

# The SHORT WAVE Magazine

VOL. XXXIX

DECEMBER 1981

NUMBER 10

**JRC** Japan Radio Co., Ltd.

**NRD-515**  
**NRD**  
**NRD**  
**NRD-515**



The NRD 515 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 £1090.20inc VAT

**LOWE ELECTRONICS Ltd.**

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Frequency Band (kc/s)	Area	Services	Frequency Band (kc/s)	Area	Services
10-14	W.W.	R. Nav.	4,438-4,850	I	Fx.
14-70	W.W.	(a) Fx.	4,850-4,700	W.W.	Aero. Mob. (R)
		(b) M. Mob.	4,700-4,750	W.W.	Aero. Mob. (OR)
70-90	I	(a) Fx.	4,750-4,850	I	(a) Aero. Mob. (OR)
		(b) M. Mob.			(b) B'cst.
		(c) R. Nav.			(c) Fx.
90-110	W.W.	(a) Fx.	4,850-4,985	W.W.	(d) Land Mob.
		(b) M. Mob.			(b) Fx.
		(c) R. Nav.			(c) Land Mob.
			4,985-5,005	W.W.	S. Freq.
			5,005-5,080	W.W.	(a) B'cst.
					(b) Fx.
			5,080-5,250	W.W.	(a) Fx.
			5,250-5,430	I	(b) Land Mob.
			5,430-5,480	I	(a) Aero. Mob. (OR)
					(b) Fx.
			5,480-5,680	W.W.	(c) Land Mob.
			5,680-5,730	W.W.	Aero. Mob. (R)
			5,730-5,950	W.W.	Aero. Mob. (OR)
			5,950-6,200	W.W.	Fx.
			6,200-6,525	W.W.	B'cst.
					M. Mob.
			6,525-6,885	W.W.	Aero. Mob. (R)
			6,885-8,785	W.W.	Aero. Mob. (OR)
			8,785-7,000	W.W.	Fx.
			7,000-7,100	W.W.	Amat.
			7,100-7,150	I	(a) Amat.
					(b) B'cst.
			7,150-7,300	I	B'cst.
			7,300-8,195	W.W.	Fx.
			8,195-8,115	W.W.	M. Mob.
			8,115-8,985	W.W.	Aero. Mob. (R)
			8,985-9,040	W.W.	Aero. Mob. (OR)
			9,040-9,500	W.W.	Fx.
			9,500-9,775	W.W.	B'cst.
			9,775-9,995	W.W.	Fx.
			9,995-10,005	W.W.	S. Freq.
			10,005-10,100	W.W.	Aero. Mob. (R)
			10,100-11,175	W.W.	Fx.
			11,175-11,275	W.W.	Aero. Mob. (OR)
			11,275-11,400	W.W.	Aero. Mob. (R)
			11,400-11,700	W.W.	Fx.
			11,700-11,975	W.W.	B'cst.
2,000-2,045	I	(a) Fx.	11,975-12,330	W.W.	Fx.
2,000-2,045		(b) Mob. except Aero. Mob. (R)	12,330-13,200	W.W.	M. Mob.
			13,200-13,280	W.W.	Aero. Mob. (OR)
2,045-2,065	I	Met. Aids.	13,280-13,360	W.W.	Aero. Mob. (R)
2,065-2,300	I	(a) Fx.	13,360-14,000	W.W.	Fx.
		(b) Mob. except Aero. Mob. (R)	14,000-14,350	W.W.	Amat.
			14,350-14,990	W.W.	Fx.
2,300-2,498	I	(a) B'cst.	14,990-15,010	W.W.	S. Freq.
		(b) Fx.			
		(c) Mob. except Aero. Mob. (R)	15,010-15,100	W.W.	Aero. Mob. (OR)
			15,100-15,450	W.W.	B'cst.
2,498-2,502	I	S. Freq.	15,450-16,460	W.W.	Fx.
2,502-2,825	I	(a) Fx.	16,460-17,360	W.W.	M. Mob.
		(b) Mob. except Aero. Mob. (R)	17,360-17,700	W.W.	Fx.
			17,700-17,900	W.W.	B'cst.
			17,900-17,970	W.W.	Aero. Mob. (R)
			17,970-18,030	W.W.	Aero. Mob. (OR)
2,825-2,850	I	(a) M. Mob.	18,030-19,990	W.W.	Fx.
		(b) M. R. Nav.	19,990-20,010	W.W.	S. Freq.
2,850-2,850	I	(a) Fx.			
		(b) Mob. except Aero. Mob. (R)	20,010-21,000	W.W.	Fx.
			21,000-21,450	W.W.	Amat.
2,850-3,025	W.W.	Aero. Mob. (R)	21,450-21,750	W.W.	B'cst.
3,025-3,155	W.W.	Aero. Mob. (OR)	21,750-21,850	W.W.	Fx.
3,155-3,200	W.W.	(a) Fx.	21,850-22,000	W.W.	(a) Aero. Fx.
		(b) Mob. except Aero. Mob. (R)			(b) Aero. Mob. (R)
			22,000-22,720	W.W.	M. Mob.
			22,720-23,200	W.W.	Fx.
3,200-3,400	W.W.	(a) B'cst.	23,200-23,550	W.W.	(a) Aero. Fx.
		(b) Fx.			(b) Aero. Mob. (OR)
		(c) Mob. except Aero. Mob. (R)	23,550-24,990	W.W.	(a) Fx.
3,400-3,500	W.W.	Aero. Mob. (R)			(b) Land Mob.
3,500-3,800	I	(a) Amat.	24,990-25,010	W.W.	S. Freq.
		(b) Fx.			
		(c) Mob. except Aero. Mob. (OR)	25,010-25,600	W.W.	(a) Fx.
3,800-3,900	I	(a) Aero. Mob. (OR)			(b) Mob. except Aero. Mob.
		(b) Fx.	25,600-26,100	W.W.	B'cst.
		(c) Land Mob.	26,100-27,500	W.W.	(a) Fx.
3,900-3,950	I	Aero. Mob. (OR)			
3,950-4,000	I	(a) B'cst.			(b) Mob. except Aero. Mob.
		(b) Fx.	27,500-28,000	I	Met. Aids
4,000-4,063	W.W.	Fx.	28,000-29,700	W.W.	Amat.
4,063-4,438	W.W.	M. Mob.			

# **TRIO**

*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



**Securicor 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. Securicor 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.**

### **HEAD OFFICE AND SERVICE CENTRE**

Chesterfield Road, Matlock, Derbys. Tel. 0629 2817 or 2430.

Open Tuesday-Friday 9-5.30, Saturday 9-5.00. Closed for lunch 12.30-1.30.

For all that's best in ham radio, contact us at Matlock.

For full catalogues send 70p in stamps with your address. Mark enquiry SWM.

# 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.



Carriage £2.00

# 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.**

*There were shepherds abiding in the field, keeping watch over their flocks by night. And lo, the angel of the Lord came upon them, and the glory of the Lord shone about them, and they were sore afraid.*

*And the angel said unto them, "fear not, for behold I bring you good tidings of great joy, which shall be to all people. For unto you is born this day, in the city of David, a Saviour which is Christ the Lord".*

*And suddenly there was with the angel a multitude of the heavenly host, praising God, and saying:*

*"Glory to God, glory to God in the highest, and peace on earth, goodwill towards men".*

LUKE 2 V 8 to 14

**A PEACEFUL CHRISTMAS TO OUR FRIENDS.**

## NEW BRANCHES SPECIAL OFFER

WE ARE PROUD to announce the opening of two new branches, and would be so delighted if you went along and said hello to Ian G3PRR in Grimsby or Peter G4GSA in Stoke that for the fortnight Monday January 4th until Saturday January 16th, we will be, for personal callers only, be offering, **FIVE PER CENT OFF OUR LIST PRICES** (see "Free Finance" section for eligible items)

## 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 £100SMC 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!!



— SMC THE COMMUNICATORS —



## FOX TANGO ONE THE WORLD BEATER



£1295 inc. VAT @ 15% & Securicor

### GENERAL COVERAGE, ALL SOLID STATE

The FT-ONE is a full-coverage all mode transceiver, equipped for reception between 150kHz and 29.99MHz, and transmission on all nine amateur bands. Commercial version transceiver 1.8-29.99MHz

### KEYBOARD FREQUENCY ENTRY

Fully digital synthesised, the FT-ONE uses a front panel keyboard for initial frequency entry. A change is accomplished via the main tuning dial or the pushbutton scanner, tuning in either 10Hz or 100Hz steps. The FT-ONE permits extremely fine tuning and instantaneous band change with equal facility.

### DUAL VFO SYSTEM

Ten digital VFO's with memory are provided, in conjunction with an A-B selection scheme that allows instant recall of any Tx, Rx or transceive frequency. For split-frequency operation, the operator may select TX on VFO-A and RX on VFO-B, automatically storing the calling and listening frequencies. For nets, a nonvolatile memoryboard is available as an option, (eliminates the possibility of dumping memory).

### FULL CW BREAK-IN

Advances in solid-state technology have made full CW break-in reliable enough to be incorporated into the FT-ONE. Selection of traditional semi-break-in (for use with amplifiers not equipped for full break-in) or full high-speed break-in.

### SWITCHING REGULATED SUPPLY

Extremely compact and light in weight, the switched mode power supply reduces substantially the space required to produce the operating voltages used in the FT-ONE. It is highly efficient, uniquely stable and offers superb reliability.

### ELITE CLASS PERFORMANCE

In addition to the above and superb receiver filters, the FT-ONE is packed with subtle virtues. Rear panel jacks allow the use of both an external receiver and an independent receive antenna, when scanning, automatic halting on a received signal may be programmed, an optional Curtis 8044 keyer board is available and there is even a microphone squelch (AMGC) to reduce background noise pickup between words and sentences!

### GAIN/INTERCEPT OPTIMIZED RECEIVER

Utilising up-conversion with a first IF of 73MHz, the FT-ONE RF amplifier stage uses push-pull power transistors configured to produce a typical output intercept of +40dBm. The first mixer is a diode ring module, then follows a low noise post amp, for optimum noise figure consistent with modern day intercept requirements. The result is a receiver with a typical two-tone dynamic range well in excess of 95dB (14MHz CW bandwidth). Additional gain tailoring is provided via a PIN diode attenuator controlled from the front panel.

### FILTER READY FOR COMPETITION

Three filter bandwidths are available for CW operation (two for FSK !!), using optional 600Hz or 300Hz crystal filters. Filter insertion losses are equalised for constant IF gain. Both IF Shift and Variable Bandwidth are provided, and two CW filters may be cascaded, for competition-grade selectivity. For SSB work, the Variable Bandwidth feature eliminates the need for costly 1.5kHz or 1.8kHz filters, in addition, a high-performance audio peak and notch filter is standard equipment.

### EXPANDED OPERATING DISPLAYS

Digital displays for the VFO frequency, memory channel, and RIT offset are provided for quick frequency identification. The large front panel meter provides easy viewing of transceiver operating parameters, including final transistor collector current, input DC voltage, FM discriminator centre tuning, speech processor compression level, and forward/reflected relative power.

### NON OPTIONS

Remember with your FT-ONE the noise blanker, speech processor and power supply are all built-in not expensive options.



# SOUTH MIDLANDS COMMUNICATIONS LIMITED

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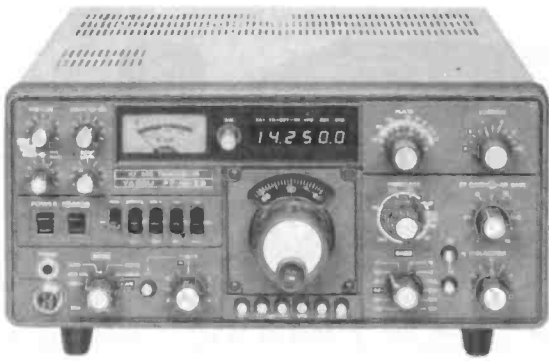
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## FT101ZD £635 inc. VAT @ 15% & SECURICOR

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ 8 pole filters for razor edge selectivity.
- ★ Selectable CW fixed bandwidth CW-W and CW-N\*.
- ★ Semi-break in with sidetone for excellent CW.
- ★ Digital plus analogue frequency displays.
- ★ 6146B PA's with 6dB of negative feedback.
- ★ 180W PIP and - 31dB 3rd order intermod.
- ★ RF speech processor fitted - adjustable level.
- ★ VOX built-in and is adjustable from the front panel.
- ★ Wide dynamic range for big signal handling.
- ★ High usable sensitivity, for those weak ones.
- ★ Superb noise blanker - adjustable threshold.
- ★ Attenuator; 0-10-20dB, front panel switch.
- ★ AGC; slow-fast-off, front panel switchable.
- ★ Clarifier (RIT) switchable on TX, RX or both.
- ★ Low level transvertor drive output facility.
- ★ Universal power supply 110-234V AC and 12V DC\*.
- ★ Incredible range of matching accessories
- ★ 6 models: Digital/Analygue - AM/FM options.

\*Option.



## FT902DM £885 inc. VAT @ 15% & SECURICOR

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ 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.
- ★ Instant write in memory channel.
- ★ Tune up button (10 sec, of full power).
- ★ Curtis Keyer - Iambic, single or straight.
- ★ Switchable AGC and RF attenuator.
- ★ Optional 350 or 600 Hz CW, 6kHz, AM filters.
- ★ Clarifier (RIT) switchable on TX, RX or both.
- ★ Audio Peak and tunable notch filter.
- ★ Plug in modular, computer style constructor.
- ★ Fully adjustable RF Speech processor.
- ★ Ergonomically designed with necessary LEDS.
- ★ Incredible range of matching accessories.
- ★ Universal power supply 110-234V AC and 12V DC.

\*Option.



## FT107M £725 inc. VAT @ 15% & SECURICOR

- ★ 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, Ic, ALC, Compression and SWR.
- ★ Semi-break in with side tone. Vox built in.
- ★ Choice of built-in or separate power supply units.

\*Option.



## FT707 £569 inc. VAT @ 15% & SECURICOR

- ★ 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.
- ★ Excellent Rx dynamic range, power transistor buffers.
- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth - 16 crystal poles.
- ★ Bandwidths 6kHz\*, 2.4kHz-300Hz 600-350Hz\*
- ★ 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.
- ★ Indicators for: calibrator, fix, int/ext VFO.
- ★ Receiver offset tuning (RIT-clarifier) control.
- ★ Advanced noise blanker with local loop AGC.
- ★ 25kHz crystal calibrator feature.
- ★ Internal, xtal or external VFO control.

\*Option.



## FT720RV £245 inc. VAT @ 15% & SECURICOR

- FT720 Control Head**
- ★ Four easy write-in memory channels
  - ★ Rx priority channel (auto check)
  - ★ Scanning band/memory empty/busy
  - ★ Up/down tuning/scanning from mic.
  - ★ Optically coupled tuning control
  - ★ Manual and automatic tone burst
  - ★ String LED's for 'S' and PO7 status LEDs
  - ★ 1½ W of audio to internal/external speaker
  - ★ 3.3 (4.3)" D x 6" W x 2 (2.2)" H
- 720RV 10W, deck. 720RVH 25W, deck**
- ★ 144-146MHz (144-148MHz possible)
  - ★ 12½ kHz synthesizer steps, 600kHz shift
  - ★ 0.3µV for 20dB quieting
  - ★ Rx 0.5A, Tx RV 3.5A, RVH 6.5A
  - ★ 5.8 (6.5)" D x 6" W x 2(2.2)" D
- 720RU 10W, 70cm. deck**
- ★ 430-434MHz
  - ★ 25kHz synthesizer steps, 1.6MHz shift
  - ★ 0.5µV for 20dB quieting
  - ★ Rx 0.5A, Tx 4.5A
  - ★ 5.8 (6.5)" D x 6" W x 2 (2.2)" D
- S72 Switching box**
- ★ Pushbutton band change
  - ★ Auto change of steps/splits



## FT290R £249 inc. VAT @ 15% & SECURICOR

- ★ 144-146MHz (144-145 possible)
- ★ Multimode USB, LSB, FM, CW
- ★ 2.5W PEP, 2.5W RMS/300m W
- ★ LED's, "ON AIR", "BUSY"
- ★ Moving coil meter for S & PO
- ★ Integral telescopic antenna
- ★ Width 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 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 (±10kHz)II
- ★ Long battery life SMC 2.2A/Hr

## FT480R(2m) FT780R(70cm.)

- ★ USB-LSB-CW-FM (A3, A1, F3).
- ★ 30W PIP A3, 10/1 W our A1 F3.
- ★ Bandpass filter no tune design.
- ★ Bandwidth 2.4kHz and 14kHz at -6dB.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx & Rx freq (inc RIT).
- ★ String LED display for "S" and PO.
- ★ Digital receiver offset tuning.
- ★ Advanced effective noise blanker.
- ★ Memory scanning with slot 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.

## FT480R £379 inc. VAT @ 15% & SECURICOR

- ★ 144-146MHz (143.5-148.5 MHz possible).
- ★ Excellent dynamic range sensitivity.
- ★ FM; 25, 12½, 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.

## FT80R £449 inc. VAT @ 15% & SECURICOR

- ★ NMOS four bit micro control.
- ★ 430-434MHz (440-445) possible.
- ★ GaAs Fet RF for incredible sensitivity.
- ★ 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.



**FT480R**



1 - 6MHz shift now available

**FT780R**



**FRG 7 £ 199 inc.** VAT @ 15% & Securicor

- ★ "Industry Standard" value for money Rx.
- ★ 30MHz to 500kHz in One MHz bands.
- ★ SSB (LSB/USB), CW, AM.
- ★ Sensitivity AM; 0.7 μV 10dB S/N at 30%.
- ★ Selectivity; ± 3 kHz at - 6dB.
- ★ Stability; 500Hz after 30 minutes.
- ★ Triple conversion, drift cancelling.
- ★ Direct frequency readout to 5kHz.
- ★ Fine tuning control.
- ★ AGC; DC amplified, 3 stage control.
- ★ AF; Powerful 2 watts of audio.
- ★ Forward facing internal speaker.
- ★ Record socket "volume independent".
- ★ Well calibrated "sharp" preselector.
- ★ AM automatic noise suppression circuit.
- ★ Antenna Hi to 1.6MHz, 50 ohm 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.
- ★ 2 IC, 9 FET, 13Tr, 16D (9Ge, 5Si, 2Z).
- ★ Weight; 7Kg (without batteries).
- ★ Dimensions; 340 (W) x 153 (H) x 285 (D) mm.
- ★ Optional battery holder.

**FRG 7700 £ 329 inc.** VAT @ 15% & Securicor

- ★ Wide coverage, All mode receiver.
- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory option with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @6dB.
- ★ 3 Selectives on AM, squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500ohm to 2MHz, 50ohm to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Constantly variable tone control.
- ★ 110 and 240Vac and 12Vdc option.
- ★ Switchable speed A. G. C. system.
- ★ Signal meter calibrated in "S" and SIMPO
- ★ Accessories; Tuners, Convertors, LPF, Memory, FRT7700; 150kHz-30MHz, Attenuator, Switch etc.
- ★ FRV7700A; 118-130, 130-140, 140-150MHz.
- ★ FRV7700B; 118-130, 140-150, 50-59MHz.
- ★ FRV7700C; 140-150, 150-160, 160-170MHz.
- ★ FRV7700D; 118-130, 140-150, 70-80MHz.
- ★ FF5; 500kHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (easy internal fitting).

**FT 208R(2m) FT 708R(70cm).**



- ★ 4 bit CPU chip frequency control
- ★ Keyboard entry of frequencies/splits
- ★ LCD digital display with backlight
- ★ Ten channels of memory
- ★ Memory back up five-year lifetime cell
- ★ Up/down manual tuning
- ★ Manual or auto scan for busy/clear
- ★ Priority channel with search back
- ★ Memory scanning feature
- ★ Scan between any two frequencies
- ★ Auto scan restart
- ★ Quick change NiCad pack
- ★ 1,750Hz tone burst
- ★ Built in condenser microphone
- ★ 500mW AF to int/ext speaker
- ★ External speaker/mic available
- ★ Keyboard offers 16 tone DTMF
- ★ 168(H) x 61(W) x 39(D)mm
- ★ C/w NiCad pack, helical



**FT 208R £ 209 inc.** VAT @ 15% & POSTAGE

- ★ 144-148MHz (144-148 possible)
- ★ 12.5/25kHz synthesiser steps
- ★ Any split + or - programmable
- ★ ±600kHz repeater split
- ★ 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 and 455kHz

**FT 708R £ 219 inc.** VAT @ 15% & POSTAGE

- ★ 430-440MHz (440-450 option)
- ★ 25kHz synthesizer steps
- ★ Any split + or - programmable
- ★ ±7.6MHz EU split standard
- ★ 1W or 100mW RF output
- ★ Rx: 20mA squelch, 150mA (max AF)
- ★ Tx: 500mA at 1W RF
- ★ 0.4μV for 12dB SINAD
- ★ Dual conversion 46.255MHz and 455kHz



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- ★ 1/10 Watts
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- ★ 144-146MHz
- ★ Tone burst
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- ★ Hardware kit

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UNBEATABLE  
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25 Watts!

- ★ 144-146MHz FM
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The new Azden DX-345 desk mic is purpose made for ham radio by one of Japan's foremost audio engineering companies. With its heavy die cast metal casing, built in variable compressor and 500-50k ohm o/p, it matches any transceiver. Our ridiculously low price makes it a must.

Available January

**£29.00**

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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**KILL TV INTERFERENCE  
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**HP4A £5.95**

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 T.V. interference because of its advanced design, yet it has no effect on the picture. Designed to be plugged into any UHF T.V. receiver. Be prepared, keep one handy!



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**WELZ PROFESSIONAL  
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**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!



**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.

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WE HAVE SOME VERY ATTRACTIVE PRICES  
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WE ARE THE PEOPLE MOST PEOPLE COME TO!**





# C.B. ANNOUNCEMENT

By the time you read this, C.B. should be legal. As one of the country's largest communications outlets, we shall be selling only legal sets. And it won't be rubbish! We've been pretty selective in our ordering so you'll only find certain brands on our shelves. We are specialists and we have our name to protect! Get in touch with us and we will advise you on the best value for money.



Prices start around £70

### 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.

## TUNE INTO THE WORLD... FROM YOUR ARMCHAIR!

### FRG7700 £319



Here's a complete monitoring system that builds up into a comprehensive listening system for a wide variety of transmissions, both locally and from the other side of the World. As communications engineers, we know there is good equipment and poor equipment. We rate the FRG7700 very highly. It forms the main unit of the system and provides one of the most cost effective ways of listening to the entire shortwave band. Listen to all the World news direct as it comes in from stations stretching round the Globe, international family requests from Australia and New Zealand, sport from America, topical news comment from Russia and China. If you're interested in Amateur Radio then the SSB facility lets you listen in on conversations with amateurs from places far and near. Hear a mobile operator motoring through the traffic in Manchester or going home from work in Perth, Australia. Listen to expeditions in Africa or the Antarctic. It's all possible and the more skilled the operator, the more interesting it becomes. The possibilities are endless, ship to shore radio, aircraft on the Atlantic run, foreign news agencies, etc. And if this is not enough plug in the optional VHF converter and listen to private, commercial and military air traffic over the U.K., local airports, local shipping, taxis, radio amateur repeaters and many other interesting transmissions. To improve reception, there's also the matching aerial tuning unit. So why not send S.A.E. today for full coloured leaflets and enjoy a new hobby from the comfort of your fireside. Go on - treat yourself!

**AERIAL TUNER £37.50**  
**VHF CONVERTER from £65.00**



### NEW FOR CB!

### "BLUE DIAMOND"

legal base station aerial  
(ground plane)

**£25 p&p £2.50**  
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### YAESU'S SSB/FM PORTABLE FT290R



**£249 inc. VAT.**

Here's the new all mode portable from Yaesu. 2m FM/SSB/CW in a hand held unit! We've got large stocks, factory fresh, just off the production line. So if you want the latest models get in touch with us today.

### TRIO'S NEW FM TWINS

VHF TR7730 £247  
UHF TR8400 £334



Here's a couple of exciting new units from Trio, designed for the VHF and UHF enthusiast. A new generation of FM rigs from Trio embodying the latest in design and technology in a new slimline package. Both units cover the full UK band segments with high and low power settings (10 watts UHF/25 watts VHF). Five programmable memories and dual vfo's add versatility to an already comprehensive range of facilities. Dual scanning facilities cover both memories and the entire band and, of course, all the usual features such as operator offset, tone burst, remote control microphone, squelch are standard. The bright LED readout gives clear accurate frequency display in conjunction with an LED bar meter. All mounting hardware and microphone is provided in the package.

### DATONG ELECTRONIC MORSE TUTOR £49.45



We've put together a nice little morse training kit comprising the famous HK708 morse key and matching oscillator unit complete with volume control and built-in speaker. If you aspire to a G4 this will help you on the way.

### H.F. TRANSCEIVERS

- TS830S 1.8-30MHz Base **£694**
- TS530S 1.8-30MHz Base **£534**
- TS130S 3.5-30MHz Mobile **£525**
- FT101Z/FM 1.8-30MHz Base **£503**
- FT101ZD/FM 1.8-30MHz Base **£645**
- FT707 3.5-30MHz Mobile **£549**
- FT107M 1.8-30MHz Base **£775**

**MAIL ORDER SLIP to: Waters & Stanton Electronics, Warren House, Main Road, Hockley, Essex.**

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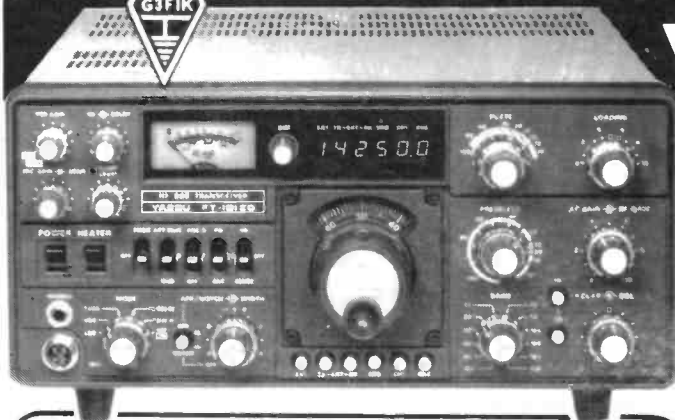
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## YAESU MUSEN



### FT-101ZD Mk III

YAESU's FT-101ZD with FM is the most popular HF rig on the market thanks to its very comprehensive specification and competitive price. Incorporates notch filter, audio peak filter, variable IF bandwidth plus many other features.

#### FT-480R High technology all-mode 2 metre mobile



The most advanced 2 metre mobile available today - USB, LSB, FM, CW full scanning with priority channel, 4 memory channel, dual synthesized VFO system.

#### FT-707 All solid-state HF mobile transceiver



The definitive HF mobile rig, digital, variable IF bandwidth, 100watts PEP SSB, AM, CW (pictured here with 12 channel memory VFO). Latest bands.

#### FRG-7 General coverage receiver



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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This is the latest and most exotic product from YAESU's superb design team. The new FT-ONE provides continuous RX coverage of 150KHz - 30MHz

plus all nine amateur bands (160 thru 10m).

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**FULL** break-in on CW • audio peak filter • notch filter • variable bandwidth and IF shift • keyboard scanning and entry • RX dynamic range over 95 dB! and **NO** band switch !!!

