

The SHORT WAVE Magazine

50p

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NUMBER 9

JRC Japan Radio Co., Ltd.

The NRD is a PLL-synthesised communications receiver of the highest class featuring advanced radio technology combined with the latest digital techniques. The new NRD 515 is full of performance advantages including general coverage, all modes of operation, PLL digital VFO for digital tuning, 24-channel frequency memory (option), direct mixing, pass-band tuning, etc. JRC's 65 years of radio communications experience will give you "the world at your fingertips". The NRD 515 is but a single item from the JRC product range which extends all the way to full marine radio installations for supertankers.

NRD 515 HF RECEIVER / PRICE £1090.20.

NRD-515

NRD-515

NRD-515

NRD-515

NRD-515

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MATCHING
TRANSMITTER

NSD-515



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ELECTRONICS LTD**

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LOWE SRX30D

a familiar name, but a whole new receiver



A familiar name, but a whole new receiver behind it. Building on all the excellent features of the SRX-30, including the drift cancelling system covering 500 KHz to 30 MHz; the selectable sidebands and AM; the easy to use tuning system; we now introduce the all new SRX30D which incorporates the suggestions made by our customers. Outstanding new features are:—

- Extended coverage 200 KHz - 30 MHz.
- Digital readout in large green display units which give true unambiguous frequency information — even when you switch sidebands or use the clarifier.
- All new frequency synthesis using Plessey SL6 1641 double balanced modular ICs for a new high standard of performance.
- All new audio system which produces outstandingly good quality on the built in speaker, and is capable of driving external hi fi speaker units for even better sound.
- All new IF filters with optimum bandwidth for mode in use. Automatic filter selection from mode switch.

There is so much that is impressive about the SRX30D that you have to see it and handle it to really appreciate the performance.

We predict that the SRX30D will be a landmark in low cost, high performance SWL receivers. Just consider how much you should pay for a receiver covering 200 KHz - 30 MHz with accurate digital readout; high performance USB/LSB/AM with switched filters; drift cancelling frequency synthesis; built in mains supply and built in speaker; high quality construction and advanced design — and so much more.

Then look at our price for the SRX30D and you will be even more impressed.

£195.00 inc VAT, Securicor carriage £4.50.

UL1000

£39.50 inc. VAT

The UL-1000 is a new concept receiving station accessories and will help any keen listener to improve the performance of his station, particularly in the difficult conditions existing in the medium wave band (500 KHz-1.6 MHz).

The UL-1000 is a self-contained variable gain, tuned pre-amplifier suitable for use with various aerial systems. A particular feature of the UL-1000 is the use of a high Q loop aerial for the 500 KHz-1.6 MHz band.



TRIO

pacesetter in amateur radio



The Trio 9500, a 70 cm multimode mobile giving SSB, FM and CW operation in a compact rig. Add the spacious 70 cm band to your operating.

TR9500 70 cm multimode.
£449.88 inc. VAT. Securicor carriage £4.50.



TR-9000 The exciting TR-9000 2-metre all-mode transceiver combining the convenience of FM with long distance SSB and CW in a very compact, very affordable package. Because of its compactness the TR-9000 is ideal for mobile installation; add on its fixed station accessories and it becomes the obvious choice for your shack.

TR9000 2 metre multimode.
£374.90 inc. VAT. Securicor carriage £4.50.



TR-7800 Trio's remarkable TR-7800 2-metre FM mobile transceiver provides all the features you could desire for maximum operating enjoyment. Frequency selection is easier than ever, and the rig incorporates new memory developments for repeater shift, priority, and scan. The TR-7800 by Trio, the only FM mobile.

TR7800 2 metre FM rig.
£284.97 inc. VAT. Securicor carriage £4.50.

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pacesetter in amateur radio



TS830S £694.83 inc. VAT

The TS830S has every conceivable operating feature built in for full and lasting enjoyment of the HF bands. It combines VBT (variable band width tuning), IF shift and a IF notch filter as well as very sharp filters in the 455 kHz second IF.

DFC230

A digital frequency remote controller complete with up/down microphone and having four memories. Ideal for simpler mobile operation. Compatible with the TS830S, TS530S, TS130S and V and the TS120 series.



DFC230

£179.86 inc. VAT

R1000

£297.85 inc. VAT



SECURIOR CARRIAGE £4.50



The TS530S is an HF transceiver based on the reputation of the TS520 series. Included are of course the new bands, and of course the rig has both digital and analogue frequency readout.

TS530S

£534.98 inc. VAT. Securior Carriage £4.50



The TS180S is the super de luxe transistorized HF transceiver from Trio. Having so many features, memories etc. Send for a leaflet, or ring for more details.

TS180S

£679.65 inc. VAT. PS30 £88.55



The TS130S is THE mobile 200Watts PEP HF transceiver from Trio, again featuring the three new bands. Just the rig for mobile high power operation. Also available the TS130V, a 20 Watt PEP version.

TS130S

£525.09 inc. VAT
TS 130V £445.05 inc. VAT.



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143 RECULVER RD., HERNE BAY, KENT
Tel 02273 63859



IC290E TWO METRE MULTIMODE MOBILE. 10W RF output on SSB, CW and FM. Standard and Non-Standard Repeater Shifts. 5 Memories and Priority Channel. Memory Scan and Band Scan, controlled at Front Panel or Microphone. Two VFO's. Led S-Meter. 25KHz and 1KHz on FM – 1KHz and 100Hz Tuning Steps. Instant Rev-Repeat



IC25E 25W 2M FM MOBILE. Amazingly Small. Two VFO's, Five Memories, Priority Channel, Full Duplex and Reverse, Led S-Meter, 25KHz or 5KHz Step Tuning, Same Multi-Scanning Functions as the 290 from Mic or Front Panel.



IC24G 10W 2M FM MOBILE. This is the Low-Cost, easy to use Economy Model. Full Band – 80 Channels at 25KHz Spacing by easy to use Press Button Switches. 12½KHz Spacing if required and the same Reliable Performance as the famous IC240. Price £169



IC202S/4023W 2M or 70CM SSB PORTABLES. These Two have been around for a long time and are well proven. SSB, CW and Side-Tone. They come fitted with 144-144.4 (IC202S) and 432-432.4 (IC402). Battery or 12V operation. Built in Antenna or socket for External Antenna.

THE POPULAR IC2E HANDY TALKY – EVERYBODY HAS ONE!



CHECK THE FEATURES:

- FULLY SYNTHESIZED** – Covering 144-145.995 in 400 5kHz steps
- POWER OUTPUT** – 1.5W with fine 9V rechargeable battery pack as supplied – but lower or higher output available with the optional 6V or 12V packs.
- BNC ANTENNA OUTPUT SOCKET** – 50 ohms for connecting to another antenna or use the Rubber Duck supplied.
- SEND/BATTERY INDICATOR** – Lights during transmit, but when battery power falls below 6V it doesn't light indicating the need for a recharge.
- FREQUENCY SELECTION** – by thumbwheel switched, indicating the frequency.
- + 5kHz SWITCH** – adds 5kHz to the indicated frequency
- DUPLEX SIMPLEX SWITCH** – gives simplex or plus 600kHz or minus 600kHz Transmit.
- HI-LOW SWITCH** – reduces power output from 1.5W to 150mW reducing battery drain.
- EXTERNAL MICROPHONE JACK** – If you do not wish to use the built-in electret condenser mic an optional microphone/speaker with PTT control can be used. Useful for pocket operation.
- EXTERNAL SPEAKER JACK** – for speaker or earphone. This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck

A full range of accessories in stock

IC ML1	
10Watt Mobile Booster for IC2E.....	£49.00
BPS 11 volt Battery Pack.....	£30.50
BP4 Empty Battery Case For, 6x AA Cells.....	£5.80
BP3 Standard Battery Pack.....	£17.70
BP2 6 Volt Pack.....	£22.00
BC30 Base Charger For Above.....	£39.00
BC25 Mains Charger As Supplied.....	£4.25
DC1 12 Volt Adapter Pack.....	£8.40
HM9 Speaker/Microphone.....	£12.00
CP1 Mobile Charging Lead.....	£3.20
IC1/2/3 Cases.....	£3.60 each

All Prices include V.A.T.

ASK ABOUT THE 70CM VERSION THE IC4E – NOW AVAILABLE

BUY DIRECT FROM US OR OUR AGENTS AND GET TWO FULL YEARS WARRANTY ON ALL EQUIPMENT

IC730 100W ALL BAND MOBILE. 80-10M, 8 Bands SSB, AM and CW. Two VFO'S with 10Hz-100Hz and 1KHz Steps. Memory for each Band. Noise Blanker, VOX, CW Monitor, APC and SWR Detector. Speech Processor and Fan. Switchable RF Pre-Amp and WWV. 13V DC Operated or use ICP515 Mains Power Supply.



IC720A 100W HF + GEN COVERAGE TRANSCEIVER. This is the Best Money can buy. AM, SSB, RTTY and CW. Built in Fan, Speech Processor, Two VFO'S and APC. Tuning Rates Down to 10Hz and memories. General coverage Receiver from 100KHz to 30MHz (Transmit too if you have a licence!). Run from 13V DC or use PS15 mains PSU.



And to match the IC720A:—**IC2KL 500W Output all Mode Linear Amplifier.** Similar size and completely Automatic—No Tuning. **ICAT500** Completely Automatic Antenna Tuner

IC251E & IC451 2M and 70CM ALL MODE BASE STATIONS. Both well proven designs with twin VFO'S, Variable Tuning Rates and Power Output, Scanners and Memory Channels, Automatic Repeater with full Reverse, 144-146 or 430-440, 10W Output on FM, SSB and CW, Built in 12 and 240V supplies. None other like them.



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A3	20/15/10 3ele Beam 8dB gain.....	£147.00
ATV5	80-10 Trapped Vertical.....	£74.40
ATV3	20/15/10 Trapped Vertical.....	£34.00
VHF (144MHz)		
A3219	19ele Long 'Boomer' Yagi 16.2dB gain.....	£62.00
214B	14ele Jnr 'Boomer' Yagi 15.2dB gain.....	£49.50
ARX2	Ringo Ranger 6dB gain vertical.....	£24.75
A144-4	4ele Yagi 9.0dB gain.....	£16.25
A144-7	4ele Yagi 10.0dB gain.....	£20.31
A144-11	11ele Yagi 11.3dB gain.....	£25.72
DX120	20ele Array 13.2dB gain.....	£47.20
ARX2B	Ringo Ranger II.....	£28.75
ARB2K	Conversion Kit for Ringo to Mk II version.....	£12.75

WE ALSO STOCK:—

J-BEAM ● MICROWAVE MODULES ● YAESU ● WESTERN RSGB BOOKS ● BEARCAT ● JIL ● TAL ANTENNAS ● VIDEO GENIE

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M750E TRANSCEIVER
2M FM-SSB-CW

- ★ 1/10 Watts
- ★ All modes
- ★ Digital readout
- ★ 144-146MHz
- ★ Tone burst
- ★ RF gain control
- ★ Dual FVO
- ★ Up/down Mic
- ★ Hardware kit

SUPER DEAL

£289 (carriage free)
SAE FOR COLOUR LEAFLET

FDK
M700EX TRANSCEIVER
2M FM 25 WATTS

- ★ Synthesized
- ★ 25 & 12½ KHz steps
- ★ Priority scanning
- ★ Variable power
- ★ Digital display
- ★ Tone burst
- ★ Reverse repeater
- ★ Fully protected
- ★ Hardware kit

SUPER DEAL

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SAE FOR COLOUR LEAFLET

AZDEN
2M TRANSCEIVER
UNBEATABLE PRICE
£219
(carriage free)

SUPER DEAL

25 Watts!



- ★ 144-146MHz FM
- ★ Digital readout 25KHz or 12½KHz
- ★ 8 memories (programmable)
- ★ Programmable scanning
- ★ Remote mic control
- ★ Detachable control head
- ★ Complete with all accessories

IMPORTED DIRECT BY US
12 MONTHS WARRANTY

GLOBAL PS15
13.8v 5-6 Amp
METERED PSU
£31.95
(carriage £2.00)



At last a fully metered power supply providing 5-6 amps at 13.8v DC. Made specially for us by one of Japan's foremost manufacturers. Fully protected and with an extremely generous transformer, this unit will power almost any mobile transceiver up to 25 watts. A flick of the switch indicates either volts or amps.

Latest version
SX200 MONITOR
26-500MHz
£260 inc. VAT

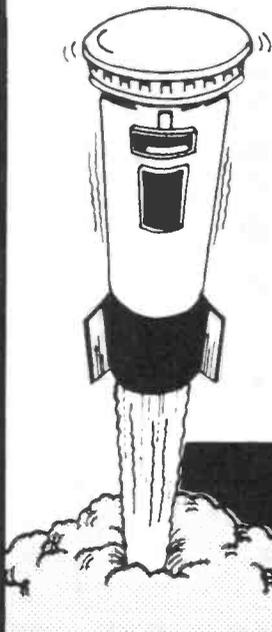


Here's a really wide coverage receiver going all the way from 26MHz to 500MHz (with just a few gaps). Mains or battery operation, FM or AM, means it can be used just about anywhere for anything. Channel memory, scanning and built-in clock are just a few of its features. If you're interested in amateur radio, aircraft, Police, taxis, etc., then this receiver covers them all.

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- A Guide to Amateur Radio (18th ed.) **£3.10**
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- UK Amateur Radio Call Book **£4.37**
- Radio Amateurs Examination Manual **£2.75**
- Radio Data Reference Book **£5.00**
- Amateur Radio Log Book **£2.50**
- Receiving Log Book **£2.68**
- Mobile Log Book **£1.15**

"WELZ" PROFESSIONAL RF PRODUCTS AT AMATEUR PRICES!

SAE FOR COLOUR LEAFLET



SP300 £79

The SP300 is the most sophisticated in-line RF measuring device available to the amateur. Accurate to between DC and 500MHz at power levels from 1 watt to 1kw. This unit tells the truth about the actual amount of RF reaching your aerial. Ideal for measuring power and swr curves to very precise standards.

CH-20A
£13.95



The CH-20A is a 2 way coax switch (S0239) to laboratory standards rated at DC-900MHz for an insertion loss of less than 0.1db at up to 1kw. We guarantee that you won't find anything better at double the price!



SP15M £29.95

The SP15M is a budget price version of the SP300 model having a sensitivity such that it is able to measure power and swr curves from 1 watt to 200 watts. We actually guarantee that you will not be able to buy anything more accurate at the price!

**WE CAN SUPPLY ALMOST ANY AMATEUR RADIO PRODUCT
WE HAVE SOME VERY ATTRACTIVE PRICES
WE HAVE FULL SERVICE FACILITIES
WE ARE THE PEOPLE MOST PEOPLE COME TO!**

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WITH EVERY
FRG7700 & R1000
RECEIVER

1200 CHANNELS! AR22 VHF FM MONITOR
AMATEUR MODEL £83 inc. VAT
(Marine version £86)



Truly amazing! The AR22 tunes across the 2 metre FM band 142-148MHz (also includes Police and Fire Brigade) in 5kHz steps. So small it will fit into a shirt pocket and yet nothing is sacrificed in terms of performance. Price includes rechargeable batteries, mains charger, fly aerial etc. You won't find a smaller monitor anywhere.

PROFESSIONAL AIRCRAFT MONITOR
R517 £49.50
(as supplied to pilots, ground crew etc.)



The R517 is a professional aircraft monitor receiver, having superb sensitivity and capable of tuning across the entire aircraft band 118-143MHz. For easy tuning there is both a coarse and fine tuning control. In addition there is a 3 position switch for selecting xtal controlled channels (xtals £3.00 extra) for your local airport. The unit is completely portable running off self-contained batteries.



TRIO R1000
COMMUNICATIONS RECEIVER
OUR PRICE £305 (Free Securicor Delivery)

The R1000 has really caused a stir in the receiver market! Its performance matches professional receivers costing many times more and with our new competitive price of £305 it must be the best value on the market today. Full digital readout from 200kHz (actually it operates right down to 20kHz but with reduced sensitivity) means accurate tuning and the 30 position band selector switch means really good bandspread for easy operation. Other features include noise blanker (a really good one!) built-in speaker, digital clock/timer and both 230v AC/12v DC operation. (Yes we include the 12v DC kit free!) Each model is fully checked and delivered anywhere in the U.K. within 24 hours of receipt of payment!



YAESU COMMUNICATIONS RECEIVER
FRG7700 £299
FRG7700MEM £380

Free Securicor Delivery

The FR7700 is a new model from Yaesu that replaces the FRG7000. Full coverage is provided between 200kHz and 30MHz with bright digital readout that also doubles as a clock. Features include noise blanker, FM detector, internal speaker, 230 volt AC operation and built-in timer. As an optional extra there is also a memory unit which enables up to 12 selected frequencies to be stored and selected.



SR9 VHF RECEIVER
AMATEUR/MARINE
£46 inc. VAT

The SR9 must be one of the most popular monitors for 2 metre amateur radio enthusiasts. (Also available as a marine version at the same price). It is fully tuneable across the band with the option of also installing up to 11 xtal controlled channels. Power requirements are 12v DC negative earth at 200ma approx. The unit comes complete with mobile mounting kit and built-in speaker.

NO MORE TV INTERFERENCE FROM CB OR AMATEUR!
GLOBAL
HP4A £5.95



Post free. If you're suffering T.V. interference, here's a brand new device specially designed and made for us in Japan. The HP4A now offers about 100% cure against TV interference because of its advanced design, yet it has no effect on the picture. Be prepared, keep one handy!

28MHz FM!

NEW AZDEN
PCS2800



£179 inc. VAT

Here's an exciting new 20 watt input (10 watts output) transceiver with a host of features to put it head and shoulders above the competition. Compare its features:- 200 channels, high/low power switch, computer control touch pad, 6 programmable memory channels, automatic band searching, automatic memory scanning, microphone frequency control button, priority channel, digital frequency readout, removable control panel (permits main transceiver to be mounted remotely), slide in mobile bracket, built in speaker and a host of other features. Its high power and very sensitive receiver gives it better coverage than its competitors. Send for details today or come and see our demonstration model.



M161 FM SCANNER
AMATEUR OR MARINE MODEL
£59 inc. VAT

This highly compact monitor can be supplied either for the 2 metre amateur band or the marine band. It has the capability of scanning up to 16 channels and hunting out and locking on to any signal that appears. Ideal for mobile or base operation an external 12v DC supply is required but unit has built-in speaker, mobile mounting brackets, etc. The receiver comes with the national calling channel. Additional crystals for channels are £3 each.

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TS 7730



- COMPACT SIZE • 25W OUTPUT • 5 MEMORIES
- MEMORY SCAN • BAND SCAN

£247 inc VAT

TR90	180-10m Transceiver 9 Bands	894.00	(-)	carr.
TS830S	Digital V.F.O. With Memories	215.00	(2.00)	
VFO 230	All Band ATU/Power Meter	119.00	(2.00)	
AT230	External Speaker Unit	34.96	(1.50)	
SP230	Dig. Frequency Remote Controller	179.00	(1.50)	
DFC230	500Hz CW Filter	29.00	(0.50)	
YK88C	270Hz CW Filter	32.66	(0.50)	
YK88CN	8 Band 200W Pep Transceiver	525.00	(-)	
TS130S	8 Band 20W Pep Transceiver	446.00	(-)	
TS130V	External V.F.O.	86.00	(1.50)	
VFO 120	200W Pep Linear For TS120V	144.00	(1.50)	
TL120	Mobile Mount for TS 130/120	17.00	(1.50)	
MB100	Base Station External Speaker	23.00	(1.50)	
SP120	100W Antenna Tuner	49.45	(1.50)	
AT130	A.C. Power Supply — TS130V	88.55	(5.00)	
PS20	A.C. Power Supply — TS130S	86.00	(5.00)	
PS30	5 Band Mobile Aerial System	25.76	(1.50)	
MA5	Dual Impedance Desk Mic.	13.80	(0.75)	
MC50	Flat Microphone 50K OHM IMP	13.80	(0.75)	
MC35S	Flat Microphone 500 OHM IMP	17.90	(0.75)	
MC30S	H.F. Low Pass Filter 1kW	371.00	(-)	
LF30A	2m Synthesised Multimode	34.96	(1.50)	
TR9000	Base Pinth for TR9000	284.00	(-)	
BO9	2m Synthesised F.M. Mobile 25W	247.00	(-)	
TR7800	2m Syn. F.M. Cmp. Mble. 25W	166.00	(-)	
TR7730	2m Synthesised F.M. Portable	58.00	(1.50)	
TR2300	10W Amplifier for TR2300	17.71	(1.50)	
VB2300	Mobile Mount for TR2300	6.90	(0.50)	
MB2	Flexible Rubber Ant. for TR2300	196.00	(-)	
RA1	2m F.M. Synthesised Handheld	13.80	(1.00)	
TR2400	External Speaker/Mic. for 2400	45.00	(1.50)	
SMC24	Base Stand and Quick Charger	18.40	(1.00)	
ST1	12V Quick Charger	11.50	(0.50)	
BC5	Soft Carrying Case Plus Belt Hook	15.87	(0.75)	
SC3	Spare Batt. Pack and Chargr. Lead	334.00	(-)	
PB24	70cm F.M. Syn. Mobile T'ceiver	64.86	(2.00)	
TR8400	Base Station Power Supp. for 8400	449.00	(-)	
PS10	70cm Synthesised Multimode	297.00	(-)	
TR9500	Syn. 200KHz — 30MHz Receiver	26.90	(1.50)	
SP100	External Speaker Unit	58.88	(1.50)	
HC10	Digital Station World Time Clock	21.85	(0.75)	
HS5	Deluxe Headphones	10.35	(0.75)	
HS4	Economy Headphones	12.40	(1.50)	
SP40	Mobile External Speaker			

ICOM	H.F. Mobile Transceiver 8 Band	586.00	(-)	
IC730	H.F. T'ceiver & Gen. Cov. Rec.	963.00	(3.00)	
IC720A	Power Supply for 720A	468.00	(-)	
PS15	2m Multimode Base Station	259.00	(-)	
IC251E	2m Syn. Compact 25W Mobile	396.00	(-)	
IC25E	2m Multimode Mobile	169.00	(-)	
IC290E	2m F.M. Synthesised Handheld	3.60	(0.50)	
IC2E	Soft Cases	12.00	(0.75)	
ICL1/2/3	Speaker/Microphone	30.00	(1.50)	
ICM9	230 V.A.C. Base. Charger and Hod	4.25	(0.75)	
ICB30	Car Charging Lead	3.20	(0.50)	
ICB25	230 V.A.C. Trickle Charger	22.00	(1.00)	
ICCP1	Car Charging Lead	17.70	(1.00)	
ICBP2	6V Nicad Pack for IC2E	5.80	(0.75)	
ICBP3	9V Nicad Pack for IC2E	30.60	(1.00)	
ICBP4	Empty Case for 6 x AA Nicads	8.40	(0.75)	
ICBP5	11.5V Nicad Pack for IC2E	49.00	(1.00)	
ICDC1	12V Adaptor Pack for IC2E			
ICML1	10W Booster			

T.V. INTERFERENCE AIDS				
Ferrite Rings 1 1/2" Dia. Per Pair	0.80	(0.20)		
Toroid Filter T.V. Down Lead	2.00	(0.50)		
Low Pass Filter LP30 100W	3.95	(0.50)		
Trio Low Pass Filter LF30A 1kW	17.90	(0.75)		
Yaesu Low Pass Filter FF501DX 1kW	22.25	(0.75)		
HP4A High Pass Filter T.V. Down Lead	5.96	(-)		

ANTENNA BITS				
H1 - Q Balun 1:1 5kW Pl. (PL259 Fitting)	9.96	(0.75)		
T Piece Polyprop Dipole Centre	1.00	(0.20)		
Ceramic Strain Insulators	0.40	(0.10)		
Small Egg Insulators	0.40	(0.10)		
Large Egg Insulators	0.16	(0.02)		
75 OHM Twin Feeder — Light Duty — Per Meter	0.14	(0.02)		
300 OHM Twin Feeder — Per Meter	0.60	(0.20)		
URM 67 Low Loss 50 OHM Coax — Per Meter	0.25	(0.05)		
UR76 50 OHM Coax — Per Meter	0.25	(0.05)		

Please send total postage indicated. Any excess will be refunded.

