchy E's session the next day produced QSO's with three Germans in DJ square. Another tropo. opening into Israel on the 20th revealed more 4X4's on SSB using horizontal aerials. The E's on the 24th lasted from 1523 to 1620 GMT and was remarkable for the very short skip contacts.

Henry mentions that he, with 9HI's BT, C and EU have earned the nickname of "The Maltese Falcons" since they never miss the slightest VHF opening. Their immense enthusiasm to push VHF DX to the limit is rubbing off on other Mediterranean operators now that they see what can be done. This is the way to prove that amateur radio is a worthwhile pursuit since so much is learnt about propagation.

Satellite Matters

Oscar 6 finally died around June 10 due to battery failure. Originally designed for a life of one year, it was pretty reliable for 4 years and 8 months. Due to a couple of failures in the Thor-Delta launch vehicles, the earliest possible launch for A-O-D is between February 15 and April 1, 1978. AMSAT believes that the rumoured Soviet amateur satellite may be launched in October.

Joe Kasser, G3ZCZ, editor of the AMSAT-USA Newsletter, informs that the Comsat Corporation donated a portable Oscar terminal to the Boy Scouts on June 6 and which is kept at the Geneva World Scout Hq. It was assembled in the U.S.A. from Japanese parts by an English amateur, which latter was very appropriate as the Boy Scout movement was started by an Englishman. Its first demonstration was at a site 20 km. north of Washington DC and stations in Kentucky, Illinois and California were worked via 0-7.

Beacons

The 4m. beacon, GB3SX, is now on again on 70-685 MHz from AL71d. During a 2m. QSO,



David Butler operating G4ASR/P during the May 2m. portable contest. The "prime-mover" was an FT-DX560 transceiver driving a Europa transverter feeding two bayed, 6-element, Jaybeam quads; additional punch to the signal was provided by a Datong RF speech processor. 432 stations were worked on 23cm., 70cm. and 2m. during the last three weeks in May from a rare "XJ" QTH square in Cornwall.

GM3ZBE mentioned he would be getting a new crystal for the Angus beacon, GB3ANG, to get it onto its allocated QRG of 144-975 MHz, as he cannot pull the existing one down onto frequency. He said that the Lerwick beacon, GB3LER, is all ready but he has not had time yet to instal it. Maybe working soon after this is published, on 144-955 MHz.

From G8HUY came news of a new East German beacon, DMØVHF (FN27h) on 144-985 MHz using crossed dipoles and ten watts. There are reports of ISØA around 144-145 MHz heard during an E's opening and E's watchers should listen for EA2OIZ, whereabouts unknown, on 28-247 MHz for indications of possible E's to Iberia on 4m. and 2m. This one gives its call six times in chirpy CW, followed by a long period of carrier. F8SH reports reception of FX3VHF on 50-1 MHz by VE1ASJ in New Brunswick on June 7 via two or three hop E's.

Repeaters

From a GB2RS news item on July 10, it seems that no UHF Phase 2 nor any new VHF repeaters will be licensed, "... for the time being until certain legal aspects have been resolved." RSGB Council has upheld the Repeater Working Group's recommendation that channel RB8 be allocated to Raynet

for emergency, portable repeater use.

NFD Roundup

For most participants, VHF NFD coincided with very hot, sunny weather. Many amateurs have remarked since, over the air, that there were some really foul signals about, especially on 2m. One of the worst at G3FPK was a G5 who managed to splatter over 50 kHz even when only S7! By contrast, the enormous signal from G3ASR/P, the Edgware and District RS's 2m. station, was one of the narrowest and cleanest ever heard, using G3SJE's gear.

The Norfolk VHF Contest Group managed 6 QSO's on 23 cm. from G8AWZ/P; 49 on 70 cm. from G8ECN/P; 508 on 2m. from G4BEW/P and 99 on 4m. from G3ZIG/P. G(W)8BHH reports 18 QSO's on 23 cm.; 161 on 70 cm.; 603 on 2m. and 124 on 4m. from Beacon Hill, Powys. G4ERX writes that the Vange ARS entered two stations. 367 QSO's were made by G3YCW/P on 2m. with 9 countries, and 104 by G4ELM/P on 70 cm. with 6 countries.

The Isle of Man RS fielded seven operators for its two stations. On 2m., GD3FLH/P notched up 326 contacts and GD3YEO/P made 119 on 4m. Reporter Richard Rimmer, GD3YEO, mentions bad splatter from a Welsh portable on 2m. On 4m. too, he complains of, "... some really atrocious signals in

quality, stability and spurious outputs." However, he praises GM4BVE/P who was S9-plus-20 dB yet gone within 5 kHz either side. Richard says that the weather was rotten! GM4CXP reports that the Borders ARS operated from Hardens Hill, near Duns (YP18d) using his call on 4m. on which 83 QSO's were concluded, best DX being Cornwall. 2m. produced over 140 contacts with about 20 on 70 cm. G4DGU is very pleased with his 23 cm. set up which made 52 contacts for the A.E.R.E. (Harwell) ARC, by far the most so far known.