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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

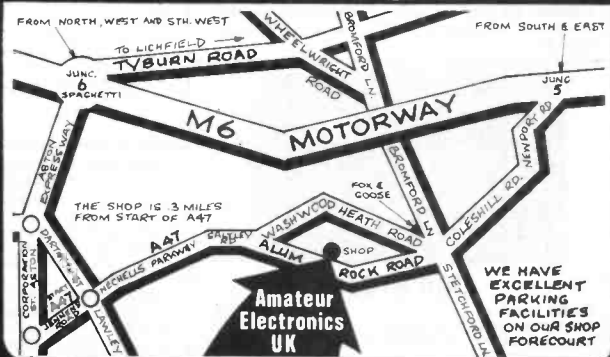


FT-208R with standard charger

### AGENTS

- NORTH WEST - THANET ELECTRONICS LTD. GORDON, G3LEQ. KNUTSFORD (0566) 4040.
- WALES & WEST - ROSS CLARE, GW3NWS, GWENT (0633) 880 146.
- EAST ANGLIA - AMATEUR ELECTRONICS UK - EAST ANGLIA DR T. THIRST (TIM) G4CJT, NORWICH 0632 650866
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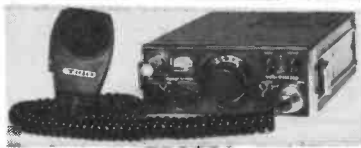
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**TR7730** the new compact 2m Transceiver



**TR2300**

TR2300 2m Synthesised Portable Transceiver. We have lost count of the number of this model we have sold over the last 12 months. Hikers, campers, climbers, you can hear them all over the country and reliability which is the essence of TRIO equipment. **£166.75**

**JAYBEAM**

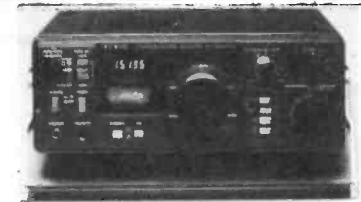
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**TR7800**

Continuing TRIO's policy of presenting the Radio Amateur with the finest equipment available, we were pleased to announce the NEW TR7800 2m FM Mobile Transceiver. 15 memory channels - Priority channels with simplex  $\pm 600$  KHz or non-standard operation - "Priority alert" bleeps when signal on M14 priority channel. Frequency coverage 144.00, 145.955 in switchable 5 KHz or 25 KHz steps. Front keyboard for selecting frequencies, programming memories and controlling scan function. ALL THIS and MORE for **£284.97**.



**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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The TR9000 is a compact lightweight 2 mtr. FM USB/LSB/CW Transceiver with an outstanding array of functions. FM1 for 25 KHz steps (for mobile use) FM2 for precise 100 Hz steps (for base station use). Microcomputer control giving many advanced features. Built in 5-channel memory. New type microphone with UP/DOWN switching. Built in high performance. N. Blanker. Side tone for CW.

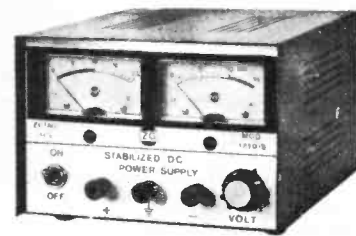
**TRIO**

TS830S HF Transceiver.....	£ 694.83
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TS530S HF Transceiver.....	£ 534.98
SP230 Speaker.....	£ 34.96
DFC230 Digital remote control.....	£ 179.86
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TR7800 25 watt 2m FM Transceiver.....	£ 284.97
TR7850 40 watt 2m FM Transceiver.....	£ 314.87
TR9000 2m Multimode Transceiver.....	£ 394.91
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R1000 Solid State Receiver.....	£ 297.86

Full range of TRIO accessories stocked.

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RF Speech Clipper.....	£ 26.45
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**MOD. 1210 S**

**SOLID STATE STABILISED POWER SUPPLIES**  
Maximum ratings quoted. Prices include postage.

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Regency Digital Flight Scan Synthesised Aircraft Band Receiver.....	£ 215.00
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AR22 2m Hand Held Receiver.....	£ 83.00
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FX1 Station Wavemeter.....	£ 28.00
2-way Antenna Switch 3-30MHz.....	£ 5.00
3-way Antenna Switch 3-30MHz.....	£ 10.00
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- \* VBT variable bandwidth tuning
- \* IF notch filter
- \* IF Shift
- \* Various filter options
- \* Built in digital display
- \* 6146B final with RF negative feedback
- \* Optional Digital VFO for increased flexibility
- \* Innovative PLL system of frequency generation
- \* RF speech processor
- \* Adjustable noise blanker level
- \* Adjustable audio tone
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- \* RIT/XIT
- \* SSB monitor circuit
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# DATONG PRODUCTS

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- **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 HF7 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 modulating your transmitter. The effect is as if 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 TVI.



Model FL2

Model PC1

Model ASP

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 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?

### 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



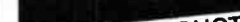
Model DC144/28

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 (the cast box, S0239 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.

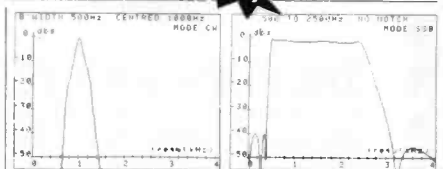
Model D70



### 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.



### 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

- 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



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# SHORT WAVE MAGAZINE

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Editor: PAUL ESSERY, G3KFE/G3SWM

Advertising: Charles Forsyth

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### AUTHOR'S MSS

Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of A4 sheets. Photographs should be lightly identified in pencil on the back with details on a separate sheet. All drawings and diagrams should also be shown separately, and tables of values prepared in accordance with our normal setting convention — see any issue. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

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# AMATEUR RADIO EXCHANGE



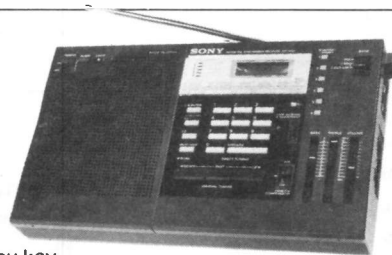
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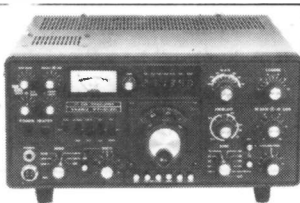


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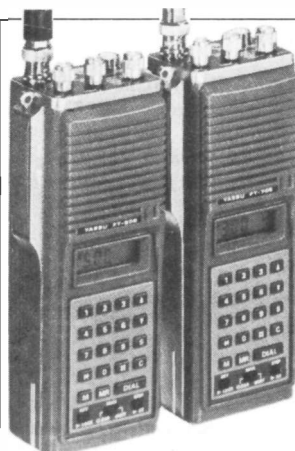
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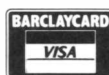
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FOR THE RADIO AMATEUR AND AMATEUR RADIO

# The SHORT WAVE Magazine

## EDITORIAL

### Re-Think Required?

The October amateur radio exhibitions have come and gone. Although both successful and well worth visiting, it does seem that perhaps some rationalisation should be considered for next year: two exhibitions so close together must have drawbacks from everyone's point of view, including the public's.

The impression we gained from our visit (our production schedules prevented us from mounting a stand at both shows) to the Granby Halls event, by far the smaller of the two, was of a well-organised affair. There was plenty of space between the stands — a pleasure for visitors — and it was even possible to get something to eat without joining an endless queue. Also, a considerable effort had been made to improve the notorious interior appearance of the building.

The new A.R.R.A. exhibition venue at Donington, though not perfect, was a great improvement in most respects. However, the idea of allowing the exhibition to spill-over into an unheated hall the best part of a mile away from the main centre, and then charging visitors to "bus" them to and fro, was not a happy one, and caused considerable annoyance to both stand-holders and visitors alike. Also, the arrangements for the disabled were non-existent — which was particularly sad in this International Year of the Disabled; indeed the lack of planning in this respect resulted in the RAIBC stand being tucked away in the remote hall which meant, to all intents and purposes, complete inaccessibility for the disabled.

But having said that, for our part it was enjoyable and, as always, a great pleasure to meet friends old and new at our stand; there really is nothing quite like the personal exchange.

Perhaps the strongest impression gained from the two exhibitions is the immense and increasing interest in amateur radio — and this can't be bad!

### Increase

As a result of increases in many of our costs, regretfully we have to announce that the price of *Short Wave Magazine* will be 55p with effect from the January 1982 issue; direct subscription rate will be £8.40 (2nd class post). The new sub. rate takes into account increased postal charges due to come into force early in the New Year, but subscribers should note that, as always, we shall still be carrying part of the cost of posting the *Magazine* ourselves; current subscribers will not, of course, pay the new rate until their subscription falls due for renewal. Single copies, despatched from Welwyn by first-class post, will cost 80p.

### Christmas

The Christmas holiday period means that the January issue will not be published until December 28th.

The staff of the *Magazine* would like to take this opportunity to wish all our readers and advertisers a very Happy Christmas and a Peaceful and Successful New Year.

*John Collins*  
G3KFE.

WORLD-WIDE COMMUNICATION

# COMMUNICATION and DX NEWS

*E. P. Essery, G3KFE*

## Vale G2BVN

**R**OY Stevens, G2BVN, died on September 30, after a long illness. "Steve" devoted most of his life to Amateur Radio, and at that to the wider aspects of the hobby, as well as finding time to be a top DX operator. His views on many things were different to, say, the writer's, but having said that, we never doubted for one moment that his opinions were formed out of a one hundred-percent dedication to Amateur Radio, and that what he did at national and international level was entirely the result of his thought-out ideas.

Steve was, as his call indicates, one of the pre-war AA licensees and in September 1939 his training was to be put to use; he was one of the 'Early Birds' and so was in France by September 5; his return from that country was achieved one month *after* the Dunkirk beach had been cleared of the remnants of the British forces. Later in the war, he broke both legs in forced landing into the Western desert. In the post-war period he was well known in the councils of RSGB, of which he was President in 1966, and gradually in the wider, international sphere. It is sad to have to record that as he became an international figure, so the illness which finally incapacitated him took its hold, causing his retirement in 1978 from his job as a chief fire surveyor, and then forcing him into a wheel chair — but he was still working with his old vigour from that wheelchair right till the end. He will be missed in many places and many countries.

## Top Band

We have mentioned once or twice that G4AKY is in the hunt for an Oceania QSO to complete his WAC from Harlow, after completing his first one from the previous QTH. Dave showed us some very interesting "graphs" he made, in which he plotted the sunrise and sunset paths in terms of date and time, for G (based on Greenwich) North ZL, and South ZL, the essential data being fairly easily obtainable. Plotting these three lots of data as three different-coloured "sine-waves" produces some interesting conclusions; for instance, one of the ZL points is in theory unworkable insofar as a path does not occur at any time during the year (albeit we think in good conditions it might be possible — not probable — for two or three minutes). Another interesting thing is that the curve for G can be

adjusted for time quite easily by going westwards four minutes for one degree of longitude, or east by a similar amount, and this exercise brings out vividly the fact that the further west one goes the harder it becomes as the time-window decreases. All so theoretical, you may murmur. But, in fact, known G-ZL QSOs on Top Band can be shown to fit into the plot perfectly, although there aren't that many to play with. We are twisting the G4AKY arm for an article on all this 'ere long. Turning to Dave's October news, he seems to have been a bit down; on CW there are 14 countries, scattered around Europe, Asia and N. America, and 14 also on SSB, the best being EA9EU in Ceuta for an Africa contact and OH0BH for Aland. Among the gotaways, we were intrigued to see K1PBW on CW, and 4X4 on both CW and SSB.

That K1PBW signal is all the more surprising when we picked up the latest W1BB *Bulletin*, which makes no indication that Ernie had changed his mind about going QRT, so, one supposes, he may have a pirate on the band. Scanning the rest of the W1BB offering, we notice that January 1 next, the JAs have got an additional chunk of the band, between 1810 to 1825 kHz, but it is also noted that the licensing procedure is slow, so one should put a feeler out on their old allocation of 1907.5 to 1912.5 kHz. Another change is that between 1.8 and 1.9 MHz, the Ws are now permitted full power day and night. Stew reminds us that we should have noted earlier that G3CWI is on from VP8ANT from the beginning of November, for some 33 months, the spot being Rothers Point, Adelaide Island, and the QSL route being by way of G3ZAY. Still with W1BB, he notes that GD4BEG has gone to a two element Yagi atop his vertical, which seems to be doing the trick after much trouble setting the beast up; and another trying Yagi beam is G3WXZ, who has a three-element one at 220 feet up, and plans to make it a six element job! On the other hand there is little doubt that a good "starter" aerial is an inverted-L arrangement of length around 165-175 feet total, going straight up from the ATU to about 25-40 feet and then horizontal-ish out to the end. The writer had one years ago like this and with a very poor earth it still performed well; we tuned it with a normal ATU, but W1BB makes the very fair point that all the thing needs is a variable capacitor in series with the aerial to co-ax inner, and a couple of radials or a ground mat to make the very best possible

earthing conditions, to make quite a good first Top Band aerial system. It is a variation on the vertical monopole of course, but the extra length and horizontal top combine to make it a quieter receive aerial which is easier to match on transmit. Less than ideal, yes, but well worth giving a try.

G2HKU (Minster, Isle of Sheppey) has changed from an FT-101 to a new FT-101ZD Mk.III, and spent some time looking at the drift characteristics of the new and the old boxes, plus other measurements which seemed called for; but he did manage to find time for a SSB QSO with PA0PN, and another with G3ROO who was QRP — he of the "Tunbridge" transmitter-receiver currently being described in *S.W.M.*

Turning now to G3PKS (Wells), Jack seems to be having trouble with a recalcitrant rig — he puts it down to jealousy because he bought a shiny new Bencher paddle to replace the old two-nailfiles arrangement. However, there were some days on which the rig was working, and contacts made — but, *not* on Top Band!

Still with Top Band, we next come to remind you all of the ARRL Top Band CW contest, running from 2200 on December 4 to 1500z December 6. Notice this one doesn't have a class for DX-DX contacts, so for us it is largely a question of working W/VE stations to give them another country multiplier. One would have thought that ARRL would have brought the rules up to date and made the contest a world-wide one, to help boost activity. 5 points a QSO, and a multiplier of one for each ARRL section worked, DX countries and VE8; logs to be postmarked no later than January 5, and addressed to ARRL Communications Dept, 160 Contest, 225 Main Street, Newington, Conn. 06111.

## 80 & 40

Lumped together this month, since we have devoted so much to Top Band and other things. These are two bands where dedication most definitely has its reward; and in particular where careful thinking about the vital aerial can enable DX to be worked by people who are in sites normally considered impossible.

Down at the LF end of Eighty, where the dits and dahs live, one can often come across QRP stations; a look around 3.560 MHz is a good starter. If you are after the Big Fishes, then a look into the bottom five kHz of the band is sometimes fruitful if the

time is right. As to Forty, our 100 kHz segment is voluntarily planned to permit the bottom 40 kHz for CW, and Phone above; but it is noticeable how the SSB creeps ever further down into the CW territory.

G2HLU (Reading) found himself a new country on Forty, by way of 5N0WRA, one morning when he felt driven to an early rising; it also did him a bit of good on 20, and yielded some Gs on 40 — that must have been *early!* On 3.5 MHz, there have been a few contacts written into the log, all down to the ON contest.

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**“CDXN” deadlines for the next three months —**

January issue — December 3rd

February issue — **December 31st**

March issue — February 4th

*Please be sure to note these dates*

---

G2NJ passes on the news that he worked G2OT/A, with G2UV driving the latter station; among the other points that arose was the RAOTA proposal that there should be a members CW net around 3520 kHz, at 1500z once a week. RAOTA member with views on such to pass 'em on to G2UV please. Another QSO was with G5NX/M on CW at Skipton, *en route* for Windermere, which became a three-way when G2BY in Ventnor I.o.W. chipped in to give a report to G5NX/M.

From G3IRM we have a note that the Tops CW contest is on December 5-6, from 1800 to 1800 GMT in the 3.5-3.6 MHz segment. Call CQ QMF, and gain points as follows: contacts with own country 1 point each, other countries in same continent 2 points, and with countries in a different continent 5 points, and contacts with the Hq stations GW8WJ or GW6AQ 25 points. W/A/K/N call areas each count as countries, as do those in VE/VO, VK, and Russia. Total the QSO points, and multiply by the number of prefixes worked. Each QSO takes a serial number, to start at 001 as part of the exchange. Logs by January 31 to Bertil Arting, SM3VE, Bergesvagen 26, S-823 00 Kilafors, Sweden. Note this is a new address.

Turning to last year's results, the Communist countries made a clean sweep of the first twelve places, LZ1SS being the winner and by a substantial margin; and all the first three were themselves well ahead of the rest of the pack — there were some 200 entries and another 20 check logs sent in.

G3PKS says he used 40 mainly for inter-G CW, but he did book in ZL2UV one morning for a nice chat, while lots of W/VE were heard but not attempted — though a p.s. amends that to notice K4CRF.

G4GMZ (Congleton) is a 7 MHz buff, and didn't stray far from it, as painting and decorating were stopped by early darkness and rain. A call to a weak PY1AJK proved to be, John says, the kiss of death, as the PY slipped slowly into the murk. An excellent CW QSO was with DK6CS who at 74 years old still puts out some beautiful Morse. For the rest there were several interesting QRP chaps around to be called and booked-in; something that is usually a pleasure both ends.

Talking of QRP, that was the G2HKU approach; on Eighty he mentions YU3DMU, G6AB, DJ3DE and G3ZWH/A on from Plymouth as all being worked with low-power, the last mentioned indeed being QRP both ways.

D. Whitaker of Harrogate (he of those ten-metre tests when the sun was spotless) has been looking into 40 and 80 SSB mainly in the mornings. On Eighty we see KN6M, XE1AE, XE1OX, K6HNZ/CT3, JX5VAA, and VP2EC all between 0500 and 0600; then in the next hour there was H18PGG, OE2VEL/KH6, KH6XX, HC1MD/3, HP3FL, 6W8HL, FPOGAQ, VP2VGR, 9Y4VT, VP2KAA, 7X4MD, TF3YH, C6ADV, N6YK/VP2A, and J6LIR, plus another one which we couldn't construe. As for Forty, David is rather attached to the band, and so he winkled out: at 0500 on to 0600 HP1VXY, VE7EPA, HP3ML/1; from 0600-0700 T12CCC, T12JIC, T2VEL, J73FW, YJ8RG, F08FO, CO2HT, KG4KK, VP2VGR, EL8H, CO5GV, CX3TU, ZD7HH, HP1XRK, 6Y5WS, KG4DI, KL7U, KL7Y, VK9NS, T30BF: and between then and 0800 P41C and 4U36UN. Later in the day, and back from work, ZS6AYM, SV1IT, 5N9ACO/8, FR0FLG, before 1800, with VU2YK, ZS3WK, G4LJF/3B8 just after. Then we guess the Whitaker shack was closed for an hour while the inner man was refreshed enough to locate 9K2DR at about 2000z.

### Here & There

We've already mentioned the Tops CW contest and the ARRL 160 'test; and on a more local scene the Verulam affair was notified too late for inclusion.

That leaves us room to mention the WAB and HAB activities. This activity is based on some contesting and much award hunting, with the proceeds of the whole thing being given to RAIBC for the benefit of our blind and disabled comrades. To dig right in involves getting a WAB book, and filling in all the squares with contacts, but one can of course hunt casually without the book. There are the contests, and G4HPU (Saffron Walden) has written to remind us of the Winter one, which is to run from December 1 through to February 28, 1982. To claim the award, one gets on the air in the given period and heads for some 250 points. Any one station may be claimed for a point for the county, one for

the local authority district, one point for the WAB area, and one more if the contact is with a book-holder. Each of these can be claimed just once, save that a bookholder may be worked again from a different area if that spot is wanted. All the details are available from A. C. Keeble, G4HPU, 4 Manor Cottages, Debben, Saffron Walden, Essex CB11 3JY.

Now we have a letter from P. R. Short in Port Stanley Falklands, noting that South Sandwich Is are Crown property and that, therefore LU is *not* a legal prefix for that area; thus LU3ZY is a pirate. The point is taken, and we are passing a copy of this letter to ARRL and to RSGB for G3FKM.

A change now from contests and awards, to the welcome news that VE7BC is noted both by Geoff Watts' *DXNS*, and *TDXB*, as having returned to China with some two-dozen crates of radio parts; so the slow progress in BY towards Amateur Radio is still continuing. We wonder whether this has any bearing on the continued rumours of a ZA2HAM operation from Albania — if true, they will be on from December 4-14.

That San Felix DX-pedition seems to have been rather in the nature of a non-event; it seems that the easy part is getting the licence, the harder part by far being getting a permission to land and stay — the Chileans have political prisoners there, which may have some bearing.

Back to contests-and-things. The R.A.F. club have their Christmas shindig on December 13, 1300z to 1700z; AM, FM, SSB, RTTY, CW, on 80 and 40 metres, and also VHF. Call CQ RAFARS Contest, and hand out RS(T) plus serial number from 001 plus letters RS. Score QSOs on 80 or 40 at two points each, on 144 MHz 3 points each and on 432 MHz four. Mode multipliers were given as: 1 for SSB/FM, 2 for CW/AM, and 3 for RTTY contacts. Logs and their destination aren't mentioned, but we could guess that if you get 'em in to RAFARS, c/o R.A.F. Locking within a month, that would be acceptable.

Next we come to a letter from G4BUE, who reminds us of the QRP Club Winter Sports and Weekly Activity Periods. The Winter Sports are set for 1982, and so there is plenty of time for the QRP chaps to get ready — no doubt by then they will have picked it all up in *Sprat*. As for the Activity Periods, Sundays 1100-1230 and 1400-1530, and frequencies 3560, 7030, 14060, 21060 and 28060 kHz; and it is suggested that the first half-hour of each period given over to the HF bands and, one hopes, some DX.

### Ten

We are rapidly coming to the end of our space and we've not even started on the HF bands yet! So, let's see what's what, through the eyes of G3NOF (Yeovil).

From his long experience on the band — he was an SWL for many years — Don notes the indications of a slide towards the sunspot minimum in the erratic conditions, some days good, some rather poor. Little has been heard in the mornings, save a few VK and JA signals peaking around 1100z on the short path some days. Caribbean signals have been noted around 1100-1200z, and North Americans from 1100 to 2200z. There were a few KH6s around 1800-1900, shortly after the few Africans had reached a peak at 1600. It added up to SSB contacts with A6XWT, CN8CO, D68AM, CX7BY, FG7AR/FS7, FP0GAQ, G4LJF/3B8, HC1MD/5, HP1XRK, I8UDB/IC8, IU8ONU, J3AH, J6LIR, JX5VAA, JX7FD, K6HNZ/CT3, KB7XJ (Nevada), KH6IBA, LU9FFA, M1C, OA4AWD, OY5NS, various Asian Russians, SVOBV/SV5, TG4NX, TG9EW, VKs, VP2EM, VP9AD, VU2SUN, W7IAA (Idaho), W7KZL (Arizona), W7RZC, ZSs, 6W8HL, 7Q7LW, 7X4AN, 8P6MH, 8P6OR, 8P6QL, 8P6T, and 9J2KO.

G2HLU was on SSB for a string of easy exchanges in the CQ WW SSB contest, but otherwise stuck to his key, save for one afternoon when a demonstration was given to a local SWL (a pre-war school-friend SWL at that), and W4QA and N5BQH was followed by a call from G3SWB in Caversham Park, line of sight and so very 59 plus, with G4AWY in the driving-seat — an old friend with whom Harold had lost touch. That is the sort of non-DX QSO which is so pleasant.

Now G4HZW (Knuttsford) who has a TS-820 on 28 MHz, into a two-element quad. The period started in fine style, but fell away and wasn't really right for the CQ WW SSB contest weekend; and operating was also a mite restricted by TVI. The main operating period is the early-morning, and with the change back to GMT Tony says he can get 1½ hours in the shack before work now. Thus, the operating resulted in rather the expected DX: VKs, ZLs, shoals of W6s, KH6IBA, VS6CT, 5H3TM, TI9FAG, G3MUV/CE0 on Easter Island still, OX3JF, WB3IGS who had just four watts which made him 59 in England, G4LJF/3B8, ZS2MG, EI9BC by Aurora for a new country(!), shoals of small fry, shoals of JAs, shoals of UAO stations, but nothing from that needed Zone 23. Tony starts off each morning with a CQ Zone 23 but hasn't yet registered even a gotaway, let alone a bulls-eye. The nearest report is of a JT calling CQ after he had gone to work! Gotaway of the month was JD1BAT on what used to be called Marcus Island.

Now we have a letter from G3RKH (Ordsall) who comments on how many of the current reporters he knew when he last reported to this piece some 17 years ago, when G6QB was in the chair. John struggled for years with a multiband vertical, but has finally taken the plunge

and bought a beam. The two-element tribander has made a considerable difference, and on Ten, despite the up-and-down conditions, he worked lots of W/VE, plus A4XIU, VK, JA, HC8GI, OA4AWD, V3DCS (Belize), 9J2KO, I8UDB/IC8, 7X2AK, 7X2KBS, VS6GZ, VS6JW, VU2NR, HZ1AB, HZ1HZ, K6HNZ/CT3, 8P6T, 8P6MH, VP2EC, VP2EM, HP1XRK, CX7BY, PJ8UQ, HI8PGG, HKOEHM, 5Z4RT and P41C.

G4LDS (Chelmsford) has been somewhat inactive due to problems with the rig; first a dry joint was removed and the USB oscillator now works, *but* while the G3LLL clipper was being fitted a mishap with the soldering-iron saw off the IGFET and so killed the receive half of the rig. However, since January some 122 countries have been worked; the latest crop, before the rig died, showed 3B8CF, VE4BF, a morning session which gave some Europeans followed by a call from VK4APM all by 0900, some more W/VE, 9K2DR for a new country, ZL, UL7, JR6, P29NAB, then the RSGB ten-metre contest which was spoilt by an aurora, although it was still possible to work PP2ZDD, KV4AD, UA9CJA, 4X4OQ, VE, KP4BZ, J73PP, and EUs; TI2CC was another new one, some VKs, UA9, and finally FP0GAQ. The rig was then repaired and tried out, with a few more in the CQ WW SSB contest for various Ws, JAs, VP9, VE3, 4Z4, VP2MFW, a call from V3ME in Belize, P41C (a PJ2 in disguise), HK3A, D4CBC, and VP2EM to take the countries total up to 128.

G3OUC (Newbury) found conditions on Ten pretty good, with such as UA9CCS, JA8VDY, WA6NEV/P4, WB2, WA2, and FP8HL all raised from the mobile, plus the usual crop of Russians. Pat has a QRM problem as G4MLG lives next door and puts literally volts down the G3OUC ATU; but they seem to manage to work things out between themselves. The local nets are on 1.920 MHz and 28.3 MHz, so helping to sell the band occupancy.

Now we have a couple of letters from G3LWM, who is one of those who are sparking-plugging the use of Ten and he writes now to bring up the subject of a calling channel for each mode on Ten; he suggests 29.6 MHz as being fairly well established for FM calling, with a proposal for 29.31 as alternate. For CW, 28.1 is proposed, but for SSB the choice is not so clear-cut; 28.305 has been suggested but this of course has resulted in problems with ZS beacon on 28.302 MHz, so some suggestions are wanted. Now, to a more important point; some £100 plus has been expended in getting this ten-metre activity going, so the time has come to ask for subscriptions. The proposal is that you drop a line and £3.50 to G3LWM, for which you will get a 10-UK Club membership card, membership number, and a 6-8 page newsletter two or three

times annually. RAIBC free of charge. Send your name, address and call sign on a piece of paper with your cheque/PO, writing *as clearly as possible* to Jeff Harris, G3LWM, The Oaks, Cricketfield Lane, Bishops Stortford, Herts. (0279-56347).

## Fifteen & Twenty

In very brief words, as space runs out on us. Therefore we will indicate how things have been by reference to G3NOF and G3RKH. Let G3NOF pick up the tale. Don says that again the long path to VK/ZL has been poor, but the short path around 1100 has been rather better; over the North Pole and into the Pacific has been open between 1000 and noon, while N. America has been patchy, with some openings to W6/7 call areas. A few African signals were to be heard around 1700. QSOs tell the rest on this band: A4XIA, C31LX, CP1EQ, DJ5CQ/3A, EA9KF, FB8WG, FK8DH, FP0GAQ, G3AAE/VP9, G4COA/W0 in N. Dakota, G4LGF/3B8, H44WF, HK0FBF, I8UDB/IC8, IQ8ONU, J6LOU, JAs, JX5VAA, KH6WU, a daffy of KL7s, N6TU/KH0, K7DD, OD5SV, OE5JTL/YK, OH2LP/OH0, P29NBF, P29NRL, P41C, SVOBV/SV5, TE1C., TF3YH, VKs, Russians including UK1PGH in Franz Joseph Land, VP2s, VU2CJ, VS6JW, W7s, YJ8s, ZKs, and ZLs.

Turning to G3RKH also on 21 MHz; John mentions K7BA in Wyoming, FP0FSZ, C5AAP, 5B4HY, FP0GAQ, and DJ5CQ/3A.

Now, what about Twenty? As always, its own inscrutable self, noisy, QRM aplenty, and all the rest — but the prime DX band nonetheless in the long-term.