MICROWAVE MODULES				
MMT144/28	2m Transverter for HF Rig	99.00	(-)	
MMT432/28S	70cm Transverter for HF Rig	149.00	(-)	
MMT432/144R	70cm Transverter for 2m Rig	184.00	(-)	
MMT70/28	4m Transverter for HF Rig	115.00	(-)	
MMT70/144	4m Transverter for 2m Rig	115.00	(-)	
MMT1296/144	23cm Transverter for 2m Rig	184.00	(-)	
MML144/25	2m 25W Linear Amp (3W I/P)	69.00	(-)	
MML144/40	2m 40W Linear Amp (10W I/P)	77.00	(-)	
MML144/100S	2m 100W Lin. Amp (10W I/P)	129.00	(-)	
MML432/20	70cm 20W Lin. Amp (3W I/P)	77.00	(-)	
MML432/50	70cm 50W Lin. Amp (10W I/P)	119.00	(-)	
MML432/100	70cm 100W Linear Amp (10W I/P)	228.64	(-)	
MM2000	RTTY to TV Converter	189.00	(-)	
MM4000	RTTY Transceiver	269.00	(-)	
MMC50/28	6m Converter to HF Rig	27.90	(-)	
MMC70/28	4m Converter to HF Rig	27.90	(-)	
MMC144/28	2m Converter to HF Rig	27.90	(-)	
MMC432/28S	70cm Converter to HF Rig	34.90	(-)	
MMC432/144S	70cm Converter to 2m Rig	34.90	(-)	
MMC435/800	70cm ATU Converter	27.90	(-)	
MMK1296/144	23cm Converter to 2m Rig	59.80	(-)	
MMD050/500	500MHz Dig. Freq. Meter	69.00	(-)	
MMD600P	600MHz Prescaler	23.00	(-)	
MMDP1	Frequency Counter Probe	11.50	(-)	
MMA28	10m Preamp	14.95	(-)	
MMA144V	2m RF Switched Preamp	34.90	(-)	
MMF144	2m Band Pass Filter	9.90	(-)	
MMF432	70cm Band Pass Filter	9.90	(-)	
MMS1	The Morse Talker	99.00	(-)	

YAESU				
FT902DM	160-10m Band Transceiver	866.00	(-)	
FC902	All Band A.T.U.	136.00	(1.50)	
SP901	External Speaker	31.05	(1.50)	
FT101Z	160-10m 9 Band T'ceiver (F.M.)	569.00	(-)	
FT101ZD	160-10m Band Transceiver (F.M.) Digital R.O.	635.00	(-)	
DCT101Z	DC/DC Power Pack	42.55	(1.50)	
FAN101Z	Cooling Fan for 101Z/ZD	13.80	(0.75)	
FT707	8 Band Transceiver 200W Pep	569.00	(-)	
FT707S	8 Band Transceiver 20W Pep	485.00	(-)	
FP707	Matching Power Supply	125.00	(5.00)	
FTV707R12	Transverter — 2M	198.00	(-)	
FV707DM	Digital V.F.O.	203.00	(-)	
FC707	Matching A.T.U./Power Meter	85.00	(1.00)	
MR7	Metal Rack for FT707	15.75	(1.00)	
MMB2	Mobile Mounting Brckt. for FT707	16.10	(1.00)	
FRG7	General Coverage Receiver	189.00	(-)	
FRG7700	200KHz — 30MHz Gen. Cov. Rec.	329.00	(-)	
FRG7700MA	As above but with Memories	409.00	(-)	
FRT7700	Antenna Tuning Unit	37.85	(1.00)	
FT208R	2m F.M. Synthesised Handheld	209.00	(-)	
FT708R	70cm FM Synthesised Handheld	219.00	(-)	
NC7	Base Trickle Charger	26.85	(1.30)	
NC8	Base Fast/Trickle Charger	44.10	(1.50)	
NC9C	Compact Trickle Charger	8.00	(0.75)	
FBA2	Batt. Sleeve for use with NC 7/8	3.00	(0.50)	
FN82	Spare Battery Pack	17.25	(0.75)	
PA3	12V DC Adaptor	13.40	(0.75)	
FT480R	2m Synthesised Multimode	379.00	(-)	
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	459.00	(-)	
FP80	Mtch. 230 V.A.C. Power Supp.	63.25	(1.50)	
FT280R	2m Portable Syn. Multimode	249.00	(-)	
MMB11	Mobile Mounting Bracket	22.25	(1.00)	
CSC1	Soft Carrying Case	3.45	(0.75)	
NC11C	240 V.A.C. Trickle Charger	8.00	(0.75)	
FL2010	Matching 10W Linear	64.40	(1.20)	
Nicads	2.2 AMP HR Nicads Each	2.50	(-)	
FL2100Z	160-10m 1200 Watt Linear	425.00	(5.00)	
FF501DX	H.F. Low Pass Filter 1KW	22.25	(0.75)	
FSP1	Mble. External Speaker 80HM 6W	9.95	(0.75)	
YH55	Headphones 8 OHM	10.00	(0.75)	
YH77	Lightweight Headphones 8 OHM	10.00	(0.75)	
QTR240	World Clock (Quartz)	28.00	(0.75)	
YM24A	Speaker/Mic. 207/208/708	16.95	(0.75)	
YD148	Stand Mic. Dual IMP 4 Pin Plug	21.00	(1.50)	
YM34	As 148 but 8 Pin Plug	21.45	(1.50)	
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)	

DATONG D70 MORSE TUTOR



£45.45 inc VAT

DATONG PRODUCTS				
PC1	Gen. Cov. Convtr. HF on 2m Rig	120.75	(-)	
VLF	Very Low Frequency Converter	25.30	(-)	
FL1	Frequency Agile Audio Filter	67.85	(-)	
FL2	Multimode Audio Filter	89.70	(-)	
ASP/B	Auto RF Speech Clip. (Trio Plug)	79.35	(-)	
ASP/A	Auto RF Speech Clippers (Yaesu Plug)	79.35	(-)	
C78	Manually con. RF Speech Clipper	56.35	(-)	
RFC/M	RF Speech Clipper Module	26.45	(-)	
D70	Morse Tutor	49.45	(-)	
D70	Morse Tutor	37.95	(-)	
AD270	Indoor Active Dipole Antenna	51.75	(-)	
AD370	Outdoor Active Dipole Antenna	6.90	(-)	
MPU1	Mains Power Unit			

MORSE EQUIPMENT				
MK704	Squeeze Paddle	10.50	(0.50)	
HK707	Up/Down Key	10.50	(0.50)	
HK704	Deluxe Up/Down Key	14.50	(0.50)	
EK11A	Practise Oscillator	8.75	(0.50)	
EK121	Elbug	29.95	(0.50)	
EK11A	Matching Side Tone Monitor	10.95	(0.50)	
EK150	Electronic Keyer	34.00	(-)	
ROTATORS				
KR250	Kenpro Lightweight 1-1 1/2" mast	44.95	(2.00)	
Hirschman	RQ250 V.H.F. Rotor	49.95	(2.00)	
9020B	Coilrotor (Med. V.H.F.)	49.95	(2.00)	
KR400C	Kenpro (HF) Complete with Lower Clamps	99.95	(2.50)	
KR600C	Kenpro (Med HF) Complete with Lower Clamps	139.95	(3.00)	

DESK MICROPHONES				
SHURE 444D	Dual Impedance	29.95	(1.50)	
SHURE 528T	MK II Power Microphone	39.95	(1.50)	
ADONIS AM 502	Compression Mic 1 O/P	39.00	(-)	
ADONIS AM 801	Comp. Mic + Meter 1 O/P	49.00	(-)	
ADONIS AM 802	Comp. Mic + Meter 3 O/P	59.00	(-)	

MOBILE SAFETY MICROPHONES				
ADONIS AM 2025	Clip-on	20.95	(-)	
ADONIS AM 202F	Swan Neck + Up/Down Buttons	30.00	(-)	
ADONIS AM 202H	Head Band + Up/Down Buttons	30.95	(-)	
DAIWA RM 940	Infra Red Link	45.00	(0.75)	

HAND MICROPHONES				
T.A. 600	Fist Mic.	4.95	(0.50)	
Power Mic.	Wide Impedance	9.95	(0.75)	
TRIO MC 30/35	600/50K IMP	13.80	(0.75)	
YAESU YE7A/YD846	600/50K IMP	6.75	(0.75)	
SHURE 201	High IMP. Quality Mic.	14.50	(0.75)	

STANDARD VHF/UHF				
C78	70cm F.M. Portable	21		

DATONG PRODUCTS

DESIGNED BY ENTHUSIASTS FOR ENTHUSIASTS!

SEE US IN HALL 3A AT THE A.R.R.A. EXHIBITION, DOWNINGTON PARK, 29th-31st OCTOBER

KEYBOARD MORSE SENDER - THE ULTIMATE KEYBOARD - CHECK THESE FEATURES

- **CONVENIENCE:** no need for a power cable, four internal pen cells last for 300 hours and give continuous memory back-up.
- **EXCLUSIVE COLOUR CODED KEYBOARD DESIGN:** Separate key switches beneath a tough polycarbonate membrane combine excellent "feel" with a splash proof wide-clean surface.
- **LAVISH MEMORY:** four 64-character memories with auto-repeat and programmable "pause" function, for all the routine sending.
- **BUFFER MEMORY:** ensures perfect sending despite less than perfect typing.
- **COMPREHENSIVE CHARACTER SET:** includes punctuation, procedure signals, accented letters. Plus a "merge" key for making any non-standard character.
- **BEAUTY AND STYLE:** only one inch thin and with four-colour panel Model MK looks every bit the thoroughbred it is. Model MK is supplied with output leads and spare connectors but without batteries (four HP7 pen cells).



Model MK

MODEL ASP - THE "INTELLIGENT" RF CLIPPER

Model ASP modifies your speech signal direct from the microphone and makes it more effective at the transmitter peak power were to increase by between two and three times. "Intelligent" means that unlike other speech processors, Model ASP automatically senses your voice level and reacts accordingly to always maintain the degree of true r.f. clipping selected (in decibels) by the panel push-buttons. Special circuitry does this without the undesirable side effects of simple a.g.c. devices. Adding a Datong r.f. clipper to a normal SSB transmitter has a similar effect to adding a linear amplifier but without the high cost and risk of TV!



Reviewed 73 Mag. July

G8's - ARE YOU MISSING OUT?

Unless you can monitor the other bands you are missing a lot. If you have a 2 metre all-mode receiving set up, just add Model PC1 in series with its antenna and you have a superb general coverage receiver. What better way to listen in to all the non-VHF amateur bands, not to mention everything else from 60 kHz to 30 MHz? For sheer value for money there is no better way to get high performance general coverage reception. After all what a waste it is if your expensive 2 metre all-mode rig covers one band only!



Model PC1

ATTENTION VHF SCANNER OWNERS!

Did you know that Model PC1 will extend the coverage of your SX 200 type scanner to include all the long, medium and short wave bands as well? This is an excellent way to listen to your favourite short wave broadcast stations without the extra expense of a complete new receiver.

MINIATURE RECEIVING ANTENNAS

If you don't have enough space to put up traditional receiving antennas, our active antennas are the answer. They need no tuning yet have constant sensitivity from 200 kHz to well over 30 MHz. Results are quite comparable to full size conventional antennas but the space saving is enormous. The indoor version (AD270) is 3 metres long and the outdoor version (AD370) is 2 metres long.



A TV-type feeder cable of any reasonable length can be used yet because the antennas are balanced dipoles any interference picked up by the feeder is rejected. Because of their wide frequency coverage Datong Active Antennas are ideal accessories for modern general coverage communications receivers.

Model AD370



Model DC144/28

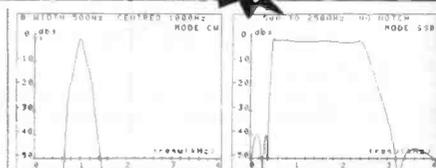
YET ANOTHER 2 METRE CONVERTER? Yes but not just another. Model DC144/28 is designed to overcome the overload and spurious signal problems experienced by conventional converters. It uses a Schottky diode balanced mixer with about 7dbm of local oscillator drive. This, coupled with a 3SK88 r.f. amplifier, gives an excellent combination of low noise figure and strong signal handling capability. Its input and output gain controls also help you get the best out of your main receiver without flattening it with excessive gain. Model DC144/28 is available either as a complete cased unit (die cast box, SO239 connectors) or as a ready built and tested PCB module.

MODEL D70: THE GO-ANYWHERE MORSE CODE TRAINER

For building up your morse code reception speed there is no better method than the Datong "Morse Tutor". You learn the code with the characters at normal speed but with an extra delay between each one. As you improve you reduce the "DELAY" control until, with it fully reduced, you find you are reading code at the chosen speed and with correct spacing. An important feature is that the unit is completely portable. This allows you to practise wherever and whenever you find it most convenient. The all-CMOS design gives about 60 hours of practice from a lowcost PP3.



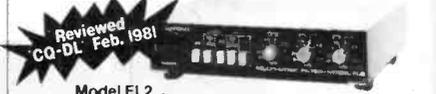
Model D70



VARIABLE SELECTIVITY FOR ANY RECEIVER. Have a look at these curves (and the others in our data sheet) and you will see why a U.S. reviewer commented that the FL2 is "incredible - it's like having a tunable crystal filter!"

With Model FL2 connected in series with your speaker you can wipe out off-tune "monkey chatter", unwanted tones and sundry "burbles" from SSB, while for CW the ultra-steep skirts allow you to use wider bandwidths for a given rejection of off-tune signals. This makes tuning easier and reduces listening fatigue. Model FL2 costs little more than a single special accessory filter yet it offers better performance, extreme versatility, and can be used with any receiver.

R. S. Dicks, 73 Magazine, July 1981 p 119.



Model FL2

Reviewed CO-DL Feb. 1981

NEW PRODUCTS PREVIEW

Model DF1
Direction finder attachment for FM, VHF receivers/transceivers, gives directional readout on circle of LED's. Connects to loudspeaker and antenna jacks.

Model RFA
R.F. switched broadband preamplifier. Boosts gain and noise figure of receivers from 30 to 200 MHz.

- Products not shown in this advertisement
- Model Datest 1 Transistor Tester
 - Model Datest 2 Transistor Tester
 - RF Speech Processor Model D75
 - Model RFC/MRF, Speech Processor PCB Module
 - Model MPU Mains Power Unit
 - Accessory Leads
 - Model VLF
 - Model FL1



INGENIEURBÜRO ULRICH HANSEN

VHF & UHF PREAMPLIFIERS: A range from Ulrich Hansen of West Germany. A range of high quality in-line preamplifiers for 2 metres or 70 cms, featuring ultra-low noise figures and state-of-the-art design. The range includes R.F. switching capability from 60 watts P.E.P. to 500 watts P.E.P. and choice of silicon low noise devices or the latest gallium arsenide MESFETs for the best possible noise figure. Indoor or mast mounted options are also included. Full details free on request. These units represent a cost-effective way of Improving your DX receiving capability.

PRICES: All prices include delivery in U.K. basic prices in £ are shown with VAT - inclusive prices in brackets.

FL1	59.00 (67.85)	VLF	22.00 (25.30)	AD270	33.00 (37.95)	MPU	6.00 (6.90)
FL2	78.00 (89.70)	D70	43.00 (49.45)	AD370	45.00 (51.75)	DC144/28	31.00 (35.65)
PC1	105.00 (120.75)	D75	49.00 (56.35)	AD270 + MPU	37.00 (42.55)	DC144/28 Module	25.00 (28.75)
ASP	69.00 (79.35)	RFC/M	23.00 (26.45)	AD370 + MPU	49.00 (56.35)	Keyboard Morse Sender	140.00 (161.00)

DATONG ELECTRONICS LIMITED
Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, England. Tel: (0532) 552461

SMC SERVICE

Free Finance on many items. Two year guarantee on Yaesu. Free Securicor on major Yaesu items. Access and Barclaycard over the telephone. Biggest Branch, Agent and Dealer network. Ably staffed, courteous, Service Department. "B Services" Securicor contract at £3.50! Biggest stocks of amateur equipment in UK. Twenty-two years of professional experience.

GUARANTEE

Yaesu's own warranty does not extend outside Japan. Repairs are the responsibility of the UK dealer selling the set. SMC's two year guarantee is backed, as UK distributors, by daily contact with the factory and many tens of thousands of pounds of spares and test equipment. Avoid hawkers offering sets without serial numbers, spares, service or advice back-up.

FREE FINANCE

On regular priced items from; Yaesu, Ascot SMCHS, CDE, HyGain, Channel Master, Hansen, SMC, MFJ, KLM, Mirage and Hy Mound, on invoices over £100 SMC offers Free Finance! How is it done? Simple, pay 20%, split the balance equally over 6 months or pay 50% down and split the balance over a year. You pay no more than the cash price!!

YAESU MUSEN

As UK Agents, we show some major Yaesu items; a new VHF multimode handportable, 2 general coverage receivers, multimodes for VHF and UHF FM transceivers for VHF, UHF and VHF/UHF, 5 HF transceivers (SSB, CW, FSK, AM, FM) and a fistful of VHF and UHF handhels. Remember there are 150 accessories to complement these lines . . .

— SMC THE COMMUNICATORS —**FOX TANGO ONE
THE WORLD BEATER**

£ 1295 inc. VAT @ 15% & Securicor

COVERAGE

RX; 150 KHz-30 MHz. Continuous general coverage.
TX; 160-10m (9 bands). 1.5-30 MHz commercial version.

MODES

All modes; AM, CW, FM, FSK, LSB, USB.
Tx and Rx on opposite sidebands possible.

FREQUENCY SELECTION

No bandswitch. Multiple methods of frequency setting. Main dial; "velvet smooth" 10 Hz resolution, 3 speeds; Set 00MHz, 00KHz/R — Normal, 00KHz/R — Fine, Controls RIT or offset (Synthesised clarifier). Inbuilt Keypad; direct digital entry to 100 Hz. Fast/slow, up/down tuning. Scanning manual or auto mode.

**FRG7**

- ★ "Industry standard" receiver.
- ★ 0.5-3MHz.
- ★ SSB (LSB/USB), CW, AM.
- ★ Selectivity of ± 3 kHz at -6dB.
- ★ Wadley-loop triple conversion.
- ★ 10kHz Direct dial readout.
- ★ Well calibrated "sharp" preselector.
- ★ AM Automatic noise suppression circuit.
- ★ Antenna Hi to 1.6MHz, 50ohm to 30MHz.
- ★ 3 position RF attenuator.
- ★ 3 position AF filter (LP, WBP, NBP).
- ★ 110-240Vac and 12Vdc.
- ★ Lights: battery economy switch.
- ★ Illuminated edge type "S" meter.
- ★ Optional Battery holder £5.00.

£ 199 inc. VAT @ 15% & SECURICOR

RECEIVER

Receiver dynamic range up to 100 dB.
Pair of low noise power transistors in RF.
Ring mixer with LO injection at 10 dBm.
Advanced variable threshold noise blanker.
AGC: slow-fast-off. Squelch control.
Variable RF attenuator and RF gain circuits.
SSB; Variable bandwidth and IF shift.
3 CW and 2 FSK bandwidth positions.
300 Hz, 600 Hz, 2,400 → 300 Hz, 6 KHz, 12 KHz.

TRANSMITTER

100w RF, (50% duty FSK) all solid state.
No preselector, no "plate" tune, no loading controls.
Mains and 12VDC. Switch-mode PSU built in.
CW change over delay; adjustable through to *full break in*.
Electronic keyer built in. Drive level control.
Front panel adjustable VOX. Signal monitor feature.
RF processor, compression control concentric with mic gain.
Auto mic gain, reduces extraneous background noises.

MEMORY

Two memory banks (A & B) each with 10 slots.
Simplex or Semi duplex A, B, RxA/TxB, TxA/RxB.
ANY frequency storable. ANY TX-RX split within coverage.
RIT offset stored together with memory channel.

METERING

Two large moving coil meters (+ 3 digitals and 12 leds).
R.H. (Rx - Tx); 'S' (1-9, + 20, + 40, + 60dB) and ALC level.
L.H. switched; Ic (20A), Vcc, Discriminator (FMzero),
Compression (0-25 db), Forward, Reflected.
Digital readout to 100 Hz. Analogue markings for "feel".
Dedicated digital readout of RIT offset to ± 9.9 KHz.
Digital readout of memory channel number recalled.
LED's; Processor, Noise blanker, Auto mic gain, Monitor,
Peak - Notch filter, Scan, Transceive, TX-RX Clarify,
Dial Lock, Tx Disabled.

**FRG7700**

- ★ Incredible new receiver.
- ★ 0.15-30MHz.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @ -6dB.
- ★ Up conversion 48MHz first IF.
- ★ 1kHz digital plus analogue display.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 50ohm to 2MHz, 50ohm to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Constantly variable tone control.
- ★ 110 and 240Vac and 12Vdc option.
- ★ 12 channel memory option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ FRG7700M £409. Memory option £90.95.

£ 329 inc. VAT @ 15% & SECURICOR

**NEW
MATCHING ATU,
LPF AND SIX
VHF CONVERTORS**

FT207R

- ★ 144-148MHz (144-148 possible)
- ★ 12.5kHz synthesizer steps
- ★ 4 bit CPU chip for freq. control
- ★ Keyboard entry of frequencies
- ★ Keyboard lockout safety features
- ★ Digital display to hundreds of Hertz
- ★ Display auto shutdown timer
- ★ Four Channels of memory
- ★ Memory back up disable
- ★ Up/down manual tuning
- ★ Bandscan for busy or clear channels
- ★ Memory scanning features
- ★ ±600kHz split built in
- ★ Any split + or - programmable
- ★ "On Air" and "Channel Busy" LEDs
- ★ Built in condenser microphone
- ★ 200mW AF to internal/external speaker
- ★ External speaker/mic available
- ★ 2.5/0.2W of RF output
- ★ Rx: 35mA squelch, 150mA full vol.
- ★ Tx: 250mA low, 800mA high
- ★ 0.3µV for 20dB quieting
- ★ Two tone encoder built in
- ★ 1.7 (2.2) " D x 2.5 (2.7) " W x 6.7 (7.2) " H
- ★ C/w NiCad pack, helical and case



FT207R
£ 169 inc.
 VAT @ 15%
 & POSTAGE

FT290R

- ★ 144-146MHz (144-148 possible)
- ★ Multimode USB, LSB, FM, CW
- ★ 2.5W PEP, 2.5W RMS/300mW
- ★ LED's, "ON AIR", "BUSY"
- ★ Moving coil meter for S & PO
- ★ Integral telescopic antenna
- ★ Bandwidth 2.4kHz & 14kHz @ 6dB
- ★ Optically coupled main tuning
- ★ 100Hz backlite LCD display
- ★ 10 memory channels
- ★ "Five year" memory backup
- ★ FM: 25kHz and 12.5kHz steps
- ★ SSB: 1kHz and 100Hz steps
- ★ Any TX/RX split with dual VFOs
- ★ ±600kHz split, 1,750kHz burst
- ★ Mobile mounting bracket available
- ★ Matching 10W linear Amplifier
- ★ Up/down tuning from mic.
- ★ AF output 1W @ 10% THD
- ★ 58(H) x 150(W) x 195(D) (1.3kg)
- ★ RX, 0.70mA, TX, 800mA (FM max)
- ★ 8 "C" Nicads or Drys Internal
- ★ 8.5 15.2V DC External
- ★ Scan on memory on clarify (±10kHz)II
- ★ Long battery life with SMC 2.2A/Hr cells



FT290R
£ 249 inc.
 VAT @ 15%
 & POSTAGE

FT208R

- ★ 144-148MHz (144-148 possible)
- ★ 12.5/25kHz synthesiser steps
- ★ 4 bit CPU synthesiser control
- ★ Keyboard entry of frequencies/splits
- ★ LCD digital display with backlight
- ★ Ten channels of memory
- ★ Memory back up '5 year lifetime'
- ★ Up/down manual tuning
- ★ Manual or auto scan for busy/clear
- ★ Priority channel with "check back"
- ★ Memory scanning feature
- ★ Scan between any two frequencies
- ★ Scan with auto pause/restart
- ★ Any split + or - programmable
- ★ Quick change NiCad pack
- ★ 1750Hz tone burst
- ★ ±600kHz repeater split
- ★ Built in condenser microphone
- ★ 500 mW AF to int/ext speaker
- ★ External speaker/mic option
- ★ 2.5 or 0.3W RF output
- ★ Rx: 20mA squelch 150mA max AF
- ★ Tx: 800mA at 2.5W RF
- ★ 0.25µV for 12dB SINAD
- ★ Dual conversion 16.9MHz & 455kHz
- ★ Keyboard provides 16 tone DTMF
- ★ 168 (H) x 61 (W) x 49 (D) mm
- ★ C/w NiCad pack and helical



FT208R
£ 199 inc.
 VAT @ 15%
 & POSTAGE

FT708R

- ★ 430-440MHz (440-450 option)
- ★ 25kHz synthesizer steps
- ★ 4 bit CPU chip frequency control
- ★ Keyboard entry of frequencies/splits
- ★ LCD digital display with backlight
- ★ Ten channels of memory
- ★ Memory back up 5 year lifetime cell
- ★ Up/down manual tuning
- ★ Manual or auto scan for busy/clear channels
- ★ Priority channel with search back
- ★ Memory scanning feature
- ★ Scan between any two frequencies
- ★ Auto scan restart
- ★ Any split + or - programmable
- ★ Quick change NiCad pack
- ★ 1,750Hz tone burst
- ★ ± 7.6MHz EU split standard
- ★ Built in condenser microphone
- ★ 500 mW AF to int/ext speaker
- ★ External speaker/mic available
- ★ 1W or 100 mW RF output
- ★ RX: 20mA squelch, 150MHz (max AF)
- ★ TX: 500 mA at 1W RF
- ★ 0.4µV for 12dB SINAD
- ★ Dual conversion 46.255MHz & 455kHz
- ★ Keyboard offers 16 tone DTMF
- ★ 168(H) x 61(W) x 49(D) mm.
- ★ C/w NiCad pack, helical



FT708R
£ 219 inc.
 VAT @ 15%
 & POSTAGE

— SAE FOR FREE 16 PAGE ANTENNA & MASTS, STOCK & PRICE LIST —



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 GI3KDR John Bangor (0247) 55162
 GM8GEC Jack Edinburgh (031665) 2420
 GI3WWY Mervyn Tandragee (0762) 840656
 GW3TMP Howarth Pontybodkin (035287) 846/324
 GW8EBB Peter Swansea (0792) 872525
 G4JCD Geoff Jersey (0534) 26788
 G4EQS Simon Redcar (0642) 480808

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FT780R

- ★ 430-434 MHz (440-445 possible)
- ★ USB-LSB-CW-FM (A3J, A1, F3)
- ★ Input; 30W (PEP A3J + A1/F3)
- ★ GaAs Fet RF for incredible sensitivity
- ★ NMOS four bit micro control
- ★ Bandwidth 2.2KHz and 14KHz @ -6dB
- ★ 'Dial set' clears non integral steps
- ★ Very bright blue display to 100Hz
- ★ Display indicates Tx and Rx (inc RIT)
- ★ Manual tone switch on microphone
- ★ String LED displays for S and PO
- ★ Digital receiver independent tune (±10KHz)
- ★ Advanced effective noise blanker
- ★ FM; 100KHz, 25KHz, 1KHz, steps
- ★ SSB; 1,000, 100, 10Hz steps
- ★ Repeater access by use of dual VFO's
- ★ Four easy write in memory channels
- ★ Memory scanning with slot display
- ★ Up/down tuning from microphone
- ★ Priority channel on any memory slot
- ★ Satellite mode allows tuning on Tx
- ★ Scanning for busy or clear channels
- ★ Size (case): 10" D, 2.3" H, 6.9" W
- ★ LED's on air, clear, hi/low, FM mod
- ★ FP80 mains PSU + SC1 console available

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CPU2500RS

- ★ Covers 144 to 146 or 148MHz
- ★ 25/3 watt or 10/1 watt model(s)
- ★ CPU controlled digital synthesiser
- ★ 10KHz (+ 5KHz up) synthesised steps
- ★ Optional 25KHz steps in St version
- ★ 6 digit readout + memory channel number
- ★ Main tuning, by optically coupled encoder
- ★ Up/down tuning/scanning from microphone
- ★ Scanning for empty or occupied channels
- ★ Band scanning up or down the band
- ★ Four normal memory channels
- ★ Further memory for 'odd' split
- ★ Can scan memory channels only
- ★ ± 600KHz plus any split (to 4MHz)
- ★ Sub audio tone squelch option
- ★ Manual (EU) and Auto (UK) tone burst
- ★ High or low (1/10) power switch
- ★ Low noise mosfet RF stage
- ★ LED's for: - 'on Air' and 'Busy channel'
- ★ VSWR and reverse polarity protection
- ★ Punch in frequency on keyboard mic (K)
- ★ 0.5A Rx, 2.5A LTx, 6 A HTx (25). 13.6V DC
- ★ Case; 7" wide, 2 3/4" high, 10 1/2" deep
- ★ Sensitivity: 0.3µV for 20dB 5Q
- ★ Selectivity: 12KHz ★ - 6dB (2:1SF)

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FT720RV (FT720 & 720RV)

- FT720 Control Head
- ★ For easy write-in memory channels
 - ★ Rx priority channel (auto check)
 - ★ Scanning of band/memory for empty/busy
 - ★ Up/down tuning/scanning from mic.
 - ★ Optically coupled tuning control
 - ★ Manual and automatic tone burst
 - ★ String LED's for 'S' and PO, status LEDs
 - ★ 1 1/2 W of audio to internal/external speaker
 - ★ 3.3 (4.3)" D x 6" W x 2 (2.2)" H
 - ★ 720RV 10W, 2M deck 720RVH 25W, 2M deck
 - ★ 144-146MHz (144-148MHz possible)
 - ★ 12 1/2 KHz sythesizer steps, 600KHz Shift
 - ★ 0.3µV for 20dB quieting
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 - ★ Pushbutton bandswitching between two decks
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FT480R

- ★ 144-146MHz (143.5-148.5 MHz possible).
- ★ USB-LSB-CW-FM (A3j, A1, F3).
- ★ 30W PIP A3j, 10/1 W our A1 F3.
- ★ Bandpass filter no tune design.
- ★ Excellent dynamic range sensitivity.
- ★ Bandwidth 2.4kHz and 14kHz at -6dB.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx and Rx freq (inc RIT).
- ★ String LED display for 'S' and PO.
- ★ Digital receiver offset tuning.
- ★ Advanced effective noise blanker.
- ★ FM; 25 12 1/2, 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.
- ★ Any TX Rx split with dual VFO's.
- ★ ±600KHz standard repeater split.
- ★ Four easy write-in memory channels.
- ★ Memory scanning with slot location display.
- ★ Up/down tuning/scanning from mic.
- ★ Priority channel on any memory slot.
- ★ Satellite mode allows tuning on Tx.
- ★ Scanning for busy or clear channels.
- ★ Size (Case): 8.3" D, 2.3" H, 6.9" W.
- ★ LED's; "On Air" Clar, Hi/Low, FM mod.
- ★ Matching PP80 Mains PSU available.

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FT101Z

- ★ 160-10 metres including new allocations.
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- ★ 6 models: Digital/Analogue - AM/FM plug ins.