As for fixed station operators, G3CHN (Devon) thought 2m. conditions were "mediocre" though Roger did work DG square with HB9AYX/P. He says that F6CTT thought conditions were poor. No great DX was heard/worked from

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3POI	—	—	184	184
G8FUF	1	80	176	257
G3CHN	—	—	140	140
G3FPK	—	—	135	135
9H1CD	—	6	120	126
GM4CXP	—	25	113	138
G4BWG	—	25	110	135
G4CDF	—	—	109	109
G3OHC	4	29	98	131
G3XCS	—	18	98	116
9H1BT	—	—	94	94
G8HVY	—	33	93	126
G4BAH	—	32	92	124
G8BKR	1	11	86	98
G6UW	—	—	85	85
9H1C	—	—	83	83
G4FCD	—	22	81	103
G8GML	6	42	80	128
G8LEF	4	37	79	120
G8HHI	—	16	78	94
G8IWA	—	17	74	91
G8JHX	—	—	74	74
G4AWU	—	—	72	72
G4DEZ	—	—	70	70
G3JXN	20	53	69	142
G8HAF	—	—	69	69
G3COJ	16	52	68	136
G4DKX	5	30	68	103

G8JJR	—	—	68	68
G2AXI	1	40	64	105
G4FBK	—	5	64	69
G8GII	—	22	63	85
G8KLN	—	1	62	63
G4CIK	—	—	62	62
G3KPU	—	—	60	60
G4GCQ	—	—	60	60
G8KSP	—	—	60	60
GD3YEO	—	8	59	67
G8LHT	—	—	58	58
G8JEF	—	—	58	58
G3FIJ	—	25	57	82
GW4FJK	—	—	57	57
GJ8AAZ	—	15	56	71
GD2HDZ	10	25	53	88
OZ9IY	—	—	53	53
G3BW	—	21	47	68
G8ITS	—	7	47	54
G4AEZ	—	15	44	59
G4ERX	—	1	43	44
G4EYL	—	—	41	41
G8KSS	—	—	40	40
G8IFT	6	16	39	61
G8EOP	8	36	38	82
G8LLG	—	1	38	39
G8JAH	—	1	35	36
G8KUC	—	7	34	41
G8JAJ	—	—	24	24
G8JKA	—	—	21	21

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 2m.

G3FPK, only a few weak GM's, a GI, some GW's, GU and GJ. GU5CBE/P was on from Sark but inaudible as they seemed to be beaming home to France all the time. G3OHC (W. Midlands) found plenty of 4m. activity working 62 stations in 3 hours, in 42 countries and 6 countries. On 70 cm., Graham found a lot of activity but did not work any great DX. G3OSS (London) also worked 6 countries on 4m. and was pleased to hear all the activity. G3XCS (Cornwall) found 4m. conditions very good and Colin worked GM4CXP/P and GM4DIJ/P (Strathclyde). On 2m. he worked the rare Wexford county thanks to EI1AA/P (WM19e) the Irish Leprechaun Contest Group!

Gigahertz Bands

G3BW (Cumbria) has taken down his 4m. beam to make room for the 23cm. aerial and is trying, with little success so far, to work some more G squares. G3OHC now has his *Quad Loop Yagi* up at 30ft. Graham has worked 8 countries so far with his 12 watts of FM and CW. On July 10/11 G3OSS got his CW across to SM6FHZ (GQ02c), SK6AB (FR30c) and DK1ZD (EN08f). Angus uses his *TS-700G* to a *Microwave Modules* 144/432 MHz transverter followed by an *Ampere* linear to an *MM* varactor tripler and confessed to shaking with excitement after making these DX contacts. During his "XJ" trips this year, G4ASR/P says his best DX on 23 cm. was 200 km. He will be back on the Lizard in September. G4BYV (Norfolk) reports contacts with DF8QK, PA0's DBQ, TGA and VTW and with SM6ESG during May, the SM being readable for about 3 hours, S9 at times. John also worked GM8BRM/M on SSB using 2 watts from his DJ9ZR mixer to the mobile's halo!

Pete Connors, G8LEF (W. Yorks.) worked SM6ESG (GR72h) on June 21; not bad for only one's fifth contact on the band. The next night he worked PA0VV (CM72d). Pete's 23 cm. gear is a cascaded pair of triplers from his *TS-700* to a *Q-L-Y*. LA8AK and LA6LU informed G8LEF that the Norwegians will be allowed to use 23 cm. from the autumn and 3 cm. from around December. Since June 1, SP and UA stations have been allowed to use 23 cm. with SP6LB and SP9AFI/9 known to be QRV.

Two Metres

No prizes for guessing the main talking point this month. *Sporadic E!* Your conductor has been overwhelmed with written and verbal reports and it is impossible to list all the dozens of contributors. Dick Madigan, EI9Q (Waterford), reckons he hears *E's* signals from the continent about one hour before most of the G stations start working them. On July 12, he managed HG4YFP (JH60c) on CW at 1525 GMT. So, when *E's* seem likely, it might be worth beaming to EI to see if Dick is already working *via* this mode. As far as can be ascertained, there were openings on June

8, when G3IMV worked YU2RIO (JF34j) on CW at 1426; on June 14, from 1630-1900; on the 21st, when G4ERX (Essex) had a contact with 17EMG (IA47a) at 1715; a wide-spread one from about 1445-1545 on the 25th; a brief one on June 28 when G3ZEM (Cleveland) worked UO5BF (OF27a) on CW at 1650; a midday one on July 8, during which GJ8EZA made a "first" with UC2AAB (NN18c) the UC2 also being worked by G8AGU (Devon). This one produced HG8KCP, HG5KDQ, OE1HGW and OK1MG for G8JAG (Cumbria). The most recent *E's* was about one hour's worth from 1440 on July 12 with OE, HG, YO and YU, at least, worked.

Just picking out a few of the more interesting contacts, on June 14 there was GW8CFQ (Clwyd) to IS0PUD (EX66a) and YO2IS (KG22j) at 1830; G18KIA (Co. Antrim) to IT9TAI (GY66c); GW8IVJ (Anglesey) to YU2RQG; GM4CXP to I0SVS (GC51j) at 1640 with IT9JLG? heard. From Leics., G3AKU worked LZ's 2KAD, 1KBI, 2KSO and 2JF on CW between 1815 and 1832, the LZ's inaudible at G3FPK!