G3RKH says he doesn't have any set pattern of operating; sometimes early morning and then at tea time, sometimes a day without switching-on. All the same, he worked, as pick of the crop, XT2AT, VP8AEN, VK, ZL, 9Y4FS, C5AAP, XE1CB, 6Y5MG, and HR1EHA.

G3NOF seems to have not done too much, although he says the long path to VK/ZL has been good around 0700, with some W6/7 as well, and KL7, KH6 showing around 1000. Contacts were actually booked in with G4LGF/3B8, HI8PGG, OE1ETA/KH6, OY9R, P29BS, PJ8UQ, UWOMF, VE7CWG, VE7VX, VKs, ZK1CV, ZK1KM, ZL1WE, ZL3QN, 7Q7LW, and 8P6OR.

So, that's it on the bands.

## Finale

We've cut very fine this time, but don't stop sending in your letters on that account — we can handle as much as you can send in! Deadlines are in the 'box' — address, as always, to "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Meantime, a Very Happy Christmas and successful New Year to you all.

# THE "TUNBRIDGE", PART II

## CONCLUDING THE DESCRIPTION OF THIS EFFICIENT QRP TRANSCEIVER

IAN KEYSER, G3ROO

### Crystal Mixer VFO

THE problem in using high frequency IF is in designing the VFO. At first it was thought that one might get away with a 1.1 MHz VFO for the 10 MHz band, but on reflection obvious problems would arise. In the mixer circuit the VFO is used to switch transistors, and in the case of the 1.1 MHz VFO there would be a large amount of second harmonic at 2.2 MHz. This would beat with signals at 11.2 MHz and produce interference on the 9 MHz IF. This could be removed by traps at 11.2 MHz, but it was decided that a more elegant system of crystal mixing could be devised that would allow any band to be covered without changing the design. To remove all problems and harmonics it is advisable to place the local oscillator above the signal frequency, e.g. for eighty metres the VFO would need to cover 12.5 to 13 MHz, and for ten metres, 37 to 39 MHz. This is why crystal mixing is used: it is difficult to make a VFO stable enough at 12 MHz, and virtually impossible at 37 MHz.

At first it seems difficult to keep the *spurii* at a low enough level, but with modern ICs it amounts to little more than building the circuit and tuning up. The knack is in choosing the correct frequencies for the crystal and variable oscillators. The output frequency of the crystal mixer is the sum of the IF and the aerial frequency, e.g. for Eighty 3.5 + 9 MHz for the lowest frequency, and 4.0 + 9 for the highest, giving a VFO range 12.5 to 13 MHz. In choosing the crystal frequency it has been found that it is best to keep this frequency as high as possible, using subtraction. Therefore the crystal mixer VFO frequency is the crystal frequency minus the VFO frequency. Using Eighty as an example again, if a crystal of 15.5 MHz was available, a VFO running between 2.5 and 3 MHz would give the required output frequency between 12.5 and 13 MHz. Of course the choice of frequency for the crystal and VFO is critical and the harmonic relationships with the band in use should be avoided if there are to be few or no birdies.

In the case of the 20 metre Tunbridge, it runs between 2.5 and 3 MHz and mixes with a crystal oscillator at 26 MHz; this gives the required output frequency between 23 and 23.5 MHz which, when mixed with the 14 to 14.5 MHz signals, gives the 9 MHz IF

signal. There is one small birdy audible without the aerial connected, but with the aerial connected the received noise covers it completely. It is, of course, very important to pay attention to decoupling and screening to achieve this.

The VFO section of the circuit, Fig. 10, uses a Clapp circuit; this has been found to be stable enough at these low frequencies, and very easy to set up. An FET is used as the oscillator, and this is fed to an emitter follower with an adjustable output level. It is very important to set the levels of the injected signals into the mixer at the critical level. The crystal oscillator uses a two-transistor circuit which is extremely versatile; as it is required for this circuit to operate in either fundamental or overtone modes, and over a large frequency range depending on the chosen band, this circuit fills the bill admirably. It is only necessary to resonate the circuit at the frequency required, and the crystal will oscillate in the required mode. The difference signal is selected at the open collector output of the mixer by a tuned circuit, and a link winding on this circuit transfers the energy to a SL610 for amplification. As described in the transmitter section, this device cannot drive a tuned circuit directly, so a BC109 is used as an interface.

### Setting up the Crystal Mixer VFO

Ideally a 'scope or valve voltmeter with an RF probe is required to set this circuit up, but a good general coverage receiver can be used and still obtain good results. Firstly use the receiver to check that the two oscillators are operating on the correct frequency. Having established this, couple the output of the PCB to the input of the receiver using co-ax cable and ensure that there is a minimum of coupling between PCB and receiver other than by the cable (this can be checked by shorting the co-ax with screwdriver, and the signal in the receiver should disappear; if not, there is too much stray coupling). Tune to the difference frequency, and a

#### Tables of Values Fig. 5 (Part I)

C56, C57, C58, C60 = 0.047 $\mu$ F	T9, T10 = 18t, 26 s.w.g., twisted pair (T50-2)
C59a, C59b = 0.22 $\mu$ F	T11, T12 = 14t, 22 s.w.g. twisted pair (T68-2)
C61, C62, C63 = see below	C64, C65 = 0.01 $\mu$ F cer.
R10 = 3R, $\frac{1}{4}$ W	L1, L2 = 20t, 22 s.w.g., single (T50-2)
R11 = 6K8, $\frac{1}{4}$ W	L3, L4 = see below
R12, R13 = 22R, $\frac{1}{4}$ W	D1 = 1N4001
RV2 = 2K2 preset, see text	D2, D3 = small signal diodes
RV3 = 2K2 preset	

*Note:* In calculating the low pass filter capacitors the cut-off frequency should be 50% higher than the operating frequency and (at the cut-off frequency) the reactance of C61 and C63 should be 50R, the reactance of C62 should be 25R; and the reactance of L3 and L4 should be 50R. Resonating capacitors should be either polystyrene or silver mica types (all tuned circuits).

The "Tunbridge" ready to go. The front panel shows, at top left, the forward/reflect switch and next to it the SWR meter; beneath are the phones and mic/key sockets. Between these and the main tuning control and dial are the USB/LSB (redundant on the version described here) and CW/SSB switches. The controls top and bottom right are, respectively, Fine Tune and RF Attenuator; to their left is AF Gain. The transceiver is housed in a case 154 x 75 x 230mm. depth.







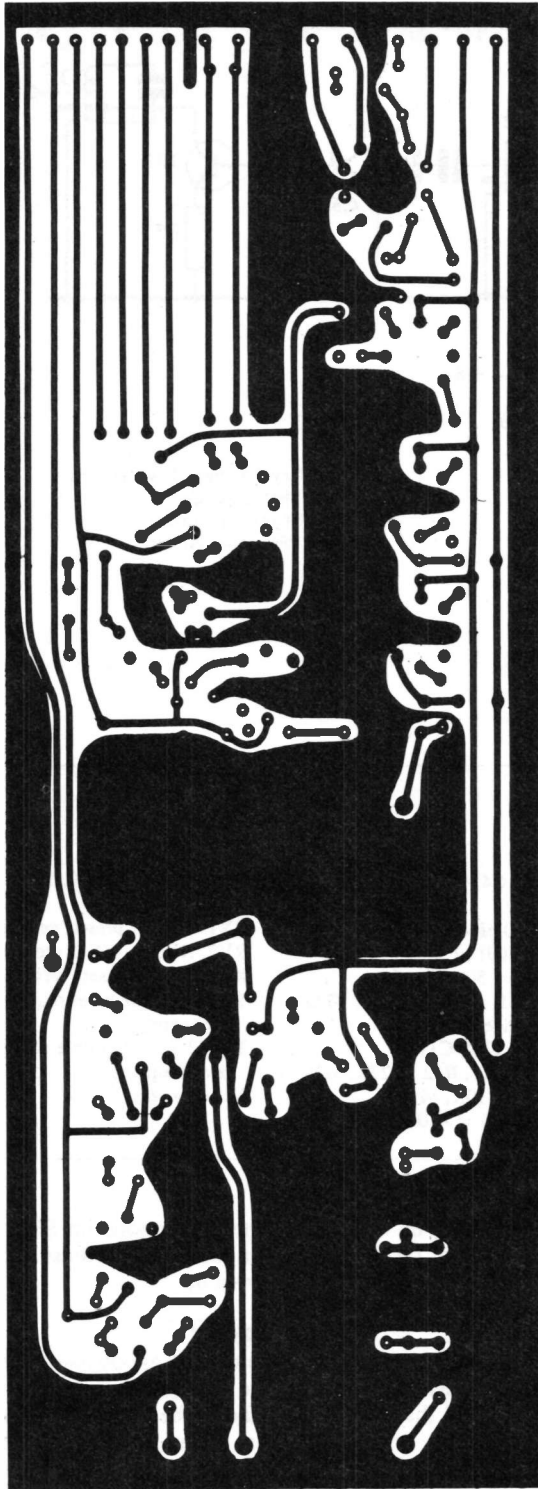


Fig. 8 TUNBRIDGE MAIN PCB FOIL SIDE

D 691

### Setting up the Transmitter

Here it is only necessary to tune the tuned circuits for maximum output. In the case of the LF bands it might be necessary to damp the tuned circuits to get full coverage of the band; if this is the case and the drive is reduced too far, the emitter resistor of the driver transistor should be reduced to compensate.

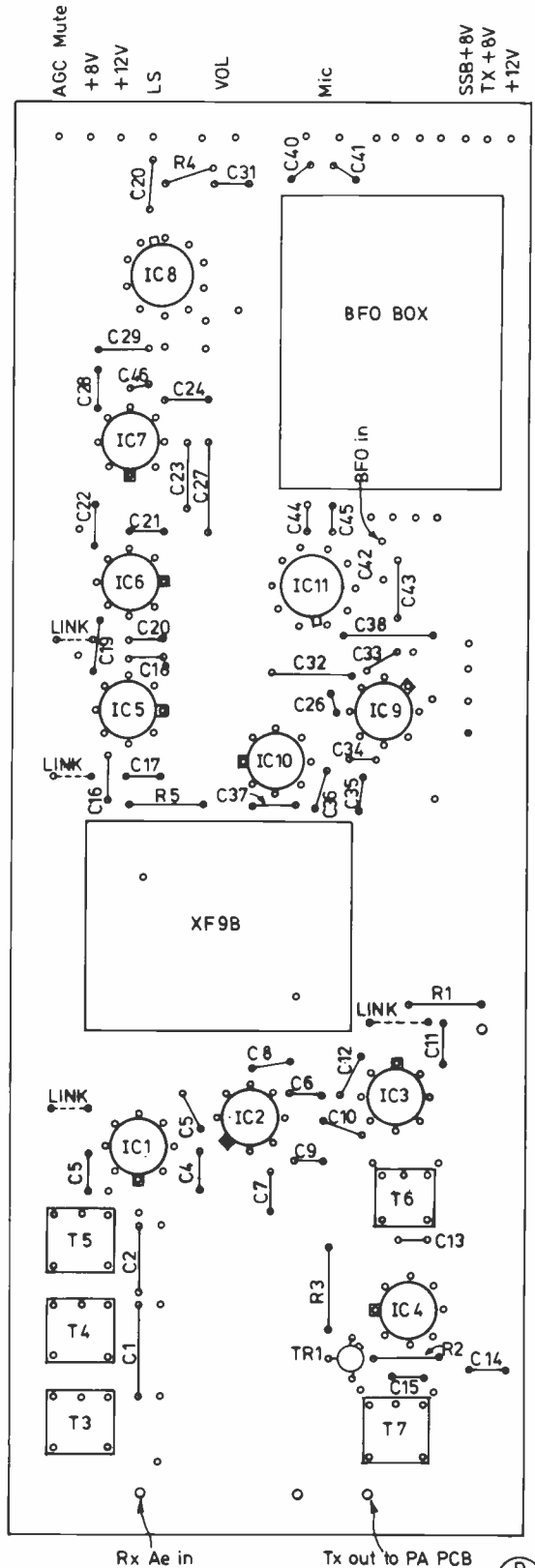
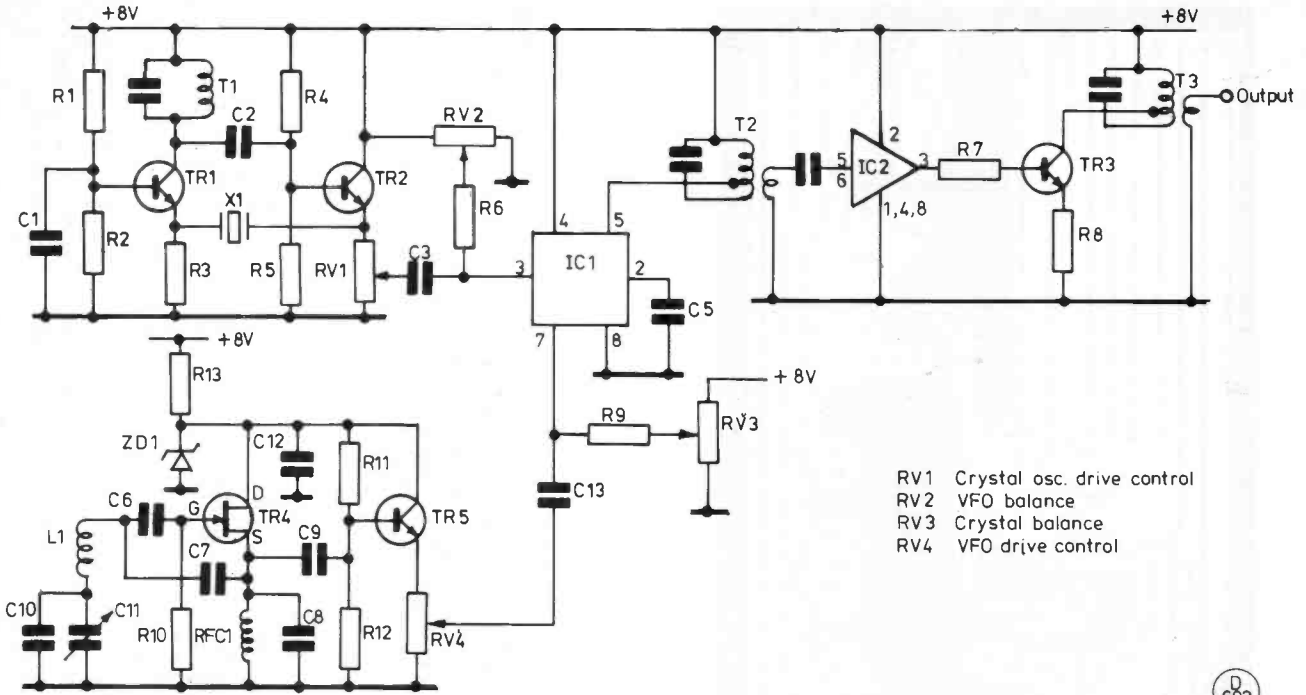


Fig. 9 TUNBRIDGE MAIN PCB COMPONENT SIDE

D 692

### Setting up the PA

There are two presets to be set up on this board. RV2, which must be set at maximum resistance first, is set up by inserting a milliampmeter into the supply lead and adjusting the standing current, under no-drive conditions, to 25 mA. With a 50 ohm dummy load connected to the aerial apply a steady drive (key



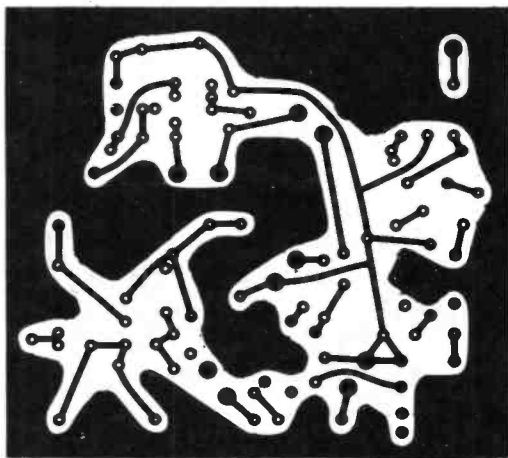
- RV1 Crystal osc. drive control
- RV2 VFO balance
- RV3 Crystal balance
- RV4 VFO drive control

Fig. 10 CRYSTAL MIXER VFO

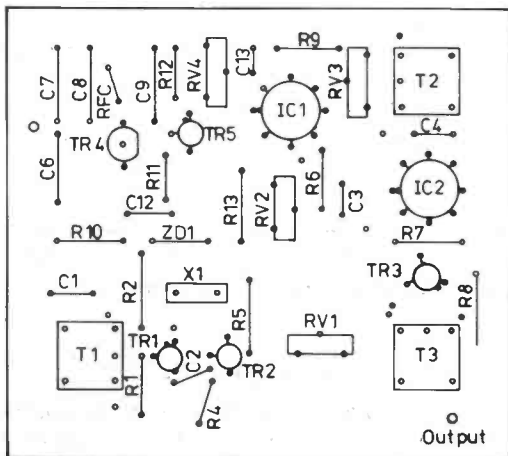
D 693

Table of Values  
Fig. 10

- |   |  |
|---|--|
| C1, C3, C4, C5, C9, C12 = 0.01 $\mu$ F cer.     | R6, R9, R10 = 47K, $\frac{1}{8}$ W           |
| C2 = 10 pF cer.                                 | R13 = 100R, $\frac{1}{8}$ W                  |
| C6 = 0.001 $\mu$ F poly                         | RV1 = 470R preset, vertical                  |
| C7, C8 = 500 pF poly                            | RV2, RV3 = 47K preset, vertical              |
| C10, C11 = to give reqd. VFO coverage, see text | RV4 = 2K2 preset, vertical                   |
| L1 = as C10, C11                                | T1 = to resonate at reqd. xtal frequency     |
| R1, R4, R11, R12 = 22K, $\frac{1}{8}$ W         | T2, T3 = to resonate at reqd. xtal frequency |
| R2, R5 = 10K, $\frac{1}{8}$ W                   | X1 = see text                                |
| R3, R7, R8 = 470R, $\frac{1}{8}$ W              |  |



(a) FOIL SIDE



(b) COMPONENT SIDE

Fig. 11. XTAL MIX PCB

D 694

down on CW, or whistle into the microphone on SSB) while looking at the reverse power on the meter. Adjust RV3 for minimum. The transmitter is now set up.

### Conclusion

Although I have tried to be as descriptive as possible in this text, it must be understood that this little rig is quite an undertaking for a novice, and that every effort should be made to understand completely the principle of the design before commencing construction.

The set has been air-tested comprehensively on my station Rhombic, where all continents were worked in the first week on SSB, and also for several weeks by G2ACG on a 130-ft. long wire where the best DX was with W4. Under all conditions it was possible to have QSO's and always with very favourable reports; on CW it is easily possible to hear stations breaking in while transmitting at speeds in excess of 20 w.p.m. and although there is a slight click on the sidetone this is not radiated, as it is a function of the rather simple muting system.

PCB layouts have not been given for the muting board/PSU and the CIO and keyed oscillator boards as these are rather simple, and could easily be built on Veroboard to save the etching.

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# VHF CONTEST SCORING WITH THE SINCLAIR ZX81

J. V. MOSS, B.Sc., AMBCS, G4ILO

THE Sinclair ZX81 needs no introduction. With over 50,000 units already sold it is likely that many have found their way into amateur radio 'shacks' alongside the more usual equipment.

One amateur radio task ideally suited to a computer is that of scoring VHF contests. Many programs have been published or marketed commercially to perform this task, but none of these will run in an unexpanded ZX81, which has only 1K bytes of memory.

The QRA Locator system should already be familiar to most VHF enthusiasts, and is illustrated in Fig. 1. As can be seen, the first character, which is alphabetic, increases in units of 2° longitude, with A being 0°. The second character increases in units of 1° latitude, with A being 40°N. Since computers store alphabetic characters as numbers from *n* to *n* + 25 (the value of *n* depending upon the particular computer), the second character may be converted to latitude by taking its code and subtracting (*n*-40). For the first character, it is necessary to multiply the code by two, but since for distance calculation, it is only the *difference* in longitudes between two stations which is required, it is not necessary to subtract a factor to produce the actual longitude.

The third character, a number, decreases in units of 1/8° while the fourth, also a number, increases in units of 1/5°. However, in the last column of Fig. 1b, the fourth character goes from 9 to 0 and the third character increases by 1, and this must be allowed for in the conversion. It might seem to be simpler to treat the third and fourth characters as a two-digit number, and to subtract 1 so that for example, the numbers in the top row then run from 00 to 09. From the programming point of view however, it is simpler to convert the code to latitude and longitude character by character.

Table 1. ZX81 Contest Scoring Program

```

10 REM PPNLLLNPKN5777533325
50 LET C = VAL"0"
60 LET R = VAL"180/PI"
100 INPUT QS
120 LET A = VAL"CODE QS(2)+1+(35-CODE QS(3))*1/4"
160 LET B = VAL"CODE QS(1)+(CODE QS(4)-29)/10"
170 LET B = VAL"B-(B>58)*26"
180 LET A = A+(QS(4)="0")/VAL"8"
185 LET B = B+(QS(4)="0")
190 LET A = VAL"(A+PEEK(16476+CODE QS(5))/48)/R"
192 LET B = VAL"(B*2-1+PEEK(16486+CODE QS(5))/30)/R"
200 IF C THEN GOTO 300
210 LET C = A
220 LET D = B
230 GOTO 100
300 LET A = ACS(SIN A*SIN C + COS A*COS C
                *COS(C - B))*VAL"6370"
310 LET B = VAL"INT(A/50)*2+1"
320 PRINT QS;" ";B,A
330 LET T = T+B
350 GOTO 100
    
```

Finally, the fifth character is a letter from A to J, omitting I, and there is no direct relationship between their computer codes and their values in latitude and longitude. The only way to convert this character is by means of two tables, one for latitude and one for longitude. It is the need for these tables which makes it difficult to write a conversion program to fit within the limited memory of the ZX81.

In order to calculate contest scores, it is first necessary to find the distance between the two stations. Thus the program must first take in the QRA locator of the competing station, and convert that to latitude and longitude, and then repeat the process for each station worked, calculating the distance *D* as:

$$D = \cos^{-1} [\sin(\text{lat } a) \cdot \sin(\text{lat } b) + \cos(\text{lat } a) \cdot \cos(\text{lat } b) \cdot \cos(\text{long } b - \text{long } a)] \times 111.18 \text{ km.}$$

The score *S* is then calculated as:

$$S = \text{integer part of } 2(D \div 50) + 1$$

The program presented here calculates and displays both distance and score, each new score being added to a total which

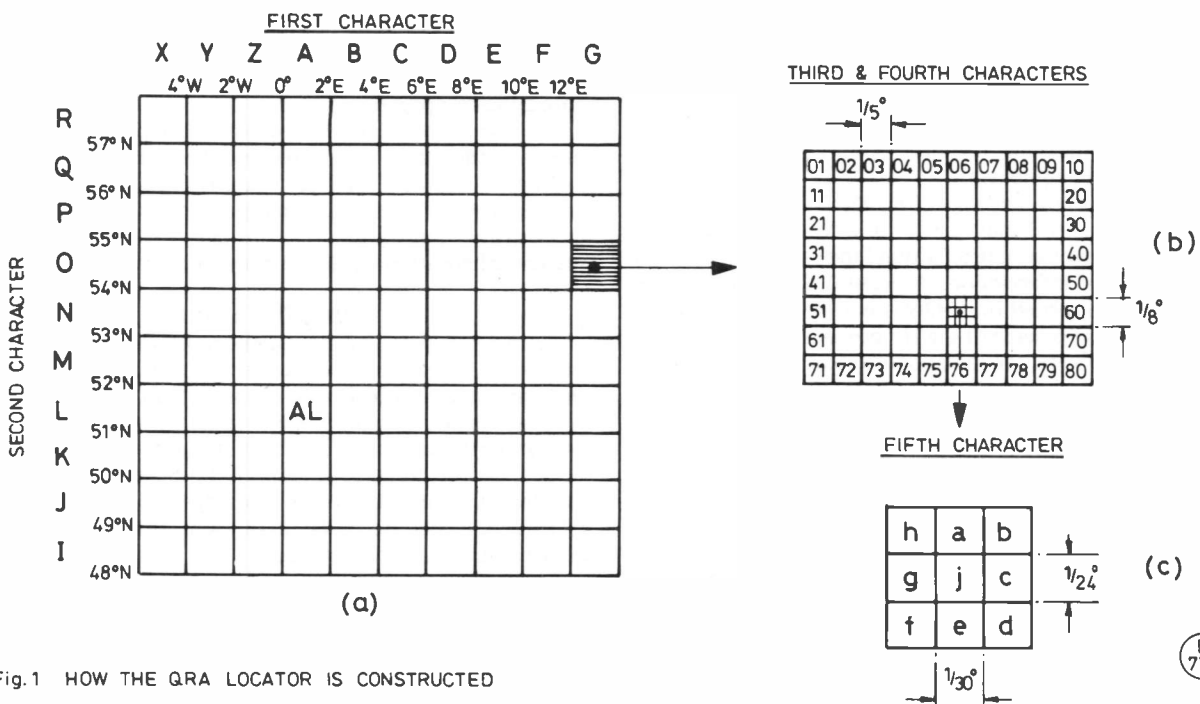


Fig. 1 HOW THE QRA LOCATOR IS CONSTRUCTED

**Table 2. Test Data**  
*Home Station QRA: AL34D*

Contest Station	Score	Distance (km)
YO77E	15	362.71299
ZL60F	3	70.456596
BL79E	9	211.45445

may be printed at the end of the run. It is not intended to be a model example program, since it is necessary to employ a number of space-saving techniques in order to fit the program into the ZX81. The program will also attempt to convert practically anything given to it into a distance and score, whether a valid QRA locator or not, since there is no room to include any validation checks. Hence the operator should be careful to check each code as it is typed in.

Variable Q\$ holds the QRA code as typed in. Lines 120 and 160 convert the first four characters to latitude and longitude. Line 170 adjusts the result so that codes beginning V-Z are taken to be west of Greenwich. Lines 180 and 185 perform the adjustment for when the fourth character is 0.

Lines 190 and 192 add in the contribution of the last character. The locations accessed by the *PEEK* commands are the letters and numbers of the *REM* line at the beginning of the program; the computer codes of these letters form the conversion table. Using

this technique, each element of the table takes only one byte of storage, instead of five which a BASIC array would require. The *REM* line must be typed in exactly as given, and it must be the first line of the program.

The technique of enclosing arithmetic expressions containing numeric constants within quotes, and using the *VAL* function, is another memory-saving device which prevents additional memory being used by the ZX81 to work out these constants and store them in binary before the program is run.

Lines 200 to 230 see if the QRA given is the first one of the run; if so, it is the home station's locator, and the values of latitude and longitude are stored away. If not, then line 300 works out the distance, line 310 the score and line 320 prints them out. Line 330 adds the score to the total.

To start the program, input *RUN*. First, the home station QRA is typed in. The program will immediately ask for another input. This is for the QRA of the first station worked. When this has been input, there will be a pause of a few seconds before the QRA, score and distance in kilometres are printed out. The program is then ready for the next QRA.

After about six lines have been displayed, a 1K ZX81 will halt with a report 4 because the memory is full. Type *CONT* and the machine will clear the screen and continue. When the last QRA has been entered, input *STOP*. The total score can then be displayed by typing *PRINT T*.

## FINDING UK-OSCAR-9

**NORMAN FITCH, G3FPK**

**O**CTOBER 6, 1981 saw the successful launch of another NASA *Delta 2310* rocket from the Western Test Range at Vandenberg in California, the main payload of which was the NASA *Solar Mesosphere Explorer*, or *SME*, spacecraft. The secondary payload was the first amateur radio educational satellite, *UOSAT*, the decision to build which was formally made on January 18, 1979. The satellite was constructed in the University of Surrey's Department of Electronics and Electrical Engineering at Guildford by a team headed by Dr. Martin Sweeting, G3YJO. The primary sponsors were AMSAT-UK, AMSAT-DL, AMSAT-USA, The Radio Society of Great Britain, plus several other organisations who, between them, donated money and equipment.

The spacecraft is now known as *UK-OSCAR-9* and, unlike its predecessors Oscars 6, 7 and 8, it is *not* a flying repeater but a sophisticated transmitter in orbit around the earth sending out a constant stream of information. A detailed description of the many experiments carried by *U-O-9* is not the intention of this article, but mention is made of the HF beacons on 7,050, 14,002, 21,002 and 29,510 kHz; the radiation detectors; magnetometer; speech synthesiser; charge-coupled device — CCD — camera imaging SS/TV, and the SHF beacons on 2.401 and 10.47 GHz.