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FT902DM

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- ★ Audio Peak and independent notch controls.
- ★ AM, FSK, USB, LSB, CW, FM, (TX and RX).
- ★ Semi-break in, inbuilt Curtis IC Keyer.
- ★ Digital plus analogue frequency displays.
- ★ 6146B's with negative feedback.
- ★ VOX built-in and adjustables.
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- ★ Tune up button (10 sec. of full power).
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FT107M

- ★ 160-10 metres (including 10, 18, and 24MHz).
- ★ USB-LSB-CWW-FSK-AM multi-mode.
- ★ Full broad band "no tune" power amplifier.
- ★ 240W PIP. 75 per cent power output at 3:1 VSWR.
- ★ 12 memory channels with clarifier on memory.*
- ★ Digital Memory Shift gives offset from memory.*
- ★ Up/down scanning control from microphone.*
- ★ Variable IF bandwidth - 16 poles of selectivity.
- ★ Bandwidths: 6kHz*, 2.4kHz-300Hz, 600Hz-300Hz.*
- ★ Selectable CW "fixed" widths CW-W and CW-N.*
- ★ Tunable Audio Peak (AFP) and Notch filter.
- ★ Diode ring mixer for very high Rx dynamic range.
- ★ Noise blanker - front panel adjustable threshold.
- ★ AGC; slow-fast-off switchable from the front panel.
- ★ Attenuator 0-20dB, plus RF gain on front panel.
- ★ RF speech processor fitted - front panel adjustable.
- ★ Digital (100Hz) plus analogue frequency displays.
- ★ Meter Reads: Vcc, Icc, ALC, Compression and SWR.
- ★ Semi-break in with side tone. Vox built in.
- ★ Choice of built-in or separate power supply units.

*Option **£725 inc.** VAT @ 15% & SECURICOR



FT707

- ★ 80-10 metres (including 10, 18 and 24MHz bands).
- ★ USB-LSB-CWW-CWN-AM (Tx and Rx operation).
- ★ 100W PEP. 50% power output at 3:1 VSWR.
- ★ Full "broad band" no tune output stage.
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- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth - 16 crystal poles.
- ★ Bandwidths 6kHz*, 2.4kHz-300Hz (600-350)Hz* -300Hz.*
- ★ AGC; slow-fast switchable from the front panel.
- ★ VOX built-in and adjustable from the front panel.
- ★ Semi-break in with side tone for excellent CW.
- ★ Digital (100Hz) plus analogue frequency display.
- ★ LED Level meter reads: S, PO and ALC.
- ★ Convenient concentric AF/FR gain controls.
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- ★ Receiver offset tuning (RIT-clarifier) control.
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FT-707 All solid-state HF mobile transceiver



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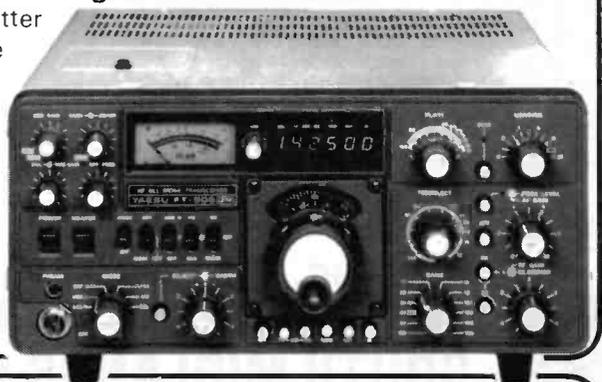
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The set with the world-wide reputation. YAESU's famous FRG-7 out-performs many a more expensive set. Rugged and reliable, it features high sensitivity and Wadley loop stability - a delight to use for the established amateur and new SWL alike.

FRG-7700 High performance communications receiver



YAESU's top of the range receiver. All mode capability. USB, LSB, CW, AM and FM 12 memory channels with back up. Digital quartz clock feature with timer. Pictured here with matching FRT-7700 Antenna tuner and FRV-7700 VHF converter.

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The new FT-708R and FT-208R provide new dimensions in operating flexibility for the discerning 70 cm and 2m operator. LCD display, 10 memories, memory and bandscan, priority function, internal lithium battery back-up. RF output FT-708R, 200mW low, 1 watt high, FT-208R, 300mW low, 2.5 watts high.



FT-708R



FT-708R with NC8 standard/quick charger/DC PSU



FT-208R

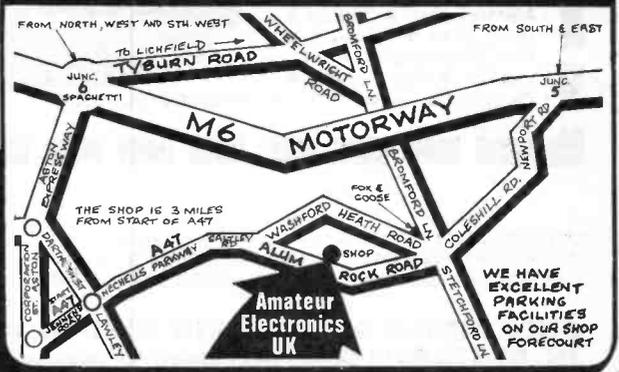


FT-208R with standard charger

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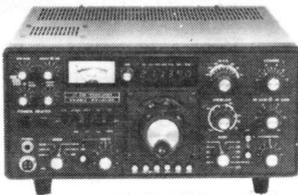
As London's number-one amateur radio retailers we always try to be first . . . for choice . . . for price . . . for service . . . and for refreshment! Now we're the first to bring you news of the number-one product, the **YAESU FT-ONE**, the latest HF rig that's going to run away from all the others. Incorporating probably the finest receiver section ever built into a Yaesu product, the **FT-ONE** is going to be a winner all the way for the short-wave listener who intends

to pass the R.A.E. Just look at all the features . . .

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- Audio Peak Filter
- Notch Filter
- 3 widths for CW
- Built-in Curtis keyer
- Built-in SWR bridge
- Memory facility
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- 2FSK widths.

FT-101 Mk.III

The tried and tested Yaesu HF base station, now with audio peak filter and reject/notch filter as standard, and choice of AM or FM.



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TWO SUPER-VALUE SCANNING RECEIVERS

Top-grade technical specifications and very special prices make this an opportunity not to miss.

MR-1000A

VHF FM pocket-size scanner, 10 channels, and allowing scan or manual tuning across selected crystal-controlled channels. Complete with Nicads and charger.



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YAESU'S LATEST

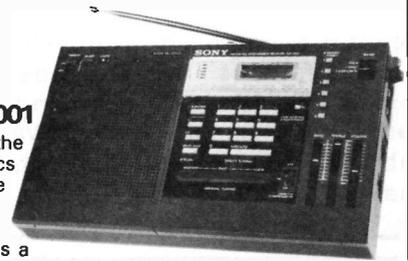
- . . . the new all-mode 2m portable FT-290R. So many features
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SPECIAL OFFER £159.00 inc. matching SONY AC-122 P.S.U.

SX-200N

Another of our sophisticated scanning receivers. Similar functions to the BEARCAT, but even wider coverage, and with AM and FM right across its range.



£262.75 inc. VAT

FRG-7700

Yaesu's latest receiver with FM right across the band now offers all these optional extras ● Memory facility ● FRT-7700 Aerial Tuning Unit at only **£34.75** ● Four VHF converters running from 50MHz up to 170MHz.



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Converter specifications ● **Phone for prices.**

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Editor: **PAUL ESSERY, G3KFE/G3SWM**
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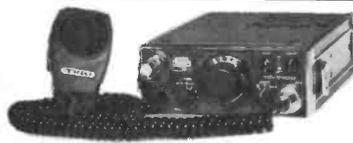
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TR2300

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TRIO R1000

R1000 Receiver £297.86
The latest general coverage from Trio. Frequency coverage 200 KHz to 30 MHz in 30 bands. Using an advanced PLL system. Full digital readout. Three filters 12 KHz for AM - 6 KHz narrow AM and 2.7 KHz SSB. Also incorporates a noise blanker. Operation is from 100-240 V AC or 12 V DC.



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TRIO

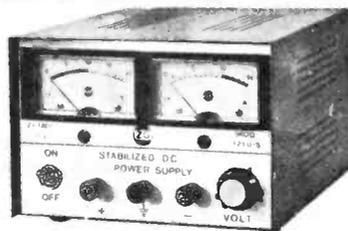
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- ★ Innovative PLL system of frequency generation
- ★ RF speech processor
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- ★ Adjustable audio tone
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- ★ SSB monitor circuit
- ★ Expanded frequency coverage

VHF BANDS

NORMAN FITCH, G3FPK

UOSAT is Launched

THE first amateur research satellite was successfully launched at 1127 GMT on October 6 from the Western Test Range at Vandenberg, California, after delays which were nothing to do with UOSAT. The satellite is now known as *Oscar 9* and is circling the Earth every 95.4 minutes at an inclination of 97.48° at a height of 560 kms.

The launch was competently covered from the U.K. by G3AAJ on 40m., G3RWL on 80m. with your scribe on 144.282 MHz. From the U.S.A., WA3NAN at the Goddard Space Flight Center was a terrific signal all through on 20m. There was a direct telephone link from Vandenberg to the University of Surrey in Guildford, where the satellite was constructed. This enabled correct information to be passed on within seconds.

Unlike 0-6, 0-7 and 0-8, *Oscar 9* is not a transponding satellite. Of main interest as this is being written is the data being transmitted on 2m. by the General Data Beacon on 145.825 MHz using NBFM at *plus/minus* 5 kHz deviation. The signal was received on the very first orbit at G3FPK and was quite strong even though the beam heading was far from optimum. Around the spacecraft, 60 analogue channels and 45 digital status points are monitored, encoded, and are available for transmission. This telemetry is transmitted in a variety of formats including 1,200 *baud ASCII*, 10 or 20 w.p.m. morse code and synthesised voice. The Tx power is 350mW and the aerial is a quarterwave canted turnstile giving a gain of 3dB. Polarisation is left hand circular.

By the time this issue appears, the spacecraft's initial tumbling phase will have ended enough for the 50 foot boom to be deployed to provide passive stabilisation by gravity gradient forces. Once the spacecraft's attitude is correct and under complete control, the HF bands beacons, 435 MHz Engineering Data Beacon, 2.4 and 10.47 GHz Beacon Experiments and SSTV camera can be activated. The engineering data beacon is on 435.025 MHz and runs 650mW using the 2m. beacon aerial in harmonic mode and modulation is as for the 2m. Tx.

AMSAT-UK has produced a looseleaf

booklet in A5 size on *UK-OSCAR-9*, called "Technical Handbook". This includes details of all the experiments and the circuit for a demodulator to process the audio output from the receiver. The looseleaf idea will allow regular revisions and additions to be made. For full details of AMSAT-UK, send an *s.a.e.* to G3AAJ at 94 Herongate Road, London E12 5EQ.

It will be some time before 0-9 has made enough revolutions for reliable orbit parameters to be calculated. In any case, a satellite in a low orbit will suffer more drag than one in an 0-7 or RS orbit, so it will be quite unrealistic to produce calendars for more than a month at a time. The best advice is to listen on the regular 80m. AMSAT net every Sunday morning from 1015 local time on 3.780 kHz, or to the 2m. one every Sunday evening from 1930 local time on 144.282 MHz SSB.

Awards News

Paul Johnston, G8MLJ, from Ferrybridge, W. Yorks., has been elected the 342nd. member of the 2m. VHF Century Club. He was licensed in Sept. 1976 and started on the band with a *Trio* TR-7010 and 5-ele. *Yagi* from his previous QTH in Knottingley. Operation from the present QTH began in August, 1980, the gear being the *Icom* IC-260E with 6-ele. *Quad*, the latter since replaced by a 16-ele. *Tonna Yagi*.

Mike Lee, G3VYF, was awarded his "225" sticker for his QTH Squares Century Club Certificate on Sept. 14. The 25 new squares comprised just two *via tropo.* with 4 *Ar*, 5 *E's* and 14 by MS mode. 6 QSOs were on SSB, 17 on CW and two on FM, and the most prized card was the one from 4X4IX (RS) the record-breaking *E's* contact from the British Isles.

Beacon Notes

On Oct. 4 the Wrotham 2m. beacon, GB3VHF, was found to be 4.8 kHz higher than its assigned frequency. Keeper Brian Bower, G3COJ, had it switched off the following day and it was subsequently found the temperature sensing device, an obsolete *MOXIE* diode, had gone open-circuit. The opportunity has been taken to overhaul the Tx and re-program the keying a little with a longer gap between the "AL52j" and the lat./long. information on RTTY. GB3VHF should be in service again on 144.925 MHz by the time this is published.

According to Roger Thorn, G3CHN, who is in close touch with the French beacon scene, there is still no firm news concerning the possible return of FX3VHF on 144.905 MHz.

Repeaters

Few facets of amateur radio arouse as much passion as VHF repeaters. At one extreme there are those who *only* contact their fellow amateurs through them, while at the other are those who would

cheerfully like to put a bomb under the lot! Probably the majority of VHF and UHF relays do provide a useful service for mobiles but some, like the notorious GB3SL in South London, have always been grossly abused by various amateur and pirate factions.

This problem is not confined to the U.K. as exemplified by a communication received from the well known Spanish VHF enthusiast Juan Porta, EA3ADW: He has sent a letter, signed by 18 other Spanish colleagues, the gist of which is that they feel repeaters are a bad influence, particularly on newcomers to the hobby. They reckon the best way to re-kindle the "ham spirit" would be to close down all repeaters. The letter has been sent to many publications with a request that those who support the proposal should write to; EA3BBU at Pastor 23, Sampedor, Barcelona, Spain.

Contests

No results to report this month, so first to the "one-off" events, the first of which is the 144 MHz CW affair. There are two contests in fact, the main one being an IARU, 24 hour effort, starting at 1600GMT on Nov. 7, with the RSGB contest running from 1000-1600GMT on the 8th. Both are two section events for either single-op. or multi-op. stations, with scoring on the radial ring system. Since the rules state that serial numbers must start with "001," it would seem one cannot enter for both events.

The Cray Valley RS has a three band activity weekend on Nov. 14 and 15, the 144 MHz leg of which is on the 15th. from 1000 to 1300GMT. Exchanges to consist of report, serial number and *administrative* county, *e.g.*, Greater London, rather than Middlesex, or Strathclyde, rather than Ayrshire. The maximum power limit is 25 watts PEP. There are separate categories for those licensed for less than one year and for those using a home built Tx or Rx during the contest. Scoring is 10 pts. for working G3RCV and G8FCV; 3 pts. for non-Cray Valley members working CV stations; 2 pts. for CV members working each other and one point for other contacts. Total score is the station points aggregate multiplied by the number of counties plus countries worked. Non-members should send their entries by Dec. 14 to; Bob Treacher, 79 Granby Road, London, SE9 1EH, with members entries going to G4DF1. (*QTHR*)

Four legs of the 432 and 1,296 MHz *Cumulatives* are scheduled for Nov. 2, 10, 18 and 26, the former from 2000 to 2200, the latter 2200-2400GMT. They are all-section, all-mode events with radial ring scoring on 432 MHz and one point *per* kilometre on 1,296 MHz and only three of the seven periods during October and November may be entered for scoring.

The BATC's Autumn Cumulative Contest has three sessions in November on

the 7th., 15th. and 23rd., 2000-2300GMT. Exchanges to consist of video only transmitted four-figure number chosen by the entrant, plus call, QTH locator, serial no. starting at "001" each session sent by 'phone or video. The scoring is 2pts./km. on 432 MHz; 8pts./km. on 1.3 GHz and 16pts./km. on 10 GHz. If one station does not receive a picture, only half points for both.

Overseas News

José Gené, EA3LL, has added a good number of new squares by E's and MS from the end of May through mid-August, including a dozen in the British Isles. The highlights of the E's season were:- May 31, 1613-1728, SV, 9H and IT9 worked. June 1, SV1LY heard on CW at 0921. June 2, 1720-1729, YU, YO and SV worked. June 9, 1521-1703, SV, YU and I7 worked. June 17, 1501-1652, LZ and YU worked. June 27, 1345, two SVs. July 10, 1506-1718, EI, G, GI, GM and GW stations in droves and a few more EIs between 1909 and 1955.

July 15 brought DL and Y stations from 1437 and on the 21st., CN8BA was copied at 1645. July 22, 1535-1738, SV, I and IT9 stations worked. Aug. 11, 1605, three HGs. Aug. 16, 0728-0936 saw a big opening to UO5, YO, LZ, HG and YU. By contrast, tropo. conditions to Italy were not good; only 5 or 6 days in August with poor conditions to the north. In the IARU Contest over Sept. 5/6, José was in AA12c and worked up to AH, BH and ZH squares. On July 26, G3CHN was heard working a Frenchman at 2200GMT but an MS sked. with SP6BTI was imminent so he did not manage to attract Roger's attention.

José confirms that this year has seen a great increase in 2m. DX-ing from Spain, exemplified by operation from *all* squares in the country in the September contests. By next year, the newcomers will be more experienced. He says there is no officially recognised phonetic alphabet and operators tend to use all sorts of Spanish words, like "C for Casa," (house!). On the rumour front, there was a report that an EA4 had worked into YI (Iraq) and that EA8XS worked into TF on tropo!

Paul Galea, 9H1BT, wrote from Dingli in Malta to say he has been busy with studies and looking after their new baby daughter. Unfortunately, four 16-ele. *Tonna Yagis* were lost during shipping so a replacement set are awaited. He, too, was in on many of this year's E's events but the general tendency was to short skip stuff in the lower latitudes with a few G and GW folk in the south. Paul's only new ones were UO5OGX at 1650 on June 7, some SPs on June 10, CN8BA at 1639 on July 29, a sufficiently long opening to allow a normal QSO with exchanges of addresses, etc.

Aug. 6 was a memorable day at 9H1BT. At 1639 an EA was heard on the 2m.

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3JXN	42	86	120	248
G3XDY	30	83	123	236
G3COJ	24	74	123	221
G8HVV	22	83	141	246
G8LEF	22	62	101	185
G8FMK	16	57	70	143
G8IFT	15	34	81	130
G4CMV	14	59	157	230
G3PBV	13	62	123	198
G8GXE	13	57	89	159
GD2HDZ	12	44	90	146
G8KAX	9	43	78	130
GJ8KNV	8	73	164	245
G8ATK	6	56	113	175
G8HHI	6	52	120	178
G4ERX	6	46	95	147
G3BW	5	30	187	222
G2AXI	5	58	106	169
GW3CBY	3	14	65	82
GJ4ICD	1	96	208	305
G8OPR	1	38	111	150
GJ8SBT	1	—	134	135
GJ3RAX	1	27	74	102
G3VYF	—	91	262	353
G3POI	—	—	343	343
G3IMV	—	—	290	290
SP2DX	—	—	280	280
DK3UZ	—	—	280	280
I4EAT	—	25	238	263
EA3LL	—	15	227	242
G4ERG	—	16	208	224
9H1BT	—	11	210	221
G4IJE	—	—	219	219
G4IGO	—	13	203	216
G3CHN	—	—	212	212
9HICD	—	13	178	191
G3NAQ	—	58	128	186
GM4COK	—	12	172	184
G3SEK	—	—	182	182
G3FPK	—	—	179	179
G4BWG	—	38	136	174
G3KEQ	—	—	173	173
G4DEZ	—	—	171	171
G8LGL	—	32	135	167
GM4CXP	—	25	142	167
G8MFI	—	26	128	154
G4AWU	—	22	130	152
GW3NYY	—	32	120	152
G8VR	—	3	145	148
G4MCU	—	29	118	147
G8JJR	—	38	108	146
GW4EA1	—	—	146	146
G8VLQ	—	38	106	144
G8IXG	—	—	139	139
G8CXQ	—	15	119	134
G4HFO	—	50	78	128
G4JZF	—	12	116	128
G8KGF	—	28	99	127
G3FIJ	—	29	84	113
G4FBK	—	5	105	110
G8TGM	—	—	109	109
G8KPL	—	7	91	98
G4GHA	—	—	95	95
GI8EWM	—	25	67	92
G6UW	—	1	89	90
G8JAG	—	7	81	88
G4MJC	—	12	76	88
G4IRX	—	—	85	85
G8WRD	—	29	46	75
G8RWG	—	—	71	71
G8VVF	—	—	66	66
G8JGK	—	—	62	62
G8TIN	—	3	56	59
G8SKG	—	5	53	58
G8SVG	—	—	58	58
G4GSA	—	6	51	57
G4GXL	—	4	52	56
G8LXY	—	18	34	52
G6ADC	—	12	40	52
G8WUU	—	11	37	48
G8XQS	—	—	47	47
G4LDY	—	2	39	41
G8MBI	—	—	40	40

Starting Date: January 1, 1975. No satellite or repeater QSOs. "Band of the Month" 23cm.

calling frequency but peaking in the odd direction of 260°. It turned out to be EA8XS, who was worked at S8-9 at 1644, followed by EA8AK. By 1704, EA8XS was "end stop" on the S-meter of Paul's

Braun SE-401. They worked again with an S9-plus 40dB. report from EA8XS. Paul then went down to half a watt and got an SI report from Salvador, "... and that made the day, almost 3,000 kms. on half a watt". Paul is now up to 41 countries on 2m. with 210 squares in the table.

Six Metres

As we enter the post-autumnal equinoctial era, 6m. signals from distant parts are being reported, but none yet from across the Atlantic. John Baker, GW3MHW, (XM6Od) reports ZS6's DN, LN and PW received on Sept. 14, 15 and 20, with G3UUT working ZS6LN crossband 10/6m. on the 20th. Others listening on 6m. include GW4HXO, G3ENY and G6NB. The Cyprus beacon now seems to be on 50.501 MHz, 3 kHz higher than previously. On Sept. 27, ZS3E was worked crossband at 0725 by G3WBQ and G5KW.

Four Metres

Main news about 4m. is the loss of the top 200 kHz from Jan. 1, 1982 which means the U.K. beacons will have to shift, probably to around 70.1 MHz where the 5B4 and ZB2 ones are already. The band will now be 70.025 to 70.500 MHz, thus fitting nicely into the "standard" 500 kHz tuning range of many HF transceivers.

Ken Willis, G8VR, (Kent) has been carrying out some 4m./2m. crossband MS experiments with Heinz Jonuscheit, DK1PZ, (FL) on 70.068/144.068 MHz respectively. Heinz copied many bursts and pings from Ken at the first attempt which did not result in a completed QSO, however. YU3ES (GF) has now joined in this venture thanks to a converter subscribed to by Ken, and Paul Turner, G4IJE, and built by the latter. Hopefully, Stane should have received the 4m. converter by now.

GW3MHW asks for more space for 4m. and 6m. news in this feature. Well, if readers send in the news, we will use it, John, but only *two* of you did this month. John reports that new stations are still coming on and that G6NB in Bucks. and G3ENY (Salop) are expected on again, soon. There was a weak *Aurora* on Sept. 26 during which Chris Tran, GM3WOJ, worked G3UUT and G3OSS. G4IJE has acquired a PA transistor and is working on a 50 watts final for the band. After more than ten years trying, GD2HDZ has worked EI on Sept. 14. It was EI6DT in Dublin.

Two Metres

After the excitement of the summer months, the past month has seen a return to generally uninteresting conditions. With some three weeks of unabated, low pressure weather systems from the west dominating our weather, tropo. conditions, not unexpectedly, have been rather flat. Many readers started their

letters with phrases like, "Not much to report this month".

First the *s.w.l.* reports and Mike Allmark (Leeds) mentions many OZs and SM6s on Aug. 30 in FR, GQ and GR squares. The following day he copied LA6HL and LA3EQ, GM4LBE (ex-GM8TLO) in Shetland (ZU65f) and the gaggle of OYs in WW referred to last month. On Sept. 3, he copied SK7JD (IR) during an MS sked with G4CDC. The Sept. 5/6 contest brought reasonable conditions, best tropo. DX being DK5RQ (GI24g) at 1,126 kms. On Sept. 7, Mike heard a weak tropo. signal from OE3LFA (II52g) at 1,379 kms.

Kevin Jackson (Leeds) had not written for a while so his letter covered the highlights of the summer's VHF/UHF DX-ing, both amateur band and TV. He quoted figures at various locations for geomagnetic activity during the big *Ar* on July 25. The equivalent "A" index reached 400 at Lerwick and the Borders Region and 240 at Hartland Point in Devon.

Kevin happened across a QSO on 10m. between a G station and SV0BP in Crete during which the SV said he was thinking of coming on 144 MHz with QRO from an 800ft. hill top, sometime after Christmas. The SV also mentioned that SW0WA (Crete) had worked an ON on 2m. FM with 10w. to a colinear vertical. It seems there is a repeater on the island now and that some of the local SV9s are building big amplifiers and large aerial arrays. It appears that SV0BP is looking for financial assistance and Kevin says he sounded very enthusiastic. His QTH is;-Box 301 Iraklion, Crete.

Dave Sellars, G3PBV, (Devon) did not find conditions in the IARU Contest too good on the whole. However he did manage DJ4GC/P (EL) and heard OK1KHI/P (HK). 75 stations were worked for an average 12½pts./QSO. Quote of the contest by a G4 to a Frenchman, "You are five and nine but I can't understand a word you're saying!" Nice to hear from Ray Elliott, G4ERX (Essex) again, even though he has had very little time for the hobby this year. On Sept. 13, CJ square was added in the guise of PA2VST/LX/P for no. 95 on the band.

Rob Mackean, G4HAO, (Liverpool) was not able to do much in the IARU contest as it was his elder brother's 21st. birthday party which attracted 100 guests. However, EI2CA/P in Wexford was another new 1981 county. He found "rock bottom" conditions for the RSGB Region 1 Contest on Sept. 13 and made 92 QSOs for about 1,200 pts. Activity was very poor. EI3VFF/P was only worked in Waterford on Sept. 9 and not heard from any other location. High spot of the month was working GM8SAU in St. Kilda (VR18g) on the 16th. at 0909. Finally, Rob asks if any reader can ever recall there being a radio club at Edinburgh

ANNUAL VHF/UHF TABLE									
January to December 1981									
Station	FOUR METRES		TWO METRES		70 CENTIMETRES		23 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G2AXI	58	9	64	19	44	9	7	1	203
GD2HDZ	49	6	63	15	43	9	5	4	186
G8FMK	—	—	65	17	56	11	28	3	180
G3BW	41	6	65	28	32	6	6	4	178
G8VLQ	—	—	69	26	45	14	—	—	154
G3FJJ	41	5	60	15	28	4	—	—	153
G3PBV	2	2	60	23	41	9	10	2	145
G8GXE	—	—	55	11	46	9	17	5	143
G8HHI	—	—	49	16	44	12	14	2	137
G8RZP	—	—	66	20	40	10	—	—	136
GW3NYY	—	—	65	28	29	9	—	—	131
G8RZO	—	—	66	20	33	9	—	—	128
G4JZF	—	—	74	20	28	4	—	—	126
G6ADC	—	—	62	11	39	5	—	—	117
G8VR	32	3	44	29	6	1	—	—	115
GW3CBY	22	6	50	14	17	6	3	2	115
G4HAO	—	—	81	20	—	—	—	—	101
G8WUU	—	—	60	14	23	3	—	—	100
G8KAX	—	—	43	10	27	5	10	3	98
G4DEZ	—	—	67	30	—	—	—	—	97
G3FPK	—	—	74	22	—	—	—	—	96
G8WRD	—	—	45	12	27	11	—	—	95
G3CO	14	3	39	8	22	5	—	—	91
G4FKI	37	5	26	5	16	4	—	—	87
G8VJV	—	—	67	18	—	—	—	—	85
G4ARI	18	2	54	10	—	—	—	—	84
G4GXL	—	—	55	15	7	2	—	—	79
GW8TVX	—	—	55	15	—	—	5	2	77
G8RWG	—	—	57	15	—	—	—	—	72
G8TGM	—	—	48	18	—	—	—	—	66
G8LXY	—	—	33	6	20	6	—	—	65
G8XTJ	—	—	51	11	—	—	—	—	62
G8TIN	—	—	40	7	12	3	—	—	62
G6AJA	—	—	52	8	—	—	—	—	60
G6ABB	—	—	44	12	—	—	—	—	56
G8TRW	—	—	44	11	—	—	—	—	55
G4LDY	—	—	42	9	2	1	—	—	54
G8RZA	—	—	44	9	—	—	—	—	53
GM4CXP	3	1	35	13	—	—	—	—	52
G8SKG	—	—	39	10	2	1	—	—	52
GW3MHW	44	8	—	—	—	—	—	—	52
G4MJC	—	—	29	11	5	4	—	—	49
G8MBI	—	—	28	9	—	—	—	—	37
GM4COK	—	—	21	12	—	—	—	—	33
GM4ELV	—	—	10	3	—	—	—	—	13

Three bands only count for points. Non-scoring band figures in italics.