On the 25th June, YU3UPI (HG73a) gave GM4CXP 599 at 1527 when Derrick was "messaging about" with one watt output from his IC-202 to his *Parabeam*, and "4S9I" turned out to be HB91—rotten CW! G3COJ (Bucks.) had a half QSO with SP9FG (JJ70b) sending at a leisurely 10 w.p.m. G3CHNs attempt to work YO3SF was ruined by HG4YD who kept bawling at Roger throughout. The countries worked from the U.K. included DL, HG, I, OE, OK, SP, YO and YU. Apologies to the many whose *E's* contacts have not been mentioned, but this month the whole feature could have been devoted to it. However, from the other end of things, Fausto Minardi, I4EAT (FE60) reports having worked CT1, EI, F, G, GI, GM, GW, ON, OZ, SM and 9H in June *via E's*. His friend, I4XCC, worked UW6MA (TH69c) at 1022 GMT on June 20. I4EAT has 165 QTH squares and 40 countries worked on 2m. and is looking for GU and GJ QSO's. Offers to P.O. Box 94, I-48018 Faenza, Italy.

For several days from mid-June,

2m. tropo. conditions were very good. This coincided nicely with the GM6UW operations which gave G3OHC two new squares, ZR and ZP. On June 20, Graham worked LA6HL at last for a new country, with ON, OZ and SM worked on the 23rd. G8HHI (Hants.) worked LA8AK (CU47d) on the 20th and SM7FSE (GQ56b) on the 22nd,

G8JEF (Merseyside) managed three LA's, picked up more squares and asks if we could consider a "QTHCC" award for the working 100 squares. G8KSS (Bristol) got his AM across to LA6HL on the 20th and also to DL and PA. G8LEF had a lot of success with the Scandinavians and noticed the same clockwise rotation of the opening as mentioned for

THREE BAND ANNUAL VHF TABLE
January to December 1977

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G3OHC	46	6	57	14	24	5	152
G8LEF	—	—	66	17	36	11	130
G8GML	—	—	63	12	44	9	128
G4BYP	25	5	51	10	26	7	124
G4FCD	32	2	65	16	3	1	119
G2AXI	22	2	45	15	26	5	115
G3XCS	34	4	48	17	8	4	115
G8HQJ	—	—	58	17	28	10	113
GD2HDZ	14	3	41	13	32	8	111
G4ECQ	28	3	65	15	—	—	111
G3FIJ	27	2	47	10	19	4	109
GM4CXP	17	2	47	17	13	6	102
G8HHI	—	—	54	13	31	4	102
G3BW	—	—	49	12	30	7	98
G8BKR	—	—	60	14	18	4	96
G4CMV	—	—	69	15	7	2	93
G3FPK	—	—	68	20	—	—	88
G4FOR	—	—	62	16	7	2	87
G4DKX	7	1	37	11	19	6	81
G4FBK	—	—	53	14	12	1	80
G8JHX	—	—	60	17	—	—	77
G8IFT	—	—	50	8	16	2	76
G8ITS	—	—	43	8	20	1	72
G4DEZ	—	—	57	15	—	—	72
G8GII	—	—	31	5	28	6	70
G8LHT	—	—	52	13	—	—	65
G4ERX	—	—	48	12	1	1	62
G8KSS	—	—	50	12	—	—	62
G8MKW	—	—	46	10	—	—	56
G8JJR	—	—	47	8	—	—	55
G4GCQ	—	—	45	9	—	—	54
G8HAF	—	—	40	7	—	—	47
G4AEZ	2	1	24	6	12	1	46
G8IZY	—	—	38	7	—	—	45
G4FKI	—	—	21	5	4	1	31

70 cm. G8MDI worked a number of new countries in the period June 16-23 the best DX being on the 23rd with some OZ's and SM's.

Arthur Breese, GD2HDZ, heard LA for the first time ever on the island but his farmer neighbour's unsuppressed muck-spreading tractor blotted it out. However, after a trip to the local, he did work LA8UU and then SM6GUS. On the same night, the 20th, GD3YEO worked his first LA, LA6HL, at 1855. Later on, OZ1BUR was contacted and on succeeding nights, OZ1QQ/A, PA0CIS and DB7XO. PA0OOS, who used the call C31NX from Andorra, said that VHF conditions from the Principality were very poor with only local EA's and F's worked. No doubt the QAH of 2165m. *a.s.l.* was far too high.

As this is being compiled, a spell of good tropo. conditions started at the end of the first week of July with good signals from the north, from Scandinavia and later north Germany, including DM. Late on the 11th, DM3ZBA (GO79c) was besieged by hundreds of stations.

G8APZ worked DM3TKL/P a few miles away in HO71, for a rather rare square.

Meteor Scatter

During their Scottish trip, the CUWS chaps worked SM3BIU (HX18j) from XO26d. From YS63j, they worked DK4TG, SK6AB and DK5MS (GI15e), and SM0FFS from ZR41c. They used 100 watts to a *Parabeam* at 80 w.p.m. CW. The keyer was a home made memory one. Details from G4CIK, at 40 Lower Park Street, Cambridge, CB5 8AR with s.a.e. and 10p for copying. In the daytime *Persoids*, G4DSC made it with SM3FGL (IV53g) on June 4 and with SM3BIU on the 12th. G4DGU had a real time QSO at 170 *l.p.m.* CW with HG5AIR and is claiming a G/CT1 "first" for his SSB contact with CT1WW (WB). On July 12, G3POI worked LA3WU in DV05 for no. 184 square on 2m.

Two Metre Band Plan

A request for users to always QSY

quickly from the SSB/CW calling QRG's of 144-300 and 144-050, after making contact and also *well away*. It is a constant source of amazement that so many operators seem almost scared to move more than 10-20 kHz up or down. It would be appreciated also if the random MS calling frequency of 144-200 MHz was kept clear for that purpose, in the SSB segment, likewise 144-100 MHz in the CW part. There seems to be a lot of rather wideband FM around the ancient 144-48 MHz frequency and some on 144-400 MHz too. Surely it is about time all operators recognised and respected the band plan?