### Orbit Parameters

In view of the great interest shown in *U-O-9*, the most important matter is to know when and where to listen for the spacecraft. As this is being written, it has been aloft for several weeks enabling a reasonably accurate assessment of its orbital parameters to be made. These prediction charts in this article are based upon the following information obtained from the Secretary of AMSAT-UK:—

<b>Period</b>	<b>95.37 minutes</b>
<b>Inclination</b>	<b>97.45°</b>

<b>Apogee</b>	<b>554.29 kilometres</b>
<b>Perigee</b>	<b>551.14 kilometres</b>
<b>Longitude increment</b>	<b>23.92° West per revolution</b>

From this data, it can be calculated that the maximum slant range is 2,710 kms. and the velocity of the spacecraft is 7.6 kms. per second. This *polar* orbit is such that it will be within range twice daily. From the London area, these periods are presently from 0110 to 0630 in the early mornings, and from 1130 to 1650 GMT in the afternoons. Overhead passes occur when the satellite crosses the equator at 180.7°W and 346.8°W and these give a maximum acquisition time of just over twelve minutes. The spacecraft will be out of London range for orbits which cross the equator, travelling north, between 23.7°W and 143.8°W and between 225.3°W and 302.3°W, unless there is some kind of anomalous propagation.

Because of the relatively low orbit, *U-O-9* will be subject to more variation in its period than is 0.8, which orbits at 904 kms. average altitude, due to increased atmospheric drag. Consequently it is unrealistic to expect accurate orbital calendars to be available for several months ahead. However, the charts presented here are independent of these unpredictable variations.

### Using the Charts

To make use of these charts, one must know two things: the time when the spacecraft will cross the equator going north, and the longitude at which this occurs. AMSAT-UK is able to correlate such information from various amateur observations and professional sources and quite accurate predictions for the week ahead are broadcast over the GB2RS News Bulletin Service on 80m. and 2m. on Sunday mornings. The Sunday morning AMSAT-UK net on 3,780 kHz from 1015 local time also disseminates such information.

Taking an example, let us assume there is an orbit which crosses the equator at 0320 GMT at 200°W. From Fig. 1a, look up the "200" line and read off the lower AOS, curve 27.5 minutes from the scale at the left. Therefore, the spacecraft should be heard at 0347½ GMT. The figure "1" on the curve indicates that it comes over the horizon virtually due, true north. From the middle,



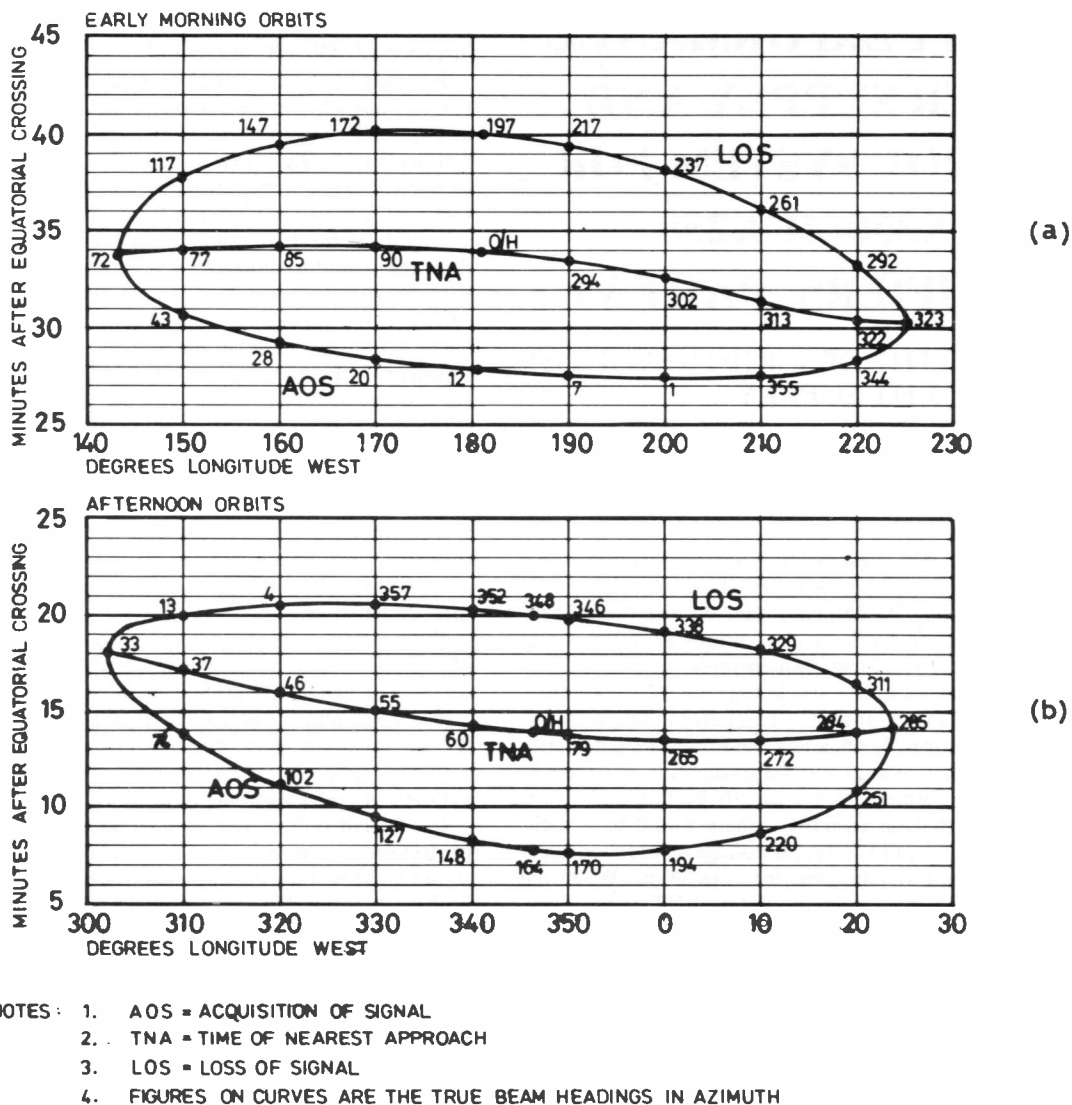


Fig.1 UK-OSCAR 9 SATELLITE PREDICTION CHART (Compiled for London).



TNA, curve we read off 32.6 mins. and an aerial azimuth bearing of 302°. Thus the spacecraft will be nearest about 0352½ GMT. Finally, the LOS curve gives 38.1 mins., so loss of signal would occur at 0358 at azimuth 237°. During the pass, the satellite will travel from due north, through northwest and west, disappearing in a southwesterly direction.

These charts can be used for any British Isles location but the AOS/LOS time will differ from the London ones. As near-overhead, south-to-north, or *ascending node* passes are concerned, for each one degree of latitude north the observer is from London, the signals would be heard 15.9 seconds later. For example an Edinburgh listener would receive his first signals 73 seconds after the Londoner. Conversely in the early morning, *descending node* orbits, the AOS and LOS times would be a similar amount earlier.

For longitudes other than the Greenwich meridian of 0° the degrees longitude west scale figures should be increased by one's westerly longitude, e.g., someone in the extreme southwest of Ireland would need to add 10°. The curve shapes remain the same for all practical purposes and, from the information given, readers

may trace off the basic "minutes and degrees" graticule and displace the tracing to suit their own lat./long. figures.

**Where to Listen**

In the introduction, mention was made of the various HF bands beacons, which are phase related, and to the SHF beacons. The General Data Beacon transmits on 145.825 MHz in NBFM mode with plus/minus 5 kHz deviation. The maximum Doppler shift of the signal due to the spacecraft's velocity is plus/minus 3.1 kHz. The Engineering Data Beacon is on 435.025 MHz using the same modulation system, but the Doppler shift is three times greater.

**Further Information**

Readers who are AMSAT members will know all about this interesting spacecraft from *Oscar News* and other publications. Those who are not yet members and who would like to know all about *U-O-9*, are invited to join AMSAT-UK. Full details can be obtained from: Mr. R. Broadbent, G3AAJ, Secretary AMSAT-UK, 94 Herongate Road, London E12 5EQ. Please send an *s.a.e.* for a prompt reply.

*Why not give (or ask for!) a subscription to "Short Wave Magazine" for Christmas. It costs just £8.40 for twelve issues.*

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

CONTINUING THE DESCRIPTION OF THE  
EHT SUPPLY

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

L303 also has some RFI suppression duties, but its presence is part of another slight problem and its solution, which is worthy of explanation. Rather naturally, all the preliminary testing and modification work on the various prototypes was done using sundry low-voltage transformers, and it will be remembered from earlier in the article that one of the primary design objectives was the "soft start". This part of the system was made to work well quite early on, and it was not until slightly later in the development proceedings and the graduation, so to speak, to rather larger transformers, that a slightly baffling effect was observed. This was that, at switch-on, there would be a slight surge of voltage which would cease; the voltage would then begin to rise as the soft start system came into operation. When the authors finally bit the bullet and connected the EHT transformer, the first application of power resulted in all the fuses to the system blowing and the demise of the main thyristors (we learned more about the fusing of semiconductor devices from that, but this is discussed later). This was, to say the least, discouraging.

However, to cut a long story short, what we had forgotten was the inclusion of "dV/dT protection".

Basically, a thyristor displays a capacitance between its anode and cathode when in the blocking state, in much the same manner as any other *pn* junction and particularly the varicap diode. It follows that if a thyristor is subjected to a voltage with a large rate of rise (dV/dT) a current will flow through the device, despite the fact that it is in the blocking state. The larger the dV/dT, the greater the current; and should this be equal to or greater than the thyristor's holding current, it will switch on as though it had received a gate pulse. This condition of large dV/dT can be caused, for example, by the closure of the main switch (the contactor in the case of the present design) or by switching transients from other equipment on the same mains circuit. If the current through the thyristor is limited in some way by the load — for instance, if the load is purely resistive — a dV/dT switch-on will cause no more than a single-cycle current pulse of limited magnitude, so no damage will occur. If, however, the load is a larger transformer feeding into discharged capacitors, which is the case with the EHT transformer at initial switch-on, the thyristor load impedance is virtually zero. The result is an extremely large current pulse through the thyristors, which cause their destruction.

Whilst it is possible to increase the dV/dT withstand capability of a thyristor, it is nevertheless necessary to limit the maximum dV/dT that can be applied to it. In this design, the combination of L303, R312 and C304 acts as a snubber network to limit the dV/dT to about 400V/microsecond, which is well within the withstand capability of the thyristors. The presence of R312 in this network provides damping to prevent ringing.

It is worth noting that, in general terms, the better the RFI protection on a thyristor system, the less sensitive is it to dV/dT, as can be seen from the duplicate function of R312 and C304 in both dV/dT and RFI protection. The particular variant in use at G4FRX has neither any switch-on surge nor RFI on any HF or VHF band, so it would seem that the problems have been solved; indeed, the latter result puts a commercial motor-speed controller (used by one of the authors for an electric drill and handling about

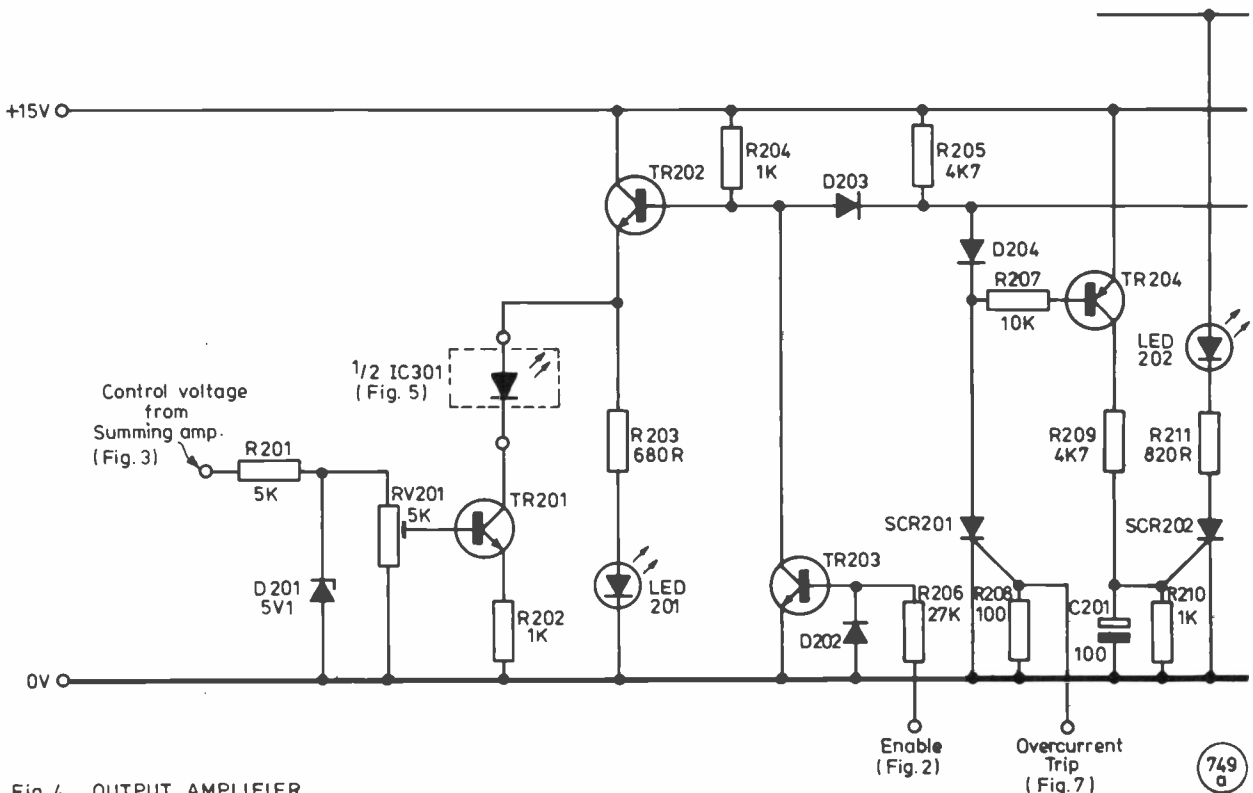


Fig. 4 OUTPUT AMPLIFIER

one-tenth of the power of this system) to shame! Thyristor controllers of one kind or another have a rather poor reputation as generators of mains-borne hash and assorted noises, but it would seem that suitable design tactics can easily eliminate this problem; to put it another way, the only means of detecting that a thyristor control system handling, potentially, a couple of kilowatts is in use at G4FRX is to look inside the box!

Returning now to the description, the thyristor stack controls the mains feed to the EHT transformer, which is shown in Fig. 6. The output of the transformer is rectified in a bi-phase half-wave system and smoothed to produce a DC output in the conventional manner. The current in the secondary winding of the EHT transformer is monitored by R421, which provides a *negative* voltage for the current feedback to the gain multiplier and the trip circuitry. The positive output from the smoothing network passes through R422, across which a voltage develops as the output current increases. This voltage is monitored by the network consisting of RV401, C423 and the LED in IC401. The current through this LED increases with the steady-state output current, and will also increase with a fast-rising output transient (flashover) through the action of C423. The time constant for the transient response is set by RV401. The current through the LED is reflected in the phototransistor on the other side of IC401, and this is used to operate the flashover trip circuitry.

The final stage on the EHT output side is the voltage feedback chains. These also double as the bleed resistors for the reservoir capacitors. The relatively high current through them is a deliberate ploy to improve the no-load stability of the unit.

The use of separate chains for the control and trip feedback serves to protect the unit from a loss of feedback, which is not a particularly pleasant failure case prospect because the control system would then wind up to full output — depending on the use to which it is being put, this could be expensive! Conservative rating of R423 and R425 is extremely desirable here, and 25W units are recommended.

The purpose of R424 and R426 is to limit the feedback voltages if the control and trip circuits should be accidentally disconnected.

The trip sense amplifiers are shown in Fig. 7. These are based on the MC3423P1 crowbar protector IC, which for some strange reason seems rather difficult to come by from the usual sources: it is, however, available from *RS Components* under the stock number 307-890. It is worth a small digression here to mention that this is a most useful IC; G4FRX first used one in his transverter system, described in *S.W.M.* a couple of years ago, and has used them in many projects since then. The device will give an output current to fire a thyristor if the input voltage at pins 2 and 3 exceeds approximately 2.6V. It has an internal voltage reference and an internal latch which maintains the output current until the supply to the device is cut off. A number of other features, such as a time delay and remote actuation, are not used in this application. It does, however, have a disadvantage insofar as it is extremely sensitive to supply transients and hence requires copious decoupling!

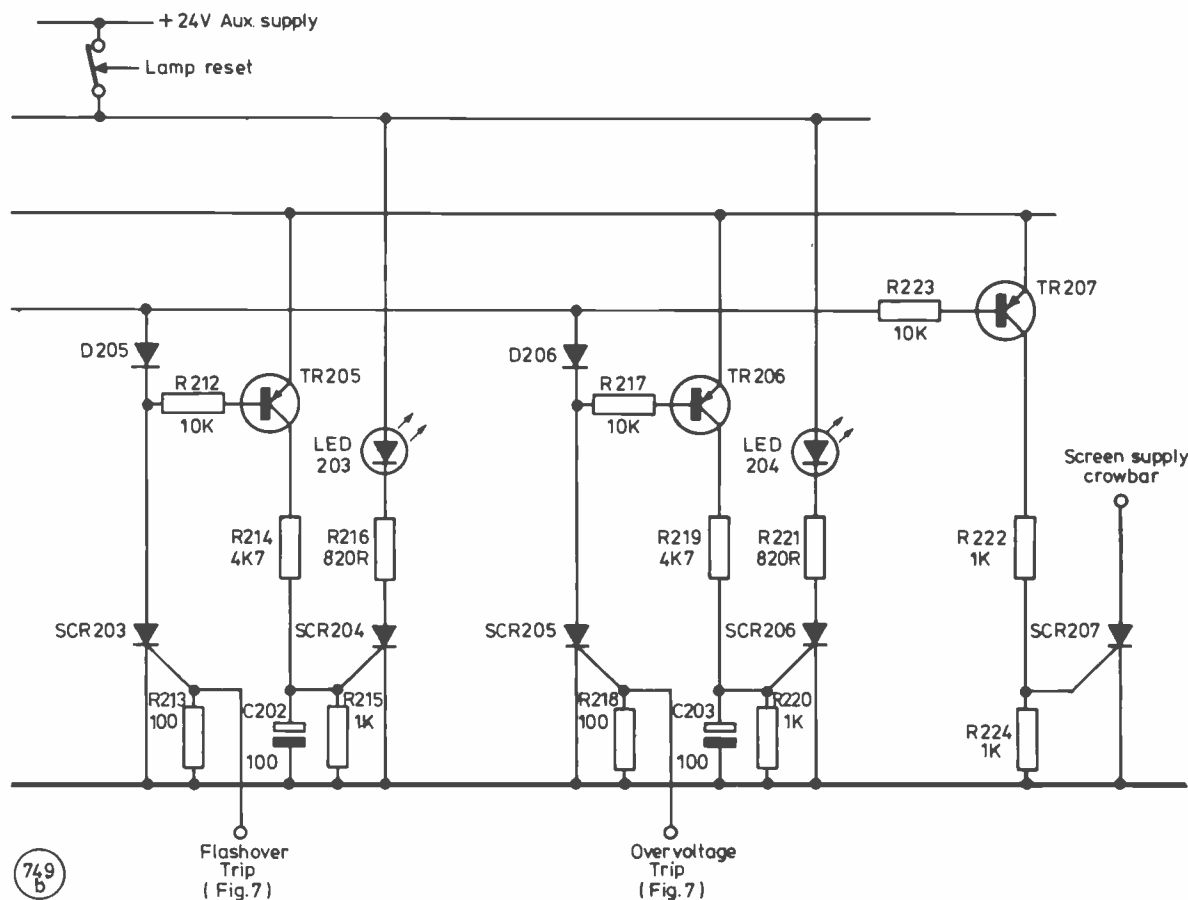
The overcurrent trip uses an averaging amplifier of an identical form to that used in the gain multiplier (Fig. 3) and in fact takes its input from the same point in the EHT section. The output of this amplifier is loaded by R503 and sensed by IC502. The trip point is set by the gain of the averaging amplifier, which is adjusted *via* RV501.

The flashover trip utilises the phototransistor in IC401 as a simple emitter follower. As the current through the LED in IC401 rises, so does the current through RV502 and hence the voltage on its wiper. RV502 is used to set the trip point.

The overvoltage trip simply uses RV503 as a potential divider in the feedback chain, with IC504 sensing the voltage on its wiper.

A low value resistor, such as R504, is provided on each trip sense amplifier so as to limit the output current to a safe level.

That completes the basic description of what has become known to his friends as “Nelson’s atom smasher!” By way of a



### Table of Values The EHT Supply

R1, R2, R3 = 4K7	C421, C422 = <i>see text</i>
R4 = 15K	C423 = 0.1 $\mu$ F, 100V
R5 = 750K	C501 = 1 $\mu$ F, 35V tant
R6, R8, R9, R10, R12, R13 = 10K	C502, C504, C505, C507, C508 = 0.01 $\mu$ F, 50V
R7 = 390R	C503 = 25 $\mu$ F, 25V tant
R11 = 330K	C506 = 0.47 $\mu$ F, 30V
R101 = 1K0	RV1 = 10K 10-turn (front panel)
R102 = 500K	RV2 = 47K
R103, R104 = 20K	RV3 = 10K
R105, R106, R114 = 82K	RV 101 = 1K0
R107, R108, R109, R118, R119 = 100K	RV102, RV103 = 47K
R110, R111, R113, R116, R117 = 47K	RV201 = 5K0
R112 = 24K	RV301 = 1M0
R115 = 150K	RV401 = 200R
R201 = 5K0	RV501 = 1K0
R202, R204, R210, R215, R220, R222, R224 = 1K0	RV502, RV503 = 10K
R203 = 680R	D1 to D4 = BY257
R205, R209, R214, R219 = 4K7	D5, D6, D8, D9, D10 = 1N4006
R206 = 27K	D7 = BZV85C10
R207, R212, R217, R223 = 10K	D11 = BZV85C5V1
R208, R213, R218 = 100R	D101 = 1N4006
R211, R216, R221 = 820R	D201 = BZV85C5V1
R301, R302 = 3K3, 10W	D202 to D206 = 1N4006
R303 = 4K7	D301 = BZX70C20
R304 = 470K	D302 = 1N4006
R305 = 1K0	D303, D304 = BZV85C6V2
R306, R309, R314, R315, R316, R317 = 100R	D306 to D309 = BY257 bridge
R307, R310 = 47R, 2W	D401 to D420 = 1N5408
R308, R311 = 82R, 2W	IC1 = LM340T (or 7815)
R312, R313 = 10R, 10W	IC2 = LM320T (or 7915)
R401 to R420 = 560K, 2W	IC3 to IC7 = LM741CN
R421 = 1R, 25W	IC101, IC103, IC104 = LM741CN
R422 = 5R, 25W	IC102 = CA3046
R423, R425 = 390K, 25W	IC301 = TIL111
R424, R426 = 1K5	IC401 = TIL111 (or separate devices)
R501 = 1K0	IC501 = LM741CN
R502 = 20K	IC502 to IC504 = MC3423P1
R503 = 10K	TR1 = BC548
R504, R505, R506 = 20R	TR201, TR202, TR203 = BC548
R507 = 100R	TR204 to TR207 = BC557
C1, C3 = 2.2 $\mu$ F tant	TR301 = 2N2646
C2, C4 = 470 $\mu$ F, 25V	SCR201 to SCR206 = 2N5061
C5, C6 = 1 $\mu$ F tant	SCR207 = BT106
C7 = 10 $\mu$ F, 35V tant	SCR301, SCR302 = 2N5061
C8 = 100 $\mu$ F, 16V	SCR303, SCR304 = BT152-600R
C9 = 2.2 $\mu$ F, 35V tant	L301, L302, L303 = 20 $\mu$ H
C10 = 10 $\mu$ F, 16V tant	<i>see text</i>
C101 = 1 $\mu$ F, 35V tant	L401 = <i>see text</i>
C201, C202, C203 = 100 $\mu$ F, 10V tant	T1 = 20-0-20V 250mA ( <i>i.e.</i> RS 207-762)
C301 = 0.22 $\mu$ F, 20V	T301 = RS 196-448
C302, C303 = 0.1 $\mu$ F, 50V	T302 = RS 207-756
C304, C305 = 0.47 $\mu$ F, <i>see text</i>	T401 = <i>see text</i>
C306, C307 = 0.047 $\mu$ F, <i>see text</i>	F1 = 20mA
C308, C309 = 0.1 $\mu$ F, 20V	F2, F3 = 250mA
C401 to C420 = 0.01 $\mu$ F, 1kV	F401 = 8A HRC, <i>see text</i>
	F402 to F404 = 500mA HRC
	S1 = push-to-break (front panel)
	FL1 = <i>see text</i>
	LED201 to LED204 = all on front panel

Note: All resistors  $\frac{1}{2}$ W except where specified. Transistors may be any switching types, and diodes usual clamping/steering variety, *i.e.* 1N4148, 1N4001.

little light relief before looking at how the unit may be constructed and persuaded to operate, it is worth taking a look at a few topics which cropped up during its development and which have relevance not only to this system but to power supply design generally; they tend to be the items that the textbooks leave you to discover the hard way!

### Design and Development Topics

Even if one's approach to designing a power supply unit is the basic one mentioned in the first part of the article — that is to say, to take a suitable transformer, add rectifiers and smoothing and a sprinkling of fuses according to taste and *hey presto!* the EHT supply — one must consider the ratings of all of these components, just as one must if one wishes to build a more complex design such as the present one. To take the rectifiers first, there are two possible configurations — the bridge and the bi-phase half-wave — and the choice between them will have been dictated by the available transformer. Now any of the standard textbooks will give details of how to calculate the forward current rating,  $I_{FRM}$ , of the diodes, and also what the rectifier will have to cope with in the area of what used to be known as PIV but which data sheets nowadays tend to refer to as  $V_{RRM}$ . All this is quite straightforward and obvious; for instance, with the bi-phase half-wave arrangement as used in the "atom smasher", the peak reverse voltage across each "leg" of the rectifier will be 2.8 times the value of the transformer secondary. If we take as an example a 2000-0-2000V transformer, this will imply 5.6kV as the total  $V_{RRM}$ . This in turn will suggest that each "leg" of the rectifier will have to be made up of several diodes in series to achieve this value, since common semiconductor diodes do not seem to have values of  $V_{RRM}$  much in excess of 1200V. Our old friend the BY127, for instance, has a value of 1250V.

Now assuming that we wish to use this particular device with our 2000-0-2000V transformer, conservative design would suggest using at least six per "leg" so that there was something in hand to cope with mains transients, etc. (this is one reason why mains filters and VDR suppressors are a Good Idea in power supplies of any kind; transient voltages on the mains can reach very high values, and rectifiers which are run right up to their ratings are very vulnerable to the first mains spike which comes along as the immersion heater switches off, or lightning hits your local power line). The textbooks usually go on to suggest that equalising resistors are placed across each diode, usually of a value corresponding to 500 ohms per volt of  $V_{RRM}$ ; so in the present design, for example, which uses 1000V devices, the nearest preferred value of 470K or 560K is in order, with about a 2W rating.<sup>1</sup>

Also, of course, equalising capacitors of about 0.01  $\mu$ F, at a suitable working voltage, are usually suggested.

This is all good sound stuff, but, with the honourable exception of Volume 2 of the RSGB's *Radio Communication Handbook*, Chapter 16, the textbooks don't seem to mention what is probably the most important characteristic of rectifier diodes (not that the data sheet itself is sometimes any better in this respect. . .). This is a sneaky little item known as  $I_{FSM}$  and it is defined as the non-repetitive peak forward current, usually in terms of one half-cycle.

This parameter may sound a little esoteric, but it becomes of prime importance if we consider the moment of switch-on — not with the present supply because of its soft start but with a more "basic" EHT unit (or indeed this one, assuming that Murphy takes over one fine day and the soft start doesn't just as you are hearing your first UA6 on 144 MHz tropo and have turned on the linear in eager anticipation). At the instant you hit the switch, the smoothing capacitors look like more or less a short circuit as far as

<sup>1</sup> In fact, the calculated value for the 1N5408 at 100°C — *i.e.* a worst case — gives a value of fractionally over 1.6M, so the rule-of-thumb figure is very conservative.