University?

Graham Taylor, G4JZF, (Staffs.) also worked EI3VFF/P in VL and WL squares, the latter being a new one. Welcome to Martyn Hunt, G6AJA, (Cumbria) who enters our table with 60 points. His gear is the Yaesu FT-221R and a 12-ele. *ZL-special* aerial. He is finding the QSL return rate very slow, though. Apologies to Adrian Chamberlain, G6ADC, (Coventry) whose Squares Table entry was omitted last time. New ones in September for Martyn Jones, G8CXQ, (Warks.) were GM3JFG (XR) on Sept. 1, and EI3VFF/P (WL) on the 7th. to make it 117 squares on the band.

Paul Broadhurst, G8LGL, (Avon) wrote on Sept. 3 so just missed last month's deadline. His letter lists *Perseids* MS QSOs with DK1PZ (FL) on Aug. 10, OE3OBC (II), HG1YA (IH), ON5FF/CT1 (WZ) and YU3ZV (HG) on the 11th., HG5A and HG5KDQ (both JH), YU3ES (GF), OZ1CSI (HP), HG1KSO (IH), YU3ZV (HG), C31SY (AC) and YU1EU (KE) on the 12th. and SM3DCX (IV), DJ5MS (GI) and YU3ES again, on the 13th. Several of these were *via* random mode, completed in single

bursts. Aug. 16 brought an *E's* QSO with SP8AOV (LL) at 1529 during a brief opening.

Ken Willis, G8VR, (Kent) reports on "... a fairly barren month". He enclosed a photocopy of his VHFCC parchment dated January 1952 and it was no. 92 of the original series when the rules were for VHF contacts, "... from 50 Mc up ..." — no fancy Megahertz in those days! Now, 30 years later, Ken has a claim for his QTH Squares Century Club. Now firmly hooked on MS mode, he reckons one way to beat flat conditions is to work sporadic MS CW QSOs. During September, Ken had complete contacts with YU3ES (GF), SP9AI (JJ), SM6EAN (FR), EA1QJ (VD), SM5CUI (IT) and OH3TH (LV).

G8VR and G4IJE have been conducting some interesting MS experiments with YU3ES and SP2DX in which Paul sends a series of high speed "Os" and Ken, "Ss" simultaneously on slightly different frequencies. Over three tests of three, ten minute periods up to Oct. 7, when some 100 bursts were received at the distant end, more than 90% contained information from one G station only.

Over the period Sept. 25-27, Paul

Turner, G4IJE, accompanied by Martin Hughes, G4ISM, Paul Adams, G4IYA, and John Cooper, G8WUU, braved the foul weather and operated -/P from AK05j square, near Lydd in Kent. 16skeds were arranged and 10 completed QSOs were made with OH3TH (LV), SM2CKR (KX), DF7RG (GI), SP9AI (JJ), YU1ADN (KD), HG8CE (KG) and I3LGP, YU3ES, I3TJQ and YU3ULM, all in GF. Nothing was heard from DL7YW, OH5LK, SM0EJY and YU2CCB; one QSO was lost because the gales brought down the 16-ele. aerial into a gorse bush, and one QSO was lost because the chap at the other end seemed to have no ideas on the proper procedure. From home in September, Paul worked DF5IZ/IA5 (FC) on Elba on the 11th., this producing 136 bursts and 105 pings; EA1TH (YC) on SSB on the 15th. and SP9CSO (JJ); OH3TH (LV) on the 16th. and DJ5MS (GI) on the 29th.

Congratulations to Terry Hackwill, G8WRD, (Berks.) who has passed his morse test and awaits a G4 call. John Fitzgerald, G8XTJ, (Bucks.) complains about the stations who operate in the beacon sub-band, 144.85 to 144.99 MHz. These include some G3s of 1950s vintage, it would seem, as well as more recently licensed folk. He hears many operators asking where they can go in the band with all the new stations coming on but, as John comments, the allmode section of 144.50 to 144.85 MHz is often sparsely populated. Therein he worked, on FM, GW4JZY/P for his best DX on that mode so far.

Arthur Breese, GD2HDZ, was off the air for a couple of weeks at the end of September as the gales damaged his aeriels. However, GD3TNS and GD3YEO kindly came to the rescue and got it all together again. Geoff Brown, GJ4ICD, got square no. 208 during the IARU Contest, thanks to a PA in BM50 on a gas platform in the North Sea. He made 651 contacts as a Single-op. entry for 8,904 "RSGB" points and 225,600 for the IARU entry. 19 countries were worked in the 24 hours.

Andy Renouf, GJ8SBT, has just taken out a subscription to the *Magazine* and enters the Squares Table with 134. His equipment comprises a *Trio* TS-700 with rebuilt front end, a 16-ele. *Yagi* aerial and a 4CX250B amplifier. On random MS, Andy reckons far too few operators "break" every so often, thus missing big bursts on SSB. Walter Davidson, GW3NYY, (W. Glam.) is certainly steaming away on MS from XL square. His long list of QSOs from Aug. 19 to Sept. 29 identifies three new countries; LX1GR on Sept. 2, LA6HL on the 6th. and DF5IZ/IA5 on the 12th. Best DX so far is SM2CKR (KX) at 1,956 kms. He comments upon the abysmal tropo. conditions lately but did work across to the C and D squares in the IARU Contest.

Reg Woolley, GW8VHI, (W. Glam.)

reports that EA8XS heard him on Sept. 4 for half an hour. G5KW in the Scilly Isles was also copying Salvador at S9-plus that evening. During the first week of September, Reg worked EI3VFF/P in VM, UL and WL squares.

Clive Penna, G3POI, (Kent) got a letter from PA0CIS following the 2m. MS operation from Monaco in July when ten skeds were made, daily, at the same time. Five "firsts" were 3A to PA0MS, YO2IS, SP2DX, ON5QW and G3POI. Clive has a tape of some of it from the Monagasque end and it reveals a lot of ignition QRM. (Seems no better than when your scribe operated there in the 1957-1964 era as 3A2BT, from time-to-time.)

Seventy Centimetres

Mike Allmark (Leeds) heard LA6HL (CS) on Aug. 31 and DJ9DL (DL) was loud on Sept. 2. After the IARU Contest, conditions improved to the east when DF3XZ (FN) was copied, plus some PAs in CN square. During the Contest on Oct. 3/4, G3PBV found conditions and activity abysmal with only 13 stations worked, including a PA. Dave reckons few stations beamed to Devon. The only F heard was F6CTT/P (AJ) who was worked. G4ERX lists him as a new square, too.

G4JZF winkled out EI3ZVGG/P in WL square in early September. Graham was on in the UHF Contest but found things very quiet although F6CTT/P was worked. G8CXQ is now on the band and has 15 squares so far. Tony Collett, G8GXE, (Berks.) was in on a five-way QSO on Aug. 31 with GW8ELR (Dyfed), GW4LXO (S. Glam.), G8TFI and G3ZWK in which at his QTH, GW4LXO was some 4-5 S-points stronger than GW8ELR, whereas the reverse was the case at G8TFI and G3ZWK.

GW3NYY reports a tropo. QSO back on July 28 with EA1QJ (VD59h) and wonders if that was a first GW/EA QSO on the band. GW8VHI was heard by EA8XS on Sept. 4 at 2320 but Reg could not copy anything from Salvador. Reg was only running 10w. to a 19-ele. *Tonna*. At the beginning of September, he worked EI3VGG/P in VM, UL, VL and WL squares. Reg passes on the news that the following are QRV on 70cm;- EI5DD (VN) with 10w. and 88-ele. *Parabeam*; EB1AK (VD) and G3ZPJ in St. Ives (Cnwl) with a *Yaesu* FT-780R and a couple of 23-ele. *DL6WU* beams.

Gigahertz Bands

In spite of very poor condition, Angus McKenzie, G3OSS, (London) made 51 QSOs in the UHF Contest on Oct. 3/4 including four each DLs and PAs. He thought activity high and now has a masthead preamp. with a calculated system *noise figure* of 0.8dB. The aerial is a four times 23-ele. *Tonna* array. By contrast, for G3PBV, the contest was a non-event with only three stations heard

and none worked. Prior to that, GJ4JWA and G8KBQ (Somerset) were added on Sept. 1 and 7 respectively.

Ray Cox, G8FMK, (Oxon.) mentions the period Sept. 3-6 when conditions were good. A new beacon ON5SHF on 1,296.880 MHz was audible in Thame at 2200 on the 3rd., following a tip-off by G3OSS. No continentals were heard, though. However, on the 4th., PA0CRA (CM) was worked when neither ON5SHF nor PA0QHN could be detected. The latter was heard at S2 on the 5th. at 0800 and a "CQ" call produced a QSO with PE1DPX (DM) for a new square on 23cm. and the best DX of 470 kms. so far. On the evening of the 6th., Ray again heard PA0QHN but activity was nil. Beacon GB3MLE (ZN32b) was switched on on the 7th. as confirmed by G4CCH in Humberside, but no copy at G8FMK. It is on 1,296.93 MHz.

A contact with EI6AS was a first for GD2HDZ on 23 cm. and especially pleasing since there is a lot of high ground between Laxey and EI. Andy Renouf, GJ8SBT, is now on 23cm. with 3w. and a 15-over-15 aerial. GB3IOW can be detected all the time. The output power should be 30w. by now.

John Tye, G4BYV, (Norfolk) worked PA2HJS (CK) on 9cm. on Aug. 7, a QRB of 384kms. His Tx triples up from 1,152 MHz and gives 0.5w. output to a four foot dish. The Rx is an interdigital mixer with an HP2350 and no RF stages. The coax feedline is FHJ-4. The main "IF" is an AR88D of fond memory. John reports that G8ADC in Luton worked a couple of PAs on 13cms. and that Simon Freeman, G3LQR, (Suffolk) worked across to PA on 3cms.

Final Miscellany

Kevin Jackson mentions that MS addicts who want shower information can buy the British Meteor Society's *Radiant Catalogue for 1981* from G. Falworth, 12 Barn Croft, Penwortham, Preston, PR1 0SX at £1.50 post free. He sells many more publications dealing with astronomical and space matters.

G8GXE has passed the morse test and awaits a G4 ticket. Tony wrote that it was very difficult to find details of where to take the test in London. Eventually it was found to be at Lansec House in New Fetter Lane, but he had the Devil's own job trying to get the telephone number from the Post Office. Let us know, Tony, and we will publish it.

Deadlines

All your contributions for December by Nov. 4 and for January by Dec. 2 or earlier to:- "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. 73 *de* G3FPK.

THE "TUNBRIDGE", PART I

A FULL BREAK-IN CW AND SSB MONOBAND TRANSCEIVER

IAN KEYSER, G3ROO

THE idea of the "Tunbridge" was first conceived when I was asked by the West Kent A.R.S. to give a talk on getting on the new bands. I decided that I would try to take a "worst case" situation and show that it was not too difficult to design a rig that was easily reproducible, not too complex, yet with good specification. At first a direct conversion receiver was considered, but on reflection it was decided that with the problems of audio image and netting on CW, a superhet was a better system. After roughing out the idea it was discovered that the component count would be about the same anyway, but the cost would be a little higher due to the filter.

After considerable searching through the data sheets of the new ICs it was realised that the new 'block' ICs, although very good for the experienced constructor, left a lot to be desired for the novice. A lot of work had been done using the SL600 range, and so the unit was designed around these devices. The PCB was originally designed for metal can ICs; however it would be a relatively simple matter to change the pads for the SL600 range, as there is very little difference in the pinouts. It must be pointed out that due to the lack of screening of these devices there may be instability problems, and for the same reason IC bases must be avoided.

Having decided that it was going to be a superhet receiver, it was necessary to decide on the IF frequency. Thinking of the 10 MHz band, and that I wished to show the problems that could arise, I decided on a 9 MHz IF. This was really influenced by two factors; firstly that I had a XF9B doing nothing and, secondly, I

doubted that it would be possible to use a 10.7 MHz filter on the 10.1 MHz band and be able to cut the IF breakthrough to a low enough level. Low frequency filters were out of the race from the beginning as they would not be suitable for a single-conversion rig on the higher HF bands. There are, however, many other popular filter frequencies, *i.e.* 5.2 MHz, that could be used in this design providing input/output impedances are observed.

Receiver Design Considerations

As stated, the receiver was to be a single conversion superhet, with an IF of 9 MHz, and to have an audio output sufficient to drive headphones. AGC was considered but, having weighed up the problems of muting, etc., it was decided that the advantages gained by AGC are far outweighed by the disadvantages when trying to achieve a full break-in system on CW. At first the rig was to be CW only, but after consideration it was decided that SSB would be included to fully justify the cost of the filter. The resulting LF strip is therefore 2.5 kHz wide, and any additional selectivity could, if required for a CW station, be included in the audio stages.

Transmitter Design Considerations

SSB: The SSB generator was to be built on the main PCB as there was little likelihood of any changes to be made in the design of these stages. The resulting DSB signal would be filtered by the receiver crystal filter and then converted to the required band, amplified and filtered so as to reduce the number of interconnections between the boards. As all the filtering, both on receive and transmit, was to be broad enough to cover the whole band chosen there might be some problem in making these circuits broad enough to cover the eighty and one-sixty metre bands, but as there is plenty of reserve gain there should be no major difficulties.

CW: As the design of the keyed 9 MHz oscillator was likely to cause some problems this unit was to be built on a small board which could then be solder-mounted on the rear of the main PCB at right angles in some suitable position. If the rig was to be CW only, the keyed oscillator could be drawn in place of the SSB generator.

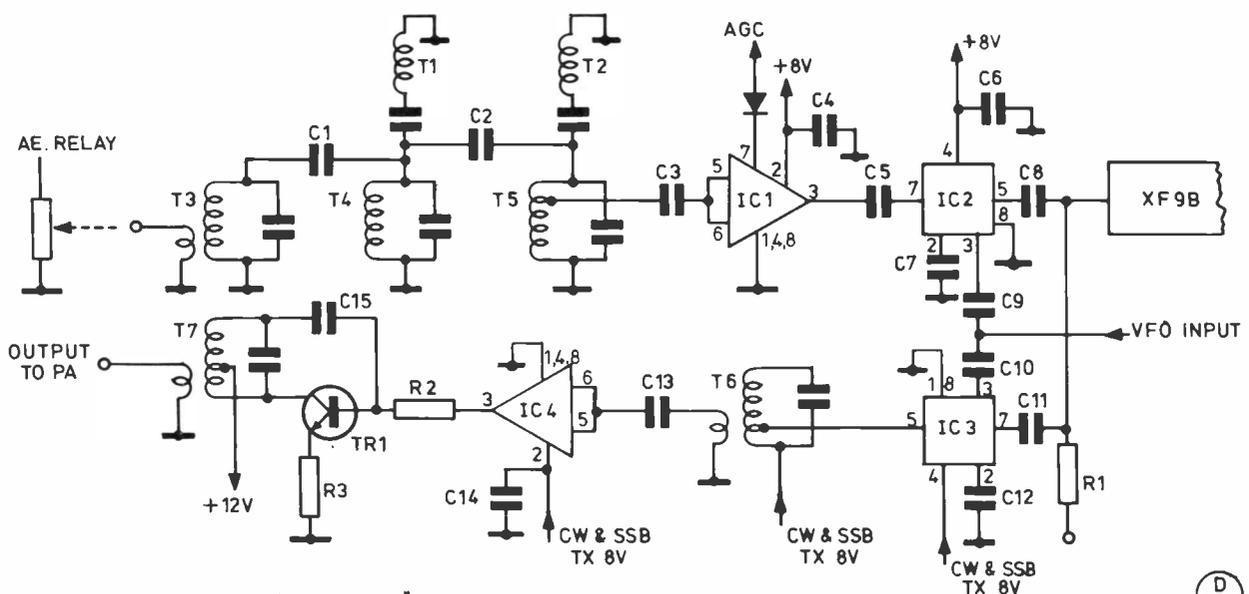


Fig. 1. RF SECTION OF "TUNBRIDGE" MAIN PCB

For simplicity, the main PCB is divided into two sections at the filter, see also Fig. 2. T1 and T2 are IF traps, tuned to the IF; T3 to T7 are all tuned to signal frequency. *Coil data:* T3 aerial input link, tap 1/10th main winding; T5, tap 4/5th main winding; T6, tap 1/3rd main winding, and link winding 1/3rd main winding; T7, tap half main winding, and link winding 1/5th main winding. All from cold end of coils. The coils are all wound on Toko 10K coil formers supplied by *Ambit International Ltd.*, and calculated from data in their catalogues.

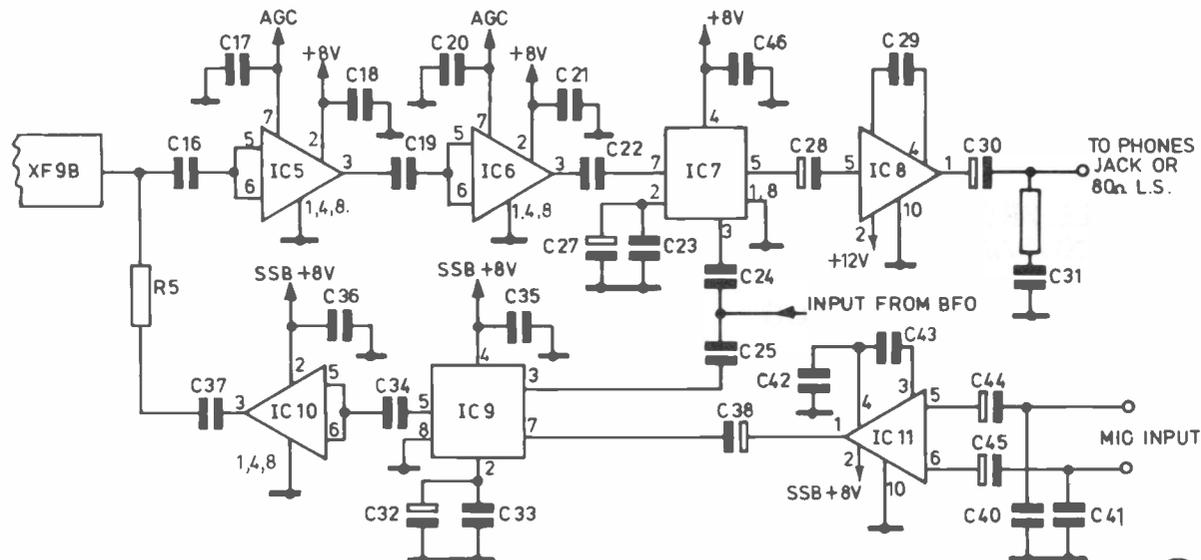


Fig. 2 MAIN PCB, "TUNBRIDGE" AF STAGES, IF STAGES AND SSB GENERATOR.

**Table of Values
Figs. 1 and 2**

C1, C2 = 3.3 pF cer. (10/15/20m)	C42 = 100 pF poly.
C1, C2 = 6.8 pF cer. (40m)	R1, R2 = 470R, 1/8 W
C1, C2 = 12 pF cer. (80/160m)	R3 = start at 220R 1/8 W, and adjust for drive
C3 to C14 = 0.01 μF disc. cer.	R4 = 2R, 1/4 W
C15 = 0.5 pF cer.	R5 = 220R, 1/8 W
C16 to C26 = 0.01 μF disc. cer.	IC1, IC4, IC10 = SL610
C27, C28, C32, C38,	IC2, IC7, IC9 = SL640
C44, C45 = 1 μF elec., 18V min.	IC3 = SL641
C33 to C37, C40, C41, C46 = 0.01 μF disc. cer.	IC5, IC6 = SL612
C29, C43 = 6,800 pF, mica or cer.	IC8, IC11 = SL630
C30 = 100 μF elec., 18V min.	TR1 = see text

coupling of the signal into the input of the IF strip as there is very little distance between them. The audio output from the product detector is restricted to 3.5 kHz. The output from this device is sufficient to drive phones to a very good level, and if required, a small 80-ohm speaker can be powered from the phones socket.

The transmitter is in three sections; the SSB exciter, the keyed 9 MHz oscillator for CW, and the two-stage RF power amplifier. Firstly, the SSB exciter, this is very simple, but gives excellent results. The microphone signal is amplified by an SL630 and fed to the signal input of an SL640 used in its designed mode as a double balanced modulator. The output is a DSB signal with reduced carrier, but if the carrier suppression is insufficient there is provision to include further balancing on the PCB (see xtal mixer VFO section). The DSB signal is amplified by IC10 prior to being filtered by the crystal filter. To keep descriptive continuity, we will

The Final Rig

The receiver is a very straightforward design. The signal from the aerial is fed to the aerial relay for switching between the receiver input and the transmitter output; from the relay it is taken to the front panel to the input attenuator. This is a simple 5K carbon potentiometer and although very simple, it does the job without problems of setting up. From there it is fed to the receiver input on the main PCB, see Fig. 1. At this point it is filtered by a three-stage close-coupled bandpass filter. On the 10 MHz band there are two traps included to reduce the IF breakthrough; in the test rig, only one stage was required to reduce it below an audible level, but a second trap was included to ensure that there would be no problems. On the forty and twenty metre bands no traps are required at all. The filtered signal is then amplified by an RF amplifier, SL610, and fed to the receiver mixer, SL640, to be mixed with the local oscillator to produce the IF signal. This signal is filtered by the crystal filter, and then amplified by two IF stages (SL612), see Fig. 2. The wideband noise produced by this wideband amplifier is no problem because, when demodulated by a product detector, it produces ultrasonic noise which can easily be filtered out in the AF stages; this enables much greater simplification in the receiver circuitry. The product detector used was again a SL640 due to its very simple demands on external components.

The BFO/C10 (Fig. 3) was built in a small tin box and mounted on the main PCB with wire feet, this was done to reduce the

**Table of Values
Fig. 3**

C47 = 0.01 μF ceramic	X1 = to suit filter and sideband in use
C48, C49 = 50 pF poly.	T8 = small toroid, primary 20t, secondary 4t
VC1 = 6 to 30 pF trimmer	TR2 = 2N3819
R6 = 47K, 1/8 W	

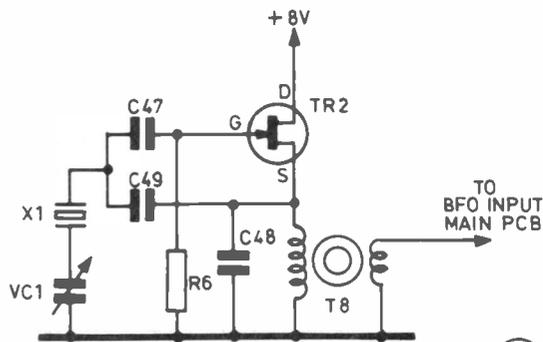


Fig. 3 BFO/C10 CIRCUIT

continue with the transmitter in the SSB mode; however, at this stage the CW keyed oscillator is fed in and the following amplifiers are used in both modes.

The 9 MHz signal is fed to the signal input of an SL641 (Fig. 1). This is a receiver double balanced mixer with very similar circuitry to the SL640 but the output is the collector of a transistor, enabling it to be connected directly to a tuned circuit. In this device the 9 MHz signal is mixed with the local oscillator signal to produce an SSB signal on the required band; the required signal is selected by a tuned circuit and is fed to an SL610 (IC4) for amplification. Still further filtering is required, and as the SL610 cannot drive a tuned circuit directly, TR1 is used as a buffer and the collector of this transistor drives the tuned circuit. Capacitor C15 is included to neutralise the transistor and to maintain stability. The type number of this transistor is not critical: providing that it has a high Ft, it will do! In practice I have used devices such as 2N3053 without problem; however, a 2N3866 will ensure sufficient drive even on ten metres.

By reducing the emitter resistor, up to 100mW of drive is available to drive the P.A. The link winding output from the main PCB is fed directly to the main power amplifier board (Fig. 5). This board was kept separate from the main PCB to keep its size to a minimum and to enable modification to be carried out without damage. The amplifier used was donated to the G-QRP Club data sheet service by W5TVW; minor changes were made to the basic design, by replacing the two emitter resistors with 500mA fuses and including variable bias to have some control over the quiescent current in the SSB mode. The two fuses were not included for transistor protection (I've proved that they are not fast enough!) but they are a source of low inductance, low resistance resistors. It was decided to include on the board the low pass filter for the band chosen, and a reflectometer; the latter has proved to be an invaluable addition for the few extra components it required. The output of this board is fed to the aerial relay, and so to the aerial. In the CW mode there are no main changes, all that is done is that the supply is removed from the SSB exciter and applied to the keyed 9 MHz oscillator instead. The output of this oscillator is fed into the signal input of the transmitter mixer as described earlier; it is then amplified in the same way as the SSB signal.

Keying Circuit

The circuit, Fig. 7, is used in both modes; the microphone socket is used as the key socket on CW. This has one very simple advantage without increasing the complexity; when required to tune up while on SSB it is only necessary to select CW and press the p-t-t switch and the transmitter will run at full output as if on CW with key down. When the key line is open circuit, the cathode

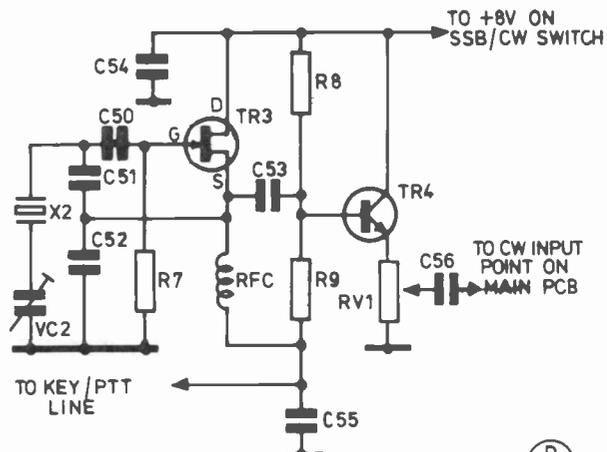


Fig. 4 KEYED 9MHZ OSCILLATOR

D 687

Table of Values Fig. 4

C50 = 0.001 μ F cer.	TR3 = 2N3819
C51, C52 = 50 pF cer.	TR4 = BC108
C53, C54, C55, C56 = 0.01 μ F cer.	RV1 = 2K2 min. preset
R7 = 470R, $\frac{1}{8}$ W	VC2 = 6 to 30 pF preset
R8, R9 = 22K, $\frac{1}{8}$ W	X2 = suitable to be "pulled" into passband of filter

of D3 is held near to +12V via RL and D4. The bases of TR3 and TR2 are at approximately 0.8V due to the base current supplied by R3; TR2 and TR3 are both hard on. With ZD1 shorted out by TR2, TR1 is turned off and no voltage appears on the Tx + 8V line; TR3 being on removes any charge in C10.

When the key line is earthed by the key or p-t-t switch, D3, a germanium diode, conducts, reducing the common base voltage of TR2 and TR3 to about 0.3V. This turns these two transistors off, allowing the voltage across ZD1 to rise to its Zener voltage of 8.6V. TR1 turns on and the Tx + 8V line rises to a little above 8V. TR3 also turns off allowing C10 to charge up from the now present Tx + 8V line via RV1 and R2. D2 has been included in case further modifications are made using the AGC line of the receiver, such as manual IF gain or AGC; in either case the action of TR3, although still required, would be undesirable.