Sign Off

Apologies to many correspondents for omitting their contributions which are nevertheless thoroughly read and digested; keep 'em coming! Next month's deadline is August 4, the following one being September 8. All copy to:—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. 73 *de G3FPK*.

NEW QTH's

This space is for the publication of the addresses of holders of new call signs, 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, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ.

EI3DD, S. O'Rourke, San-Martino, Cloonbrackna, Roscommon, Co. Roscommon.
EI4DD, M. Rossiter, 205 Sundrive Road, Dublin 12.
EI0DB, D. J. Aldridge, The QTH, Ileigh, Thurles, Co. Tipperary.
G3DVL, F. Harrop, 15 Keymer Road, Hollingbury, Brighton BN1 8FB. (*re-issue*).
G4FMK, A. E. Smith, 8 The Parkway, Canvey Island, Essex SS8 0AA.
G4FRE, D. J. Robinson (*ex-G8JMO*), 19 Highfield Road, Attleborough, Nuneaton, Warks. CV11 4PW.
G4FSO, Midlands Electricity Amateur Radio Club, P.O. Box 12 Bull Street, Dudley, West Midlands DY1 2DE.
G4FUB, A. D. Frost, 16 Castle Mead, Hemel Hempstead, Herts. HP1 1PR. (*Tel. Hemel Hempstead 3921.*)
G4FUM, Dr. D. Hutchinson (*ex-G18MIV*) 13 Kernan Grove, Portadown, Co., Armagh BT63 5JU.
G4FVH, J. P. Sumner, 4 Cherry Tree Avenue, Leicester Forest East, Leicester LE3 3FN.
G4FVZ, P. L. Gould (*ex-G8DAX*), 21 Beaconsfield Street, Queens Road, Hull, N. Humberside HU5 2PZ.

G4FXA, V. Arnold, 7 Tintern Avenue, Tyldesley, Manchester M29 7WL. (*Tel. 052-34 78567.*)
G4FXG, R. F. Redhead, 7 Brocklewood Avenue, Poulton-le-Fylde, Lancs. FY6 8BZ.
G4FYS, P. Grimshaw (*ex-G8KME*), 55 Combe Street Lane, Yeovil, Somerset BA21 3PD. (*Tel. Yeovil 4773.*)
G4FZO, W. A. Cash, 10 Alyth Road, Bournemouth, Dorset BH3 7DF.
G4GBE, R. Blacker (*ex-G8JTK*), 23 Leasowe Road, Rubery, Birmingham B45 9TB.
G8MLX, J. A. Perkins, 14 Lowther Road, Norwich, Norfolk NR4 6QW.
G8MUJ, D. Perkins, B.Sc., C.Chem., F.R.I.C., 14 Lowther Road, Norwich, Norfolk NR4 6QW.
G8MXE, W. G. K. Scott, Moor Cottage, Pyworthy, Holsworthy, Devon, EX22 6LG.
G8MXK, R. J. H. Shears, 66 Low Road, Wortwell, Harleston, Norfolk IP20 0HJ. (*Tel. Homerfield (098-686) 435.*)
G8MZX, R. A. Barker, 10 Fontwell Road, Fordhouses, Wolverhampton, West Midlands WV10 6PS.

G8NAI, J. Lazzari, 3 Terson Way, Parkhall Weston Coyney, Stoke-on-Trent ST3 5RQ. (*Tel. 0782-322642.*)
G8NCA, L. Plant, 9 Horton Drive, Weston Coyney, Stoke-on-Trent, Staffs. ST3 5HG. (*Tel. 0782-324695.*)
G8NCC, J. R. Morgan, 13 Manor Green, Stratford-upon-Avon, Warks. CV37 7ES. (*Tel. 0789-4958.*)
G8NEY, D. Millard, 2 Poundfield Road, Minehead, Somerset TA24 5EP.
G8NEZ, P. J. Sharpe, The Post Office Porlock, Minehead, Somerset TA24 8PY.
G8NFI, R. Prince, Ty-Capel Bungalow, Penrynnydd Road, Llangejni, Anglesey, Gwynedd. (*Tel. Llangejni 722957.*)

CHANGE OF ADDRESS

EI6AS, A. E. Latham, 92 Glengaeory Estate, Dun Laoghaire, Co. Dublin.
G3ATU, S. A. Herbert (ZB2CJ), The Cottage, Roker House, St. George's Terrace, Roker, Sunderland, Tyne and Wear.
G3GGG, R. Bishop, 31 Blenheim Close, Didcot, Oxon OX11 7JQ.
G3LNW, J. McGuire, 14 Wolsley Road, Kingston Hill, Stafford ST16 3XN.
G3LYN, R. J. Amblin, 21 Elinghamcombe Way, Bath, Avon.
G3ORP, P. J. Pickering, 21 Palmir Road, Maidstone, Kent ME16 0DL. (*Tel. Maidstone 676776.*)
G3OSH, A. W. Haines, Kariona, 22 St. Peter's Close, Horton, Ilminster, Somerset TA19 9RJ. (*Tel. Ilminster 3349.*)
GW3PXY, E. Thomas, Sunmead, Glanfraed Lane, Llandre, Bow Street, Dyfed SY24 5BY.
G3SS, E. F. Lawden (*ex-5Z4SS*), 89 Heathcote Drive, East Grinstead, West Sussex RH19 1NE. (*Tel. East Grinstead 23861.*)

G3TML, T. H. Lloyd, 6 Gladstone Road, Spondon, Derby DE2 7JJ.
 G3UIK, J. S. Young, 30 Litchfield Way, Hampstead Garden Suburb, London NW11 6NJ.
 G3YLT, T. P. Smith, 38 Argarmools Road, Formby, Merseyside L37 7DA. (Tel. Formby 75966.)
 GM3ZDH, R. A. Dixon, Whaligoe, Coe Gardens, Soroba, Oban, Argyll PA34 4JT.
 G3ZGN, P. Swarbrick, 1 Hill View, Charminster, Dorchester, Dorset.
 GM4AQM, J. M. Kelly, 32 Malcolm Crescent, Monifieth, Dundee, Tayside. (Tel. Monifieth 3036.)