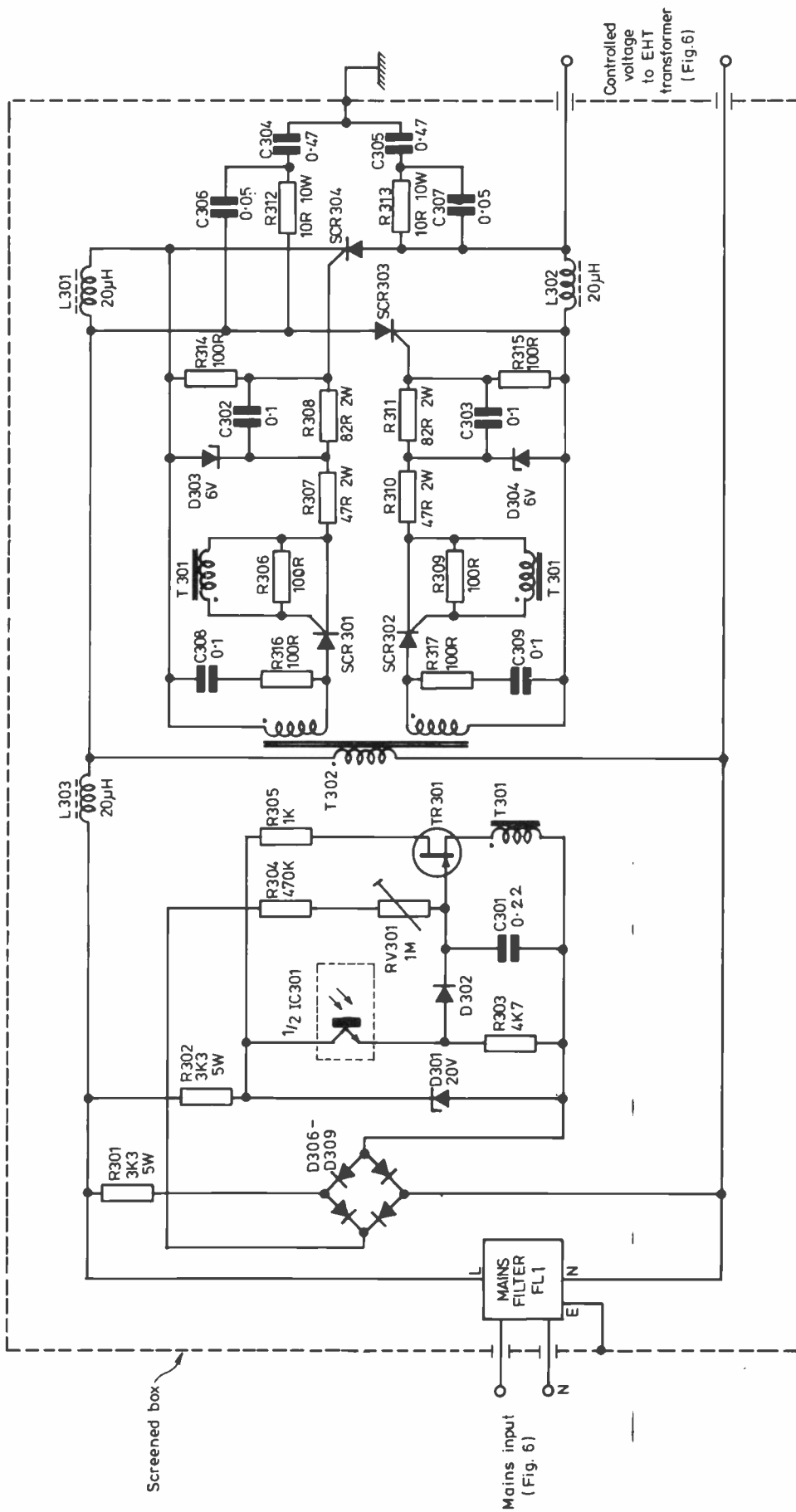


Fig. 5 SCR STACK AND PHASE CONTROL

D 750



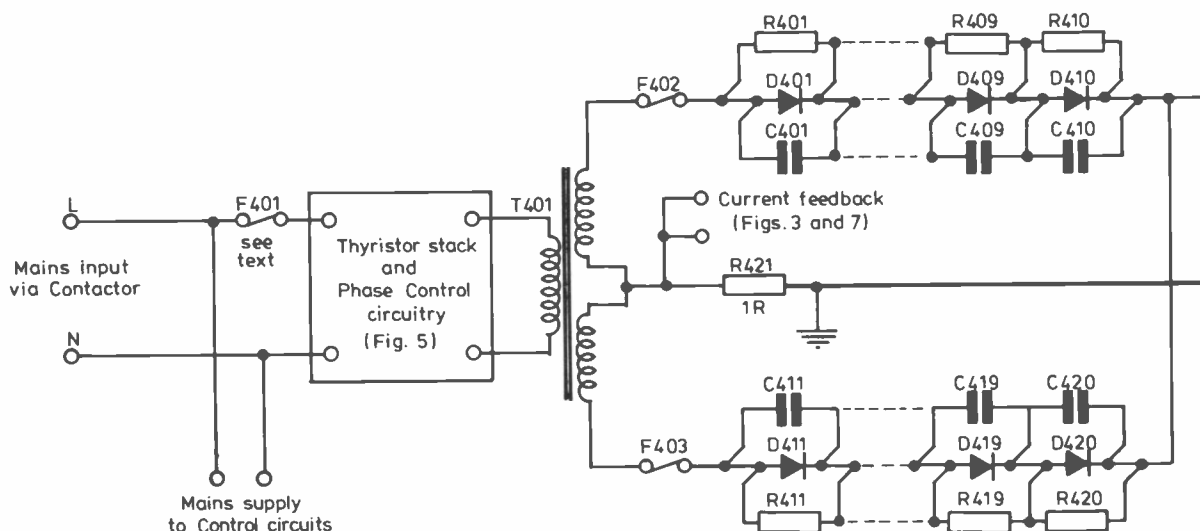


Fig. 6 MAINS DISTRIBUTION, EHT TRANSFORMER AND RECTIFIER.

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the rectifiers are concerned, and thus the only factor limiting the prospective current in the poor old rectifier diodes is the secondary resistance of the transformer.

The formula to bear in mind here is that due to Mr. Ohm; the current which will inexorably flow is that found by dividing the transformer's secondary peak voltage by the series resistance of its secondary. For instance, if we consider the previous example of a 2000-0-2000V transformer, a reasonable value for the resistance of its secondary might be 55 ohms assuming that it has about 1 amp rated secondary current. Thus the peak voltage will be given by 2000 times root 2, which is 2828; 2828 divided by 55 gives a current of just over 51A which, for a bi-phase rectifier, will flow in each leg.

Now the current surge which is represented by this figure is basically exponential in character, and for any reasonable value of smoothing capacitor it will be tending to pass its worst within about a half-cycle of the AC waveform from the secondary. But it must nevertheless be handled by the rectifiers, which is where the parameter of  $I_{FSM}$  comes in. If we examine the data sheet for the BY127, we shall discover the depressing fact that the value of  $I_{FSM}$  for this device is 40A, and thus it is obvious that if they were to be used with a transformer such as that mentioned above, a catastrophic failure would, at some point in time, be a foregone conclusion. It should now be obvious why this parameter is somewhat important!

Some published supplies add resistors in series with the secondary, or between the rectifiers and the smoothing capacitor, but this will adversely affect regulation as well as meaning more components dissipating unwanted heat: in fact, one often has the uncharitable suspicion on looking at the rectifier diodes and resistors chosen that the designers have not really thought through their designs well enough. Many diodes are available with much higher values of  $I_{FSM}$  than the BY127, and the present design, for example, uses the 1N5408. This is a 3A diode with a  $V_{RRM}$  of 1000V and an  $I_{FSM}$  of 185A. It costs the same as a BY127 and, although one needs to use more of them per leg because of the lower  $V_{RRM}$ , one tends to sleep better at night as a result of knowing that they are that much less likely to blow up. The author's EHT transformer is, as previously mentioned, a 2300-0-2300V component, and its secondary resistance is 62 ohms; this gives a worst-case surge current of about 52A, which is well within the capabilities of the rectifiers to handle.

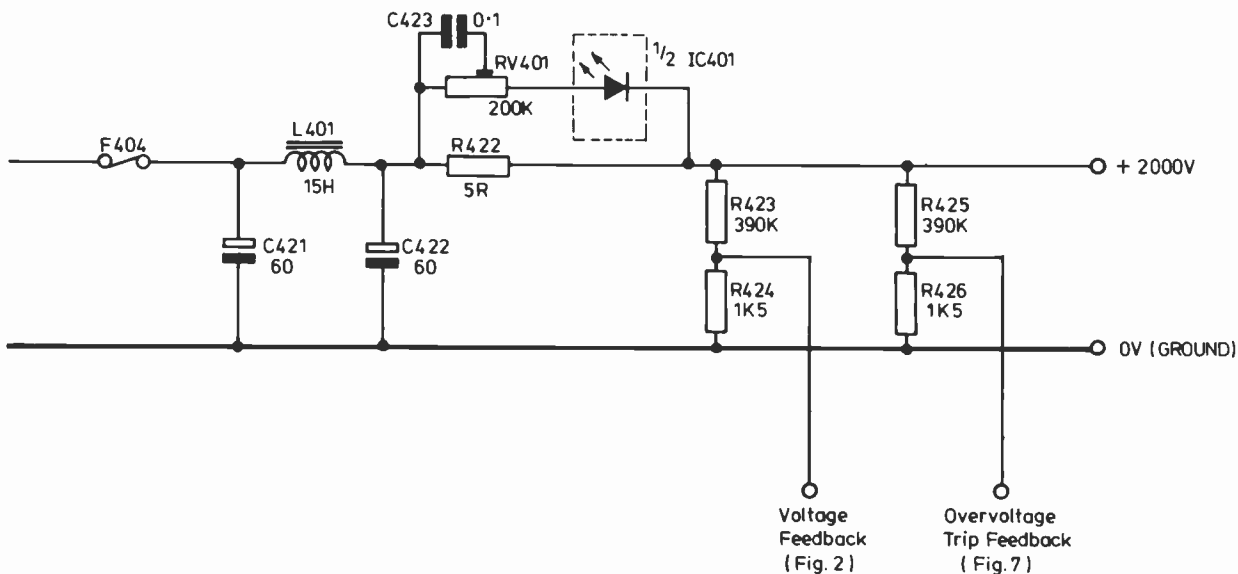
The BY127 is quite an old design, and in fact certain component suppliers seem to regard it as obsolete — perhaps this explains its relatively low ratio of  $I_{FRM}$  to  $I_{FSM}$ . Certainly, it seems that one

needs to think carefully about the rectifier limitations before simply using a component because So-and-so's design did!

Still on the subject of rectifiers, it is worth noting that most manufacturers require that semiconductor diodes are derated in terms of  $I_{FRM}$  if used into a capacitive load — the usual figure here seems to be a factor of 0.8. This means that if, for instance, one were using the BY127 in a bi-phase half-wave system, the total capacity of the rectifiers would theoretically be 1.6A instead of the 2A (*i.e.* 1A per leg) which is specified. In other words,  $I_{FRM}$  is specified in terms of a resistive load, and the data sheet value must be multiplied by 0.8 if used in a capacitor-input filter configuration such as the majority of EHT systems.

Moving slightly away from the subject of rectifiers themselves and considering the complete rectifier stack, with associated equalising resistors and capacitors (which in fact could be omitted if avalanche diodes, such as the BYW56, were used, but these are still relatively expensive devices) there is one interesting effect which may be observed, especially when using a thyristor drive system; it caused a little dismay at G4FRX until the cause was, at least provisionally, identified. When the EHT transformer and its associated rectifier stack was first connected to the thyristor drive, it was noticed that as the voltage began to wind up the rectifier stack itself started to make a noise rather reminiscent of a very high-voltage power line on a damp day; it was a slightly sizzling, crackling sound which suggested an imminent disaster, and we waited with some trepidation for the smoke and flames. It was then noted that the quality of the sound changed with the load; and, although we had by this stage become relatively inured to pyrotechnics of one sort or another, we were relieved to note that none of the components seemed to be about to depart with the usual explosion!

Having considered the matter, we came to the conclusion that the components responsible for the sound effects were, in fact, the ceramic equalising capacitors. The theory is that these are, being ceramic, slightly piezo-electric: when they are subjected to the steeply rising waveform characteristic of thyristor drive, a slight degree of mechanical deformation takes place and thus they "rattle" at 100Hz. In the prototype rectifier stack (which has managed to last for the duration of the tests and development without exploding, bursting into flames or blowing fuses: it should go into a glass case forthwith) the effect is probably accentuated because the capacitors used were physically large 3kV working components that were available at the time. No doubt the theory could be tested by substituting other types of capacitor; however, the authors must confess that they rather like the sound!



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At least you know that the grey box contains something other than a low-power transformer and rectifier unit!

Still on the subject of "noises off", it is noticeable that some transformers seem to take objection to thyristor drive and "buzz" quite badly at certain points in the input waveform. Again, this does not seem to be the precursor of any loud explosions or fuse-blowing, and is probably a function of the constriction of the core and the tightness of the laminations. The author's 2300-0-2300V transformer, for example, is completely quiet, but a 2000-0-2000V component which was tested on one of the prototypes had the authors wondering whether there was a DC offset getting into the primary and standing by to remove power in the event of a problem; it even drowned the noise from the rectifier stack!

The moral of the story would seem to be that if either seem somewhat vocal, there is probably nothing amiss: a setting which corresponds to about half-power is the worst case, and unless smoke is seen to rise from somewhere there is no cause for alarm.

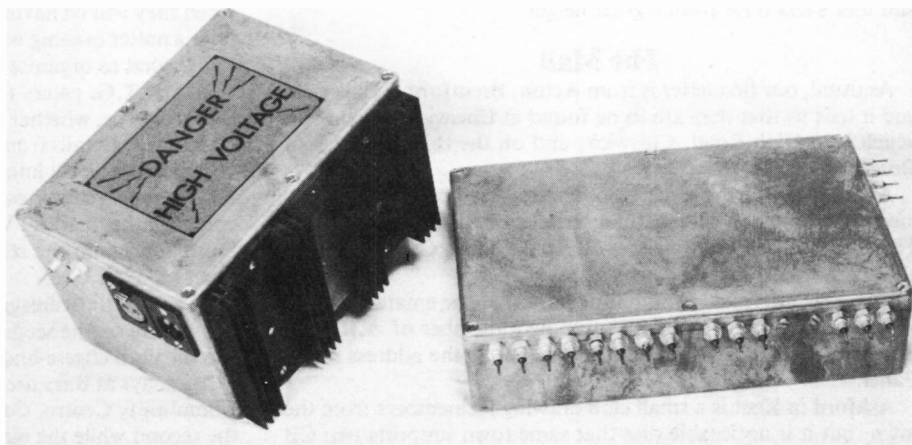
The next item for consideration is probably the transformer itself, and here again the standard textbooks, such as the *RSGB Radio Communication Handbook*, Volume 2, chapter 16, go into the necessary details. The only point to be made here is that, due to the relatively light duty cycle in most applications, it is not necessary to obtain a transformer which is capable of the full output current which is required from the unit. For example, if we wish to use a pair of 4CX250Bs, the maximum anode current

would be 500mA peak on SSB (not, of course, that the anode current meter should be showing peak currents of 500mA!) and about the same on CW. However, since one generally spends about 50% of the time in "receive", and also since the basic duty cycle of SSB and, to a lesser extent, CW is quite low, it is only the extreme case such as MS working or long RTTY transmissions which would require the full 500mA rating from the transformer secondary: a 300mA rating would probably be quite in order for the average amplifier which was not used for these latter two modes.

The smoothing capacitors, however, do need some thought and some derating, and it is in this area above all that skimping will not do — the manner in which some manufacturers get away with it is somewhat mystifying! It is obvious at the outset that the choice is between electrolytic capacitors or paper types of one sort or another, and since we are attempting to smooth voltages of the order of 2 or 2.5kV and no electrolytic has this order of voltage rating, they will have to be used in series along with appropriate equalising resistors of about 100 ohms per volt of the capacitor's rated voltage. Since any failure here is likely to lead to a disaster, these components should again be generously rated.

For reasonable regulation, some 20 or 30µF is really a bare minimum for the order of load represented by a pair of valves, and certainly it would appear that nothing could be simpler than connecting the appropriate number of capacitors in series to suit the required value of voltage rating and capacitance. For

The EHT control system. The left-hand unit contains the SCR stack and phase control oscillator (the Fig. 5 circuitry) and the other box contains the control electronics.



example, if we required a 2000V rail and had four 100 $\mu$ F 500V components to hand, these would seem to be quite usable. . . .

The first point is that a 2000-0-2000V transformer does *not* imply a 2000V rail; depending on the rectifier configuration, the voltage which appears across the smoothing capacitors will be a good deal higher than 2000V, and indeed for the bi-phase half-wave rectifier as used in the present design, the voltage off-load can be calculated as 2000 times root 2, that is 2828. So if four 500V capacitors were hooked up to a 2000-0-2000V transformer and rectifier system, there would be a loud explosion! It follows that the capacitors must be chosen with the peak voltage which will appear across them in mind, and, for a capacitor-input filter, this will be 1.414 times the transformer secondary voltage with no load. Bearing in mind that some derating will improve reliability, it would seem that capacitors of about 3kV working voltage would be required; that is to say, two more of our 100 $\mu$ F 500V components as mentioned above. The problem then, of course, is that the effective capacitance of six 100 $\mu$ F components in series is 100/6 $\mu$ F, that is to say just over 16 $\mu$ F, which is distinctly on the low side for this type of application.

The other important factor is the ripple current rating of the capacitors used in the smoothing. As a rule of thumb, one can assume that for a bridge or bi-phase half-wave rectifier, the ripple current in the smoothing capacitors will be about 1.3 times the load current; in other words, if we again take our pair of 4CX250Bs up to 500mA anode current, the ripple current in the smoothing capacitors in the power supply will be roughly 650mA. Now it is true to say that one should *never* run electrolytic capacitors at their full ripple current rating, and thus it would be prudent to think in terms of capacitors possessing a 1A ripple current at 100Hz for use with our pair of valves and their EHT supply.

To summarise, the capacitors need to be chosen on the basis of:

1. The required working voltage, bearing in mind that for a capacitor-input filter the voltage across the capacitors will be 1.414 times the voltage of the secondary winding under no-load conditions and also that a little derating is a sound idea.
2. The capacitance, bearing in mind the requirements of (1) above and that a minimum of 20 to 30 $\mu$ F is required.
3. The ripple current rating, bearing in mind that it will need to be about 1.3 times the load current plus a fairly substantial derating factor as discussed above.

Manufacturers tend to state the ripple current ratings of electrolytic capacitors in their catalogues or data sheets but seldom, if ever, on the capacitors themselves, so that a quick telephone call or letter to the maker will save a rather messy and explosive problem later on. Remember if all else fails that a physically large capacitor will have a higher ripple current rating than a smaller one. One final point in this area is that some makers rate the ripple current of their products at 50Hz instead of 100Hz, presumably with a half-wave rectifier in mind instead of a bridge or bi-phase half-wave; some research has led to the rather surprising fact that there does not seem to be a linear relationship either way between the 50Hz and 100Hz ratings, so a little care is required to be certain that the capacitor will be usable.

(to be continued)

### Correction

In Fig. 3 (*Part V*, November issue, p.492), R102 should be connected to the -15V rail, not the +15V rail.

## CLUBS ROUNDUP

By "Club Secretary"

**T**HIS month you find your scribe trembling at the bumper bundle of reports in front of him — with even less time than usual to complete the piece because of having had to go to Donington to help man the *Magazine* stand for a while. G3KFE just said "tough"! But enough griping, there's only one way in and that's headfirst from a great height!

### The Mail

As usual, our first letter is from **Acton, Brentford & Chiswick**, and it tells us that they are to be found at Chiswick Town Hall, which is in High Road, Chiswick, and on the third Tuesday of December.

**Addiscombe** are primarily a contest group, and so their meetings are somewhat informal; the place to aim for currently is The Woolpack, 154 Gloucester Road, Selhurst, Croydon, from about 9 p.m. on Tuesday evenings.

If you are interested in mobile operation on the amateur bands, whether at LF or VHF, you should be a member of **A.R.M.S.** Details are obtainable from the Hon. Sec. at the address in the Panel.

**Ashford** in Kent is a small club drawing its members from the town, but it is noticeable that that same town supports two CB

clubs — it sounds like a bit of converting is called for! If you want to become a member, then you head for the top of Hart Hill, near Charing, any Tuesday evening.

December 1 is the main date for members of **Aylesbury Vale**, when they have an inter-club quiz, with the Leighton and Linslade gang; the venue is Elmhurst Youth Centre, Fairfax Crescent, Aylesbury, starting at 8.0 p.m. We are not quite sure if they are a once-monthly group, or whether they have informals in between — but doubtless the Hon. Sec. would be only too pleased to tell you, if you contact him at the address in the Panel.

If you live in **Bishops Stortford**, the locals are to be found on the third Monday in each month, at the British Legion club, at the top of Windhill.

Next we head for **Brighton**, and their Hq at 47 Cromwell Road, Hove; the dates are December 2 for a film night, December 16 when they will be having a Christmas Party, and 30th when they have a natter evening with a hint that the committee would like to know what to organise for 1982.

**B.A.R.T.G.** caters for those among us who are interested in radio teletype, whether by teleprinter and mechanics or VDU and electronics. Details from the Hon. Sec. at the address in the Panel.

The amateur TV interest is catered for by **B.A.T.C.** who cover the whole spectrum from SS/TV on HF to the UHF 625-line-and-colour of the 'real' ATV dabs. All this range of interest and much more appears in the regular club newsletter "CQ-TV". Details from the Hon. Sec.

Over now to **Bromsgrove** where they are fixed up at Avoncroft Art Centre on the second Friday of each month. For December, this means a cheese-and-wine party on 11th.

Tuesdays at **Bury** are set out for the locals to appear at Mosses Community Centre, Cecil Street, Bury; the 'main' meeting is on the second while the remaining ones are informal.

On to **Cheltenham**, and the Old Bakery in Chester Walk, Clarence Street, where the gang foregather; on December 3 for an AGM, and on 18th for a natter.

The **Chesham** lads have just had an AGM, and therefore as we write the new committee are huddled in a corner getting their programme together; they have, in December, high hopes for an outdoor event — so G8PUC would like you to contact him at the address in the Panel.

**Chichester** have changed their Hq to the Spitfire Club at Tangmere, on the first and third Mondays of the month. For December 7 they have some slides of the year's activities, and on the 21st they are going to have a Christmas Social evening.

Back in 1947, the Hon. Treasurer of **Clifton** was elected to his post, and in 1981's AGM he stood down — not a bad term of "temporary" office. The group are now to be found on Fridays at New Cross Inn, which lies at the junction of New Cross Road and Clifton Rise, New Cross, London. December 11 is down for a constructional contest, and on the 18th they have the Christmas Party — so we guess the other evenings are informals.

If you are near **Colchester** we commend the local club to you; they are at Colchester Institute in Sheepen Road, and from the programme it looks like alternate Thursdays as a rule. December 10 is down for a film show which we understand will include "The Secret Listeners".

Another 'Thursday' club is at **Conwy Valley**, where they are now to be found on the second Thursday of each month, from 7.45 in Green Lawns Hotel, Bay View Road, Colwyn Bay.

One of the biggest clubs around is **Cornish**, which meets on the first Thursday in the month at the SWEB Clubroom, Pool, Camborne; we are just a little ahead of their programme, but we can guarantee they will have something fixed up. If in doubt, you can always contact the Hon. Sec. — see Panel.

**Crawley** have a video-cassette evening, with "The Secret Listeners" and the G6CJ Aerial Circus. This is set for December 9, at Trinity United Reformed Church Hall, Ifield, Crawley.

Nice to see the **Cray Valley** newsletter heading again, although it does seem to consume editors at a rate of knots! But, it tells us that they are going to be at Christchurch Centre, High Street, Eltham, on the first Thursday in December, with the doors open at 7.30 p.m. No doubt they have something set up for that date, and the Hon. Sec. — see Panel — will be able to give you the gen.

Now we move on to **Crystal Palace**, where Saturday, December 19 is down for a Film Show and Christmas Party. This will be as usual at Emmanuel Church Hall, Barry Road, SE2 at 8 p.m.

Up we go now to **Derby**; December 2 is the junk sale, and on the 9th there is a night on the air, this being followed on December 23 by the Christmas Party, which leaves December 30 for "The Year in Retrospect". All these are at the Hq which is on the top floor at 119 Green Lane, Derby. Incidentally they now have a record paid-up membership of no less than 208!

The Central Library is the **Dudley** Hq, on the 2nd and 4th Tuesday in each month — December 8 is an Open Meeting.

Although we don't have a programme, we are advised that **East Antrim** are booked in at Carntall Hall, Mossley, on the second Tuesday in the month. Details from the Hon. Sec., at the address given in the Panel.

## New One

This is at **Edenbridge**, and they are to be found at the Conference Room, the Women's Institute Hall, Station Road, Edenbridge, Kent, on the second Tuesday of the month. For the rest, try the Hon. Sec. at the Panel address.

The second and fourth Thursdays are the ones at **Edgware**; December 10 is a junk sale, but for this month they appear to be scrubbing the other meeting which would have fallen on Christmas Eve.

The **Ex-G Club** name is self-explanatory; for those born in, or naturalised to, the UK but domiciled abroad. Details from the UK Secretary at the address in the Panel.

December in **Fareham** shows us December 2 for a talk on

microprocessors and how they work, by G4IJP, followed on 9th by a night on the air. Then they have a slide show by G8VOI on 16th, and a blank for the following week — Christmas Eve again being responsible.

**Farnborough** seem to be a bit coy about their Hq address in the current newsletter, but we have it on record as the Railway Enthusiasts Club, Access Road, off Hawley Lane, which is near the M3 bridge. December 9 is the Chairman's Evening, and on 23rd it is a social evening with YLs and XYLs.

We come now to the **G-QRP Club**, and their membership of 1209 at the last count. Anyone interested in the use of low power, or for that matter home-brew, could well think about a subscription — we think the newsletter alone is worth more than that. Details from the Hon. Sec. — see Panel.

**Guildford** foregather at the Model Engineers Hq in Stoke Park on the second and fourth Fridays; for more information contact the Hon. Sec. — see Panel.

On to **Harrow**, and the Roxeth Room, Harrow Arts Centre, High Road, Harrow Weald, on Fridays. For the rest of the story, we have to refer you to the Hon. Sec. at the address in the Panel.

The **Harwell** club meet at the Social Club of the AERE at Harwell on the third Tuesday of each month, with membership open to all with an interest in the hobby. Details from the Hon. Sec. — see Panel.

Turning to **Hereford**, we find their dates are December 4 and 18. The first of these is down for G4BVY to talk about receiver performance, and the other one is a "Fun Evening and Christmas Quiz".

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

January issue—November 27th

February issue—December 31st

March issue—January 29th

April issue—February 26th

*Please be sure to note these dates!*

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The **Home Counties ATV** group caters for amateur TV buffs within reach of the Swan Hotel, High Street, Iver. The date is normally the fourth Wednesday in each month. More details from the Hon. Sec. at the address in the Panel.

**I.R.T.S.** have turned their newsletter back into the earlier simple form, as a way of cutting costs, but it still has much of interest; and of course since IRTS is a national society, the Hon. Sec. can put you in touch with activity anywhere in EI. He is in the Panel.

Tuesdays are operating and Fridays nattering at the Hq in Unity Hall, near the Sloop Inn, Wootton Bridge, **Isle of Wight**; to judge by the latest letter, there has been an upsurge of get-up-and-go, and this can't be bad!

The **Liverpool** group is based on the Conservative Rooms, Church Road, Waverley, and their chosen evening is Tuesday in each week. Details of the goings-on can be obtained from the Hon. Sec. — see Panel.

Turning to **Loughborough**, we have it that they are in session on Fridays, but that in addition they have extra evenings for construction, RAE and Morse as may seem needed from time to time. Details from the Hon. Sec. (by letter only please, he says) at the address in the Panel.