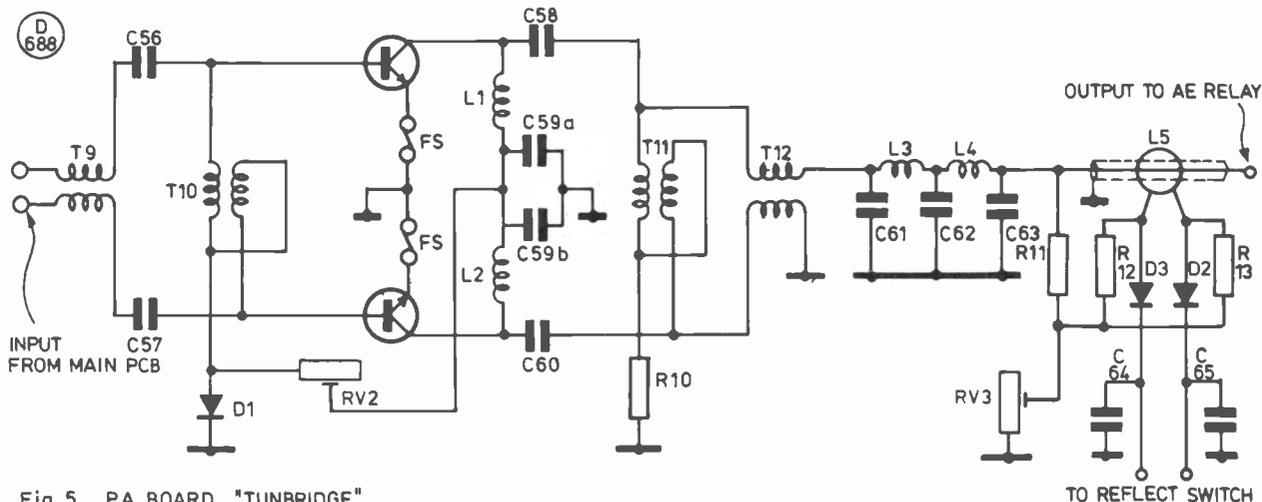
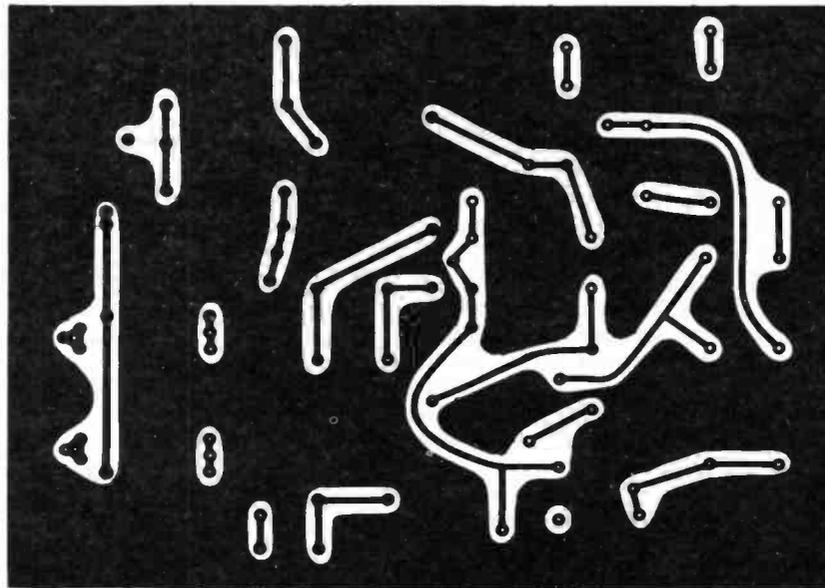
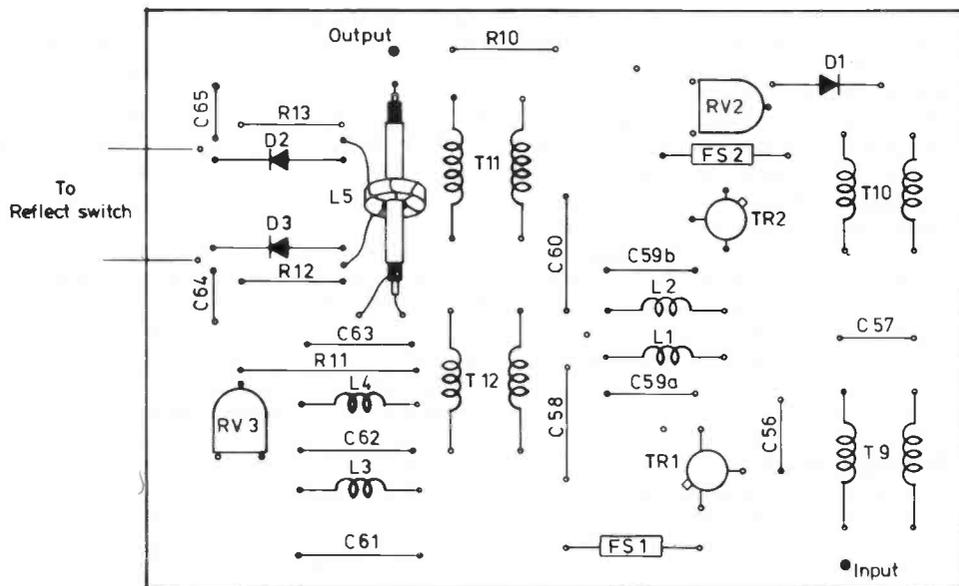


Fig. 5. PA BOARD, "TUNBRIDGE"



FOIL SIDE



COMPONENT SIDE

D
689

Fig. 6 PCB FOR PA

To complete the description we have to open the key line again. When this occurs, TR2 and TR3 turn on again, TR2 shorts out ZD1 reducing the line to zero, and TR3 turns on, removing the charge from C10 so bringing the receiver to full sensitivity very rapidly.

The resulting mute voltage is fed to the mute level control on the back drop of the case. On CW this is a voltage divider enabling the degree of receiver muting to be controlled by the operator in this mode. On SSB no sidetone is required, and to accomplish this the bottom end of the mute control is lifted from the negative supply by a section of the mode selection switch (push button); this allows the AGC line to rise to the full mute level, killing the receiver.

Power Supply

Although not included in the original circuit, a switch has been inserted between IC1 and IC2. This is used to switch between the mains PSU and an external 12 volt supply. The one-amp fuse, and D1, form a reverse polarity circuit; in the case of supply reversal D1 conducts, blowing the fuse (with luck) before any further damage can be caused to the circuitry! D1 is unspecified, but can be any high-current silicon diode. As there is no other fuse in the set due to lack of space, it is necessary to replace the fuse in the mains plug by one of 1/2-amp rating.

to be continued

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SHORT WAVE LISTENER FEATURE

By Justin Cooper

VARIOUS contributors this time around make mention of receivers and the building thereof; and, of course, there are all sorts of ways and circuits for doing this. However, there are two points at which one must demur. The first is the proposal to use valves; there is no reason at all in 1981 why anyone wishing a good receiver should use valves, even if they have a junk-box full of the things. If you feel a bit adrift with transistors, then for Pete's sake make the beast with FETs — after all, professional electronic old-timers often refer to a valve as a “hot-cathode FET” — with some degree of truth at that. The big snag with semiconductors used to be the front-end mixer performance, but there is no need to be worried on that score today.

The second proposal is to use a TRF (tuned radio frequency) receiver, and with this the implication of the use of reaction. Here the snag is a bit more subtle: for any given tuned circuit ‘Q’, the bandwidth (to the 3dB down points either side of resonance) will be a *proportion* of the resonant frequency. Thus, if you measure the bandwidth in kilohertz, you find it varies as you vary the resonant frequency. Now, if your TRF is comprised of an RF stage, detector and an AF stage, the RF stage tuned circuit will be damped well and truly by the aerial to which it is coupled, while the detector stage with smooth reaction (we hope) has a far higher Q by virtue of the positive feedback. This sounds fine, but . . . a single tuned circuit of a given Q will be found to be sharper at the ‘nose’ and wider in the ‘skirts’ and so telephony becomes distorted as sidebands are cut, while the signal alongside still splashes into your wanted one. Since there isn’t any AM on our HF bands these days, one normally operates with the set just oscillating, when selectivity will be found to have fallen away some. Furthermore, a Big Signal will have enough oomph to stop the reaction and so render it not copiable. Heaven only knows why books which include TRF circuits are still published!

In fact, any home-brew receiver project in this day and age, if it hopes to be more than a toy, just has to be either a superhet or a direct-conversion (homodyne) job; and the design must make a wide *dynamic range* a first, prime requirement, followed closely by the need for selectivity and stability, a good tuning rate, and so on. The irony of it all is that a good single-band direct-conversion receiver can meet these requirements with a simpler construction than any TRF.

The basic homodyne receiver can be regarded as a product detector and AF sections of a superhet, but with its input at tuned RF instead of IF. A product detector (or even an old-fashioned diode + BFO) is a mixer to all intents; and it is in the mixer stage(s) of a receiver where the limit to dynamic range is usually set. It is also the place where painstaking work by the home constructor can improve matters without too much expense.

In ascending order of ‘goodness’ one would say transistor, FET, single-balanced, double-balanced, and double-double-balanced mixers — the last three normally using diodes, although a double-balanced FET mixer appears in the literature. Each of these types requires the right amount of oscillator injection, and a balanced mixer is a pair of mixers, a double-balanced mixer is a pair of single balanced — with, sad to say, a resulting increase in the output power requirement from the oscillator. Given the correct oscillator input, the mixer will begin to overload as soon as any input at the RF port reaches a level of minus 5dB with respect to the oscillator, as a rule of thumb. At the other end — the smallest possible signal the receiver can see — we will normally be limited by noise picked-up on the aerial, but if we forget this, the ‘noise floor’ will be defined by the thermal, shot and flicker noise of the mixer, and by the spectral purity of the oscillator. By this latter term we are taking into account that an oscillator will generate the wanted oscillations *plus* some harmonics and noise.

To prove this, take any older receiver with a BFO switch, and switch on the BFO and note how the hiss level rises; and the harmonics of the oscillator will be audible too, as BFO harmonics in the tuning range of the receiver.

Finally, the RF input, the oscillator input and the output from the mixer must be correctly matched. The match to the output port must be maintained both in the IF (or audio) passband but also to the unwanted products of the mixing process which are decoupled away. It goes without saying that the stage following the mixer, whether we are talking of direct-conversion receivers or superhets, must be of suitably low-noise performance in itself, which may entail selection of devices.

However, fascinating subject though receiver design be, we must turn our attention to the letters!

QSL's

M. N. W. Thornton (Romford) discusses his QSL return, and, like so many others, finds that, in general the going rate seems to be replies to about two-thirds of the cards sent out. To achieve this rate, the SWL reporter *must* make his reports worth answering. A report, to be worth answering, must be of some help to the recipient. If you send a report to some poor soul who is calling CQ and not getting a nibble, or, worse, isn't hearing other stations calling him, a report detailing the circumstances, sent direct, may well save him tearing the station to bits to find a non-existent fault, or altering a good aerial when he should be looking inside a newly-deaf receiver. Such a report will almost surely rate a QSL, and particularly if it indicates that the signal was as good as, better than, or poorer than, other signals from the same area. On the other hand, the “You were 59 last night and please can I visit your shack?” report sent to the ham next door rates a thick ear from most amateurs! While the *S.a.e.*, or IRCs and pre-addressed envelope, may in a border-line case turn the trick, in general the better and more comprehensive and painstaking the report, the more likely it is to click — too many reports received are just plain awful and only rate the dustbin.

Questions

P. Catterall (Chorley) runs a Yaesu receiver into a 132-foot wire and a vertical. Phil has a tortured phrase in his letter (don't we all sometimes?) which we think asks us to define “hearing” a station. This is something which quite definitely varies from person to person, but the minimum consists in hearing and identifying for certain, the station logged. It's no darned use identifying the station *he* is working (unless it also is wanted, of course), saving as a means to lead you to your target — particularly if he is an expedition station buried deep in the pile-up. Such a station may involve quite a long period of time before the identification is certain. Some SWLs choose to make it harder by setting their own, more difficult rules, like hearing a complete contact, or even several.

A question which crops up pretty rarely now that SSB is all but 100% on the HF bands, is about the “AM/SSB” phrase in the HPX Rules, but *K. Cooke (Cardiff)* wants a clarification. Originally it was worded that way to prevent people sending us, say, an all-AM or an all-SSB listing (or both) and asking us to give each a separate entry. We got in a bit of a tizzy with it all, and decided we would have to have a single, all-modes, Phone table. Thus in 1981, an HF Phone SWL would probably be all SSB, but if he can listen on VHF he would probably hear mainly FM stations, and the odd AM and SSB signals. All, for HPX purposes, are telephony and go in a Telephone list.

Now, having cleared that one up, there is a clear mis-

understanding in Kevin's letter when he assumes that SSB must be a form of FM, from the way that darned rule is worded. No, sir! Quick clarification coming up. There are two basic ways of impressing information onto a transmitter's carrier. One is to wobble it about in an amplitude mode, and the other is to wobble it about in frequency. The latter is FM, and is used by the BBC VHF broadcasts for the sake of the high quality so obtainable when the carrier is made to deviate by a large amount; amateurs are allowed only narrowband FM, as indeed are the commercial VHF base-to-vehicles using the mode. Turning back to the amplitude modulation situation we have some redundant information in an ordinary AM signal. Imagine the modulation is a pure 1000 Hz tone and 100% modulation; look at this on an oscilloscope and we see, in the absence of modulation, a pure CW signal of some amplitude 'X' when we set the 'scope controls suitably. Putting the modulation back on, and the picture on the 'scope changes: the amplitude will be seen to rise to 2X, and then fall to zero, and repeat, at a rate of 1000 Hz. This is AM, as the amateur and the BBC know it. Now take a selective receiver to the same signal and tune through it, and you will find the carrier and, on either side and one kHz away, two other signals, each of half the carrier's amplitude. These two are part of the signal, as we can see by flipping the modulation on-and-off a couple of times. The 'modulation' is the information we wish to transmit, and the carrier is transmitted as well, making the 'detection' at the receiver nice and easy. But each sideband contains the same information, so one must be redundant. As for the carrier, we can remove it at the transmitter and fit it back in at the receiver. So — three-quarters of the AM signal is surplus to our real needs. If we remove the redundant three-quarters in the low-level stage of the transmitter and make the output stage linear we can, roughly speaking, make the one sideband four times bigger than it was in AM, using the same valves in the output stage.

From the receiver point of view the SSB signal has some advantages too; one can cut the bandwidth of the receiver by half, and by merely not transmitting the carrier, the receiving station is freed of the cacophony of whistles which used to be the result of every transmitting station's carrier. In addition, since the carrier is re-injected at the receiver, its amplitude can be set at the receiver too, which eases the QRM problem somewhat for the receiving SWL.

Getting a Ticket

Surprisingly often we get a letter in which the writer says he is too old or not technical enough to study for the RAE (or the Morse). This is absolute hogwash and bunkum! Anyone can take the RAE and pass, provided he is prepared to put his mind to the learning, and if necessary teach himself to think and learn. Get hold of Tony Buzan's "Use Your Head" (*BBC Publications*) and read it carefully. Get your chosen textbooks (RSGB or ARRL), the Examination Manual, pencil and paper, and get stuck in. Then pass the examination, and don't be downhearted if you have to have two bites at it. We know of an SWL who took the RAE about eight times, but who has now passed. And, for those who worry about the stress involved in taking the RAE, we reckon the stress that is built into SWL'ing to a high degree (*i.e.* to an HPX score or around a thousand up) is rather greater.

Snags

Abound everywhere; *J. M. Dunnett (Prestatyn)* had no QRM from the TV set until the engineers came and swept out the dead flies. Then the QRM was vile right up to 21 MHz, and the engineer said he "wouldn't know how to deal with the problem". Some 'engineer'. The obvious answer is that he didn't put the TV back to the state in which he found it (apart from the dead flies!). After all, if the problem starts immediately the TV has been 'mended' there isn't much likelihood of there being a snag on the mains or the aerial; unless a neighbour's new TV was commissioned on the same day.

Mrs. R. Smith (Nuneaton) thinks her new arrangements are quite marvellous, now she is getting the hang of "driving" them;

different receiver, ATU and aerial all in one lump is a bit of a facer! There is also the move of the rig to a new location in the house, which removes the need for headphones and so enables operation at new times of day. One must say, though, that while the speaker is useful in that way, there is little doubt that the 'cans' are a great help to the listening process.

J. M. Short (Thornbury) asks what on earth happened to his last HPX score. A Very Good Question! The answer, after a longish examination, is that there has only been one entry to the Table which reached as far as your scribe; a 729 sent in for the July issue, which for some reason — probably picking up two cards at once while typing the Table — failed to appear in the July listings and was first shown in the September listing.

D. C. Casson (Reading) continues to listen and this time reaches the 1000 mark, the while he continues the good work on his Morse with much help from G2HLU, who transmits Morse to this end on 28.300 MHz. We must admit that Ten is a very good band for slow Morse transmissions.

N. Jennings (Rye) wrote to ask for a copy of the HPX Rules; but by the time his letter was received here the September issue which included the Rules was already published.

D. McKinney (Co. Armagh) runs an FRG-7 with a heliscan horizontal dipole about sixteen feet up; by the time this comes to the reader, David should have his RAE results, and we have our fingers crossed for him.

G. A. Davey (Bury St. Edmunds) has got himself an FDK Multi 700 receiver for VHF FM signals, but this meant the sale of all the HF gear, which makes prefix hunting a mite difficult. Now's the time for a bit of home-brewing!

We had rather given up *N. Askew (Coventry)* for lost, but we have an update to his score which accompanies his letter; Norman has been very much occupied with other things, which caused a QRT between May 15 to the time of his letter, which included a list covering the month before that.

A spot of luck for *D. J. S. Williams (Romsey)* who was spotted and identified by a colleague reading this piece who himself has a G8 call. On a different tack, SWL Williams remarks on the noticeable difference at the new QTH in the strength of signals from South America. It is probably something to do with take-off and the ground conductivity.

Now we turn to *A. Stevens (Crowthorne)* who comments on the revival of 28 MHz as a DX band after its summer sleep; VK0AM at Mawson Base, Antarctica provided the proof! By now, a lot more will have been logged, doubtless. Turning to the examinations, Allan reports that this year has given him the magical three-out-of-three passes — congratulations!

Last time out we referred to *E. B. Ward (Ruddington)* and his home-brew receiver — lo and behold, he's got an FRG-7 in the shack now! But despite all the difficulties with the home-brew gear, a dispassionate consideration indicates that it was quite a machine when driven properly. On a different tack altogether, Barry suggests that your old J.C. is professionally employed as either a teacher or lecturer, rather than in industry. Keep trying! On yet another topic, Barry recalls the happy sound of so-called

ANNUAL HPX LADDER

Starting date, January 1, 1981

SWL	PREFIXES		
P. J. Catterall (Chorley)	363	A. Rowland (Bude)	238
G. Caselton (Orpington)	357	R. D. Newall (Bracknell)	238
J. Singleton (Skelmersdale)	304	L. Ayres (Chalfont St. Giles)	222
D. McKinney (Co. Armagh)	303	M. Hill (Bedworth)	207
J. Hayes (London N9)	275		

200 Prefixes to have been heard since January 1, 1981, before an entry can be made. Entries in accordance with HPX Rules, p. 365, September issue.

A HIGH-PERFORMANCE POWER SUPPLY AND CONTROL SYSTEM FOR 4CX350/4CX250 AMPLIFIERS, PART V

THE EHT SUPPLY

JOHN H. NELSON, B.A., G4FRX and
M. C. A. MORONEY, B.Sc.

“Energy is Eternal Delight”

(*The Marriage of Heaven and Hell*, by William Blake)

WE now turn to the final part of the power supply and control unit with a discussion of a high-performance anode supply system. It must be stressed at the outset that unlike, for example, the screen-grid power supply outlined in the last section, the kind of power supply to be described is *not* an essential requirement for good performance of a high-power amplifier using a 4CX350 or 4CX250 or, for that matter, practically any other type of valve except perhaps the travelling-wave tube. It is eminently possible, and indeed more or less standard amateur practice, to take a suitable transformer, some rectifiers (usually a string of the ubiquitous BY127s in a bridge or biphasic configuration) and 30 μ F or more of smoothing according to availability and taste, and call it the EHT supply. It works, and with due attention to detail works well. Why, therefore, bother with anything else?

A Philosophical Digression

There is a general point here, which is worthy of some discussion. Although most of the comments received by the author concerning this series of articles have been very favourable, there are one or two people who appear to have missed the point of why they were written at all, particularly those who use this class of valve on the HF bands. It remains an unfortunate fact that at VHF and UHF, where effective radiated powers are greater and receiver noise floors are much further down, the number of really clean high-power signals can still be counted on the fingers of one hand; and it is also unfortunately true to comment that most users of this family of valves end up with amplifiers that are far short of their potential performance. To obtain the best performance from the 4CX350 or 4CX250, bearing in mind that we have a moral duty to do so for the sake of our local colleagues and our neighbour's television sets, takes some attention to detail and a willingness to adopt a different attitude from the prevailing “well, we're only amateurs — what does it matter”?

This series of articles has attempted to show some of the ways in which the best possible performance can be achieved from this family of valves. It has *not* said, in effect, “do it this way or it will never be any good”. Some amateurs evidently take a delight in getting away with all sorts of crudities, and why not? The hobby is, hopefully, large enough to contain us all. But what may well have been good enough twenty years ago may not be good enough under present-day conditions of large antennas, good low-noise receiving systems with adequate filtering and good stopband rejection, and much more activity. It seems an injustice that those who take some trouble over their transmissions, both for moral

and for legal reasons, are often the ones who suffer at the hands of the man who will not take the trouble to think through the way his amplifier tunes and loads (how do you tune and load a tetrode amplifier without a screen-current meter? How on earth can it be a *linear* amplifier if the screen supply to a 4CX250 isn't stabilised?), who has no real idea of the havoc that 10 kW e.r.p. can cause on a busy band if it is not well set-up and controlled, and who cares even less.

If all this sounds very sanctimonious and holier-than-thou, try a small experiment the next time that a good opening occurs on 144 or 432 MHz, or there is a contest. Find out first what level of incoming signal your receiver can cope with before producing spurious responses of one sort or another, and then take a tune round the big signals. A few of the older-established contest groups, who know what they are doing, will sound perfectly clean; many of the rest will have quite revolting signals, and quite often these will be the people who are only too happy to tell you all about the DX which they have worked! Yes — but at what cost to the other users of the band? If you perform a small calculation and work out how many more stations could fit happily into that band if every signal were clean and narrow, the result may well prove depressing.

Perhaps attitudes have to change as well as technology: perhaps one should stick to trying to improve the technology instead of preaching about attitudes. The fact remains that it is eminently possible to produce clean signals from valves in this family, although it will take a little more effort than simply building Fred or Joe's design and blazing away. It may also be fun and self-training, which is why we have a licence in the first place.

Back to Business

So — to return to the present design — why should one bother with anything else in the EHT department? As we have said, it is not essential to do so, as it is in other areas of the circuitry, but there are a number of reasons why it might be worthwhile. One is inherent in the words “. . . suitable transformer” mentioned above. An amplifier using a 4CX250 or 4CX350 will require, depending on the valve type, 2 or 2.5 kV or thereabouts; more than this is detrimental to the life of the valves since they have oxide-coated cathodes and are therefore very susceptible to deterioration from ion bombardment at excessive values of anode voltage. In fact, since all the valves in this family are of high permeance (*i.e.* they are capable of high anode currents at relatively low values of anode voltage) the anode voltage can be chosen to optimise the intermodulation performance of the amplifier and not necessarily for the highest power output.

This, of course, is a somewhat perfectionist approach which also, perhaps rather awkwardly, implies a transformer which, after rectification and smoothing, will produce the required voltage. However, suitable transformers, while not exactly rare, are not what might be called readily available. One might, for example, find one with a secondary winding which would give rather too little output with a biphasic rectifier system (or lack a centre tap) and yet rather too much with a bridge configuration. Alternatively one might find one with, for example, a 2300-O-2300V secondary, as the author did recently, which would give rather too much however one were to rectify and smooth the output voltage. Many EHT transformers also have only one primary winding, which gives no latitude for adjustments; if the incoming mains is on the high side, as it is at G4FRX for example (250V for most of the time) this also is unhelpful.

The crux of the matter is that if the voltage into the primary of the transformer could be controlled in some way, the secondary voltage would naturally change also; this would make it possible to use a rather wider range of transformers than if one were simply constrained to find one to supply a suitable secondary voltage from the mains supply. One cannot, of course, take this line of reasoning too far in the other direction: a 500V transformer could not be turned into a 2 kV transformer without some problems in other areas!

It is also useful for some purposes not to be tied to one value of

anode voltage for an amplifier, whether or not it uses one of the 4CX family of valves. For example, we have noted that about 2 kV is a suitable value of anode voltage for a 4CX250B amplifier, which it indeed is in Class AB1. In Class C, however, when FM or CW is in use, this may not necessarily be so. The terms of the amateur licence in the UK limit us to 150W DC input to the PA, which for 2 kV implies an anode current of 75 mA — it is salutary to note that this is less than the required *standing* current for a 4CX250B in Class AB1! No '250B amplifier known to the author could be called a model of efficiency at this order of anode input, and indeed the best one measured recently out of a sample of nine gave an efficiency of about 38%. This is nothing less than miserable for a Class C amplifier. However, when the anode voltage on the same amplifier was changed to 1 kV and the drive level increased to raise the anode current to 150 mA the efficiency rose sharply to 66%, which is rather better.

A subsidiary reason for having some control over the anode voltage supply might be where one wishes to use different amplifiers (using different valves) for other bands; for instance, as well as one of the 4CX family for VHF or UHF, one might wish to use the wonderful 813 in an HF amplifier. For this venerable device, some 3 or 3.5 kV is useful for good performance, naturally at lower values of anode current than are used in one of the 4CX family. It would be useful to have an anode supply which could cope with both.

Hence at this point we have identified some reasons why one might use a variable anode voltage supply. One easy answer would be "well, all you need is a Variac!"

Well, yes — but first find one. A new Variac rated at 1 kVA costs something like seven times more than all the components for the present design if bought new, and, as for a second-hand one, the author has not seen one for years. Also, as will be seen shortly, the system described here will perform certain things which a Variac will not.

One point which must be considered in the context of the anode supply for a high-power amplifier is the care and protection of both the valves and the supply itself. Unless one is lucky, good valves will have been expensive and it is common sense to engineer the system so that they have as long a life as possible: this being so, protection against excessive anode current, flashover and so on is good practice. Equally, the EHT transformer itself is likely to be an irreplaceable item and its well-being is of prime importance. The amount of energy lurking around various parts of any high-voltage supply is, by amateur standards, very high and it can do a good deal of damage if it goes astray; one's performance in

contests is *not* likely to be enhanced by loud bangs emanating from the EHT department.

With all these points in mind, it then becomes necessary to consider how to fulfil the requirements without using a Variac, or indeed any other method involving great expense. Which is, of course, the cue for the entry, stage left, of one of the most interesting and useful of all modern semiconductor devices — the thyristor.

A Non-Philosophical Digression

To digress a little, the author can accurately trace the genesis of this part of the power supply to one afternoon spent travelling on a train from Birmingham to London. It was necessary to vary the high-voltage supply to the anode of a 4CX350FJ for some experiments on the variation of intermodulation performance with anode voltage, and this was being mulled over as the countryside passed by. Now, having a strong interest in railways, the author noted on arrival at Euston station that the electric locomotive which had hauled the train was the one of its class which had been modified for thyristor control of its traction motors.

The word "thyristor" had been in the back of the author's mind for some time, along with thoughts of the speed controller on a domestic electric drill which used these devices, but a cursory reading of the literature had seemed to indicate that they could not be used into a highly inductive load such as the primary winding of a transformer. However, it occurred to the author whilst looking at the locomotive that its traction motors could hardly represent anything like a resistive load! So later that day, magazines and manuals were pored through to see how it was done.