G4AZD, A. G. Edgecock, 8 Jarmin Road, Colchester, Essex. CO1 1XW
 G4BRU, A. Lambe, Nimbus, Boscolla, Truro, Cornwall TR4 9ED. (Tel. 0872-77108.)
 G4CSF, B. Beckwith, 62-A Gladstone Street, Glossop, Derbyshire SK13 8NE.
 G4DEP, D. R. Dabinett, 52 Cedar Grove, Yeovil, Somerset BA21 3JS.
 G4DIU, A. G. Walker, 9 Woodstock Road, Bedhampton, Portsmouth, Hants. PO9 3HX.
 GM4DLU, A. T. McCudden, Cruachan, 1 Balloch Road, Balloch, Dunbartonshire G8 3SR.

G14DQD, H. D. McLaughlin, 24 Josephine Avenue, Limavady, Co. Londonderry BT49 9BA.
 G4EEN, G. Morris, 42 Dunbar Court, 2-A Carshalton Grove, Sutton, Surrey.
 G4EJP, P. R. Sheppard, 24 Grange Road, Leconfield, S. Humberside.
 G4EJP/A, P. R. Sheppard, Signals Division, Army School Mechanical TPT, Leconfield, S. Humberside.
 GM4ENF, A. Fyffe, 21 Newtown, Cupar, Fife.
 G4FFN, C. A. Baker (ZS6BQE), 19 Denne Street, Witfield Ext. 9, Boksburg, Transvaal 1460, Republic of South Africa.

HOW'S YOUR FIST?

NOTES FOR THE GUIDANCE OF WOULD-BE CONTRIBUTORS

HAVE you ever thought about contributing to the literature of Amateur Radio? One would hazard a guess that most people have at one time or another, but have been put off by the effort involved on the one hand, and the lack of knowledge on how to approach it on the other; or even, perchance, by fear that their literary ability is not good enough. In this short note it is hoped we may show "how it's done" properly, and thus encourage new writers to try their hands.

Firstly, the drawings aspect. Circuit diagrams are in any case redrawn by our draughtsman to be in accordance with BS 3939, so what is required here is that it be good enough for him to be able to understand it. As for other drawings, again they will be redrawn to our convention, but these will need a caption, and as far as may be, information which can be transferred from the drawing to the caption should be so treated. Each drawing or photograph should be given a "Fig." number and the captions written on a separate sheet of paper; "Fig." numbers can be shown on the draft drawing, but in the case of photographs the "Fig." number should be pencilled lightly on the back.

Perhaps we should next talk about photographs; quite apart from any articles we are always pleased to receive good photographs to adorn our pages. If a picture is sent in on its own, it is vital to scribble (legibly) a few words to indicate just what it is on a separate sheet; ambiguity must be avoided at all costs! The size is not too important, but should be somewhere in the range between 120 and half-plate for preference. *No colour prints!* It goes without saying that the print should also be as sharp as possible too. As to the shape, don't forget that we may have to crop it a little to get it into the desired space so don't crop it too tightly in the negative or the enlarging, thus giving us a bit of room to manoeuvre things to best effect.

We now come to the real task, the article itself. It should be *typed on one side of the paper only* with the largest possible spacing between lines that the typewriter will afford, and a *large margin* (2½ inches is not too much) on the left hand side, and good margins also at top and bottom, into which space will in due course go the editorial markings. In this age of change, the degree of punctuation tends to vary from the sublime to the gorbliney

between one publication and another, so try to punctuate it as it would be normal to expect it to appear in *SHORT WAVE MAGAZINE*. What really does make us cuss is a superb article written on both sides of airmail paper with a felt-tip pen and an almost indecipherable fist—the written equivalent of Martian Morse!

As for the abbreviations which are inevitable in a technical article, they should be in accordance with our standard convention, so most of them can be got right by no more effort than reading through a couple of issues.

In essence, what this amounts to is to try and make your offering as near as possible to the way it will appear on the final printed page, with each separate part (pictures, drawings, captions, script) all on separate sheets of paper and cross-referenced on a summary sheet which can well carry the title proposed and your name and *correct postal address*.

As to length, up to around 2000 words for a single part article; if it must be longer, then try to divide it into parts yourself as this means your wording will show a natural break where it is wanted.

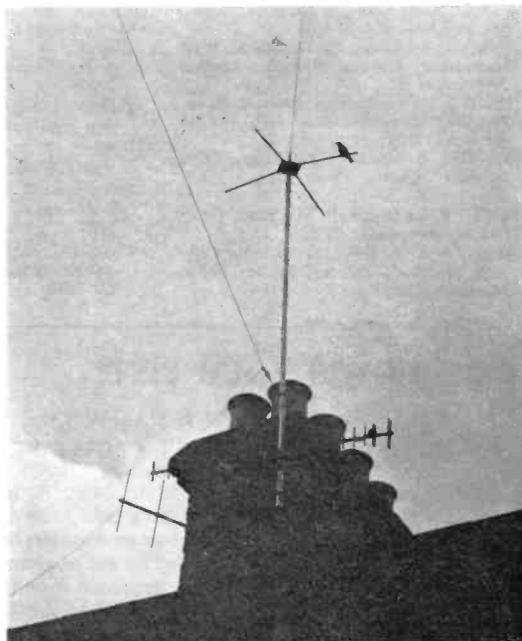
This last comment brings us to the question of Style: let it be said here and now that we can't all be a Milton, or a Shakespeare, or a Burke, but we *can* eschew all forms of pomposity; the ideal to aim for is that if someone who knows you reads your article, then that person can visualise you saying those same words at a club meeting or over a pint at an informal session. The advice of Sir Arthur Quiller-Couch to his students at Cambridge in 1913 is just as valid today: "Whenever you feel an impulse to perpetrate a piece of exceptionally fine writing, obey it—wholeheartedly—and delete it before you send your manuscript to press. *Murder your darlings.*" That same great writer also warns against the insidious ills of jargon. Jargon calls forth the circumlocutions rather than the direct speech on the one hand, and on the other it is full of vague, woolly statements, its yea is not a yea nor its nay a nay.