For the moment, the **Louth** group is at Pleasant Place, off Ramsgate, Louth, However, it seems there just might be a change of venue, so a call to the Hon. Sec. might be a good idea.

December 3 is down for a constructional contest, and December 15 for the Christmas Social, both at the Red Cross Hall, The Crescent, **Maidenhead**.

December 3 is also the date for **Meirion**, at the Ship Hotel in

### Names and addresses of Club Secretaries reporting in this issue:

- BARRY COLLEGE OF F.E.: J. A. Share, GW3OKA, 3 Uplands Crescent, Llandough, Penarth, S. Glamorgan.
- BOLSOVER: D. Brocklehurst, G8KIF, 33 Cheshunt Drive, Clowne, Nr. Chesterfield, Derby S43 4JG.
- BRAINTREE: Norma Willcombe, 355 Cressing Road, Braintree. (*Braintree 45058*)
- BRIGHTON: J. Trimmer, G4JDM, 7 Dale Crescent, Patcham, Brighton.
- CAMBRIDGE: D. Leary, G8JKV, 9 Priory Avenue, Swavesey, Cambs. CB4 5RY. (*Swavesey 31120*)
- CHELMSFORD: A. Reeve, G4KQE, 9 Abraham Drive, Silver End, Witham, Essex.
- CHELTENHAM: G. Cratchley, G4ILI, 47 Golden Miller Road, Prestbury, Cheltenham. (*Cheltenham 43891*)
- CHESHAM: A. Scott, G8PUC, 8 Lynton Road, Chesham, Bucks. HP5 2BU. (*0494-785625*)
- DERBY: Mrs. J. Shardlow, G4EYM, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ. (*0332-556875*)
- DUDLEY: N. Rock, G3RLY, 28 Conway Avenue, Kingswinford, Staffs. (*Kingswinford 277617*)
- E. ANTRIM: J. Welch, G14JXM, c/o 20 Bryantang Brae, Doagh, Ballyclare, Co. Antrim BT39 0RJ.
- EDENBRIDGE: K. M. Hawkins, G3ZMC, 19 Forge Croft, Edenbridge, Kent TN8 5BW. (*Edenbridge 863005*)
- EX-G: F. W. Fletcher G2FUX, 53 St. Ives Park, Ringwood, Hants. BH24 2JX. (*Ringwood 3561*)
- EXMOOR: D. Jones, c/o Loughrigg, East Street, South Molton, Devon.
- GLENROTHES: I. Robertson, GM4HBG, 123 Altyre Avenue, Glenrothes, Fife.
- G-QRP: Rev. G. C. Dobbs, G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham B37. (*021-770 5918*)
- HÖRNDEAN: D. Bernard, 33 Greenfield Crescent, Cowplain, Portsmouth, Hants. (*Horndean 593429*)
- LEEDS: C. D. Gledhill, 21 Warrels Place, Bramley, Leeds LS13 3NS. (*Pudsey 567702*)
- LOUGHBOROUGH: J. S. Smith, 91 Anson Road, Shepshed, Loughborough, Leics. (*Letters only*)
- MALVERN HILLS: R. Dixon, G4BVY, 9 Wyche Road, Malvern, Worcs. WR4 4EF. (*Malvern 62900*)
- MELTON MOWBRAY: R. Winters, G3NVK, 32 Redwood Avenue, Melton Mowbray, Leics. LE13 1TZ. (*Melton Mowbray 3369*)
- MID-ULSTER: D. Campbell, G18XQO, 109 Drumgor Park, Craigavon, Co. Armagh, Northern Ireland BT65 4AH.
- OTLEY: Mrs. P. Horne, G8KRU, 14 Fieldhead Road, Guiseley, Leeds LS20 8DT.
- UNIVERSITY OF KENT, CANTERBURY: P. Cockerell, G6CSZ, Keynes College, U.K.C. CT2 7NZ.
- VALE OF THE WHITE HORSE: A. Lovegreen, 16 Church Lane, Wallingford, Berks. (*Wallingford 37482*)
- VERULAM: G. Dale, G3PZF, 16 Palfrey Close, St. Albans. (*St. Albans 57665*)
- WACRAL: L. Colley, G3AGX, 'Micasa,' 13 Ferry Road, Wawne, Nr. Hull, Yorks. HU7 5XU.
- WIMBLEDON: E. G. Allen, G3DRN, 30 Bodnant Gardens, Wimbledon. (*01-947 3914*)
- WIRRAL: G. O'Keefe-Wilson, G4MIA, 20 South Drive, Upton, Wirral. (*051-677 1531*)
- WORCESTER: D. S. Pritt, G8TZE, 15 Paxhill Lane, Twynning, Nr. Tewkesbury, Glos.

*See November issue Panel for names and addresses not appearing here.*

Dolgellau, and it is set aside for a session of RAE revision, and a natter to follow.

On to **Melton Mowbray**, where the evening of December 18 is given over to a Grand Christmas Junk Sale. This popular event is to be run off at the St. John's Ambulance Hall, Asfordby Hill, Melton Mowbray.

The **Midland** AGM was back in October, and no doubt the new programme is all but complete; however, they had already fixed up for a Christmas Natter Night on December 15 at Hq, which is at 294A Broad Street, and that is almost opposite the Birmingham Repertory Theatre.

Like so many others the **Mid-Sussex** gang will be having some sort of social evening in December; this is on December 10. Their other meeting would have been on Boxing Day had they not cancelled it. The venue is Marle Place, Further Education Centre, Leylands Road, Burgess Hill.

One of the few Sunday meetings is at **Mid-Ulster**, where the locals gather at the home of G14BAC in Banbridge, Co. Down; the start is sharp at 1500, and there are various interesting items on the programme for these first Sundays each month.

**Northern Heights** notes that CB and amateur aerals alike are affected by high winds; for more on this phenomenon, try a visit to the Bradshaw Tavern, Bradshaw, Halifax, on any Wednesday evening. December 2 is a Family Evening, with pie-and-peas, for which they want some advance warning of your attendance.

Alternate Mondays at Tamar Secondary School, Paradise Road, Millbridge, **Plymouth**; and we have a feeling they have a warm welcome for newcomers or visitors. Details from the Hon. Sec. at the address in the Panel.

Up in **Pontefract** they would normally be down for December 10 and 24, but clearly the XYLS weren't going to allow the latter date! However on December 10 they will be having a social evening, and Hq is the Carleton Community Centre, Pontefract, on the top floor.

**R.A.I.B.C.** looks after the blind and invalid folk in our hobby, they being the full members. The rest are supporters or representatives, who make the organisation tick properly. They are usually about at the rallies and shows, although at Donington someone had tucked them away in a corner where they were hard indeed to see, and harder still to reach in a wheelchair. Details from the Hon. Sec. — see Panel.

On to **Reading**, where on December 8 there is the AGM to be followed on December 22 by the Christmas Dinner. The Hq is at "The White Horse", Emmer Green, which is off the B481 Reading-Nettlebed road.

Our next stop is at **Reigate** where they have the constructional contest on December 15. This is at the Conservative and Constitutional Centre, Warwick Road, Reigate.

It is a bit sad that the **Royal Air Force** note about their AGM arrived just too late for inclusion in the November issue, as it was down for November 6. However, any serving or ex-R.A.F. type can still join for the effort of writing to the Hon. Sec. for details.

At **Saffron Walden** they have the third Wednesday of each month booked at Debden Village Hall; they are in the process of putting together a programme to suit the interests of all the members. Details from the Hon. Sec. at the address in the Panel.

**St. Helens** has a place at the Conservative Club, Boundary Road, weekly on Thursdays. Someone must be working hard because almost all these dates had a settled programme during October and November; so no doubt there is something set up for December.

**Skegness**, the ads. used to say, is so bracing — be that as it may there is a good local club, based on the "White Swan", Burgh-le-Marsh on the first and third Tuesday each month; various activities are on the go, to suit a wide range of interests.

Now we head for **South Birmingham**, and here they have the main meeting on the first Wednesday; to which they add every Thursday evening for operating the club rig, and every Friday for an open evening. All are at Hampstead House, Fairfax Road, West Heath, Birmingham.

On the first Monday in December, **Southdown** have their AGM, at Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, East Sussex.

**South-East Kent YMCA** is a group that covers the area around Dover, from Hq at Dover YMCA, "Godwynehurst", Leyburne Road, Dover. On December 2 there is a natter evening, with a film on lasers down for 9th. December 16 is a talk on meteor scatter, and 23rd is naturally enough set aside for a Christmas Social; a final date for 1981 is December 30, and on this evening the Chairman, G8KEN, will be suggesting things to do in 1982.

December is AGM-time at **Southgate**; the second Thursday in the month, at St. Thomas Church Hall, Prince George Avenue,



Oakwood N14.

Next we have **Stevenage**; December 3 was "to be announced" and on 10th there is a social evening at the Broadway Hotel in Letchworth; then on December 17 it is back to Hq for a natter evening. Hq is at the Staff Canteen, British Aerospace Plant B in Six Hills Way, Stevenage.

Nice to hear again from **Stratford-on-Avon**; but for the moment we have to refer you to the Hon. Sec. for the details of venue and dates — he is in the Panel.

For **Surrey** the Hq is at *TS Terra Nova*, 34 The Waldrons, South Croydon — for the remaining data we have to refer you to the Hon. Sec. at the address in the Panel.

The dates for **Sutton & Cheam** are December 4 at Sutton College of Liberal Arts, Cheam Road, Sutton, and December 18 at Banstead Institute, High Road, Banstead.

Turning now to **Sutton Coldfield** we are told they have a booking on December 14 for a talk on MPs and ATUs; and that the venue is Sutton Coldfield Public Library, Sainsbury Centre.

For the **Thames Valley** members we can only say that they are in session on the first Tuesday of each month, at Dittons Library Meeting-room, Watts Road, Thames Ditton. We could also add that although we don't have the latest, from past experience they will have something going "on the night."

Amateurs around the Ramsgate district are served by the Radio Club of **Thanet**, at Birchington Village Centre, on alternate Fridays.

The **Thornton Cleveleys** group is really booming, with 140-plus members, all getting together on Monday evenings at the Leisure Centre, Cleveleys.

Looking to **Torbay**, we find they have an informal every Friday, plus the main meeting on the last Saturday of the month; all at Bath Lane, rear of 94 Belgrave Road, Torquay. In addition, they are running an RAE course at Torquay Technical College.

The **Tyneside** lot are still using the Community Centre, Vine Street, Wallsend, every Monday evening, and various activities are being run; and they say they are pleased to welcome visitors and new members.

The **Vale of the White Horse** club have their Hq in the club room upstairs at the "White Hart" in Harwell, every Tuesday, with the first one in each month down for a 'main' meeting.

We seem to be a bit out of phase with the **Verulam** newsletter, but it tells us that they have a place at the Charles Morris Memorial Hall, Tyttenhanger Green, Tyttenhanger, near St. Albans, on the fourth Tuesdays in the month; and there is also an informal on the second Tuesday in the month at the R.A.F.A. in St. Albans.

**W.A.C.R.A.L.** is the club which brings together all committed followers of the Christian faith, anywhere in the world. The details can be obtained from the Hon. Sec. at the address in the Panel.

At **Wakefield** they are in session on December 1 for a club project evening, on December 15 for a social evening at Hq, and 29th for an on-the-air and natter date; and all are at Room 2, Holmfield House, Denby Dale Road.

The West Kent area is covered nicely by, oddly enough, the **West Kent** club, which is based on The Adult Education Centre, Monson Road, Tunbridge Wells, and on December 11 there is to be a home-based Fox Hunt.

After a long silence we hear again from **Wimbledon**, and we see they are now at the St. John Ambulance Hall, Kingston Road, Wimbledon, on the second and last Fridays.

A new venue is mentioned for **Wirral**; they are now in a place at Minto House School, Birkenhead Road, Hoylake, where they are to be found on the first and third Wednesdays in each month. To get there, take a West Kirby bus from Moreton, and get off at Ethelbert Road; or by rail, get off at Meols Station, The school lies between Ethelbert Road and the Cottage Hospital on the north side of Birkenhead Road.

Over now to **Worcester**, where a new Hon. Sec. takes the seat; but he can still say that they are based on the "Old Pheasant", New Street, Worcester, on the first Monday in each month. December's meeting is to be addressed by G3RGD, on the subject

of the joys of using Morse as an operating mode.

Every Tuesday evening you can join the **Worthing** club, now at their new Hq in Pond Lane Amenity Centre. They have to have something going with 100 members!

Next stop **Yeovil**, and Building 101, Houndstone Camp; December 3 is a Quiz by G3KSK, and he follows this up on 10th with "Some Simple but Useful Formulas"; a change to G3MYM on 17th with "Electrical Bandspreeding" as his theme. Next a Wednesday evening, when they have the natter night on 23rd. Finally, December 31 is another natter plus, possibly, christening the new band.

## Latecomers

We managed to fit most of them into their slot, but there are still a few, starting with **Braintree** where the new publicity secretary is, again, a YL; she tells us that they have the first and third Mondays at the Braintree Community Centre, Victoria Street, which is next door to the bus station; December 18 is a social evening.

**Cambridge** has an update to let us know they are still using the Visual Aids Room, Coleridge Community College, Radegund Road, and the club scribe notes that the latter is a turning off the well-known Coleridge Road in the south part of the city. Every Friday it is.

At December's **Chelmsford** meeting, there is some doubt as to whether it will be a junk sale or a Chinese take-away — find out by going on the first Tuesday to the Marconi College, Arbour Lane.

On **Exmoor** we find the local club to be based in South Molton, at Loughrigg, East Street, every Thursday.

Another lost sheep returned to the fold is at **Glenrothes**, where they write to advise that on December 20 they have Mr. Alex McGrow, who will give a talk on metal detecting and bottle collecting. For the venue, we must refer you to the Hon. Sec. — see Panel.

**Horndean** meet at Merchiston Hall, every second Tuesday of the month — details from the Hon. Sec. at the address in the Panel.

Up there in **Kilmarnock & Loudoun**, they now have their place at the Broomhill Hotel, London Road, having abandoned the old Buchanan Centre venue. December 22 should be interesting in that they have social evening with other Ayrshire clubs.

We are asked to remind readers of the Christmas Rally on December 13, organised by **Leeds & District A.R.S.**, which will be held at Pudsey Civic Centre, Dawsons Corner, Pudsey; this is a purpose-built exhibition centre on the Leeds Ring Road.

**Otley** club writes in to say that they are running the Northern Mobile Rally on May 23, 1982, at the Great Northern Showground in Harrogate. Details on this, and the club too, from the Hon. Sec. — see Panel.

The **Barry College of Further Education** get together every Thursday at Weycock Cross Annex, Barry; they have also got a Rally provisionally set for May 1982.

**Bolsover** is a new one to us, although they have been around for three years; they have a booking every Wednesday at "The Angel" in Bolsover. At the time of writing the programme was still to be pasted together, but now they will have things all set up, doubtless.

If you want to find the **Malvern Hills** lads, try the "Red Lion" in Great Malvern on the second Tuesday; December 8 is down for the AGM. Start at 8 p.m. (with morse between 7.30 and 8 p.m.).

Finally, **University of Kent, Canterbury**; they are in session at 1400 on Wednesdays in Eliot Seminar Room 4, University of Kent, Canterbury. More details from the Hon. Sec. — see Panel.

## Finale

That, *mes amis*, is yer lot for this time. For the next three "Clubs" features, the deadline dates are indicated in the body of the piece; all your letters addressed to your "Club Secretary", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Meantime, enjoy your Christmas, and take care. 73!

# BASICS FOR THE S.W.L. AND R.A.E. CANDIDATE PART III

## SUGAR-COATED THEORY

**L**AST time round, we looked at capacitance, inductance and resistance in the world of DC, switching on and switching off. Now, we must look at AC conditions as applied to these same three components. So — perhaps it wouldn't be a bad idea to define AC, and to decide on what waveform we will regard as the "standard".

### Definitions

We may define an alternating current as a current which varies in a cyclical manner and crosses the "zero" line in each repetition. Those inverted commas around "zero" imply that we may arbitrarily define our zero, which, as we will see later, will cater for such a case as an AC ripple voltage superimposed on a DC HT voltage.

Turning to our standard waveform, let us consider firstly the *desiderata*. Firstly, it would be nice if a standard waveform of voltage applied across resistance, or inductance or capacitance, would result in a current waveform of like shape. It would also be nice if such a wave could be generated to a fair approximation easily enough to enable us to experiment; and it would be nice if we could resolve a complex periodic waveform into a series of our standard waveform and multiples thereof. Such a waveform exists, and this paragon of all the virtues is called a *sine wave*. One cycle of a sine wave is traced out if, on graph paper, we plot the sine of an angle as the angle goes from 0 to 360°, see Fig. 1a. If you know what a sine is, relax while we explain to the others.

At Fig. 1b we show a right-angled triangle inside a circle. Consider this triangle — *any* right-angled triangle for that matter. The longest side lives opposite the right-angle (and a right angle is 90°); this longest side is called the *hypotenuse*. In our figure, then, the hypotenuse happens to be a radius of the circle. The angle of the triangle which lives at the centre of the circle we have marked as  $\theta$  — the Greek letter "theta". We have already defined the hypotenuse; we may now call the side opposite to  $\theta$  the "opposite" side of the triangle, and the third side can be called the "adjacent" side since one end of it forms part of the angle  $\theta$ . If we want the sine of an angle, we draw a right angled triangle having one of its angles as theta — the angle whose sine we want — and then sine  $\theta$  may be defined as the ratio of the length of the opposite side divided by the length of the hypotenuse, *i.e.*,  $AB/OA$ .

Still with Fig. 1b, if we can now imagine radius OA being rotated anticlockwise and thus angle  $\theta$  changing, line AB will change in length and therefore the ratio  $AB/OA$  will change: thus the value of sine  $\theta$  can be related to the degrees round the circle. Let us call the right-hand end of the horizontal 0°, and sweep round in an anticlockwise direction through the full 360° of the circle and — lo! — 360° is the same as 0°. At 0°, the opposite side just disappears, and so sine 0° also is zero; at 45° opposite divided by hypotenuse side equals 0.707; at 90° the hypotenuse and the opposite side merge and are equal, and so sine 90° equals 1.

Now, what about 91°? The triangle we draw for 91° will have the same proportions as the one we drew for 89°, and so the sine is the same. Next to  $\theta = 180^\circ$ , where the value of  $AB/OA$  again reaches 0. At 181°  $AB/OA$  is of the same proportions as at 1° but the sign of the sine has become negative. Carrying on, it reaches maximum negative at 270° and 0 at 360°, completing the cycle. So 361° is the same as 01° in the next cycle.

So, with all this in mind, you can plot it out on a bit of graph paper for yourself, and come out with something like Fig. 1a; and if you do a repeat but using the sine tables or a calculator you should get an even better plot. However our point is simply that Fig. 1a is a picture of one cycle of a sine wave.

In practical electrics and radio, we are looking at our cycle continually repeating, and so we have to bring in *time*. The domestic mains in U.K. run at 50 cycles per second, in U.S.A. at 60 cycles per second. Sometimes we talk in terms of cycles or megacycles per second, although usually just "cycles" or "megacycles" (*i.e.*, dropping the words "per second" which are implicit rather than explicit). However the pedants got a bit uptight with this slackness and invented a new unit called the *hertz*, where one hertz = one cycle per second.

Now we have our sine-wave and our hertz firmly in the mind we may consider what would happen if we impress a sine-wave of voltage across a pure resistor, a pure capacitor, and a pure inductor successively. First, a resistor. At any given instant, we may apply Ohms Law, and if we take a lot of instants(!) over a cycle of volts, we can calculate the various values of I at these instants; we can plot a graph of current and of voltage, we will find both are sinusoidal in shape, that when one is above our zero line, so is the other; that they cross zero simultaneously; and that they are both below zero together. They needn't be numerically the same, as the numbers are a function of applied volts and the resistor we are using, and we can all choose differently. The wave of volts and the wave of current are said to be "in phase". See Fig. 2.

Before we take the next step, perhaps we should make clear what we mean when we talk about "phase" — the word has different connotations for different uses. In electrical work, we come back to the sine-wave. Fig. 2 defined what we meant when we said two waves were in phase. At Fig. 3 'A' shows two sine-waves, where the zero-crossing is still always at the same instant, *but* when one wave is above zero the other one is below, and *vice-versa*. If we go to our angle drawing of Fig. 1 and consider Fig. 3 in its light, we may say that one sine-wave is at zero degrees when the other is at 180; and if we now look at the same point on each of the two sine-waves, these two points also will be 180° apart. If one point is at 45° then the other will be at 225°, and we say the two sine-waves are at 180° "out of phase" one with the other. The particular case is sometimes referred to as "in anti-phase". At Fig. 3b we show a pair of sine-waves at 90° phase relationship. One wave is 90° leading the other one; or we can look at it the other way round and say the latter lags 90° upon the former. We can in fact have any number of degrees leading or lagging the relationship between two sine-waves of the same frequency. If we have two sine-waves of different frequency, then their phase

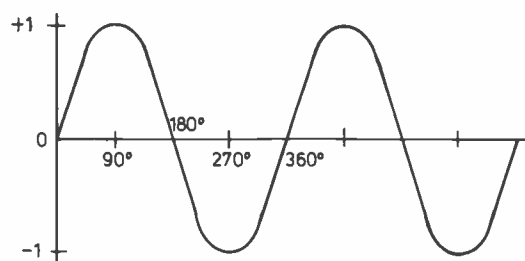


Fig. 1a The Sinewave on a graph.

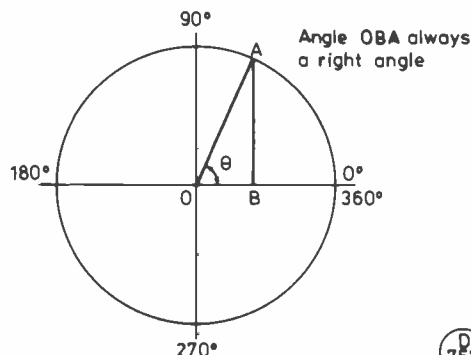


Fig. 1b The derivation of sine  $\theta$  (see text)

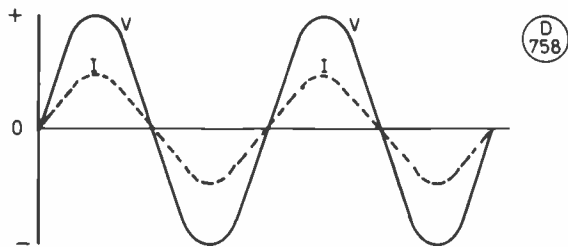


Fig.2 Voltage and current through a resistor

D 758

relationship will differ from moment to moment. But, notice, the angle notation doesn't make reference to frequency.

Now, let's look at a sine-wave of voltage applied to a capacitor. Recall first what happened to the electrons when we put a battery across our capacitor; see Fig. 4. If the sine-wave of voltage starts at the origin and goes positively, we may note that the maximum rate of change of voltage occurs around 0° and 180°, and the minimum rate of change of voltage occurs at those points (90° and 270°) where the waveform changes direction. Thus, we may say that at 90° and 270°, current is momentarily zero; an electron heading into the capacitor slows, stops for an instant, and starts to retreat whence it came. At the origin, the instant the volts start to rise there is a rush of electrons to the capacitor which falls away as the rate of change of volts declines. Applying this argument over several cycles of voltage and we see a relationship between current and voltage like Fig. 4, and clearly the two sine-waves are 90° out of phase, with the current leading the voltage. Notice two things; firstly that to get to this position we did not need to have a current flowing inside the capacitor — the current rushes to a plate and then away again, on either side. Notice also that, since we have been talking of *rate of change* at various moments, we have implied that the higher the frequency of the sine-wave, the greater the maximum value of the current for an given amplitude of voltage.

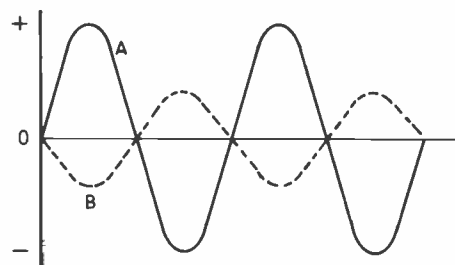


Fig.3a Phase: two sinewaves in 'anti-phase', or 180° out of phase.

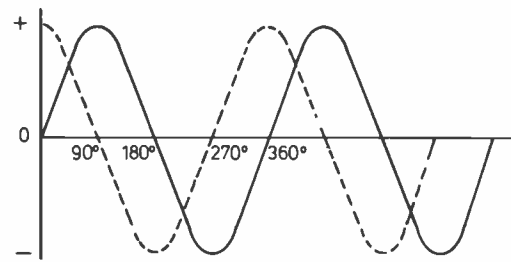
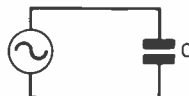


Fig.3b Two sinewaves 90° out of phase

D 759

What about power? We agreed earlier that  $E \times I = W$ . Recall from schooldays that if we multiply two things of like sign the result is positive, and conversely that if we multiply two things of opposite sign the result is negative. Applying this argument to a resistor, clearly 'W' is at a maximum when current and voltage are at maximum (whether positive or negative) and at zero when voltage and current are zero. Turning to our capacitor, the voltage and current are 90° out of phase, and so if we multiply E by I, there will be times when E and I are both positive and other times when E and I are negative; and for an equal proportion of each cycle E and I will have opposite signs. What does *this* mean? Simply that for half the time we are looking at negative power! If we have taken positive power to mean that work has been done (the resistor case saw the resistor get hot), then clearly negative



Current leading voltage in circuit

D 760

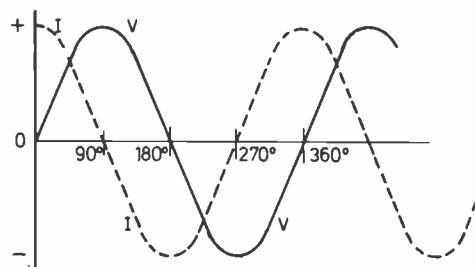


Fig. 4 Relationship between Voltage and Current at a Capacitor

work is the case where the component is returning power to the supply. Thus, in the case of a capacitor, we may say that over a period of time comprising any number of complete cycles of voltage, there is power going into the capacitor for half the time and for the other half of the time that power is negative, and so returned to the supply. Although volts and current can both be shown to flow, no power is dissipated within the capacitor.

Now, what about the other question relating to capacitors, namely Ohms Law? Clearly, if we make our capacitor infinitely large, our maximum currents will also be infinitely large; and if our capacitor is vanishingly small our current will be vanishingly small. We have also already indicated that our waveforms are connected by reference to "rate of change" and clearly the higher the frequency, the higher the rate of change. Thus, the E/I relationship can vary, as it did with a resistor, so we have some property akin to resistance but somewhat different. Let us call it *Reactance*, and give it the symbol X. For a capacitor, we can show that  $X_c = 1/2 \pi fC$ . The reactance of a capacitor varies with frequency: at zero Hz it is infinity, and as frequency rises so  $X_c$  will fall. A useful property, as we shall see.

However, enough of capacitors — away with them! Let us change our view a bit and look at *Inductance*. If we a DC apply to a pure inductor, clearly infinite current will flow as there is no resistance present. If we make a coil a perfect inductor, we can apply an alternating voltage and see an alternating current, but once again we shall see a phase displacement as with the capacitor,

but in the opposite direction. Lenz's Law is relevant; it says that in an inductive circuit, any change in the applied voltage will result in a voltage of such polarity as to *oppose* the change creating it. The latter is called a "back EMF". This back EMF is the thing which causes a spark at a switch controlling a relay, and you switch off. If your "switch" happens to be a transistor, and you haven't allowed for back EMF, you will probably have "popped" the transistor!

Follow this argument through to an inductance being fed with AC. Again we come to "rate of change" — with reference as before to the applied voltage; clearly, when rate of change is zero, back EMF is zero, and current at a maximum rate of change. As the applied voltage reaches a maximum rate of change, so does the back EMF, and hence the current is at a minimum. Fig. 5 shows the circuit, waveforms and phase relationships. But, not surprisingly in view of our argument, we find that this time the sine-wave of current lags the voltage. Turning to the matter of power, in a perfect inductor energy would go into the inductor and out again over each cycle, as we saw in the capacitor case. Since  $EI = W$ , we can do the algebraic sum of multiplication, taking account of sign, and plot the ebb and flow of power over a cycle; and then do likewise for the capacitor, and plot. Compare the two, and meditate upon them awhile (for homework!); then go back to our current waveforms in the capacitor and the inductor (Fig. 4 and 5), the voltage being assumed (since it is so drawn) as being the same.