The upshot of this was that there seemed to be three ways of producing a variable high-voltage supply. These were:

- (a) a Variac
- (b) a switched-mode supply with appropriate control system
- (c) a thyristor-controlled 50 Hz supply.

Option (a) had already been ruled out on cost grounds, as well as for reasons which will become evident shortly. Option (b) was attractive but would have meant obtaining a specially wound transformer at enormous cost, as well as making the design very much a one-off. This left option (c).

This looked most promising, since it made it possible not only to use an existing transformer but one which, as mentioned above, could not have been used in the ordinary way because it would have given too much output. It became even more promising when certain spin-offs were taken into account. If thyristor

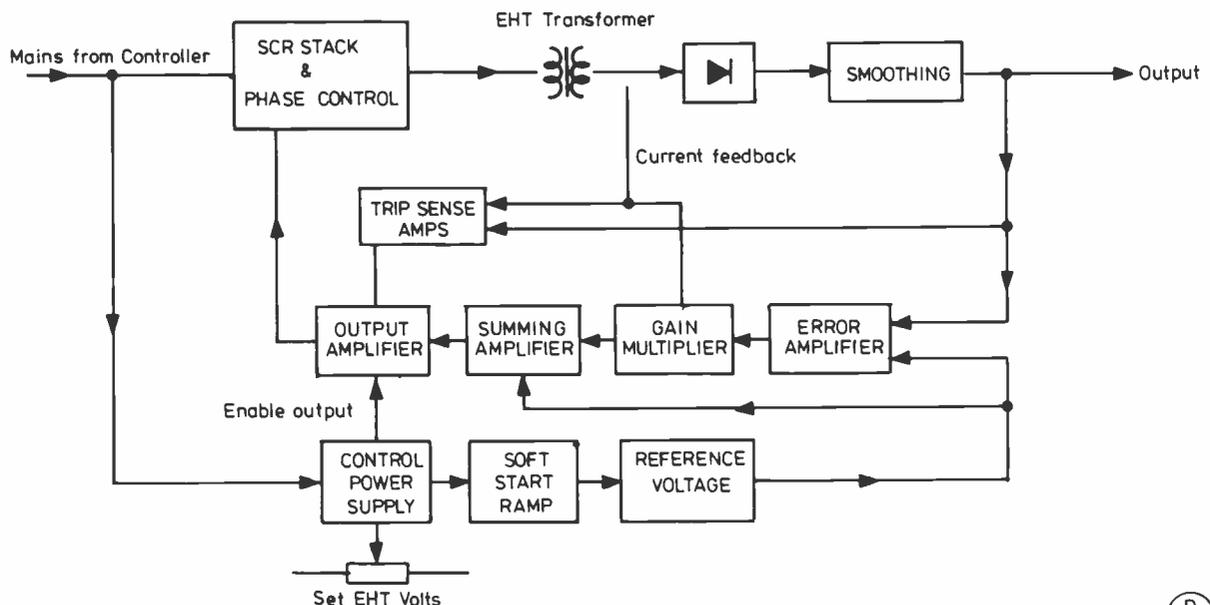
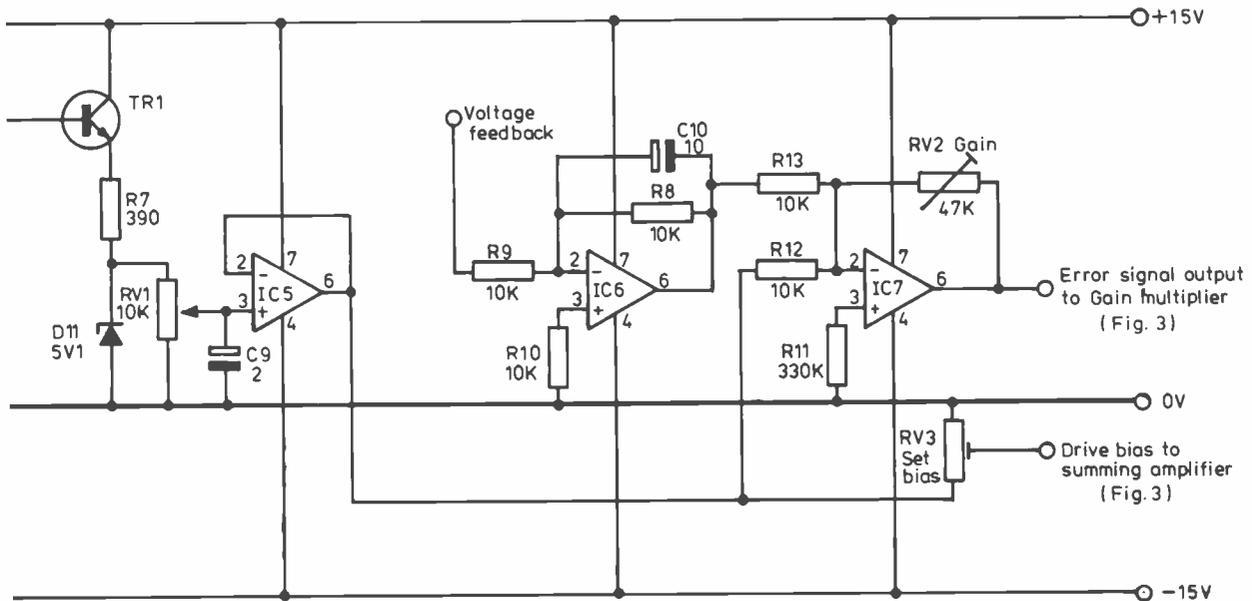


Fig. 1 OVERALL BLOCK DIAGRAM

747
b

selected for minimum temperature coefficient.

When the unit is powered off, the integrator IC4 is reset by discharging C8 via D6, D8, R1 and R2. This will leave a maximum residual voltages on C8 of 1.2V, *i.e.* the forward bias voltage of the two diodes. Should the unit be switched on again immediately (which theoretically cannot happen if the control logic as described in the first article of the series is doing its job, but Murphy is alive and well and lives in aeroplanes and power supplies. . .). D9 and D10 will prevent TR1 being driven into conduction until the integrator has ramped up from this residual voltage. This prevents any switch-on surge occurring in the feedback loop.

The voltage at the wiper of VR1, which is the "EHT voltage" control on the front panel, is followed by the output of IC5, which is a simple voltage follower. This presents a high impedance to VR1 and hence prevents any loading on it. The reference voltage developed in this way at the output of IC5 is fed to the error amplifier IC7, and also to the drive bias preset VR3.

The feedback voltage from the output of the EHT rectifier is presented to IC6, which is an averaging amplifier. The purpose of this is to smooth out the ripple of the EHT output and thus to provide a steady voltage to the error amplifier; its time constant is set by the values of C10 and R8. It also acts as a lowpass filter, reducing the loop gain at high frequencies and thus resisting loop instability. The feedback voltage thus obtained is the second input to the error amplifier IC7, which has an output voltage proportional to the difference between the feedback and the reference voltages. The gain in this part of the circuit is determined by VR2, which is used to set the overall loop gain.

The error signal so derived is fed to the gain multiplier stage (Fig. 3). This is a four-quadrant analogue multiplier, the principle of which is described elsewhere (Ref. 2). The other input to the multiplier is a voltage proportional to the secondary current in the EHT transformer. This is generated by IC101 which is an averaging amplifier taking its input from the current feedback resistor in the EHT circuit; the gain here is set by VR101. A fixed bias on the output of approximately 0.6V is given by R102; this allows an error signal to pass through the multiplier at zero load. Since the multiplier has a useful input range of 0 to 12V, setting the fixed bias at 0.6V allows a gain multiplication range of 20 to 1. The theoretical background to this circuit is shown in the Appendix.

The output error signal from the gain multiplier is added in IC104 to a bias signal derived from the reference voltage via VR3. This stage also inverts the error signal so as to give a positive voltage for more drive to the thyristor stack.

If we now refer to Fig. 4, the output from IC104 passes to TR201, which is a simple emitter follower to convert the voltage output from IC104 to a current through the opto-isolator IC301; this is physically located within the thyristor stack box. The diode D201 on the base of TR201 protects its base-emitter junction from damage due to a negative drive voltage; an early demise is usually forecast for transistors under these circumstances! A negative voltage could occur at this point if the load were to be suddenly removed.

It will be evident that TR201, as the driver for IC301, can be considered as the main 'enable' device for the thyristor stack. This transistor derives its collector current from TR202 which is normally fully saturated and receiving its base current from R204. This normal condition is indicated by LED201, which is the 'EHT run' indicator on the front panel. The base current to TR202 is cut off when the unit has just been powered, at which point the output of IC1, as discussed above, is positive. As such it drives TR203 into saturation, so that all the current is sunk through R204 and the base of TR202 is consequently taken down to earth. The base-emitter junction of TR203 is also protected from negative voltages by a diode, D202, since shortly after switch-on the 'enable output' line goes negative, switching off TR203 and hence allowing TR202 to saturate and TR201 to conduct.

It is clear that TR202 must be turned on before the thyristors can be driven, and herein lies the basis of the protection circuitry. TR202 is switched off by a trip; for instance, if we consider an overcurrent trip, then SCR201 will be fired by its associated trip sense amplifier if an overcurrent fault occurs. SCR201 will thus conduct and current will be sunk through R204 via D203 and D204. It follows that the base of TR202 will be taken down to earth, as discussed above. In the same way, current will be sunk through R205, thus providing base drive for TR204 and TR207. When TR204 conducts, C201 will charge until SCR202 fires, which will be after a delay of about 100 milliseconds, and LED202 (the 'EHT overcurrent' lamp on the front panel) will illuminate to indicate the cause of the trip. This delay is required because the trip sense amplifiers tend to give an output pulse when the power

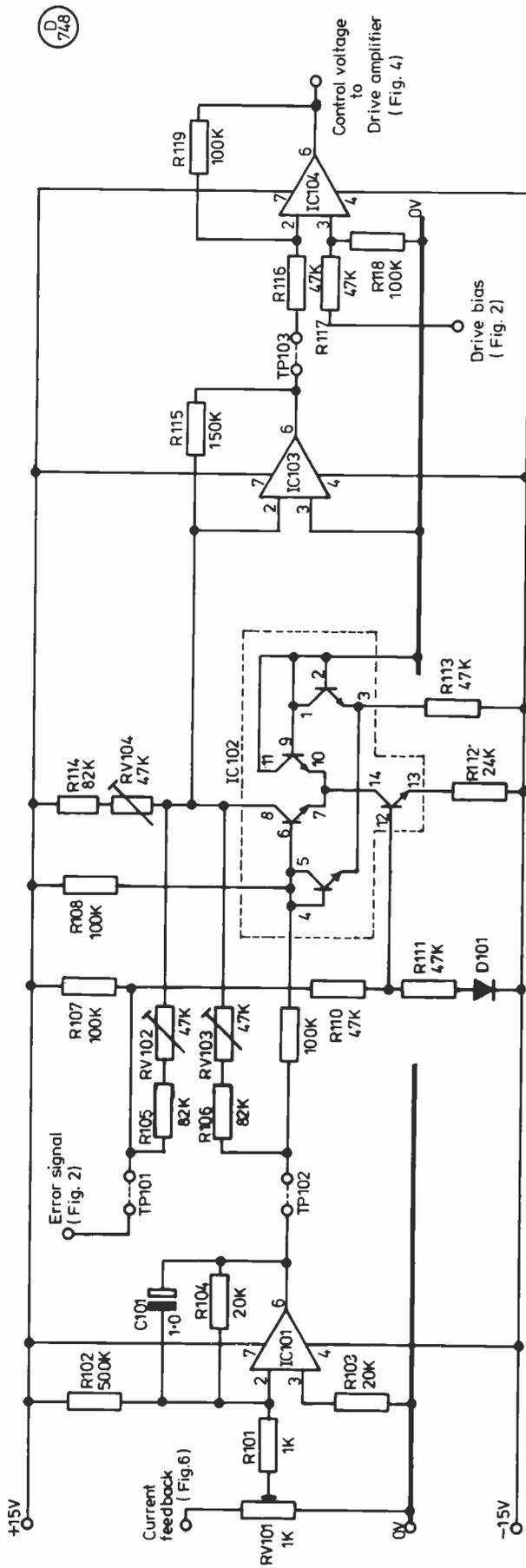


Fig. 3 GAIN MULTIPLIER AND SUMMING AMPLIFIER

rails collapse after switch-off; this could have the effect of lighting all three trip indication LEDs at once, which would be, to say the least, rather confusing! The function of TR207 is discussed shortly.

The LED trip indicators are powered from the +24V relay supply which is generated in the bias and control logic box shown in Part I of this article, and this is so that the LED associated with the fault remains on after a trip has occurred. The LED will remain illuminated until its associated SCR is switched off by interrupting the +24V supply with the 'lamp reset' push-button switch on the front panel. An investigation of the cause of the trip may then be made.

As mentioned above, TR207 is turned on by a trip signal and this will fire SCR207. The function of this thyristor is to crowbar the screen supply rails in the event of a fault, as mentioned in the screen supply design, and there are two reasons for this. One is to ensure protection for the valves, and indeed the capacitor in the valve base, in the event of a flashover — both are much more likely to survive unharmed if the screen-grid of the valve is quickly taken to earth and the fault current dissipated in somewhere other than the valve — and the other is 'belt and braces' protection for the rest of the system since, in the event of a fault, not only will drive to the main thyristors cease very quickly but because the screen over-current relay RLG will operate to reset the main timer and therefore all supplies are removed by the control logic. This was shown in Part I. As we have seen, drive to the thyristors is removed by a trip signal which switches off TR202, while TR207 switches on and crowbars the screen supply.

The authors would at this point reiterate that where voltages and currents of this order are being switched and controlled, the concept of 'over design' ceases to have any meaning. There is rarely a second chance with high-voltage power supplies of any kind, not only for valves and other components but, of infinitely greater importance, for you. Please use your common sense when dealing with this type of system, don't snort at some basic precautions and a bit of safety awareness: let's stick to detecting the presence of high voltages with meters and so on, not with fingers!

The Thyristor Stack

We move next to the heart of the unit, the thyristor stack and its associated phase control oscillator (Fig. 5). The latter is a conventional ramp and pedestal design, which is described more fully in the Appendix and also Ref. 3. The supply to the oscillator is taken directly from the mains via R301 and the bridge rectifier D306-9. This gives a supply voltage of about 120V, which is used to generate the ramp voltage. The supply voltage to the oscillator proper is dropped further through R302 and stabilised by D301 at 20V. The pedestal voltage is generated by the collector current through the photo-transistor in IC301 and is thus a direct reflection of the drive voltage to TR201 in the output amplifier; the purpose of using IC301 is to provide the necessary electrical isolation between the two parts of the circuit.

The output pulses from the oscillator are conveyed to the thyristor stack by means of a pulse transformer, T301, which has the effect of galvanically isolating the two halves of the stack from each other and the oscillator.

The design of the thyristor stack itself might seem to be a little elaborate and unusual, but it has been dictated by the limitations of thyristors when driving into highly inductive loads. Under normal circumstances, a thyristor driving into a resistive load will remain on until the end of the half-cycle of the AC waveform, at which point the current will drop below the thyristor's holding current. However, with an inductive load such as the primary winding of a transformer, the current tends to 'ring', which causes the thyristor to turn off, or commutate, prematurely. This has the rather tiresome effect of limiting the allowable range of phase control to the middle portion of each half-cycle, if indeed the thing condescends to work at all. In this circuit, which is based

on a GE design (Ref. 3) the main thyristors in the stack are given continuous gate currents for the required conduction periods, as opposed to gate pulses to turn them on. This overcomes the problem of premature commutation.

Having said that, the second problem with an inductive load is, surprisingly, failure to commutate! The phase lag due to an inductive load can cause a thyristor to remain permanently in the 'on' (conducting) state unless it is forced to commutate by external means. The arrangement used in this design is self-commutating insofar as each thyristor is used for half of the AC cycle and thus the current through each device falls to zero at the end of the half-cycle; they therefore commutate in the usual way.

As if the above problems were not enough to contend with, there is a further requirement in that the supply voltage to the load *must* have a minimal DC component. Given the fact that the primary resistance of the EHT transformer likely to be used in this application will be about an ohm or less, it is obvious that if the DC 'offset' is of any magnitude, enormous currents will flow in the primary. This was proved the hard way during tests with one of the early prototypes, when a transformer was accidentally subjected to abuse of this kind: the result was a blinding flash, accompanied by a loud bang and the reduction of the transformer to a charred mess of varnish and copper, closely followed by the demise of the main house fuses! Great attention was paid to the finer points of this section of the circuit after that. . . .

The use of a single control oscillator, together with an inverse parallel arrangement for the thyristor stack, ensures that the DC component is always at a minimum since the firing angle is symmetrical and the voltage drop is the same for the two halves of each AC cycle.

As mentioned above, the main thyristors in the stack are given continuous gate signals throughout the required conduction period. This is achieved by using a low-voltage transformer, T302, to give two isolated supplies. The output of each winding is rectified by a controlled rectifier (*i.e.* SCR301) which is turned on by a pulse from the phase control oscillator *via* T301 at the desired firing angle. The purpose of R306 is to lower the gate sensitivity of SCR301 and thus prevent spurious operation. The output of the rectifier is stabilised and current limited (by R307, D303 and R308) to prevent excessive continuous current flow into the gate of the associated main thyristor — it may be noted at this point that one of the best ways of destroying an SCR is to set up a condition of excessive power dissipation in its gate! The purpose of C302 and C303 is to override the current limiting at initial switch-on so that the main thyristors are prodded firmly into conduction.

Since the rate of rise of current through the main thyristors can be up to 200 million amps per second, it follows that the potential for RFI in this type of design is enormous — certainly, a breadboard version of one of the prototypes was the best RF breadboard noise jammer ever seen by the authors, and any MF or HF radio reception within about 50 yards of it was quite out of the question. However, RFI prevention (as well as another type of protection, which will be discussed shortly) is quite simple. RF is attenuated by L301, R313 and C305 for SCR304, and similarly the corresponding components look after SCR303. These form a first-order filter with a roll-off point of 5 kHz, which gives good attenuation at radio frequencies. R313, whilst limiting the Q of the filter, protects SCR304 by reducing the rate of discharge of C305 into its anode: this could otherwise cause its destruction. The mains input to the thyristor stack is taken *via* a proprietary mains filter, which, acting in the opposite direction to which it would usually be expected to work, keeps RF out of the mains distribution wiring. RFI attenuation is completed by enclosing the entire thyristor stack and its phase control oscillator in a die-cast box and taking all connexions to it *via* feedthrough capacitors; ferrite beads were also liberally sprinkled around the prototype.

to be continued

“CLASS ‘A’ ONLY”

*Lots of those 'black boxes'
Cover Top to Ten,
And lots of Class 'A' wallahs
Play around with them.*

*Some are old and fragile
And on Eighty quite a lot;
Others much more agile
Work the blooming lot!*

*But all have one thing common;
(To some it was a plod!)
That Morse test took some doing!
It's over now! Thank God!*

*So leave the key unused then
And give the mike a bash,
And don't go down too far on Ten
To hit that Morse code patch!*

.

*Did I forget to tell you
About the CB mob?
They're glad the keys are idle,
For them it's just the job!*

*Listen then a while on Ten
In that keyless bottom bit
And hear the 'buddies' use AM
And rigs not quite legit.*

*Perhaps the big H.O. man
Will keep them in their place!
That fact is quite uncertain,
Doubtful in any case.*

*So soon you'll find the 'buddies'
Have taken Ten away!
They got in at the bottom,
You really had no say.*

*Maybe if you did use your key
To keep the blighters out,
It would be nice one day to say,
'We've still got Ten all right'!*

*Lots of those 'black boxes'
Are pretty good on Ten.
Let's see more Class 'A' wallahs
Plug in their keys again.*

Anon

CLUBS ROUNDUP

By "Club Secretary"

ANOTHER large bunch this month, so with no more ado let's get into the pile.

The Mail

Acton, Brentford & Chiswick are top of the pile, and they have G3GEH describing the station of GU4GYT in Guernsey which he helped to set up. November 17 is the date, at Chiswick Town Hall, High Road, Chiswick.

Addiscombe now foregather every Tuesday evening in the Woolpack, 154 Gloucester Road, Selhurst, Croydon. They make a late start — 2100 by the clock.

A.R.M.S. and an interest in operating from the car or other personal transport go together; details from the Hon. Sec. whose address appears in the Panel.

Ashford in Kent is our next stop, and there the Hon. Sec. remarks on the one small amateur radio club and the two large local CB clubs — albeit he also has a brace of new members from the CB ranks. The venue, at the top of Hart Hill, near Charing, is not easy to find, and so if you want to look them up, on any Tuesday, you had best get in touch with the Hon. Sec. He will then give you all the detailed directions.

At **Aylesbury Vale**, there is a lecture on November 3, on the Exploitation of Natural Phenomena, to be given by G3KLT, at Elmhurst Youth Centre, Fairfax Crescent, Aylesbury.

The **Bishops Stortford** group are still getting together on the third Monday of each month at the British Legion Club, which lies at the top of Windhill in Bishops Stortford. November's date is for the home-constructor contest, for the G3WYD Trophy.

At **Brighton** the venue is 47 Cromwell Road, Hove, and the dates November 4 and 18. On the 4th, G8VEH is going to be talking about "Electricity and how to avoid it — shack safety and all that." This club now have some 122 members, but it does seem from the newsletter that the committee are not happy at the support they are getting — doubtless the AGM on 18th will bring the problems to the surface.

B.A.R.T.G. covers the interest of the chaps with teleprinters, be they of the old-fashioned mechanical type — nice and reliable! — or the modern electronic wonder machines. Details from the Hon. Sec. — see Panel.

Another specialist group is the **B.A.T.C.** — they have a common interest in television operation, whether of the fast-scan type or the slow-scan stuff found on the DX bands. Again, details from the Hon. Sec.

Our next port of call is somewhat inland — **Bromsgrove** — where the meetings are on the alternate Friday at Avoncroft Arts Centre and the Parkgate Inn; so, for November 13, there is a surplus sale at Avoncroft, and on November 24 an informal at the Parkgate.

Tuesday evenings are booked by **Bury** at Mosses Community Centre, Cecil Street, Bury; November 10 is down for G3AKK to talk about radio astronomy at Jodrell Bank, and the other evenings are informals — operate the station, construction projects, Morse tuition, or just a natter.

November in **Chichester** has a new Hq for November onwards, this being the Spitfire Social Club, Tangmere, on the first and third Mondays, *i.e.* November 2 and 16. The new Hq was forced on the club by the revised scale of charges for the room at Lancasterian Wing, which were quite preposterous — the winter season charges would have forced the club subscription to treble the present level.

The New Cross Inn is home for the **Clifton** group, every Friday evening; this is at the junction of New Cross Road and Clifton Rise, New Cross, London.

On to **Colchester**; November 12 is down for a talk on contests and contest operation, and on 26th G3CO will explain how to go about obtaining a Private Pilot's Licence. Both are at Colchester Institute, Sheepen Road, Colchester.

Into GW-land now, to meet the **Conwy Valley** crowd, where we have it that there is a meeting on the second Thursday in every month at Green Lawns Hotel, Bay View Road, Colwyn Bay; and it seems this new Hq is much approved of by the members.

Next stop Cornwall, and the **SWEB** Clubroom, Pool, Camborne, the home of the **Cornish** club. For November 5 they have a surplus equipment sale.

Looking at the **Crawley** newsletter, we find they have November 4 down for a talk on SS/TV by G3HSK, at Trinity United Reformed Church, Ifield, while on November 25 there is a talk on "VHF Communications" by G3FZL. The informal sessions are held at members' homes.

A very much changed appearance to the **Cray Valley** newsletter, which seems to have been caused by some production hang-up; but it still has most of the information. Christchurch Centre it is, High Street, Eltham, on the first and third Thursdays of every month.

Deadlines for "Clubs" for the next three months—

December issue—October 30th
January issue—November 27th
February issue—December 31st
March issue—January 29th

Please be sure to note these dates!

On Saturday, November 21, the **Crystal Palace** club will be at Emmanuel Church Hall, Barry Road, London SE22, to hear G2FKZ talking about the GB2RS Propagation Forecasts.

Now we come to a new club; in **Edenbridge Kent**; they are booking the second Tuesday in every month in the Conference Room, Women's Institute Hall, Station Road, Edenbridge. A programme is being put together, but at the moment they are looking for new members and the business of getting the show on the road. Doubtless, the programme will be being hammered out as this is written.

Edgware seem to have all sorts of things bubbling along; they are to be found at Watling Community Centre, 145 Orange Hill Road, Burnt Oak, on the second and fourth Thursdays. November 12 is a video tape show — "The Secret Listeners", and "Satellite Communication" — and on the 26th S.W. Herts. UHF Repeater Group will be talking about repeaters and microwave beacons.

Pressing on to **Fareham**, we find them in Room 12, Portchester Community Centre; on November 4 there is an 80-metre receiver project by G4IJP, followed by a natter on 11th. November 18 is set aside for someone to tell all about GB3PH and its workings. That leaves November 25, when G6NZ will be talking about Historic Radio.

The Railway Enthusiasts Club, Access Road, off Hawley Lane, near the M3 bridge, is the Hq of the **Farnborough** group. November 11 is down for a surplus equipment sale, and on November 25 there is the AGM.

The **Guildford** Hq is not stated, but our records show it as being the Model Engineer's Hq in Stoke Park, on the second and fourth Friday evenings.

Harrow are now based in the Roxeth Room, Harrow Arts Centre, High Road, Harrow Weald, where they can be found on any Friday evening. November 6 is an informal and practical

evening, and on 13th they have a talk on "Basics" in which they are introduced to simple semiconductor circuit theory. Another informal-and-practical comes on 20th, and on 27th they round off with a demonstration of video recording.

Next we have **Harwell**; they meet on the third Tuesday of each month at the Social Club of the Atomic Energy Research Establishment, with membership open to all. More details from the Hon. Sec. at the address in the Panel.

Civil Defence Hq, County Control, Gaol Street, sounds ominous, but it suits the **Hereford** gang quite nicely, thank you. November 6 is the annual junk and equipment sale, and on 20th there is the constructional contest.

Next we have to note the **Home Counties ATV** group, for anyone interested in amateur television; the meetings are on the fourth Wednesday in the month at the Swan Hotel, High Street, Iver.

Now another new one; the **International Police Association's** UK Section sent us details of a contest and award sponsored by the U.S.A. Section. Details on membership from the Hon. Sec. — see Panel.

Ipswich foregather on the second and last Wednesdays of each month at the "Rose and Crown", 77 Norwich Road; this is at the junction with Bramford Road.

If you want to know anything about amateur radio in Eire, you should talk to the Hon. Sec. of the **I.R.T.S.**, at the address in the Panel. The current copy of "Printed News" has some indications of activity from various clubs around the country.

In the **Isle of Wight** they meet in the Unity Hall, near the Sloop Inn, Wootton Bridge, every Friday, and by the sound of things they are getting a membership drive under way. Details from the Hon. Sec. — see Panel.

We don't have the latest details of the **Jersey** goings-on, but we do know that they can be found at the Communicare Centre, St. Brelade, on the second Wednesday of every month.

Kilmarnock & Loudoun gets us in a bit of a twist — we rarely seem to be able to spell their name right! We hope it's right this time. A call to the Hon. Sec. will provide answers as to where and when they meet, and what they are up to; and he is in the Panel, of course.

Liverpool have a little note which reminds us of their RAE class, and also that the gang are to be found on Tuesdays, at the Conservative Rooms, Church Road, Wavertree.

Another group who are due to update are at **Louth**; they seem to have the second Tuesday, at Pleasant Place, off Ramsgate, at 7.30 p.m., with talk-in for any visitors on S20. For the rest — the Hon. Sec., and the Panel!