All this being said, it remains for us to identify the articles we most want. Constructional pieces on receivers, transmitters and transceivers, with the data on the bits and where to get them; some things for the advanced constructor, and some for the novice SWL. Any facet of Amateur Radio is welcome. Send it in, with an *s.a.e.*, and if we feel we can use it, fine, but if not we can use the *s.a.e.* to return you your offering in the hope that maybe you can place it elsewhere. And, we pay for every item used.

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THE OTHER MAN'S STATION —G8IUF

Our Other Man's Station this time is G8IUF, C. E. S. Overton, of Salisbury. Charlie is now retired and gets much enjoyment out of his licence, though he has been interested in radio construction and SWL since his youth. R.A.E. was in fact passed in 1951, but it was 1974 before he got around to applying for a call, between the needs of work and a lengthy spell in hospital. Operation is on two metres with an IC-22A into a $\frac{3}{8}$ -wave vertical but as the station photograph shows there is still the interest in listening on the HF bands with an FR-50B and KW E-Zee match to the end-fed aerial from a site which enables G8IUF to hear or work pretty well all round. This range of operation is shortly due to be considerably increased on 144 MHz when the aerial is to be changed to a directional beam, weather permitting.



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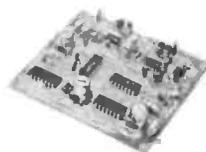
Process speech as a SSB signal at 60 kHz to increase its average to peak levels without adding harmonic distortion. Improves talk power of SSB, FM, and AM transmitters without increasing the peak transmitted power. Connects between microphone and transmitter. (See articles by Dr. D. A. Tong, Wireless World Feb. 1975, 79-82 and Oct. 1976, 77-81). Also available with alternative input connectors and as printed circuit module only (MODEL RFC/M).



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The descriptions above are necessarily brief. Please send for free copies of our data sheets and read the full story.

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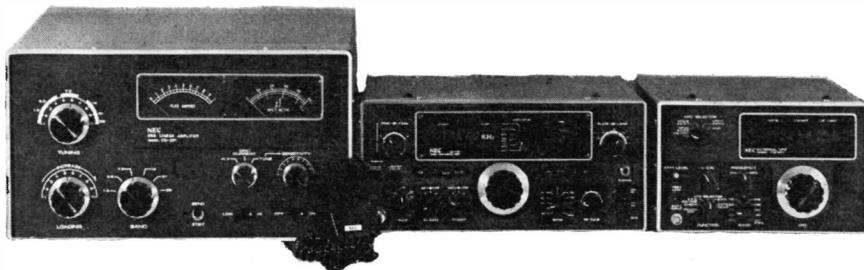


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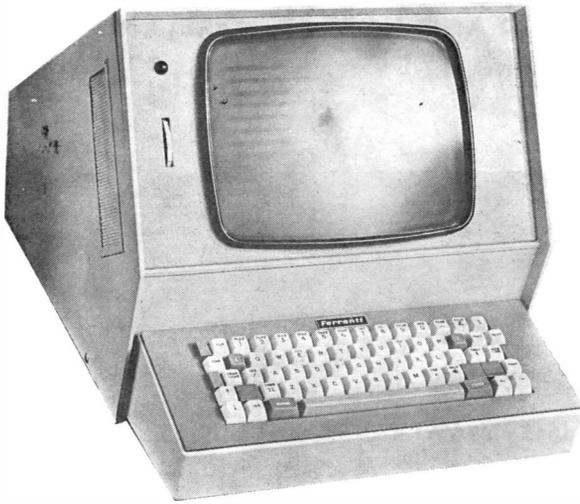
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144-030	...	b	b	b	b	b	b	b	b	b	b	b	b	b
144-4433-2	...	a	a	a	a	a	a	a	a	a	a	a	a	a
144-480	...	b	b	b	b	b	b	b	b	b	b	b	b	b
144-800	...	b	b	b	b	b	b	b	b	b	b	b	b	b
144-850	...	b	b	b	b	b	b	b	b	b	b	b	b	b
145-000/SO	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-050/R2T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-075/R3T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-100/R4T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-125/R5T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-150/R6T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-175/R7T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-200/R8T	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-300/S12	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-350/S14	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-400/S16	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-500/S20	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-525/S21	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-550/S22	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-575/S23	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-600/S24	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-650/R2R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-675/R3R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-700/R4R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-725/R5R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-750/R6R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-775/R7R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-800/R8R	...	a	a	a	a	a	a	a	a	a	a	a	a	a
145-950/S38	...	a	a	a	a	a	a	a	a	a	a	a	a	a

PRICES : (a) £2.36 (b) and (c) £2.90 + VAT (H).

AVAILABILITY : (a) and (c) Stock items, normally available by return (we have over 4,000 items in stock). (b) Four weeks normally but it is quite possible we could be able to supply from stock.
N.B. Frequencies as listed above but in alternative holders and/or non stock loads are available as per code (b).