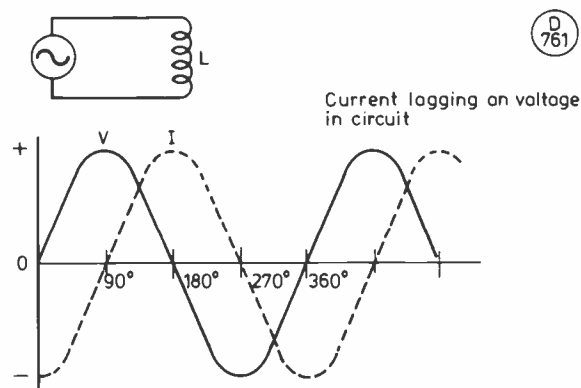


Fig. 5 Relationship between Voltage and Current through on Inductor

Applying the same argument as we did with a capacitor, there is again a feature somewhat akin to resistance, but which varies with frequency; clearly in a perfect inductor infinite current flows with zero-frequency voltage applied, so current will be going to fall with increase of frequency. This is reactance again, but in this case  $X_L = 2\pi fC$ . The subscript L or C tells us whether we are talking about reactance in an inductor or a capacitor.

The " $2\pi f$ " bit is often lumped into the greek letter  $\omega$  (omega) — note that the  $\Omega$  used of a resistor is also omega, the two symbols being the lower and upper case letters.

With that happy thought we leave you for the moment.

*to be continued*

### More Blush!

Go back to *Part I*, June issue; on p. 193 we referred to the penny and the battery, and energy doing the trick. This was correct, but on p. 194 when we turned to the penny and said "power" made it hot. *Energy* it must be, and energy defined as work done. Thanks G3CWX for spotting the error.

# "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* — So now we have the "rights" of Class-B licensees! In my simplicity I thought that anyone applying for a Class-B licence must be satisfied to operate within the limitations of that licence. If he/she wishes to operate on frequencies below 144 MHz, then he/she applies for a Class-A licence.

But now it appears that Class-B licensees have a "right" to more of the spectrum. Well, dear G8SUH (November *Letters*), there is a simple way to achieve your aims: just apply for a Class-A licence and then you will be able to use more of the spectrum, and it will not even cost you more in licence fees.

A Class-B licence is a VHF/UHF-only licence, intended for those whose interests lie in that part of the spectrum. It is not a Novice Licence; it is not an easy option for those who cannot be bothered with the Morse test. It is a pity that there are some Class-B licensees who think that that is just what it is.

*Rev. J. L. Marshall, G3RKH*

*Dear Sir* — I really must comment on the letter from G8SUH and his associates in the November issue.

Apart from the fact that they refer to one and the same thing first as a "privilege" and then as "their rights", what really annoys me is their silly use of the term "old boys" and the veiled suggestion that they are not sincere. The use of expressions like these do nothing to further their argument, and they would do well to remember that no one age group or social stratum has a monopoly of either knowledge or organising ability.

The reference to CB in their letter must be an unfortunate one — anyone who prefers the chaos on these frequencies really must be an innocent abroad. Having made their opinions known, they now want someone else to run their campaign. May I suggest that they employ the usual democratic methods of trying to alter things, *i.e.* by canvassing their MP's and my means of the ballot box.

Of course there is one easy solution for those wishing to use more of the spectrum, but I hesitate to suggest it because a certain amount of hard work and application is required — go for a G4 licence!

*E. G. Allen, G3DRN*

*P.S.* I well remember, when Class-B licences were first issued, the remark in one of *S.W.M.*'s features (I think it was G6QB's piece) that "these new licences will separate the real amateurs from those who only want to play". Was he right?

*Dear Sir* — I felt I must write to express how much I am enjoying the current series of articles by John Nelson, G4FRX. His precise approach is highly commendable and to me, very satisfying. If it fails to work when I first switch on, I know I shall have only myself to blame!

I very much hope that we shall be seeing more articles by G4FRX in *Short Wave Magazine* after the present one is concluded.

*Simon Collins, Portsmouth*

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

# VHF BANDS

NORMAN FITCH, G3FPK

## Satellite News

**O**SCAR 9 is successfully in its planned orbit as near as makes no difference. At the time of editing, there seem to be several sets of figures for the period and longitude increment, depending upon which "experts" one listens to. Orbital predictions based upon observations of actual passes are being broadcast on various nets, together with the latest information. The main one is on 3,780 kHz from 1015 on Sunday mornings, with others on the same frequency on weekday evenings from 1900.

At present, *U-O-9* is not in the right attitude for deploying the 50 foot boom, the telemetry suggesting the spacecraft is on its side, rather than upright, very slowly spinning on the axis in the direction of its orbit and occasionally tumbling. Both on-board computers are now working and the speech synthesiser is sometimes on. (Your scribe heard it on October 8 on orbit no. 499. The deviation was somewhat low, but the audio was adequate as received in SSB mode with zero beat carrier). Only the 2m. General Data Beacon on 145.925 MHz is operational so far.

It seems that it is taking much longer to get *U-O-9* into a stable attitude than was previously intimated. Quite rightly, the University of Surrey team is in no hurry to activate the remaining experiments until project manager Dr. Martin Sweeting, G3YJO, is absolutely certain that the spacecraft's attitude is correct and under complete control and that the on-board computers are functioning 100%.

AMSAT-UK has transparent *U-O-9* overlay "circles" for polar projection map users at 50p plus postage. For reasons beyond its control, the latest orbital calendar did not appear in time to carry on from the previous one. By the time this appears, the new prediction for *O-8*, *U-O-9* and *NOAA 6* and 7 will be available at £1.29, incl. postage. It is hoped to have the second *Best of Oscar News* handbook ready by Christmas at £1.29, incl. postage. Full details of AMSAT-UK membership and services can be obtained by sending an *s.a.e.* to The Secretary AMSAT-UK, at 94 Herongate Road, London E12 5EQ.

AMSAT-UK received a message that a listener had heard some telemetry from the

435 MHz beacon on *O-7*, generally thought to be long defunct. However, this report must be treated with some scepticism.

Rumours are rife that further Soviet amateur satellites are about to be launched in the *RS* series. From one of the AMSAT nets, it seems that Leonid Labutin, UA3CR, was the originator of this information but did not give any details. A low power transmitter is operating from the roof of UA3CR's Moscow home with the callsign *RS-0* on 29.331 MHz. It has been heard in the mornings around 1000 to 1200 sending continuous telemetry as the unsuccessful *RS-1* and *RS-2* transponders did a few years ago. In earlier *RS-0* operations, one could send; *RS-0 de G3FPK*, and get one's call back and a report.

## Beacon Notes

Due to the forthcoming loss of the top 200 kHz of the 4m. band, as mentioned last month, the RSGB's VHF Committee has tentatively decided to adopt the following plan for U.K. beacons; GB3CTC — 70.030 MHz; GB3SX — 70.040 MHz; GB3SU — 70-050 MHz and GB3ANG — 70.060 MHz. This information *via* Brian Bower, G3COJ.

On 2m., GB3VHF was restored to service on October 23. Brian advises that the keyer has been modified to give: "2 x letter shift, carriage return, live feed," before the RTTY identification. The keyer was built by Richard Russell, G4BAU, who designed the electronic clock seen on BBC 2 television.

On the 20m. VHF net, OZ4VV mentioned a new Swedish 2m. beacon, SK2VHG on 144.890 MHz. It is very far north in KB16a and runs 100 watts to a 16-ele. *Yagi* aerial beaming south. This one might be useful to monitor for meteor shower activity, although U.K. folk are far off its main beam.

## Contests

The results of the RSGB/IARU 144 MHz contest over the Sept. 5/6 weekend were announced over *GB2RS*. In the portable section, G4BPO/P was first and G4BWG/P came second. The multi-operator section was won by John and Jackie Brakespear, using the latter's call, G8RZO, with G8ZHP in second spot. Winner of the fixed section was Geoff Brown, GJ4ICD, while Eddi Ramm, DK3UZ, came second. Winner of the *-A* part was G8HHG/A. The best DX was apparently G3EFX/P to OK3RMW/P at 1,455 kms.

November 29 is the date for the Verulam ARC's 144 MHz contest from 0900 to 1300. Exchanges to consist of report and serial number plus your *administrative county*. Scoring is one point per contact except for G8VER, worth 10pts. There is a multiplier comprising the total number of counties worked, with countries outside of the U.K. counting as extra counties. Logs

by December 20 to G3JKS at 115 Marshalswick Lane, St. Albans, AL1 4UU.

The last two sessions of the BATC's Autumn Cumulative Contest are on Dec. 1 and 9; times and rules as given in last month's feature. The last 1981 contest is on Dec. 6 from 0900 to 1700 and is the 144 MHz Fixed, in which there are Single-op. and Multi-op. sections.

## Six Metres

Brian Bower, G3COJ, (Bucks.) reckons that the 50 MHz band has been remarkably good considering the peak of sunspot cycle no. 21 was two years ago. On Nov. 1, he worked U.S.A. 6m. stations in the 1, 4, 8, 9 and 0 call areas, with W2, W3, VE1, VE2 and VE3 heard. A new one worked on Oct. 18 was VP2VGR in the British Virgin Islands, who is better known as Tim Hugill, GW4FJK, from Dyfed. Brian was transmitting on 10m., of course.

G4JCC is reported to have made 21 10/6m. crossband QSOs on Nov. 1 and another 32 on the 3rd. On the 4th. he got his 4m. signals across to VE1ASJ in St. Johns, New Brunswick, receiving an RST 229 report. Ken Ellis, G5KW, (Scilly Is.) reports the first 6m. reception of west coast U.S.A. signals this autumn on Nov. 2 between 1715 and 1830. He worked WA6JRA, WA6PEV, K7KV (Wash.) VE6CX and K7BBO (Wash.). Ken also heard K6MYC, KB7WW (Oregon), K7CAI (Wash.) and KB60.

George Szymanski, GM4COK, (Edinburgh) has a dipole for 6m., end on to the U.S.A. but which brought in many strong Ws and VEs. On Nov. 1 he worked three of each and the next day, two more VEs, crossband on 10m. John Baker, GW3MHW, (Dyfed) has been busy moving into a new VHF shack and got back to 6m. receiving with an indoor dipole. Crossband QSOs with W1 and W2 were made on Nov. 1 and with W1-4, W8-0 and VE1 on the 2nd. He reports that the 2nd. was a very fine day with W8 stations making W.A.C. Many more Central and South American stations are QRV.

Nov. 2 seems to have been a rather historic day, according to GW3MHW. Stations in 5B4, ZB2 and 5V1 were heard working into the U.S.A. as were the few PAs who have special spot frequencies above 53 Mhz on a non-interference basis, CW only. An HA station has joined the 6/10m. crossband scene.

Mike Probert, GW4HXO, (Dyfed) has sent in a long and informative letter. He is completely new to crossband working and reckons it must be one of the most interesting and cheapest facets of the hobby. "A simple dual-gate, MOSFET converter, 2-ele. *Yagi* and the station 28 MHz transceiver and you're away!" Mike heard his first 6m. signals on Oct. 5 — the ZS6 beacons. He called ZS6LN at 1657 on 28.885 MHz giving an RST 519 report. Further crossband contacts took place on



Oct. 6, 7, 16, 17, 18, 21, 22, 24, 30 and 31 and on Nov. 1. Stations worked were EL2AV, VP2VGR, KV4FZ, HI8DAF, that probably a "first," EL2FY and several east coast Ws and VE1s.

On Nov. 1, Mike reckons 6m. sounded like 40m. on a Sunday morning, but complains that many Ws do not mention where they are listening on 10m. He has found it best to call "CQ" about 10 kHz away from 28.885 MHz, saying where *he* is listening on 6m. This ruse resulted in some pile-ups and QSOs with about 40 stations in the period to 1445 on Nov. 1. While one station was running 2 kilowatts to the four 8-ele. stacked *Yagis* at 140ft., the most enjoyable QSO was with WA1YKM (Conn.) who was running 3w. to a 2-ele. beam.

The next day Mike found the band open from 1155 to 1650 and had a full, duplex QSO lasting 20 mins. He mentions G2AOK, G4BPY, G4JCC and GW3MHW as being very active. He believes that "firsts" on 6m. were made between SV1DH, using his special call SZ2DH, and W and VE, and that HA6ND also worked W and VE stations. Mike Allmark (Leeds) reports F<sub>2</sub> propagation up to 60 MHz on Nov. 1 and 2, with U.S.S.R. TV and W1-5 and VE stations heard on 6m.

### Four Metres

Dave Sellars, G3PBV, (Devon) has managed to work his first fixed station in the county at last; it was G4CIZ in Exeter who is now QRV with 10w. to a 4-ele. *Yagi*. Paul Turner, G4IJE, (Essex) has been doing some 4m. to 2m. crossband MS tests with YU3ES in GF39d. On Nov. 8, Stane, using a 2-ele. *Yagi* and the converter built by Paul, received 13 pings and 16 bursts, the longest being 8 secs. at S5. Paul was using 50w. input and a 5-ele. *Yagi* on 4m and the QSO, which started at 0500, was completed in under half an hour. The QRB is 1,212 kms.

GW4HXO is now running about 30w. PEP of SSB from a home-brewed transverter as designed by G3XBY and G3WOS. Mike found conditions very poor in October, apart from the *Auroras* on the 20th. and 21st., when he worked GM3TAL and G6WR. Two more new Welsh stations on 4m. are Ted Hays, GW3RGL, and John Davies, GW4IOI, both near Swansea and using *Microwave Modules* transverters.

### Two Metres

With some two months of persistent low pressure systems dominating our weather, tropospheric conditions on VHF have been pretty dismal, until the beginning of November. However, some *Auroral* activity did break the monotony, while the MS addicts were unaffected.

Mike Allmark (Leeds) caught the Oct. 22 *Ar* at 1310 on Band 1 TV and at 1330 copied OZ1EKI on CW. The band was

### 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	7	65	15	45	9	5	4	190
G3BW	42	6	65	29	39	7	7	5	188
G8FMK	—	—	65	17	56	11	28	3	180
G8VLQ	—	—	69	26	45	14	—	—	154
G3FIJ	41	5	60	15	28	4	—	—	153
GW3NYY	—	—	78	30	34	9	—	—	151
G3PBV	3	2	60	23	43	9	10	2	147
G8RZP	—	—	66	21	45	12	—	—	144
G8GXE	—	—	55	11	46	9	17	5	143
G8HHI	—	—	49	16	44	12	14	2	137
G4JZF	—	—	74	20	38	4	—	—	136
G8RZO	—	—	66	21	37	11	—	—	135
GW3CBY	27	6	58	15	17	6	3	2	129
G6AJC	—	—	62	11	39	5	—	—	117
G8VR	32	3	44	29	6	1	—	—	115
G4MUT	—	—	47	12	31	11	—	—	101
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
G3CO	14	3	39	8	22	5	—	—	91
G4FK1	37	5	20	5	16	4	—	—	87
G8VJV	—	—	67	18	—	—	—	—	85
G4ARI	18	2	54	10	—	—	—	—	84
G4GXL	—	—	55	15	7	2	—	—	79
GM4COK	—	—	52	22	2	1	—	—	77
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
G6CSY	—	—	16	2	3	1	—	—	22
GM4ELV	—	—	10	3	—	—	—	—	13

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

well populated with DL, PA and OZ stations on SSB, with lots of QRM on the CW end. UR2RDR (MS68f) was winkled out but a UP2 and an OH7 in NW got away. On the way home from the local ale house at 2100, a visual *Aurora* was seen. The first radio phase ended at 2210, the second one beginning at 2340 with only PAs and GMs on CW heard.

Bill Hodgson, G3BW, (Cumbria) was off the air for three weeks as he lost all his aerials in one of the several big blows. He has makeshift beams up again for 2m. and 70cm., but the 4m. and 23cm. ones were a write-off and will have to be replaced. The *Ar*'s on Oct. 20, 21 and 22 did bring Bill a couple of new squares, though. G3COJ was QRV for the Oct. 20 event and worked EI9BG (VM27c) for an all-time new one, plus EI6AS (WN59c) and DK5FA (FK01g).

Static rain was a problem at G3PBV in the Oct. 20 *Ar* and it drowned out the signals for long periods. Dave confirms the rotten tropo. until the start of November when the band opened up to the south on the 2nd. and 3rd., but with nothing to the east or south-east. He reports that G4HFO and G3CHN worked PD0DDA/MM in

VF square at 1900 on Nov. 3 but that nothing was heard at 2230 when a sked had been arranged.

Graham Taylor, G4JZF, (Staffs.) heard the Oct. 20 and 22 *Ar*'s but only worked a couple of Dutchmen on the 20th. and heard OK1MBS. Local QRM on the 22nd. meant that nothing was worked. On Nov. 2, Graham worked EA1CV (XD) in the aforementioned lift. Terry Hackwill (ex-G8WRD) got his new call, G4MUT, on Oct. 13 and has been on the HF bands a bit from Reading. He was, nevertheless, on for the *Ar* on the 22nd. and worked GM6ALC (XQ) at 1815, for a new square.

Tony Collett (ex-G8GXE) has also passed his morse test and his new call is G4NBS, though he wishes to keep his Annual Table entry under the old call. Graeme Caselton (Kent) is now G6CSY, having passed the *R.A.E.* sat last May. He enters our tables this month. His present transceiver is the *Yaesu* FT-225RD with a 70cm. transverter, but no horizontal aerials yet. Best DX so far was F6CTT/P in a recent contest.

Welcome to Steve Palmer, G8EIU, (Kent) whose letter just missed last month's deadline. While listening to some

15m. CW, he realised much of it was very *Auroral* on Sept. 22 so went over to 2m. only to find local SSB in progress. However, the CW end revealed GMs but numerous CQ calls on SSB produced nothing. So Steve feels that a go at the morse test is even more desirable. His transceiver is the *Multi FDK-750E*, *Lunar 100w.* amplifier and *Jaybeam 10xy* aerial.

John Moxham, G8KBQ, (Somerset) runs 25w. on the band and enters our Squares Table. He caught the *Ar* on Oct. 20 and contacted GM4LPG (YR52f) and GM4BYF (YP04d) with OK1MBS (HK) heard. In the Oct. 22 affair, he worked G6BCO (YN07a), GI4KIG (WP77e) and GM6ALC (XQ77e). On Nov. 3, in a good spell of tropo. to the south, John had QSOs with EA1TA (VD), EA1CR (XD), F1BOF/P (AE), F1FVV (ZE), F1CCM (ZE), F6FRR (ZF) and other Fs further north.

John and Jackie Brakespear, G8RZP and 'RZO respectively, have re-entered the squares table from the new QTH. They welcomed the tropo. lift on Nov. 3, their list including EA1CR, EA1NQ (XD), F3QP (ZG), F6HLD (CG), DJ9OI (EO), OZ9FW (GP), OZ1ASL (FO) and OZ1DPR (EP). For Arthur Breese, GD2HDZ, the *Ar* on Oct. 11 provided Tayside and Grampian regions for the 1981 table. On Nov. 3, he heard GD4GNH working into Spain.

Geoff Brown, GJ4ICD, now has a 56-ele. *Jaybeam Yagi* array ready with a *muTek* power splitter, masthead pre-amplifier and *az-el* control. He intends to concrete a small tower to support this *E-M-E* affair as soon as the weather improves. He reports the death of GJ4JVP



VHF NFD, 1981. Members of the Parallel Lines Contest Group checking out the 70cm. aerial system comprising four, 21 element Yagis. The box contains the GASFET preamplifier. The array went up and down five times before they were satisfied with its performance. Left to right are G8IMC, G8OBS and G8LYD. The location was 8 kms. west of Wrexham.

who made the first GJ/OE 2m. QSO in 1975. Three other GJs are in hospital and Geoff suggests the size of their tax bills might be a contributory cause!

Andy Renouf, GJ8SBT, had a number of QSOs in the Oct. 22 *Ar* and got four new squares as a result. These were GI8YDZ (WP), GM4JYZ (XP), GM4LPG (YR) and GM6ALC (XQ). He got five reports of "59A" and many "49A". At the end of the event, GM8GFF was S7 running just 2½ watts!

George Szymanski, GM4COK, returned home from sea on Sept. 12 thus missing all the summer *E's*. He has been on MS but found the *Orionid* and *Taurid* showers very poor. Even so, he made complete QSOs with F8OP (CG), DL6NAA (FK), SP9AI (JJ), SK7JD (IR), OK1MDK (HJ), FIJG on SB in CD square in 21 mins., OE5XDL (HI) and I6WJB (HC) at a QRB of 1,995 kms. George has caught several recent *Ar's* and wishes people would respect directional CQ calls. Calling only for OH and U stations, he is invariably answered by many "local" Europeans. Nevertheless, on Oct. 20 he did contact UR2RQT.

Walt Davidson, GW3NYY, (Swansea) planned to move his aerials from the chimney on the house, to a mast at the bottom of the garden in an attempt to overcome many audio breakthrough problems in the neighbourhood. During October, the best QSOs were OH0JN (KU) *via* MS on the 11th., EA1QJ (VD) *via Ar* on the 20th., and UA2FAY (KO) *via* MS on the 26th. The latter was a new country and Walt wonders if any were "firsts?"

Between Oct. 3 and 26, 16 MS QSOs were completed, providing 8 new squares and a couple of new countries. An *Ar* on Oct. 11, 1520-1630, produced three GMs

in YP square on CW. Walt was QRV for the Oct. 20 event from 1600-1945 and had a ball on CW working 21 squares and 8 countries. Only 90 mins. of the Oct. 22 *Ar* was used with 7 squares and 4 countries contacted.

Richard Hope, GW8TVX, (Swansea) confirms "pretty grim" conditions till Nov. 2 when he worked F1FVP (ZF), F1CYB (BH), EA1ED (VD), with F1KCP in BI heard. Reg Woolley, GW8VHI, (W. Glam.) worked French stations in XI, ZJ and YI on Oct. 22, 24 and 31. In the tropo. lift of Nov. 2/3 he worked EA1CR and EA1s ED, QJ, RCA and TA, all in VD square. EA1RCA told Reg that EA8XS did *not* work into Iceland, recently, as had been rumoured; his best DX was to GD, as already reported.

Paul Turner, G4IJE, was on in the Oct. 20 *Ar* and worked SM6IHF (GS) for a new square. In the Oct. 22 affair he worked two more new ones; LA6VC (ES) and UP2BFR (LP), with UC2ABT heard. On the MS front, Paul completed with I5MZY (FD) on the 20th, and OH2BBF (LT) on the 23rd. *Via* tropo. on Nov. 2/3, he worked EA1CR and EA1TA, and into AE square. On the 3rd., HB9HB beacon was audible as was OE5FO (GI77b) at 1500. DL0SG (GJ77j) peaked S3 at 1700. At 1753, Paul was called by OE5XDL (HI) and at 1851 worked DK5RQ (GI).

OZ4VV said the *Ar* on Oct. 11 rumbled on from about 1200 to 2000 but no really good DX was around. Finn's best QSO was UA3MBJ at 1,600 kms. In the Oct. 20 event, Pete Bates, GM4BYF, (YP04d) did not come on till 1600 as he did a hasty rebuild of his amplifier. OK, SP and Y stations were worked from Scotland at QTFs 80 to 90°. Ray James, GM4CXM worked into IK square and a UR2.

Mark Turner, G8OBS, was operating

TWENTY-THREE CENTIMETRES

ALL-TIME TABLE

Station	Counties	Countries	Total
G3JXN	43	12	55
G3OSS	40	9	49
G3DAH	37	9	46
G6NB	28	7	35
G8FMK	32	3	35
G8IFT	28	5	33
G3XDY	25	7	32
G3NHE	24	5	29
GD2HDZ	21	7	28
G3COJ	19	8	27
G4NBS	19	6	25
G4ALN	20	5	25
G4CMV	20	5	25
G3JVL	21	4	25
G3OBD	20	3	23
G8LEF	16	6	22
G8ARM	20	2	22
G8GML	17	4	21
G8EOP	11	5	16
G5DF	12	2	14
G3PBV	9	4	13
G8AOD	11	2	13
G8KAX	11	1	12
G8LHT	7	3	10
G4DKX	7	2	9
G3OHC	8	1	9
G3BW	3	5	8
G8FJG	7	1	8
G8HHI	6	1	7
G8GNZ	4	2	6
G2AXI	5	1	6
G8OPR	3	1	4

Based on administrative counties.

the University of Nottingham station, G3UNU in the Oct. 20 Ar and the first QSO was at 1420 with an OZ at QTF 45° while the GMs were coming in at 10 to 15°. A surprise contact was YU7PXB (KF01c) at 1901 who can be QSL-ed via YU7JDE. Ken Wood, GM3WCS (YQ73c) worked into DL, ON and PA and said that G3AAQ/A in Newcastle heard HB, SP and UR2 in this event.

Clive Penna, G3POI, (Kent) took part in the CW contest on Nov. 8 and had 96 QSOs at an average of 14½ pts. each. The tally comprised 30 DLs, 17 Fs, 6 ONs, 13 PAs, the rest being U.K. stations. Best DX was DK5AI (FL33b). John Hunter, G3IMV, (Bucks.) had 86 QSOs; 50 continentals, the rest U.K. Neither thought the rules of the RSGB contest made it worthwhile looking to work British stations as much time was wasted swapping QTHs, not necessary in the Marconi Memorial event going on at the same time.

### Seventy Centimetres

G3PBV has worked "the elusive county of Hertfordshire" at last in the guise of G8ASI. The *Cumulatives* were generally poor; *Syledis* QRM and gales on Oct. 9, a bad cold on Oct. 17 but the conditions were not too bad. Oct. 25 Dave describes as "diabolical", with a mere five stations worked. Things were better on Nov. 2 with F1BOF/P (AE) worked and stations in ZF and ZG heard. G4JZF participated in the *Cumulatives* Graham's best DX being F1BOF/P on Nov. 2. HB9AMH/P was heard.

G8GXE/G4NBS reports the poor conditions for the contests apart from Nov. 2, even though he could not work the southern DX. Even so, Tony lists some quite good contacts considering the conditions on Oct. 17 and 25. G8EIU in Orpington is QRV on the band using the *Expander* with his *FDK-750E* and a 48-ele. *Multibeam*. G8KBQ worked stations in AL, YN, ZH and ZM on Nov. 2 and F1BOF/P gave John his 46th. square on the band. The next day, although conditions to the south were excellent, activity was low. Beacon FX6UHF (ZE18) on 432.87 MHz was S3 most of the day. Best DX was F1CCM (ZE17c) and F6ETZ (ZH63g).

G8RZO and G8RZP have been taking it in turns in the *Cumulatives* with Jackie getting the Nov. 2 leg and making 76 contacts, the best DX being in to EL square, plus G8PWX in Tyne and Wear. The following day brought their first Belgian from Sheppey, ON7PO. GJ4ICD says that GU3FRO on Sark now has a *Yaesu* FT-480R and *GASFET* amplifier, so this rare county should be available soon on 70cm.