Now back towards London again, and **Maidenhead**; they have Hq at the Red Cross Hall, The Crescent, Maidenhead. November 5 is down for a Grand Junk Sale, while on 17th G3VA will be preaching the virtues of the direct-conversion receiver. If you are making a first visit we suggest you contact the Hon. Sec. as to how to find the Hq.

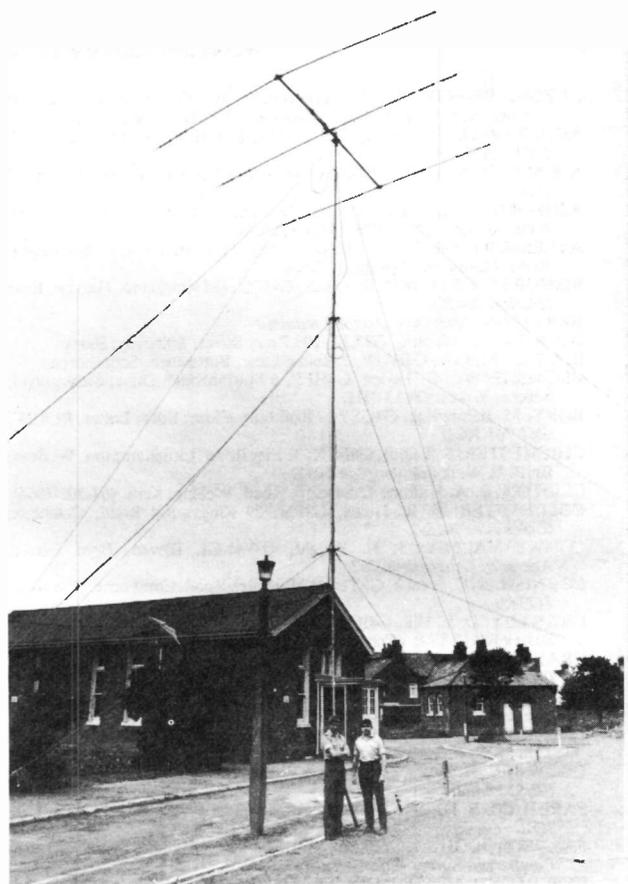
Meirion are at the Ship Hotel, Dolgellau on November 5, for a demonstration of small items of test equipment, and then on 19th they have a revision session of questions and answers for the RAE.

We need an update from **Midland**; however we have a record that they are now firmly entrenched in their own Hq at 294A Broad Street, Birmingham, which lies opposite the Repertory Theatre; but no dates, for which we must refer you to the Hon. Sec. — see Panel.

Looking at the **Mid-Sussex** newsletter, we find their base is still at Marle Place, Further Education Centre, Leylands Road, Burgess Hill, and on November 12 they will be hearing from G2MI and how the RSGB QSL Bureau works.

Yet another update is needed, this time from **Norfolk** who have weekly meetings at Crome Community Centre, Telegraph Lane East, Norwich, on Wednesdays. For the rest we must refer you to the Hon. Sec. — see Panel.

Fridays at S.H.E.7, Braemar Crescent, Northville, Bristol 7, is the arrangement adopted by the **North Bristol** group, but they are



GB4RM was operated throughout June from the Royal Marines at Deal, Kent, as part of the 21st anniversary celebrations of the Royal Naval Amateur Radio Society. Over 3000 stations were worked, on all bands 80-10m. and 2m.; equipment included a pair of FT-101Z's, a home-brew linear, a TH-3 Mk. III and dipoles for 80 and 40m. The picture shows G4LQM (left) and G4IWQ under the HF beam at GB4RM.

Photo by G4DCV

not accepting new members at the moment as their Hq is filled to capacity.

Northern Heights are at the Bradshaw Tavern, Halifax, on Wednesday evenings; at the last word they were busy pasting together a new programme, and by the time this comes to you all will have been settled.

Tamar Secondary School is the base of operations for the **Plymouth** club, and they are there on alternate Mondays; this Hq is in Paradise Road, Millbridge. The new committee were putting together a programme of events when last we heard, and they will no doubt be ready to offer some entertainment if you visit them.

Pontefract have G3ESP to talk about the Wehrmacht wireless equipment in W.W.II, with illustrations of the gear, while on November 26 there is a talk on a Noise Bridge by G4AAQ. Their Hq is the top floor of the Carleton Community Centre, Pontefract, on Thursdays.

One we mustn't forget is **R.A.I.B.C.**, the club for the invalid and blind amateurs and SWLs. And of course, the club can do with more supporters and reps., and donations of money or equipment — why not run a raffle or other "swindle", with profits from it going to RAIBC funds?

R.A.O.T.A. — the old-timers' club — is open to anyone, licensed or SWL, who can demonstrate their involvement in the hobby for twenty-five years; they have a net on Eighty on Thursdays at 1100. Details from the Hon. Sec. at the address in the Panel.

Reading now, and on November 10 they have an inter-club quiz

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- YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

and a constructional contest, while November 24 is a junk sale. The venue is the clubroom of the "White Horse" pub in Emmer Green (which is off the B481 Reading-Nettlebed road).

The November date for **Reigate** is 17th, at the Constitutional and Conservative Centre, Warwick Road, Redhill, Surrey, the start being set for 8 p.m. We note a blank in the programme for this date, although they have something set either side, so no doubt something will have been cooked up for that date by the time this comes to be read.

November 6 is AGM day for the members of the **R.A.F. Amateur Radio Society**; the venue is R.A.F. Locking and start at

1500. Talk-in will be available on S22 and the 'BC repeater.

Saffron Walden are a relatively new club who are basing their activity on Deben Village Hall, on the third Wednesday of each month. Details from the Hon. Sec. — see Panel.

We move on now to **St. Helens**, where they have Hq at the Conservative Club, Boundary Road, St. Helens, every Thursday. November 5 is, at the time of writing, not finalised, but on the 12th G3NFB will be talking about the Sun probe. November 19 is down for a "Rig Surgery" with G8XL1, and on 26th they have a surprise speaker.

Sefton have their place at the Liverpool Prison Social Club,

Hornby Place, Hornby Road, Walton, fortnightly on Wednesdays; for more details, contact the Hon. Sec. at the address in the Panel.

Next come **Silverthorn**, where they are to be found on Friday evenings at Friday Hill House, Simmons Lane, Chingford; for details of what goes on, contact the Hon. Sec. — see Panel.

The **Skegness** society is a recent formation, meeting at the “White Swan”, Burgh-le-Marsh, on the first and third Tuesdays in every month; they offer a wide range of interests in their programme, and have an RAE course running, aimed for the exam next May. Further details from the Hon. Sec. — see Panel for his address.

Quite a complex arrangement of dates at **South Birmingham**; a formal on the first Wednesday in each month (notices at 7.55 and lecture to start at 8 p.m.); Thursdays are HF night in the club shack, with all welcome, and on Fridays an Open evening, with all welcome to this also, The Hq is at Hampstead House, Fairfax Road, West Heath, Birmingham.

The **Southdown** chaps are to be found on the first Monday in every month at the Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, at 1930 for 2000 start. The current newsletter doesn't say what is on for November, but on past form they will have something of interest set up.

S.E. Kent YMCA is in Leyburne Road, Dover, and the gang turn up every Wednesday evening, 1930 for 2000 again. One special evening will be on 25th, when G3OUF will be coming along to talk about RSGB Hq and its workings. Things must be pretty interesting as the club membership is now running close to 150. More details from the Hon. Sec. — see Panel.

We turn next to **Southgate**, where they get together on the second Thursday in each month at St. Thomas Church Hall, Prince George Avenue, Oakwood. The November meeting is, as always, the G6QM Trophy evening, for home construction, and there is also to be a slide show of club events through the year past.

Stevenage are still using the Hq at British Aerospace Plant B, where they have been for many years now; on November 5 they have a talk by Dave Musson on International Computers Ltd (ICL). As for November 19, this is to be a film night.

At **Stourbridge** they have a programme calendar in the newsletter covering many months — clearly someone has done a lot of good work. The November meeting is on the third Monday, at Longlands School, Brook Street, and will, we understand, be a surplus sale.

Nice to hear again from **Stratford-on-Avon**; they are now, it seems, gathering at Bearley Radio Station, but unfortunately the Hon. Sec. gave us the October details; so for November we think it would be wise to contact him for dates, venue and details before you set off, particularly as Bearley is a Post Office Radio Station. His address is in the Panel.

Surplus sale time again, says the **Surrey** newsletter; but it referred to September! However, if you try the first and third Monday evenings in November at *T.S. Terra Nova*, 34 The Waldrons, South Croydon, you won't go far adrift, as they will have something finalised for sure.

The list of dates for **Sutton & Cheam** shows Friday, November 13 at Sutton College of Liberal Arts, and Friday, November 27 at Banstead Institute; but what will happen is still to be decided. Details from the Hon. Sec. at the address in the Panel.

November in **Sutton Coldfield** sees a natter night on November 9, and the AGM on 23rd, both at Sutton Coldfield Public Library.

The **Thames Valley** note gives details of the meeting in October, but it also states that it is always the first Tuesday of the month, at Dittons Library Meeting Room, Thames Ditton, Surrey.

The Radio Club of **Thanet** is based at Birchington Village Centre, on alternate Fridays; they start with Morse at 7.30, with the meeting proper timed for 8 p.m.

Thornton Cleveleys have 140 members on the books, which must go a long way towards filling their room at the Leisure Centre, Cleveleys, every Monday.

Torbay seem to be on top of the world at the moment, with a successful mobile rally behind them; the Hq is at Bath Lane, rear of 94 Belgrave Road, Torquay — an address oddity that has moved your scribe several times to think of diverting a journey to go have a look. They have informals here every Friday evening, with a monthly ‘Main’ meeting on the last Saturday of the month, with a talk, films, or what-have-you all set up.

Tyneside means The Community Centre, Vine Street, Wallsend, Tyne & Wear, on Monday evenings.

The next place we head for is the beautiful **Vale of the White Horse**, and the club of the same name, who have a base at the White Hart in Harwell village; November 3 sees a couple of films from British Telecom, called “Space Talk” and “Voices in Orbit”; this is the first Tuesday in the month, but they have informals on all the other Tuesdays as well. Incidentally, we need an update and a note of the name and address of the new Hon. Sec.

A ‘Pea and Pie Supper’ is the thing for **Wakefield** on November 3, and on 17th there is a slide show, both of these events being at Room 2, Holmfield House, Denby Dale Road, Wakefield, and in general terms the set-up is to assemble on alternate weeks through the year.

November 13 for **West Kent** involves the second part of a two-part lecture on Colour TV by Pat Tierney, and November 27 when Dick Mills will be talking about the BBC Radiophonic Workshop. These are Fridays and on the Tuesday following each of them there is an informal; the main meetings are at the Adult Education Centre, Monson Road, Tunbridge Wells, and the informals at the Old Drill Hall, Victoria Road, Tunbridge Wells.

Another new club is the **West Yorkshire Metropolitan Police**; membership is restricted to serving/retired officers and civilian staff, but despite this they have some thirty members, who gather together at the Police Academy, Westfield Road, Wakefield. More details from the Hon. Sec.

On now to **Worcester**, where we still need to know who has taken over the Hon. Sec. vacancy left by G4EKG; however, he has ensured continuity by telling us that they are to be found in the “Old Pheasant”, New Street, Worcester; on November 2 Dr. Alfrey from Birmingham University will be talking about radio stars.

Last month the **Worthing** group had an AGM; but meanwhile we are told that they have new Hq at Pond Lane Amenity Centre, and a membership around 100 to go with it. They meet every Tuesday.

Yeovil means Building 101, Houndstone Camp; G3MYM talks about S.I.D.s on November 5, and on 12th there is a videotape on microwaves. November 19 is down to G3MYM again, asking “Can we workVK on a milliwatt?” — and a natter night and committee meeting round off the month on 26th.

With **York** we once again reach the bottom of the pile; there they still are, holed up in the United Services Club, 61 Micklegate, York, for every Friday *except* the third one in each month. On a totally different tack, the lads are trying to help VK5ZO trace his forebears, surnamed Rawdon, who used to live in York — they have already traced back to about 1750! They are still trying and would welcome any ideas as to further progress — send them to G3WVO at the address in the Panel.

Finish

Updates please, by the deadlines shown in the ‘box’; address them to “Club Secretary”, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

Please mention “Short Wave Magazine” when contacting Advertisers — it helps you, helps them and helps us.

EQUIPMENT REVIEW

THE DATONG PC-1 GENERAL COVERAGE CONVERTER

In the November, 1977 issue of the *Magazine* the writer reviewed the *Datong UC-1 Up-Converter*. The basic idea of its successor, the **PC-1 General Coverage Converter** remains the same; *i.e.* to provide continuous coverage of the radio spectrum from 50 kHz through 30 MHz using a 144-145 MHz receiver as a tunable IF. Comparing the two products, the earlier *UC-1* had IF outputs at 28-29 and 144-145 MHz, a rotary switched attenuator providing 0, 15 and 30 dB options, a five-band preselector switch and a preselector tuning control. In the **PC-1**, a single push-button attenuator control is provided, the preselector switching and tuning controls have been eliminated and there is only a 144-145 MHz IF output. The decade "MHz" switches remain.

Construction

The components are accommodated on a tinned, double-sided, fibre-glass printed circuit board measuring 175 × 120mm. Good quality components are used and the standard of workmanship is excellent. The front and rear panels are 178 × 38mm., the layout of the former being apparent from the photograph. The rear panel carries SO-239 sockets for input and output and a 3.5mm. jack socket for the DC supply. The converter is housed in a neat, silver, anodized aluminium wrap-around case 183mm. wide, 154mm. deep and 44mm. high, provided with rubber feet.

The Circuit

The incoming RF signal first passes through a 35 MHz low pass filter *via* the attenuator to band pass filters. There are six, approximately octave, BPFs covering 30-17, 17-9, 9-5, 5-2, 2-1 and 1-0 MHz, the last being ingeniously switchable to cover 500 kHz and below. These BPFs are automatically diode switched by the "MHz" switches. A drawback with diode switching of RF circuits in sensitive receivers is that the diodes can generate intermodulation products when very strong in-band signals are present, even though several megahertz away from the desired frequency. To overcome any such problems in the **PC-1**, BA244 diodes with 50 mA. of bias, have been chosen for this switching function, using current from the supply to the local oscillator power amplifiers.

The local oscillator has to cover 115 to 144 MHz and a frequency synthesiser is used to achieve this. The voltage controlled oscillator uses a FET with an automatic level control circuit, followed by a 40673 dual-gate MOSFET buffer feeding two, broadband RF power amplifiers. The synthesiser IC is a Motorola C-MOS type MC145104P and the VCO frequency is divided by 100 in an 8629 ECL prescaler IC to drive it. The MC145104P incorporates the divide-by-N circuit, a lock detector, phase detector, a crystal oscillator operating at 10.24 MHz and a 1,024 divider to generate a 10 kHz reference frequency for the phase detector.

A parametric mixer employing varicap diodes is used in the **PC-1** and, as far as the reviewer is aware, this is the first amateur radio converter type product to incorporate this particular circuit. The claimed advantages are very high dynamic range, very low noise level as all the components are non-resistive, and conversion gain rather than loss. The overload performance is similar to that of double balanced Schottky diode mixers but the dynamic range is better.

The power requirements of the **PC-1** are 10-13 volts, unregulated DC at 140mA. and this modest need may be obtained from the accessory socket of some receivers or transceivers or from the convenient *Datong MPU Mains Power Unit*. The converter incorporates its own 8v. regulator.

Installation and Operation

The installation and operation of the **PC-1** could not be simpler. A short coaxial lead is needed to connect its 144-145 MHz output to the two-metre receiver and an aerial of some sort is required for the parts of the LF/HF spectrum of interest. Ideally, the aerial should look like 50 ohms and *Datong's* artificial aerials types AD270 or AD370 would be a suitable proposition. The only other connexion is the nominal 12v. DC.

As with the earlier *UC-1* converter, to receive a signal in the LF/HF bands it is only necessary to select the *tens* and *units* of megahertz with the two band selector switches, adding the appropriate number of kilohertz by rotating the main tuning knob of the 2m. Rx. The selected *tens* and *units* figures are back lit by clear LEDs. For example, to listen to a station on 9.243 MHz, the MHz dials would be set to "0" and "9" and the 2m. Rx tuned to 144.243, the mode, etc., being set on the Rx.

To check for internal "birdies," a 50 ohms dummy load was connected to the aerial socket and the entire thirty bands checked. The only two signals of any significance were 10.24 and 20.48 MHz, the fundamental and second harmonic of the crystal oscillator. Even so, both were below the equivalent of one microvolt at the aerial socket. A few other very weak beats could be detected with the BFO switched on but they were so low as to be completely unnoticed with any aerial connected.



The converter was used for several weeks during which extensive listening tests were made from the VLFs to 30 MHz. The reviewer has not been all that impressed with certain other, modern amateur receiving equipment using octave band-pass filtering instead of the "old fashioned" preselector tuning ahead of the RF stage. In the top class, professional receivers using this technique, half-octave, or even one third-octave BPF's would be used, so it was a pleasant surprise to find that the **PC-1** was free of the intermodulation distortion caused when very strong signals within the passband, but well removed from the desired frequency, mix to produce unwanted signals. The shortcomings of the Yaesu FT-707 and Trio R-1000 in this respect were probably not necessarily due to the use of octave BPF's, but were more likely caused by the diodes switching the filters acting as mixers.

The attenuator is a simple *pi*-section network selected by a push-button marked "GAIN, HI-LO" and was found to provide 12dB attenuation. It was quite useful in preventing overloading of the 2m. "IF strip" when receiving very strong, multi-megawatt broadcasting stations.

The manufacturer's literature carries a warning about the use of the **PC-1** with a transceiver. To prevent damage to the converter, some means must be devised to ensure that the transceiver cannot be switched to transmit mode when the **PC-1** is connected to it.

Conclusions

Those possessing a good, multimode 2m. Rx. or transceiver and wanting to listen in the VLF/LF/HF bands should find the **Datong PC-1 Converter** a very space-saving and cost effective solution. At £105 plus VAT, it is far cheaper than buying an R-1000 or FRG-7700, for instance, and enables all the mode, filter options, memory facilities, etc., of the 2m. set to be used. The

dynamic range of the **PC-1** would probably exceed that of many, unmodified "black boxes." It would be an equally attractive proposition for anyone with an HF bands only Rx. or transceiver, capable of tuning 28-29 MHz. For such use, a 2-to-10m. converter would be required between the **PC-1** and the set; e.g. the *Datong DC144/28* model reviewed in the August issue of *S.W.M.*

N.A.S.F.

"A Word in Edgeways"

Letters to the Editor

The views expressed here are not necessarily those of the Editor, nor should they be taken to represent any particular SHORT WAVE MAGAZINE policy.

Dear Sir — G3OHK raises the issue (September) of G8's and 28 MHz. The Home Office would no doubt take the view that use of the HF bands requires a knowledge of Morse — an ITU requirement which they have to uphold. CB is quite another matter in that CB-ers will be users of type-approved apparatus, and in any case international contacts will be prohibited.

Having said that, I see no good reason why the H.O. should not be pressed to allow our G8's to (a) use the 4m. band (and any other VHF allocation we may gain as a result of the cessation of Band 1 TV) and (b) use CW on any band they are permitted to use, should they so desire. Why not?

J. M. Dunnett, Prestatyn

Dear Sir — There have been many letters in the radio and electronics press over the past few months from 'A' and 'B' Class licence holders, suggesting 'B' licencees be given a better deal, with the advent of legal CB.

What is urgently needed is an organisation to campaign on our behalf, to achieve the many worthwhile views expressed. I know the RSGB claims to represent the views of all radio amateurs, yet all they seem to have done on this subject is state in the September 1981 issue of *Rad Com*, p. 806 — despite the decisions taken at WARC '79 — that Class B licencees won't be extended the privilege of the little used 70 MHz band. No doubt the decision not to bother to push for our rights was taken by one of the many committees of old boys who claim to represent our views.

G4CLF was the driving force that achieved the seemingly impossible, making CB legal. Who's willing to campaign on behalf of the now minority of radio amateurs (when compared to the enormous numbers of CB-ers), to give the legal 'B's' a little more of the spectrum, to help safeguard the interests of all?

P. Thurlow, G8SUH, and p/p G8XWG, G8WAS and G8ISH

Dear Sir — I was most interested to read the article "Bitte QRX, Krieg" in the June issue of *Short Wave Magazine*. I was in Essex in the war period and I do seem to remember hearing a couple of G7's. Then I joined the R.A.F.V.R. and was out of action for 4½ years.

As the article actually mentions D4XYN (DL1DX), is it not possible to mention any G stations in a future article? I cannot see any harm in the information being known after 35 years.

It would be a good follow-up for Michael Ockenden, G3MHF.
Mal Geddes, ZE3JO (ex-G2SO)

Address your letters for this column to "A Word in Edgeways", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.



South Midlands Communications Ltd., sent us this photograph of the new Yaesu-Musen FT-ONE transceiver, which features the latest technology in amateur radio equipment. Coverage is 150 kHz to 30 MHz on receive, and 160-10m. on transmit. This fully synthesised transceiver has a direct entry keyboard to 100 Hz, or tuning from the dial in 3 speeds down to 10 Hz resolution; frequencies may be scanned up or down, manually or automatically, and the memory bank can recall 10 memories of any frequency within the coverage, together with an RIT offset. An all-mode rig (AM/CW/FM/LSB/USB/FSK), the FT-ONE allows split-frequency operation and the Tx and Rx to be on opposite sidebands. The IF bandwidth is continuously variable on SSB from 2.400-300 Hz, and there are three switched positions on CW and two on FSK; the audio peak/notch filter can be used on CW for added audio selectivity. Other features include mains or 12v. operation, an electronic keyer and a signal monitor.

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COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

HELLO again. Plenty of hard news this month, so let's get cracking!

Firstly, on the international front, doubtless there are many already aware that four members of the Boeing Amateur Radio Club were in China as guests of the Chinese Institute of Electronics (W7EA, K7HO, K7LAY, and KC7CF), between September 4 and 12. They gave four-hour slide presentations on amateur radio in every city in which they stopped. On September 6 they were unexpectedly given permission to contact W7WHO of the home club and the Chinese authorities commented that this was the first authorised amateur radio communication demonstration in over 32 years. Three days later, on 9th, a contact was made between Beijing and Shanghai, with a couple of TR-7 rigs; the Shanghai end being operated by Hsu Y.C. who was once XU8CH and C1CH.

Now, and we believe this to be the most important part, we come to the Chinese statement. The Chinese asked the American group "to tell the world that their top Government leaders are solidly behind amateur radio, and before too long China expects to establish many friends throughout the world through the medium of amateur radio". This wonderful news was publicised in the *South China Morning Post*, the details reaching us by way of a press release from VS6CT to *The DX Bulletin* No. 109. The thought of QSOs with the Chinese after their long silence is welcome and exciting, to say the least. Also it may be that the change of heart by the Chinese could encourage those leaders of Third World countries with their heads down to change their attitude to amateur radio a little.

Still with China (and *TDXB*), we have it that Tom Wong VE7BC, a frequent visitor to China on business, has taken large numbers of ARRL *Handbooks* and some training material into China, and this month is to be met in that country by five Yaesu rigs, four Hy-Gain beams, some related materials, and some 25 "goodwill kits" of headphones, parts and so forth. Four stations will be set up at different locations, although it is only a remote possibility of operation in October. VE7BC is next to visit China, after the current trip, in April 1982.

CB

From the sublime to the gorbimey! We have in our hands a release from the Home Office which announces that CB will be legal from November 3rd. It also includes a resumé of how CB may and may not be

used, a list of do's and don'ts, and a code of practice agreed with the CB organisations; but this, one feels, has been issued more in hope than in expectation — time will tell. The formal technical specifications for UK CB are contained in Home Office publications MPT-1320 and MPT-1321, obtainable at £1.95 each from HMSO.

Perhaps from November 3 we can begin to hope for a crackdown on the illegal CB transmitters, even though it may result in some discomfort to amateur stations. Mobileers should carry a copy of their licence, just in case they are stopped, and we would hope that having proved their *bona fides*, they encourage the efforts of The Law. And, of course, if the chance appears to talk about amateur radio to a CB group, it should be grasped eagerly.

So much for the 'outside' news — now to the pile of your letters.

Ten

Seems to have been fairly profitable, but there also seems to be general agreement by the users that the band is on the slide to the bottom of the cycle.

G3PKS (Wells) notes the presence of rain static on several occasions, not to mention some mini-thunderstorms, during which a neon between aerial and earth was noted to be gently glowing, at which moment Jack beat a hasty retreat from the shack having recollections of the 'twenties and a storm which had apparently passed — the one that got left behind(!) went off with a flash and a bang and Jack was thrown about "like a pole-axed chicken!"

G2DHV (Sidcup) found some CW useful to raise HG2BHA, HS1AMM, K7KHW, PY7PO, PY2SCM, ZC4YC, and 9H1G1; plus some SSB which went to TL8JM, VK4VIK, VK6XB, ZS6ALB, and A4XIJ. He remarks that conditions have been up-and-down, though, with QRM on Fifteen and DX on Ten.

Next we come to the analysis by G3NOF (Yeovil) who incidentally has just received his QSL for K6LPL/CE0Z to take him to 338 countries worked and confirmed on Phone. On Ten there was a new country too, in the shape of GD3KHE; VKs were heard, short path, between 0700 and 1200, peaking around 1100, JAs on the same path were peaking at 1000; DU, KG6, and YB were noted around 1200-1400, with North America on some days between 1100 and 2200. The few Africans were peaking around 1600, and South America was to be found in the late evenings. It

added up to SSB with AH2L, A4XIU, A4XIJ, DU1CPL, FY7BY, GD3KHE, HZ1AB, JAs, K6LL/7 in Arizona, KA2MZS/SV9, KB7XJ (Nev.), KF7F (Idaho), KG6JJH, KH0AB, NL7K, PYs, S79WHW, SV0AW/9, UK0QAA in Zone 19, VKs, VS6CT, VS6JW, W0KXZ (S. Dak.), ZC4DY, ZF2CZ, ZL2VO, ZS1AK, 5H3TM, 8P6OR, and 9Q5FL.

We come next to G4HZW (Knutsford) who after 2½ years had his first CW QSOs, and who intends to stick out the decline in the band until he raises a station in Zone 23 to complete the WAZ on 28 MHz. Meantime, A4XIH, AP2KS, ZS, VK, EA9, JA2KLT/3B8, JY9RV, JAs, W6s, KP4KK/DU2, TF3YH which was worked just after an Aurora but was *not* an Aurora QSO, UL7, UA9, UA0, VS6JW, HL1WD, and 9K2DR, not to mention several local TV sets.

G3LDS (Chelmsford) wonders which is worst — CB signals on Ten or stations working to lists. As far as this writer goes the list operation is not worth bothering with unless one wants it for a new country; and even then it isn't liked. It seems to be the general view that list operations are *not* efficient in terms of QSOs per hour, and often the contact is only completed *via* the list-taker, which means you end up with a QSL for a half-contact. Most would like to see list operations debarred from DXCC acceptance. Returning to G3LDS, Chris got his repaired FT-101 back and immediately he switched on, the fault came back — smoke and a blown DC blocking capacitor between PA valve and pi-tank. A temporary replacement was made while the replacement capacitor was posted to him, and then G4LDS was trying the box out on the air again. A tentative CQ on Ten raised K5GAT (Naples, Texas) and KB4NH (Venice, Florida), for an odd coincidence; and then there was HZ1TC, FR0FLO/J, W6 and UA6, a call from VK6NQI, VK0QL who was putting 400 watts p.e.p output into a TH-3 at 120 feet to generate the 59 signal, TU2JQ, S79WHW, ZS3FDC/P, T12JX — a QSO which foundered amid the QRM, a string of Ws including W6YVK with 2 watts, EA9KN (Melilla), 9H4C, JAs, UK8WAA, a half-hour chat with ZL2AWI, KP4BZ, YS1ECB who was running 180 watts of AM, J73PP, XE1EFT, 6Y5HN, F0AHY/FC, and loads of small fry. This letter ends up with a fair comment: "It's amazing what you can get by calling CQ Ten on a dead band!"