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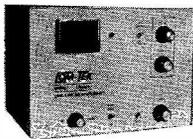
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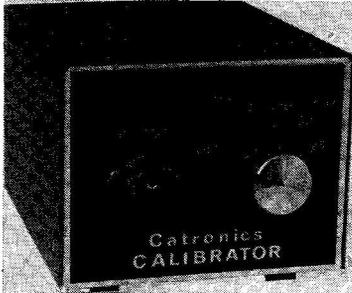
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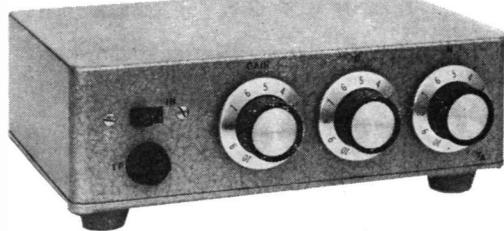
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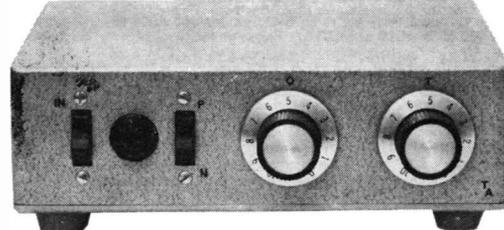
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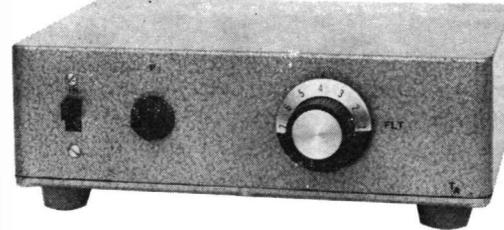
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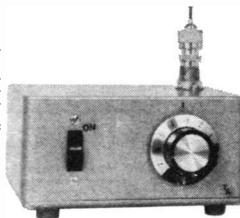
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18v, DC RELAYS, 4 pole change-over (double contacts), (will work from 14-24v. DC). Brand New, boxed, good quality, made by AEI, 40p each.

Slider Switches, 2 pole make and break (or can be used as 1 pole change-over by linking the two centre pins), 4 for 50p.

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Light Blue Tops and White lower sections. Very smart finish.

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WB5	11 x 6 1/2 x 3	£2.00
WB6	11 x 7 1/2 x 3 1/2	£2.25
WB7	12 x 6 1/2 x 5 1/2	£2.60
WB853	8 x 5 1/2 x 3 1/2	£2.60

PERSEX TUNER PANELS (for FM Band 2 tuners) marked 88-108 MHz and Channels 0-70, clear numbers, rest blacked out, smart modern appearance, size approx. 8 1/2" x 1 1/2", 2 for 35p.

SUPER FREEZIT (FREEZER), 65p can.

MULTICORE SOLDER. Size C1SAV18 Savit, 18 SWG, 56p; 1/2 Kg. (1-1/2 lb.) 60/40, 20 SWG on plastic reel, £3.00.

ALU-SOL ALUMINIUM SOLDER

(Made by Multicore) Solders Aluminium to itself or Copper, Brass, Steel, Nickel or Tinplate, 16SWG with multicore flux with instructions, approx. 1 Metre coil 40p each. Large Reel £2.75.

SOLDER SUCKERS (Plunger type).

Standard model, £5.00, Skirted model, £5.50. Spare nozzles, 60p each.

4 MHz XTAL PACKS

(10 assorted xtals between 4 MHz and 5 MHz) our selection only, £1.00 pack.

DIECAST BOXES. We still stock these but, owing to frequent price rises from our suppliers, and costly postal charges, it has been found impossible to publish up to date prices on these items. Please ring, or write (with SAE), for latest mail-order prices.

PLUGS & SOCKETS

BNC PLUGS (ex-equip.), 5 for £1.50.

PL259 PLUGS (PTFE). Brand new, Packed with reducers, 65p each or 5 for £3.00.

SO239 SOCKETS (PTFE). Brand new (4 hole fixing type), 50p each or 5 for £2.25.

N-TYPE PLUGS, 50 ohm, 60p each.

GREENPAR (GE30015). Chassis Lead Terminations. (These are the units which bolt on to the chassis, the lead is secured by screw cap, and the inner of the coax passes through the chassis), 30p each, 4 for £1.00.

WELLER TCP2 and PU2D PSU. Temperature controlled soldering iron with matching Power Supply Unit, containing sponge and spring stand, £30.00.

SPARE TIPS (for TCP1/2) Three types available: TYPE C67 (Standard), TYPE K7 (Long fine tip), TYPE P7 (Very fine tip) £1 each.

WELLER W60D mains operated temperature control soldering iron, £13.80.

SPARE TIPS (for W60D) Two types available, TYPE C67 (W60D) Standard, TYPE AA7 (W60D) Finer tip, £1.15 each.

110v. NEONS, screw-in type 4 for 50p.

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FULL RANGE OF BERNARDS/BABANI ELECTRONICS BOOKS IN STOCK. S.A.E. FOR LIST

NEW FOR THE VHF CONSTRUCTOR. A range of tuned circuits on formers with slugs and screening cans. Frequencies quoted are approximate, and vary can be greatly extended by using varying capacitors in parallel.

Type S (1/2" square, dummy type), Type SA 20 to 30 MHz (when 33pf fitted in parallel).

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Type MB 22 to 32 MHz (when 33pf fitted in parallel), Type MC 25 to 35 MHz (when 33pf fitted in parallel).

Type MD 38 to 50 MHz (when 33pf fitted in parallel), Type ME 45 to 60 MHz (when 33pf fitted in parallel).

Type MF 100 to 200 MHz (without slug) when 0 to 30pf variable fitted in parallel. All the above coils available in packs of five only (same type) at 50p per pack of 5.

AND SPIRALUX. Tools for the Electronics enthusiast. S.A.E. for list.

AEI CS10B/R MICROWAVE MIXER DIODES, up to X-Band, max. noise figure 8.5dB at 9.375 GHz, 80p each.

14 DL REED RELAYS. 5 to 12v. DC, 450 ohm coil, designed to work directly from TTL logic, single pole change over. Contact ratings, 28v., 1/2A, 3W, £1.75 each.

MAGNETIC DEVICES PROGRAMMERS. Contain 9 fully adjustable cams and 9 change over microswitches (rated approx. 1A 240v. AC). Needs slow-motion motor to drive (not supplied). Ideal for disco lights, sequence switching, etc. ex-equipment, £1.50 each.

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TYPE NB2 approx. 3 1/2" x 2 1/2" x 1 1/2", 50p each. TYPE NB3 approx. 4 1/2" x 3 1/2" x 1 1/2", 60p each.

QUARTZ-XTAL CONTROLLED CLOCKS, 9 to 12v. DC at approx. 3mA required. Dial size approx. 2", depth of unit approx. 2". Not in cases, unit only, smart modern appearance, black face with white lettering, 12hr., with second hand, and red hour and minute hands. (Cost over £40 to produce) £10.00 each, while stocks last, tested before despatch.

PYE SSB125T P.C. BOARDS (All brand new with circuit diagrams), 12v. DC.

SSB RF FRONT END PCB. 4 channel, 3-15 MHz, RF and Mixer stages, ant in, 1.4 MHz out, £2.00.

SSB CHANNEL OSCILLATOR PCB, 4 channel, with trimmers, for 4 fundamental xtals (2 stage), £1.00.

SSB AUDIO AMP PCB (3 stage), £1.50.

SSB 1.4 MHz OSCILLATOR & AGC AMP PCB (less xtal), £1.50.

LIMITED SUPPLY ONLY... ORDER NOW!

CERAMIC TAG STRIPS (4 on 1 mount), 10 mounts for 50p.

TUNED COILS, 2 section coils, around 1 MHz, with a black smart tuning knob, which moves an internal core to vary the inductance, many uses, easily rewound, 3 for 50p.

2-6pf, 10mm. circular, ceramic trimmers (for VHF/UHF work), 3 pin mounting, 5 for 50p.

ON/OFF/RX STANDBY SWITCHES for AM10B Cambridge and Vanguard control boxes, 40p each, 3 for £1.

OSMOR REED RELAY COILS (for reed relays up to 1/2" dia., not supplied), 12v., 500 ohm coil, 2 for 50p.

THIS MONTH'S SCOOP PURCHASE, PYE CAMBRIDGE AM AUDIO PCB. Brand new, 60p each, or 4 for £2.00.

ALL BELOW — ADD 8% VAT

CHARGER PCBs for ITT Starphone batteries (12v.), with battery compartment. Requires 28v. DC at 50mA. Contains transistorised circuit for constant current limiting, £2.75.

RED LEDs (Min. type), 5 for 70p.

VIDICON SCAN COILS (Transistor type, but no data) complete with vidicon base, £6.50 each. Brand New.

TRANSISTORS

TO3 TRANSISTOR INSULATOR SETS, 10 sets for 50p.

BSX20 transistors (VHF OSC/MULT), 3 for 50p.

BC108 metal can, 4 for 50p.

PBC108 (plastic BC108), 5 for 50p.

PNP AUDIO TYPE TO5 TRANSISTORS, 12 for 25p.

BFY51 TRANSISTORS, 4 for 60p.

BF152 (UHF AMP/MIXER), 3 for 50p.

2N3819 Fet. 3 for 60p.

BC148 NPN SILICON, 4 for 50p.

BC158 PNP SILICON, 4 for 50p.

BAY31 Signal Diodes, 10 for 35p.

BYX 38/300 Stud Rectifiers, 300v. at 2.5A, 4 for 60p.

BA121 Varicap Diodes, 4 for 50p.

IN914 DIODES, 10 for 25p.

RALLY SEASON HERE AGAIN! If you require items in our ads for collection at rallies or exhibitions, please give us a ring to reserve, and we will bring them along for you.

VALVES

QQV03/20A (ex equipment), £3.00.

QQV03/10 (ex equipment), 75p or 2 for £1.20.

2C39A Ceramic (ex equipment), £2.00 each.

DET-22 (ex equipment), 2 for £1.00.

6BH6 (ex equipment), 2 for 50p.

All the above valves are untested, except for heaters, and no guarantee of percentage of emission is given. Sorry, no returns.

MULLARD 85A2 80v. STABILISER VALVES (Brand New), 75p each or 2 for £1.20.

ALL BELOW — ADD 12 1/2% VAT

BARGAIN PACK OF LOW VOLTAGE ELECTROLYTIC CAPACITORS. Up to 50v. working. Seatronic manufacture. Approx. 100, £1.50 per pack.

A large range of capacitors available at bargain prices, S.A.E. for list.

TV PLUGS (metal type), 4 for 50p.

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ELECTROLYTICS, 50µF, 450v., 2 for 50p.

ELECTROLYTICS, 100µF, 275v., 2 for 50p.

ELECTROLYTICS, 470µF 63v., 3 for 50p.

ELECTROLYTICS, 1,000µF 30v., 3 for 60p.

ELECTROLYTICS 5,000 mfd. at 35v., 50p each.

ELECTROLYTICS, 5,000µF 50v., 60p each.

ITT ELECTROLYTICS, 6,800 mfd at 25v high grade, screw terminals, with mounting clip, 50p each.

TWIN IF CANS, approx. 1" x 1/2" x 1" high around 3.5 to 5 MHz. 2 separate transformers in one can, internally screened, 5 for 80p.