G4EZA (Colchester) seems to have had an entertaining month on this band. . . . As the 'season' was starting it was decided to

put up a better aerial for the band; a vertical would fit in, so one was made up, co-ax attached to nice shiny PL259, plugged into the ATU, and lo! Nix. Sudden thought: should have checked it through with the meter *before* erection. Then there was the matter of the FT-200; a little tweaking up, and what an amazing difference to the behaviour on Ten. Next, the DL on Ten with the most appalling signal heard in years; G4EZA sent him RST 576 with chirp — and he came back with “mni tnks for FB report”, and happily continued the contact. However, to other contacts — it’s amazing what an ATU can load up when you haven’t got an aerial, like CW to C31KI, DF4GV/HB0, JA8DWR, PP5AVM, PY1CBW, and SSB to 5B4RW.

G3ZPF (Dudley) stayed almost exclusively on Ten, with the Winfield Wonder Wire producing all the states at once, seemingly. Certainly all the W call areas were booked in, plus four new ones in ZF2CZ, 5T5AY, VP1A, VP2VJ, 9G1JX, PY5EG, PS8AAV, and the usual locals, on the 28325 kHz CW net. Apparently it seems to have become the local habit to cause all new Class A licences to appear on this net, to get over the initial fear of CW, the latest one being G4MNU, Christine.

Snippets

Perhaps the most important one is the letter from Jock Perrett, who used to sign 7Q7DW before the licences were terminated. Jock will, by the time you are reading this, be safely settled in ZS, and has been told that as ZS has reciprocal arrangements with UK he will be able to get a callsign by virtue of his home call. Jock was prepared to continue working in Malawi, provided he could get his callsign back; the chairman of the interview board was himself an amateur, but the rest didn’t want to know. The licensing ban still continues, says Jock (he wrote in early September), but another amateur has at least been given permission to take his gear out of the country. So — Jock goes to ZS, where he can play radio.

G3NOF notes the number of CB aeriels going up without planning permission, and which are *not* being jumped-on. Don recalls taking down his mast (which had been up since 1946) for a lick of paint and maintenance, and being jumped on immediately it went back up; he had to be prepared to produce photographic and other evidence, and himself jump up-and-down quite violently before he won the argument. If the CB position *anent* planning-permission still holds, perhaps it’ll be no bad thing, he opines, since at least it will provide a lever for the amateur wanting to hang up an aerial.

The Canada Contest will take place on December 27, from midnight to midnight zulu. CW and Phone, all bands 160-2 metres, and signal exchange to be RS(T)

plus serial number starting at 001. Ten points for a Canadian station, one point for anybody else, ten bonus points for working a CARF official station having the suffix TCA or VCA. Any one station can be worked once on CW and once on Phone on each band. The multiplier comprises the number of Canadian provinces and Territories on each band and mode (12 Provinces/Territories \times 8 bands \times 2 modes, for a maximum multiplier of 192). All the other details can be obtained from Dave Goodwin, VE2ZP, 4 Victoria Place, Aylmer, Quebec, J9H 2J3. Logs to be complete with dupe. sheets, summary sheet to show multiplier and score calculation, and comments all to be posted within one month from date of the contest, addressed to: PO Box 2172, Stn D. Ottawa, Ont. K1P 5W4.

The IPA Contest over November 7-8, will help those after the Sherlock Holmes Award. It is a bit difficult to summarise the rules, so we suggest an s.a.e. to IPARC, WA8VDC, Thomas D. Jenkins, 3327 Cloverdale W.B., Monroe, Michigan 48161, U.S.A., which is where the entries, postmarked no later than December 31, should also go.

K1CC, it may be recalled, was looking for slides for a presentation to the SP Convention; he got lots and they showed the SPs exactly why the Ws are that much easier to work — like 100-ft. towers and triband beams! — and he also was able to come up and work some 2000 contacts as SP3CC, operating from the home of SP3DOI.

HS1AMC, in a letter to Geoff Watts, indicates that all the HS licences have been determined, so there are no legal HS1s about now, and no legal ones from Zone 26. At least, not until someone agrees that XV5A and XV9A are legal; and that makes Zones 19 and 23 a bit hard to get, but Zone 26 harder.

The VP1s from Belize, are now signing V3, since September 21.

Top Band

G4AKY (Harlow) included with his report some words of wisdom from VK6HD, Mike, and noted that he himself had been somewhat inactive due to holidays. Since hearing G4AKY back in April, VK6HD heard only a couple of YUs on May 30, and ZS5LB was worked at 2235z on July 31; which leads him to the conclusion that rising before the lark every morning and hearing nothing before work is a bit much and won’t be repeated during summer 1982! However, by the time this comes to print VK6HD will have been on for the CQ WW and VK/ZL CW tests on Top Band. He is normally to be found between 1.810 and 1.800 MHz, and recommends 1.821 and 1.825 MHz as being clear in VK. His sunrise times GMT for the winter are: November 1, 2120; 10th, 2112; 21st, 2106; December 1, 2104; 10th, 2104; 21st, 2108; January 1, 2115;

11th, 2121, 21st, 2131; February 1, 2142; 11th, 2151; 21st 2200; March 1, 2205, 11th, 2213; and 21st, 2220. VK6HD urges all G stations to restrict their contacts to a simple exchange of RST so that he can make as many QSOs as possible while the band is open; and he himself wants to hook some of the Russian stations to increase his own country score on the band. Other VKs known to be on and interested in Top Band DX include VK3IM, VK3XB, VK3BEE, VK7LZ, VK7BC, VK5KK, VK5KL, and VK5KO.

Turning now to his own activity, G4AKY only found four of the continents this month, Asia and Oceania being absent this time. The most interesting ones were perhaps FP8AA (St. Pierre & Miquelon) and OY7ML, who hasn’t been reported on this band for several years.

Now to G2HKU (Minster) who worked SSB to PA0PN, and CW to GJ5DQE, 4U1ITU, and EI9J, in between his attempts to get rid of the wasps nest under the eaves; they are safely bedded down and seem to thrive on sprays! What with these, plus the sparrows and the field mice, Ted feels it might be better to give them the house and live in the garden!

“CDXN” deadlines for the next three months —

December issue — November 5th
January issue — December 3rd
February issue — December 31st

Please be sure to note these dates

40 & 80

We are lumping them together this time, partly as our deadline nears and partly to get the piece into its allotted space — the BYs and the CB-ers seem to have filled more than enough!

It must be first our sad duty to note the death in mid-September of GM3HLQ (Strathavon); he was perhaps best known for his eighty-metre Sunday morning Scotch Corner net, a net which has run continuously for thirty years. He also operated CW and DX using, latterly, an original KW-2000 only, into a very fine aerial system. Many friends will mourn his passing.

On now to G2NJ; Nick has been told by two stations that LA1SH/MM is around to be added to the /MM collection on this band, but at the time of writing he was still hunting. Afternoon operating on the band was in general pretty poor, until about 1500z when things began to liven up. An interesting station heard, but not raised, was LZ2EY/MM, who was on a fishing vessel near Ullapool, telling the GM he was working “we work with your fishermen from Scotland and Ireland”. One evening G3RJV was heard, his five watts making a merry noise among the Big Boys, so that

G2NJ was able to offer a report of RST 589. Another one noted was G6VS in Blackpool, ex-VU2EU and QRT for 30 years.

Back when the sunspots were at their minimum, an SWL named D. Whitaker used to organise and report on Ten-metre Activity Periods; and he wondered if we could recall this — indeed we recognised the handwriting instantly. David has for the moment forsaken Ten, and now looks at the LF bands, between 0600-0700z, and 1730-1830z, with a rare foray around 2200z. During the first period there are Central Americans to be heard almost every morning on 40 — for example, HT1, XE, HP, YS9, HH2, J73, CP, CE, and OA. Occasionally the Pacific stations are also about, the best being FW0BF, ZK2EL, FO8FO, and VK9JV. This year the biggest surprise has been the tea-time openings to the Indian Ocean; FROFLO/J, 3B8AE/3B9, 8Q7AZ, VU2HI were all heard along with the more common ZSs, FR7CE, and 7P8CC. Other locals have reported Pacific signals about the same time. The late evening time offered Asiatic Russians, TR8DX from Africa, and JX5VAA along with JX7FD. As he says, a funny old band, but DX is there for the digger.

G2HKU offers his CW listings as HI3JIF and UL7CAL, plus QRP to OZ1HET.

The letter from VK6HD indicates some interest; when he wrote to G4AKY on September 24, Eighty had just started to come to life, with Europeans, ZS3, FK0, and FP8AA on the long path. As for Forty, the band has been very good at his sunrise time, with Europe, Africa, and longpath North Americans all constantly in evidence.

14 & 21 MHz

These are most people's idea of where to pan pay-dirt in the DX line; however, there are problems as well, as G4EZA observes; one slow stroll up the CW end of the band during the morning DX rumpus, and he counted no less than 33 stations, either back-scatter or round-the-world signals calling CQ DX, CQ VK/ZL, and so forth: roughly one every 2.4 kHz over and above the QSOs already going on and the 599-plus YU and I stations. And, people seem to wonder at the difficulty of making themselves heard! However after it all, G4EZA shows, on Twenty *nothing* worked which, as he sadly says, *doesn't* mean there was nothing there! Turning to 21 MHz, the CW yielded FY7YE, JTOWA, KP4ERA, LU8DQ, VE7CVM, VK1NDO, VK2VKN, VK3NQA, VK3NWN who was running five watts to an Argonaut for a 559 signal, VK4NRZ, VK5NAI, VK6NLU, and 4S7MX. On the SSB front there was C5ADS, J6LU, VE7ATV, VK1FT, VK3NGT, VK5AGO, WA6HAE/HB0, 5T5EY (about whom Tim is doubtful), and 9G1JX.

The path to VK/ZL the long way round has been good most mornings, says G3NOF, of 21 MHz; there have occasionally been JAs also, but more often the JAs have been on the short path between 0700z and 1700, the peak being about 1100. The North Pole route has also presented good signals from the Pacific around 0800-1000, with the ZLs also present and occasionally KL7, and the rarer Russian areas. North Americans have been patchy, and W6/W7 poor. SSB QSOs were made with A71AD (ex-A7XD), C31WX, C5ADS, EP2TY, FR7CE, FW0BF, G4HHL/MM, HC1FF, IZ5ARI, J3AH, J73PS, JAs, JX7FD, KL7Y, NL7K, OE2VEL/KH8, OX3BX, RK0A, TF3SV, UAOQWB in Zone 19, UA0WAY, UD6HB, UF6DZ, UJ8JQC, UK1PGO (Franz Josef Land), UK7GAA, UKOQAA also Zone 19, UL7MAR, VEs, VKs including VK9YC and VK9NYG, VS6CT, VS6JW, VP2MH, WP4AMS, WD6CDU/KH9 who QSL'd by return, YC2CGW, ZE1BP, ZK2TA, ZLs, ZB2GQ, 4U1UN, 5B5JE, 5T5AY, 5W1DG, 7X4AN, 9G1JX, 9M8PW, and 9N1MM. Turning to 14 MHz, the W6/W7 stations made up for their absence from 21 MHz, around 0600, followed by the long-path VKs; the Polar path has produced its share of Pacific stations, followed by ZL and KL7. However, Don was not all that enamoured, and spent most of his time elsewhere, just taking time out to work the SSB of C31LU, IZ5ARI, KL7EC, KL7OB, V3AWS (ex-VP1WS), VKs, W7CBP, YBOBJM, YJ8RG, ZK1CG, ZK1CV, ZK2EL, ZLs and 3A2BF. On a different tack, Don mentions hearing W1AW announcing that on September 29, 1AOKM would count for DXCC, QSLs to be submitted after January 1, 1982.

A little snippet from G3RJV (Birmingham) who took his QRP rig down to Cornwall, Trevone being just south of Padstow, and for six nights worked /P with two watts to a dipole at about fifteen feet. The result was some 60 contacts on CW, with 28 countries, including W1, W2, W4, W8, VE1, VE2, and various Europeans. Just goes to show what can be done by careful operating.

G2HKU mentions 14 MHz SSB with TI2WR, VK3VQ, ZB2GW, ZL3PA/C, ZL3MA, UK1PGO, ZL3SE, ZL1VN, ZL3RS, ZL3FV, and K6XT; CW with JA4DZ, JH3FGA, UM8MBK, VK5QB, UAOJCU, and VP2VJ. Turning to G2HKU's QRP rig, we have LZ1KDZ, UA9ADQ, VP2VJ, UH8EAD, and LZ13C. There was just one CW contact on 21 MHz, a QRP one with OK1HCC.

Fifteen for G4LDS meant where to go when the band was dead on Ten; it was worth EA9KN (Melilla), 4Z4TJ, a string of JAs, OE8MHK, VE7DEN, G3XMA/W3, VE7DFS (due to visit Chelmsford and one of the locals).

G2DHV (Sidcup) stuck to CW on 21 MHz, to contact FC2CH, KA7IAG, P29NRL, VE7ATV, 9G2LC and 9M2HC. On a different line, George mentions that for a year he has been trying to get British Telecomm to come and take away three wires carried, without permission, over his roof dipole slung between the chimneys. Not exactly helpful, is it?

Finally, back to G3PKS, who did some works on the aerial farm just in time for the autumn lift, and just in time for the autumn gales too. The two big loops, each about 175 feet round so as to put the current bit at the top of the common mast, are both fed with open wire line, labelled N, E, W and S, and the loop legs are bent so that Loop One is south and west, while Loop Two is north and east by the Sun; question being, what do you call them over the air? An interesting point is that trying an earth wire of about fifty metres of co-ax screening braid around the garden doesn't seem to make any difference to the performance on the HF's (but will no doubt help on Top Band). Jack found conditions a bit patchy, all-same curate's egg, but he made a few contacts on all bands, and even, he admits, the odd SSB one. Perhaps that was a result of sorting out the VFO problem on the transmitter — overdriving cured by a bit of a re-alignment. Plus, maybe, a naughty keyer, which however responds well to what Jack mildly calls a 'good old thump'; we wonder what the VKs thought of that!

Our note last time about the death of G2CAS brought a letter from G2IF remembering his old friend of fifty years, G6FA, who was originally licensed as QRX, to use spark to one named station, back in 1911. In World War I his skill in copying Morse was put to use at Gallipoli; in 1930 he was able to help the Admiral Byrd expedition when they had lost contact with U.S.A. He continued his activity until he became ill and lost his sight; he died in January this year at the age of 88.

We also have a note from G4FWM and G3GXX to advise us of the death of Len Frankland, G3GEE, who was 79 and had been a member of the old Blackpool & Fylde Club, and later of Thornton Cleveleys club. He was a co-founder of the Two-Meter Henpecked Club, which provided much amusement to the members and to listeners as well. Both are sadly missed.

Finale

That seems to about wrap things up for another month; we can always do with more reports of course, and they should be sent to your conductor, addressed, as always, to "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. See you next time!

NEW QTH's

This space is for the publication of the addresses of holders of new call signs, or change of address, in EI, G, GJ, GU, 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.

E14AVB, M. Murray, Lisdaulan Rahara, Roscommon.
E14AXB, J. G. McDermott, Celtic Avenue, Roscommon.
E16EE, P. Gillen (G4LHO), 14 McNeill Drive, Sligo.
G3HCQ, Miss S. Gabriel (ex-G8WOE), 71 Albert Road, Ilford, Essex IG1 1HS. (Tel: 01-478-5031).
GI3ISV, C. E. Davies (ex-EI8BL/GI3HNM), 24 Brooklands Avenue, Belfast. BT16 0PA. (re-issue).
GM3SF, J. Holden (ex-ZS6VS/VQ2H), 20 Newland Crescent, Aberdeen. AB1 6LH. (Tel: Aberdeen 37573) (re-issue).
G4JHZ, L. W. Laws, 6 St. Gabriel's Avenue, Peverell, Plymouth, Devon. PL3 4JQ. (Tel: 0752-29743).
GM4JLD, P. Woods (ex-GM8COX), 320 Stewarton Street, Wishaw, Strathclyde. ML2 8DT.
G4KNB, R. Wallace, 32 Ayres Road, Old Trafford, Manchester. M16 9WH.
G4KNC, S. Wallace, 32 Ayres Road, Old Trafford, Manchester. M16 9WH.
G4KPH, D. Lewis, 4 Raymond Court, Hampden Road, Muswell Hill, London. N10 2HS. (Tel: 01-883-9894).
GW4KUS, H. C. Hemmens, 3 Gorseion Road, Pennllergaer, Swansea, West Glamorgan. SA4 1AE.
G4LCB, Dr. M. H. Goldman, 13 Guildown Avenue, London. N12 7DE.
GM4LCP, J. Staruszkiewicz, 5 Mafeking Terrace, Neilston, Glasgow. G78 3LP. (Tel: 041-880-5904).
G4LCX, E. L. Horner, 5 New Lane, Green Hammerton, York, North Yorkshire. YO5 8BL.
G4LDS, C. W. Baker (ex-G8JGK), 65 Crompton Street, Chelmsford, Essex. CM1 3BW.
G4LDY, A. J. Haas, 9 Little Grove Field, Harlow, Essex. CM19 4BS. (Tel: 0279-34277).
G4LEG, P. J. Brent, 15 Cromhall Close, Fareham, Hants. PO14 3BJ.
G4LEW, R. Bennett, 32 Oxford Road, Fulwood, Preston, Lancs. (Tel: 0772-716306).
GW4LEY, J. Pendell, "Kenmar" Guest House, Deer Park, Tenby, Dyfed. SA7 7LE. (Tel: Tenby 2210).

G4LHO, P. Gillen (E16EE), 31 Danesfield, South Benfleet, Essex.
G4LNB, N. J. Dehnugara, "Runswick", North Petherwin, Launceston, Cornwall. PL15 8NF. (Tel: 056-685-478).
GM4LNU, J. S. Thomson, 7 Charleston Place, Muirtown, Inverness. IV3 6NB. (Tel: 0463-34540).
GM4LPG, R. Maslen (ex-GM8YFY), Broomie Knowe, Dulnain Bridge, Grantown-on-Spey.
G4LRC, Louth and District Amateur Radio Club, c/o R. Padbury, 8 Osbourne Drive, Holton-le-Clay, Grimsby, South Humberside. (Tel: Grimsby 826525).
GM4ON, W. Robertson, 83 Lawrence Drive, Mountfleurie, Leven, Fife. KY8 4AU. (re-issue).
G5DTY, A. Gehammar, 23 North Drive, Heathfield Park, Birmingham. B20 3SY. (Tel: 021-554-1822).
G6ACV, Mrs. M. Gregory, 21 Back Lane, Chellaston, Derby. DE7 1TN.
G6AEC, D. C. J. Nicholls, 22 Yeo Way, Clevedon, Avon. BS21 7UP.
G6AFP, J. Boot, 7 Harrow Road, Wollaton Park, Nottingham. NG8 1FG. (Tel: 0602-283527).
G6AJX, S. Lampard, 4 Marine Lodge, 22 Clifftown Parade, Southend-on-Sea, Essex. SS1 1DN. (Tel: 0702-333668).
G6BMY, R. Satterthwaite, 4 Diben Walk, Baguley, Manchester, Greater Manchester. M23 8JZ.
G8XTJ, J. Fitzgerald, 21 Honor Road, Prestwood, Great Missenden, Bucks. HP16 0NJ.
G8XWP, J. Hart, 1 Meadow Court, Fordingbridge, Hants. SP6 1LW.
G8YUD, R. A. H. Forway, 24 Church End, Hilton, Huntingdon, Cambs. PE18 9NJ.
G8ZQA, P. Stonebridge, Jubilee House, Creeting St. Peter, Ipswich, Suffolk. IP6 8QS.
G8ZRG, B. J. Hawes, "Hawston", 129 Wycombe Lane, Wooburn Green, High Wycombe, Bucks. HP10 0HJ. (Tel: Bourne End 23447).
G8ZTW, C. J. Norman, 23 Snells Mead, Buntingford, Herts. SG9 9JF. (Tel: 0763-71160).
G8ZUF, K. M. Rogers, 36 Goodacre Road, Ullesthorpe, Lutterworth, Leics. LE17 5DL.

Change of Address

G2KI, G. A. Spencer, "Hollybank", Scotts Way, West Chinnock, Crewkerne, Somerset.
G3AKG, P. J. Fay, 116 Lowfield Road, Caversham, Reading.
G3CCB, A. S. Chester, 44 The Ridgeway, Downend, Fareham, Hants. PO16 8RE.
G3CWI, R. Newstead, 12 Rye Close, North Walsham, Norfolk.
G3EPT, K. J. Gasson, 54 Dubbs Knoll Road, Guilden Morden, Cambs.
G3EZZ, J. Eaton, "Cruachan", Ludborough Road, North Thoresby, Grimsby, South Humberside. DN36 5RF.
G3FMN, T. W. W. Dearlove, 29 Beach Road, Carlyon Bay, St. Austell, Cornwall. PL25 3PQ.
G3KPO, D. Byrne, Arlington House, 34 Pellhurst Road, Ryde, Isle of Wight. PO33 3BW. (Tel: Ryde 62513).
G3LOV, M. J. Francis, Old Chapel House, Trenale, Tintagel, Cornwall. PL34 0HP.
G3LVJ, F. Oliver, "King Croats", Maldon Road, Birch, Colchester, Essex.
G3PNF, Capt. D. A. Bowden, "Chessya", New Road, Portland, Dorset. DT5 1LE.
G3TYH, M. J. Cooney, 9 Moorfield Avenue, Ealing, London. W5 1LG.
G3VGW, R. I. Buckby, 71 Stonehill, Castle Donnington, Derby. DE7 2LZ. (Tel: Derby 0332) 810760).
G3VKC, E. Haycock, 5 Bosley Close, Christchurch, Dorset. BH23 2HQ.
G3XPA, R. W. Bevan, 167 Selby Road, Halton, Leeds. LS15 7JG.
GM3YRK, M. Comrie, 27 Westbourne Gardens, Glasgow. G12 9PE.
G3YRW, J. A. van Walwyk, 11 Valette Court, 75 St. James Avenue, Muswell Hill, London. N10 3RA.
GM3ZDH, R. A. Dixon, 2 Fair Oaks, Carmunnock, Clarkston, Glasgow. G76 9DJ.
G3ZYQ, A. L. Robinson, 9 East Crescent, Bush Hill Park, Enfield. EN1 1BP.
G4AKV, T. H. Allen, Prospect Farm, Wissington, King's Lynn, Norfolk. PE33 9RY.
G4ASL, S. G. Ayling, 115 Winifred Road, Coulsdon, Surrey. CR3 3JG.
G4CAV, A. L. Anderson, 5 Farndale Close, Spofforth Hill, Wetherby, West Yorkshire. LS22 4XE.
G4DIE, I. A. R. Dredge, 60 Springfield Close, Rudloe, Corsham, Wilts. SN13 0JR.
G4FKH, G. Williams, 21 Borda Close, Chelmsford, Essex. CM1 4JY.
G4GMZ, Dr. J. F. Alder, 20 Harvey Road, Congleton, Cheshire.
G8BTK, C. W. Harlow, 22 Priory Gardens, Berkhamsted, Herts.
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*Delivery Normally 5/6 weeks (express available), all other frequencies 7/8 weeks.

Holders: Low frequencies HC13/U or HC6/U dependent on frequency.

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144.4 (433.2)	b	e	b	e	e	b	e	e	e	e	e
144.480	e	e	e	e	e	e	e	e	e	e	e
144.800	c	e	e	e	e	c	c	c	c	c	e
144.850	e	e	e	e	e	e	e	e	e	e	e
145.000/ROT	a	c	a	c	c	b	b	a	a	c	c
145.025/R1T	a	c	a	e	b	e	b	e	e	e	e
145.055/R2T	a	c	a	e	b	e	b	e	e	e	e
145.975/R3T	a	c	a	e	b	e	b	e	e	e	e
145.100/R4T	a	c	a	e	b	e	b	e	e	e	e
145.125/R5T	a	c	a	e	b	e	b	e	e	e	e
145.150/R6T	a	c	a	e	b	e	b	e	e	e	e
145.175/R7T	a	c	a	e	b	e	b	e	e	e	e
145.200/R8T	a	c	a	e	b	e	b	e	a	a	c
145.300/S12	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	e	e	e	e	e	e	e	e	e
145.400/S16	e	e	e	e	e	e	e	e	e	e	e
145.425/S17	e	e	e	e	e	e	e	e	e	e	e
145.450/S18	a	e	a	e	b	b	b	a	a	a	e
145.475/S19	a	e	a	e	b	b	b	a	a	a	e
145.500/S20	a	c	a	c	c	b	b	b	a	a	c
145.525/S21	a	c	a	c	c	b	b	b	a	a	c
145.550/S22	a	c	a	c	c	b	b	b	a	a	c
145.575/S23	a	c	a	c	c	b	b	b	a	a	c
145.600/ROR	a	c	a	c	c	b	b	b	a	a	c
145.625/R1R	e	e	e	e	e	e	e	e	e	e	e
145.650/R2R	e	e	e	e	e	e	e	e	e	e	e
145.675/R3R	e	e	e	e	e	e	e	e	e	e	e
145.700/R4R	e	e	e	e	e	e	e	e	e	e	e
145.725/R5R	e	e	e	e	e	e	e	e	e	e	e
145.750/R6R	e	e	e	e	e	e	e	e	e	e	e
145.775/R7R	e	e	e	e	e	e	e	e	e	e	e
145.800/R8R	a	c	a	c	c	b	b	b	a	a	c
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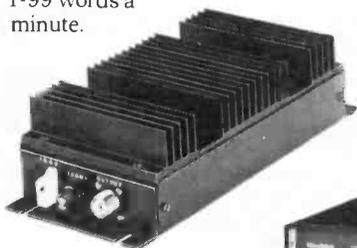
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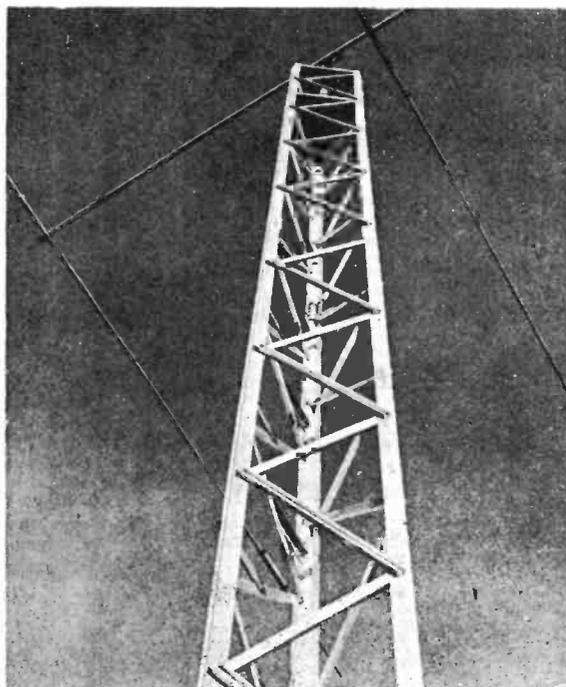
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Braking torque	4000 kg. cm.
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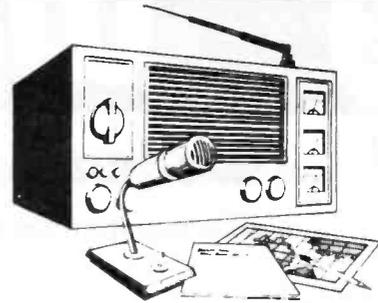
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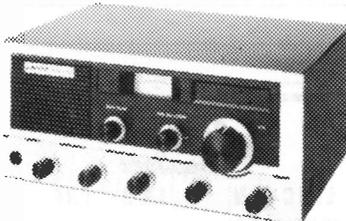
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R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
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R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	44.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
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