GM4COK is back on the band with 10w. at present, but a 2x 4CX250B amplifier on the stocks. George's aerial array is a couple of 21-ele. *Tonna Yagis* on an *az-el* mount

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3VYF	—	91	264	355
G3POI	—	—	346	346
GJ4ICD	1	96	208	305
G3IMV	—	—	291	291
DK3UZ	—	—	280	280
SP2DX	—	—	280	280
I4EAT	—	25	238	263
G3JXN	42	86	120	248
G8HVY	22	83	141	246
GJ8KNV	8	73	164	245
EA3LL	—	15	227	242
G3XDY	30	83	123	236
G4CMV	14	59	157	230
G3BW	5	31	189	225
G3COJ	24	74	126	224
G4ERG	—	16	208	224
G4IJE	—	—	224	224
9H1BT	—	11	210	221
G4IGO	—	13	203	216
G3CHN	—	—	212	212
G3PBV	13	63	123	199
9H1CD	—	13	178	191
GM4COK	—	12	178	190
G3NAQ	—	58	128	186
G8LEF	22	62	101	185
G3SEK	—	—	182	182
G3FPK	—	—	179	179
G8HHI	6	52	120	178
G8ATK	6	56	113	175
G4BWG	—	38	136	174
G3KEQ	—	—	173	173
G4DEZ	—	—	171	171
G2AXI	5	58	106	169
G8LGL	—	32	135	167
GM4CXP	—	25	142	167
GW3NYY	—	34	133	167
G8KBQ	4	46	115	165
G4NBS	13	57	89	159
G8MFJ	—	26	128	154
G4AWU	—	22	130	152
G8OPR	1	38	111	150
G8VR	—	3	145	148
G4ERX	6	46	95	147
G4MCU	—	29	118	147
G8JJR	—	38	108	146
GD2HDZ	12	44	90	146
GW4EA1	—	—	146	146
G8VLQ	—	38	106	144
G8FMK	16	57	70	143
GJ8SBT	1	—	138	139
G8IXG	—	—	139	139
G8CXQ	—	15	119	134
G4JZF	—	16	116	132
G8IFT	15	34	81	130
G8KAX	9	43	78	130
G4HFO	—	50	78	128
G8KGF	—	28	99	127
G8RZO	—	31	90	121
G8RZP	—	29	92	121
G3FIJ	—	29	84	113
G4FBK	—	5	105	110
G8LFB	—	—	109	109
G8TGM	—	—	109	109
GJ3RAX	1	27	74	102
G8KPL	—	7	91	98
G4GHA	—	—	95	95
G18EWM	—	25	67	92
G6UW	—	1	89	90
G8JAG	—	7	81	88
G4MJC	—	12	76	88
G4IRX	—	—	85	85
GW3CBBY	3	14	65	82
G4MUT	—	30	47	77
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.

as he plans to try some *Auroral* contacts and MS work on the band. GW8VHI mentions that F5JY in ZJ22e is on the band with 500w. Reg worked EI9Q at 1533 on Oct. 31 and was heard by EI9BG (VM). EI9Q has loaned Tom a 60w. amplifier. On Nov. 2, Reg worked EA1ED (VD59h) who runs 10w. and a 21-ele. beam.

### Twenty-three Centimetres

G3PBV only heard G8IDZ/P on the Isle of Wight in the *Cumulatives* on Oct. 17 and called in vain. G8KBQ has one watt on the band but missed the contests due to storm damage to the aerials. By Nov. 17, the system should be fully operational again and John will be looking for contacts on the band. He can be reached by telephone any time on Glastonbury (0458) 33145 for arranging skeds. G8GXE made four QSOs on Nov. 2, locally, but heard G8GDZ (W. Midlands), G4MHC (Worcs.) and G4KCT (York). GJ8SBT hopes to have better equipment built for January should any good tropo. appear.

### Random Jottings

Tony Collett, says that the London morse tests are held on Tuesdays only. The address is;— Post Office External Telecommunications Executive, Maritime Radio Service Division, Room 203 Lansec House, 23 New Fetter Lane, London EC4A 1AE. The 'phone number is 01-583 0000. (Yes, 0000). Ask for the Maritime Radio Service Division when you get through.

FQ square seems to be a little rare and OZ4VV has heard OZ3GW in a recent *Aurora* if you need it. UA2FAY (KO) in Kaliningradsk has a home built transceiver, 120w. and a 13-ele. *Yagi*, so should be quite workable on MS and Ar. G3PBV asks why many operators give calls in the forms, "G, figure six," or "G number six," which he reckons could be confusing in weak signal conditions. Why not "Golf six?"

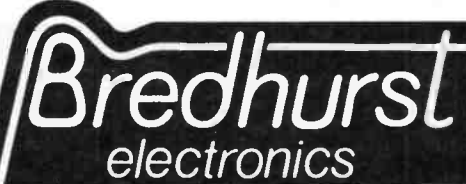
Some late news about the new Soviet amateur satellites has been received by AMSAT-UK in the form of an official announcement passed on by Mr. A. Gschwindt, HA5WH, in Budapest. Three satellites are planned, each with a 2-to-10m. transponder. The uplink/downlink bands are;— No 1, 145.86 to 145.90/29.36 to 29.40 MHz. No. 2, 145.91 to 145.95/29.41 to 29.45 MHz. No. 3, 145.96 to 146.00/29.46 to 29.50 MHz. Each satellite will have two beacons at each end of the 10m. downlink passband. As of Nov. 10, no commitment as to launch date, or any orbital parameters.

### Sign Off

Have a Happy Christmas. The January deadline is December 2, and the February one, January 6. Everthing to;— "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. 73 de G3FPK.

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MM432/144S	70cm Converter to 2m Rig	34.90	(-)
MM436/800	70cm ATV Converter	27.90	(-)
MMK1296/144	23cm Converter to 2m Rig	59.80	(-)
MMD050/500	500MHz Dig. Freq. Meter	69.00	(-)
MMD800P	800MHz Prescaler	23.00	(-)
MMDP1	Frequency Counter Probe	11.80	(-)
MMA28	10m Preamp	14.95	(-)
MMA144V	MMA144V	34.90	(-)
MMF144	2m Band Pass Filter	9.90	(-)
MMF432	70cm Band Pass Filter	9.90	(-)
MMS1	The Morse Talker	115.00	(-)

## DATONG D70 MORSE TUTOR



£45.45 inc VAT

<b>DATONG PRODUCTS</b>			
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	(-)
D75	Manually con. RF Speech Clipper	56.35	(-)
RFC/IM	RF Speech Clipper Module	26.45	(-)
D70	Morse Tutor	49.45	(-)
AD270	Indoor Active Dipole Antenna	37.95	(-)
AD370	Outdoor Active Dipole Antenna	51.75	(-)
MPU1	Mains Power Unit	6.90	(-)

<b>MORSE EQUIPMENT</b>			
MK 704	Squeeze Paddle	10.50	(0.50)
HK 707	Up/Down Key	10.50	(0.50)
HK 704	Deluxe Up/Down Key	14.50	(0.50)
EKM1A	Practise Oscillator	8.75	(0.50)
EK 121	Elbug	29.95	(0.50)
EKM1A	Matching Side Tone Monitor	10.95	(0.50)
EK 150	Electronic Keyer	74.00	(-)

<b>ROTATORS</b>			
KR250	Kenpro Lightweight 1-1/2" mast	44.95	(2.00)
KR1250	H.F. Rotor	49.95	(2.00)
9502B	Colorator (Med. V.H.F.)	49.95	(2.00)
KR400RC	Kenpro (HF) Complete with Lower Clamps	98.95	(2.50)
KR800RC	Kenpro (Med HF) Complete with Lower Clamps	139.95	(3.00)

<b>DESK MICROPHONES</b>			
SHURE 444D	Dual Impedance	29.95	(1.50)
SHURE 526T MK II	Low Impedance	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	(-)

<b>MOBILE SAFETY MICROPHONES</b>			
ADONIS AM 202S	Clip-on	20.95	(-)
ADONIS AM 202F	Swan Kneec + 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)

<b>HAND MICROPHONES</b>			
T.A. 600	Fiat Mic.	4.95	(0.50)
Power Mic.	Wide Impedance	9.95	(0.75)
TRIO MC 203	50/50K IMP	13.80	(0.75)
YAESU YE7A/YD848	900/50K IMP	6.75	(0.75)
SHURE 201	High IMP. Quality Mic.	14.80	(0.75)

<b>YAESU</b>			
FT902DM	160-10m Band Transceiver	885.00	(-)
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 FT101Z/D	13.80	(0.75)
FT707	8 Band Transceiver 200W Pep	589.00	(-)
FT707S	8 Band Transceiver 200W Pep	485.00	(-)
FP707	Matching Power Supply	125.00	(5.00)
FTV707R2	Transverter – 2M	198.00	(-)
FV707DM	Digital V.F.O.	203.00	(-)
FC707	Matching A.T.U./Power Meter	65.00	(1.00)
MR7	Metal Rack for FT707	15.76	(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	(-)
FRG7700M	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 F.M. Synthesised Handheld	219.00	(-)
NC7	Base Trickle Charger	25.85	(1.30)
NC9C	Compact Trickle Charger	44.10	(1.50)
FBA2	Batt. Sleeve for use with NC 7/8	3.00	(0.50)
FNB2	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)
FT290R	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	25.00	(0.75)
FSP1	Mble. External Speaker 8OHM 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	16.86	(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)

<b>FDK VHF/UHF EQUIPMENT</b>			
Multi 700EX	2m F.M. Syn. 25W Mobile	199.00	(-)
Multi 750E	2m Multimode Mobile	299.00	(-)
Expander	70cm Transverter for M750E	219.00	(-)

<b>STANDARD VHF/UHF</b>			
C78	70cm F.M. Portable	219.00	(-)
CPB78	10W Matching Linear	67.50	(1.50)
C58	2m Multimode Portable	239.00	(-)
CPB58	25W Matching Linear	79.50	(1.50)
CMB	Mobile Bracket	19.95	(1.00)
CL8	Soft Carrying Case	6.95	(0.75)
C12/230	Charger	7.59	(0.75)

<b>DRAE POWER SUPPLIES</b>			
All with Over-Volts – Current Limit and Thermal Protection			
4 AMP		27.95	(1.50)
6 AMP		44.95	(2.00)
12 AMP		69.00	(2.00)
24 AMP		99.00	(3.00)

<b>SWR – POWER METER</b>			
Model 110	H.F./2m Cali. Power Reading	11.50	(0.50)
SWR25	H.F./2m Twin Meter	11.50	(0.50)
UH74	2m/70	13.95	(0.50)
WELZ SP15M	H.F./2m 200W	29.95	(0.75)
WELZ SP200	H.F./2m	59.00	(0.75)
WELZ SP300			

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### EXCLUSIVE TO US IN THE UK 1kW input 600W ssb 350FM 2MTR LINEARI!

BUILT-IN POWER SUPPLY, ELECTRONIC WARM UP, VARIABLE INPUT ATTENUATOR. ADAPTS EXCITERS FROM 2W-25W. RADIAL BLOWER. LED'S FOR READY, TX, OVERLOAD, PTT & RF VOX with VARIABLE DELAY CHOICE OF EIMAC TUBES. 4 x 150A OR 4C x 250B OR 4C x 250R. ELECTRONIC PLATE CURRENT FUSE — NO THERMAL DAMAGE OF P.A. TUBE POSSIBLE. SIZE: H.88mm, W.318mm, D.372mm. FROM £300.00

D 70C	70cms. 10W in — 200W out	£489
D 200S	2mtr. 1kW p.e.p. ssb. (650 FM)	£599
D 200	2mtr. 500W p.e.p. ssb. (400 FM)	£475
D 200C	2mtr. 350W p.e.p. ssb. (150 FM)	£300

All these linears have adjustable inputs and outputs and they are all fully protected.  
ALSO AVAILABLE: 18db Gasfet masthead preamplifier which suits the output of these linears and which is also powered by them via the antenna co-ax.

 <p><b>ICOM PORTABLES</b></p> <p>IC2E FM 2m £169.00 IC202 SSB £169.00 IC402 70cm £242.00</p> <p>All accessories available— see below</p>	<p><b>ICOM MULTIMODES</b></p>  <p>IC251 2m £495.00 IC451 70cm £366.00 IC290 2m £366.00</p>	<p><b>ICOM FM MOBILES</b></p>  <p>IC24G £165.00 IC25E £259.00</p>	<p><b>ICOM 720A G/C</b></p>  <p>IC720A 200W £883.00 PS15 Power Supply £99.00 PS20P/S with speaker £130.00 IC730 See panel, below left</p>
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**CB 27/81** Now stocking **dn** 40 channel CB rigs + handhelds + Base Station. We don't only sell these but we have an in car fitting service if needed and a full service back up. These sets are designed in Germany and built by a German Company.

<p><b>ICOM HF TRANSCEIVERS</b></p> <p>IC730 200W £586.00 IC2KL 500W linear £839.00 IC2KLPS Power Supply £211.00</p> <p><b>ICOM ACCESSORIES</b></p> <p>BP5 IIV Pack £30.15 BP4 Empty case for 6XAA £5.80 BP3 ST0 Pack £15.50 BP2 6V Pack £22.00 BC3 Base Charger £37.00 DC1 12V adaptor £8.40 WM9 Mic speaker £12.00 CP1 Mobile Charging load £3.20 LC1/2/3 cases £3.50 BC30 base charger £39.00 MML1 10W Booster 49.00</p> <p><b>TRIO/KENWOOD</b></p> <p>TS830S HF Transceiver £700.00 TS130S HF Transceiver £530.00 TR8400 UHF mobile £320.00 TR9500 UHF Multimode £470.00 TR7800 VHF mobile £268.00 TR7840 HP FM 2m POA TBA TR7730 2m FM TBA TR9000 £370.00</p> <p>Many Trio/Kenwood accessories available</p>	<p>FT1 POA FT902 DM POA FT101Z POA FT101ZDFM POA FT101ZDAM POA FT707 200W PEP £569.00 FP707 PSU £125.00 FC707 ATU £85.00 FV707 DM VFO £203.00 FT707 + FP707 + FC707 SPECIAL PRICE POA</p> <p>FT277ZD Soco all extras inc £753.00 FT7670X £619.00 FT902 OM Soco £935.00 FC902 ATU POA FV901 DM VFO POA SP901 speaker POA YO901P Scope POA FTV901 Transverter £209.00 FT208 VHF £219.00 FT708 UHF £219.00</p> <p>All accessories available FT290 Multimode £249.00 FRG7700 + Opt memory POA</p>	<p><b>MICROWAVE MODULES</b></p> <p>MMA 144V 2m Preamp £34.90 MML 144/25 RF AMP £59.00 MML 144/40 £77.00 MML 144/100S New with Preamp £129.95 MMT 432/144 2-70 Transverter £184.00 MMT 28/144 10m Transverter £99.00</p> <p><b>MM 4000 RTTY</b> SEE IT WORKING AT OUR SHOP £269.00 + keyboard Full range stocked</p> <p><b>STANDARD</b></p> <p>C8800 2m + r Mobile £250.00 C7800 70cm Mobile £270.00 C78 70cm Portable C58 2mtr. Port ssb/FM CMB8 Mounting tray £19.95 CL8 Carry case £6.95 Battery charger 7.95 Set Nicads. 11.00</p>	<p><b>ROTATORS ETC</b></p> <p>DIAWA DR7600X £135.00 DR7600R 144.00 DR7500R £105.00 KENPRO KR250 £44.00 KR400 £90.00 HAM IV £189.00 CHANNEL MASTER 9502 CN620 1.8—150MHz £50.00 Pwr/swr £52.00 CN2002 2.5 kW PEP auto ATU £190.00</p> <p><b>SWAN/CUBIC</b></p> <p>102BX 235W + PS5 £800.00 103BX WARC 235W £1,000.00 PS6 Power Supply £145.00 150MX Digital 561.00 15002 Linear £406.00 ST2A ATU TBA ST3A ATU TBA HF Mobile ant £80.00</p>
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<p><b>CUSHCRAFT AMATEUR ANTENNA</b></p> <p>HF, A3 20/15/10 3 ele beam 8bD £165.00 ATV3 20.15.10 Trapped vertical £38.30 ATV5 10.15.20.40.80. Trapped vertical £83.69 214B 14 ele boomer 05.2dB £55.77</p> <p>ARX 2 Ring Ranger 6dB vertical £27.86 CS100 Speaker £12.50 A144.44 ele Yagi £18.25 A144.77 ele Yagi £22.82 A144.11 11 ele Yagi £28.94 ARX2B Ringo MkII £32.29 ARX2K Conversion Kit RINGO MkI to Ringo MkII £14.1B</p>	<p><b>FULL RANGE OF JAYBEAM STOCK</b></p> <p>144 + 10T + Yagi OSCAR 144 + 20T + Yagi OSCAR For vertical and horizontal Oscar specials</p> <p><b>BEAM ANTENNAS NOW IN STOCK</b></p>	<p><b>RECEIVERS ALL ON SPECIAL OFFER—POA</b></p> <p>R1000 Kenwood FRG7700 Yaesu FRG7700 Memory IC2001L Sony SEARCHII 2metre</p> <p><b>ALL POA ARE ON SPECIAL OFFER. PHONE HOT LINE 01-556 1415</b></p>
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ALL ACCESSORIES AVAILABLE—PLUGS SKTS CO-AX 2MTR COLINEAR £31.50, 70CM COLINEAR £31.50

PRICES INCLUDE VAT AT THE PRESENT RATE OF 15%

OPEN MON—FRIDAY 9.00—5.30. SATURDAY 10.00—3.00. INSTANT HP FACILITY AVAILABLE

EASY ACCESS M2—M11—M1 NORTH CIRCULAR ROAD—EASY PARKING





# CUT IT OUT!

## A "Western Which Report" about:-

Various advertisers will naturally try to persuade you that their product is best (and we are no exception, of course!) but what we will not do is mislead you. So the following are FACTS taken from Manufacturers' specifications on their products.

### ROTATORS

- Fact 1.** Even small rotators will turn a fairly large antenna. What they will not do is KEEP IT STATIONARY under strong wind conditions. To do this requires good BRAKE TORQUE. This is measured in Kg. cms.
- Fact 2.** Low voltage rotators (24 vac) require higher current. This causes a greater voltage loss along the cable than with a higher voltage motor unit. Cable voltage loss will reduce rotational torque.
- Fact 3.** Some rotators use un-balanced braking. Under strong winds, this places an un-balanced stress on the casing of the motor unit and can cause it to fracture. Balanced braking is thus superior.

Position	Make	Model	Brake Torque Kg. cms.	Price	Comment
1=	CDE	AR22XL	520	49.45	
1	CDE	AR40	520	65.55	
3	Ken	KR250	600	44.85	
4=	CDE	CD-45	920	113.85	
4=	CDE	Big Talk	920	91.42	
6	Western	WE-1145	1000	34.95	92% better braking torque than CD45
7=	Western	FU-400	1500	64.95	Very good value for money
7=	Emoto	103 sax	1500	86.25	
9=	Ken	KR400RC	2000	101.00	
9=	Daiwa	DR-7500	2000	108.00	
11=	Ken	KR600RC	4000	132.25	
11=	Daiwa	DR-7600	4000	144.90	
11=	Emoto	502 sax	4000	125.35	
14	CDE	Ham-4	5700	189.75	Un-balanced braking.
15	Emoto	1102	10000	189.75	75% better braking torque than Ham. Has 2 balanced brakes.
16	Ken	KR2000RC	10000	?	
17	CDE	T2X	11300	270.25	Costs 42% more than Emoto 1102 for 11% more Br. torque.

From this you will see that the WE-1145 rotator is a very good buy! We even think we are selling it too cheaply! And here's another FACT. When we used to sell another brand of rotator, we had to increase our stock of spares to over £1,200 to ensure that we had adequate spares! We have been able to reduce that stock by 90% by selling Emoto due to their reliability. You don't believe us? Then next time you go to an exhibition just take a look at the Emoto range and then the other brands. See which ones have 'grotty' little screws underneath to which you have to try and attach the multi-way cable! See which have decent input plugs. See which have stainless steel hardward and then come back and tell us! (We told you so!).

## YAESU AND TRIO EQUIPMENT OUR COMPETITORS ARE SCARED TO DEATH, IT SEEMS!

### WHAT OUR COMPETITORS SAY

We have 'Yonks' of professional experience  
We have the biggest stocks!  
We have the best Service Dept.  
We are the 'Greatest'  
We have the best showroom  
We have the most experience  
We'll give you "FREE" (this, that and other!)

### WHAT WE SAY

So have the LADIES OF PICCADILLY!  
Jolly good! Hope you're not one of the customers to get an older set which hasn't got the latest 'mods' on! Our stocks are smaller, turned over faster so that you get the latest factory released equipment.  
(So when did they walk round ours?) All we claim is that we have a very extensive (and expensive!) Department with everything from a crowbar (for those fine adjustments!) to a H.P. Spectrum Analyser (just back after service, incidentally, at a cost of £1,200! And you think your service charge was expensive!)  
Perhaps you are! It depends what you're talking about. If it is size of land, we are on a ONE ACRE site! Haven't been around our competitors to compare (and who cares!)  
May be you have been round all the Showrooms; we haven't. Ours is set out with YAESU and TRIO; we have no axe to grind one way or the other. We haven't seen one larger than ours but then we don't claim to have seen them all.  
Who first introduced the brand name of YAESU MUSEN to the UK? (Answer, Western Electronics of 24 Hook St., Hook, Swindon in 1970.) So who has most experience with Yaesu! Talking about experience, our M.D. has considerable HF operating experience having been:  
2nd World-wide SSB Contest  
1st RSGB 5 Mhz SSB Contest  
1st RSGB 21/28 Mhz Contests  
(So who's kidding whom about experience!)  
So you really believe that you can get something for nothing in this World! Take a look at the prices in this periodical. We presume that you know that RETAIL PRICE MAINTENANCE IS ILLEGAL.  
Now which Company do you think you should support? The 'Con Merchants'? The 'Scare Mongers'? The 'Price Rings'? OR WESTERN

### YAESU PRICES. (INC. VAT/DELIVERY).

FT-1..... £1,240	FT-101Z/FM..... £570.00	FT-107M..... £699.00	FT-707..... £548.00	FT-902DM..... £850.00
FRG-7..... £189.00	FT-101ZD..... £599.00	FT-227RB..... £229.00	FP-707..... £119.00	FL-210CZ..... £399.00
FT-101Z..... £539.00	FT-101ZD/AM..... £819.00	FT-29CR..... £236.00	FT-720RV..... £239.00	FRG-7700..... £315.00
FT-101Z/AM..... £556.00	FT-101ZD/FM..... £636.00	FT-48CR..... £360.00	FT-720RU..... £264.00	

We will not be under-cut! Phone for prices of many other items not listed here. Please note: — Prices may have changed by the time this advert appears due to changes in the rate of exchange of the £.

### TRIO PRICES. (INC. VAT/DELIVERY).

BO-9..... £36.00	SP-120..... £23.00	YK-88CN..... £29.95	TR-2300..... £164.95	PB-24K..... £18.95
HC-10..... £49.00	TS-130S..... £525.00	YK-88SN..... £24.50	VB-2300..... £46.00	SMC-24..... £15.95
PS-20..... £47.95	AT-130..... £79.00	TS-820S..... £569.00	MB-2..... £16.50	TR-7800..... £259.00
PS-30..... £89.00	AT-230..... £119.00	TS-830S..... £699.00	TR-2400..... £198.50	TR-8400..... £299.00
MC-30S..... £12.95	DFC-230..... £185.00	DS-2..... £39.00	ST-1..... £42.95	TR-9000..... £369.00
MC-50..... £22.95	SP-230..... £36.00	R-1000..... £295.00	SC-3..... £10.95	TR-9500..... £469.00
MB-100..... £16.50	TS-530S..... £539.00	SP-100..... £22.50	BC-5..... £18.50	

### VALVES. POSTAGE AND PACKING £1.00. MINIMUM ORDER VALUE £3.00.

6AH6..... £1.61	6BM8..... £1.15	6EA8..... £0.86	6KD6..... £5.75	12BY7A..... £1.49	6146B..... £5.75
6AN8..... £0.92	6BN8..... £0.86	6EH7..... £0.75	6LQ6..... £2.87	12DQ6..... £2.87	7360..... £8.62
6AV6..... £0.80	6BO5..... £0.69	6EJ7..... £0.86	6U8A..... £1.09	12GB7..... £2.30	QOV06-40A..... £13.80
6AW8..... £1.10	6BZ6..... £0.69	6EW6..... £0.75	12AT7..... £1.09	572B..... £28.17	3-500Z..... £85.00
6BA6..... £0.69	6CB6..... £0.75	6CK6..... £0.86	12AU7..... £1.09	5763..... £2.59	8874..... £99.00
6BE6..... £0.69	6CL6..... £2.01	6JS8C..... £5.17	12AX7..... £1.09		

### AMPLIFIER BARGAIN! The 'Clipperton L' at only £399.00 (Carr. £5.75).

### TOWER BARGAIN! A Self-supporting tower for only £179.00!

Fantastic stock clearance bargain! Due to large volume production we are able to offer this extremely strong galvanised steel sectional tower at a special price only until stocks are sold. Each section is 3.535m long (11' 7") and is approx. 13" wide. You can go up to 300' if you wish (with guys, of course!) FIRST COME, FIRST SERVED. Rush your order in today! Takes HF beams in 100 m.p.h. winds with no guys because of special high grade steel. Order Tower type WT-26S at £179.00 (carriage and VAT paid). Scotland plus £7.00.

## Western Electronics (UK) Ltd

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Tel: Louth (0507) 804955/6/7 Telex: 56121 WEST G

Hours open 9-12, 1-4.30 Mon.-Fri.

9-12, Sat.



The 'Western' gang, including our agents at Southampton, Alan Paxton, G4B1Z (0703) 5821?, N. Ireland, Mike Matthews, G18MNG, Newton (0247) 815859, extend to you and 'yours'

SINCERE CHRISTMAS GREETINGS.



# P.M.

## ELECTRONIC SERVICES

PRICES SHOWN EXCLUDE VAT  
UK CUSTOMERS PLEASE ADD 15%

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WIRRAL, MERSEYSIDE, L61 6XT

Tel: 051-342 4443. Cables: CRYSTAL, BIRKENHEAD.

### CRYSTALS MANUFACTURED TO ORDER

Prices shown are for one off, to our amateur specs., closer tolerances are available. Please send us details of your requirements.

**A Low frequency fundamentals in HC13/U or HC6/U**  
Adj. tol.  $\pm 50$ ppm. Temp. tol.  $\pm 100$ ppm 0 to 70°C.  
6.0 to 19.999kHz £28.12 100 to 159.99kHz £9.25  
20 to 39.999kHz £17.74 160 to 499.99kHz £6.19  
40 to 79.999kHz £12.40 500 to 799.99kHz £7.30  
80 to 99.999kHz £10.60

**B High frequency fundamentals/overtones**  
Adj. tol.  $\pm 20$ ppm. Temp. tol.  $\pm 30$ ppm 10 to 60°C.  
800 to 999.9kHz (fund) HC6/U £9.75  
1.0 to 1.499MHz (fund) HC6/U £10.35  
\*1.5 to 2.599MHz (fund) HC6/U £4.93  
\*2.6 to 20.99MHz (fund) HC6/U £4.48  
\*3.4 to 3.999MHz (fund) HC18 & 25/U £6.21  
\*4.0 to 5.999MHz (fund) HC18 & 25/U £4.93  
\*6.0 to 20.99MHz (fund) Allholders £4.48  
\*21 to 24.99MHz (fund) £6.73  
\*25 to 30 MHz (fund) £8.28  
\*21 to 62.99MHz (30/T) £4.48  
\*60 to 105MHz (50/T) £5.16  
\*105 to 125MHz (50/T) HC18 & 25/U £7.76  
125 to 180MHz (0/T) £7.50  
180 to 25MHz (0/T) £12.49

\*Delivery Normally 5/6 weeks (express available), all other frequencies 7/8 weeks.

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

Mid and High frequencies are available in HC6/U, HC18/U or HC25/U unless otherwise shown.  
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144.4 (433.2)	b	e	b	e	e	b	e	e	e	e
144.480	e	e	e	e	e	e	e	e	e	e
144.800	e	e	e	e	e	e	e	e	e	e
144.850	e	e	e	e	e	e	e	e	e	e
145.000/ROT	a	a	a	a	a	b	b	b	a	c
145.025/R1T	a	a	a	a	a	b	b	b	a	c
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145.425/S17	e	e	e	e	e	e	e	e	e	e
145.450/S18	a	a	a	a	a	b	b	b	a	c
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145.625/R1R	a	a	a	a	a	b	b	b	a	c
145.650/R2R	e	e	e	e	e	e	e	e	e	e
145.675/R3R	e	e	e	e	e	e	e	e	e	e
145.700/R4R	e	e	e	e	e	e	e	e	e	e
145.725/R5R	e	e	e	e	e	e	e	e	e	e
145.750/R6R	e	e	e	e	e	e	e	e	e	e
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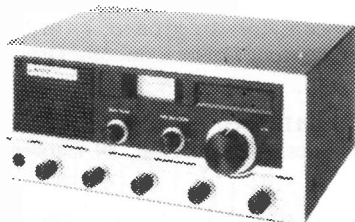


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**Selling:** FT-200/FP-200, crystallised for 10m., £190. QM70 high power (50w.) transverter.—Blacker, G4GBE, QTHR. (Tel: 021-453 8242).

**For Sale:** FRG-7, £130 or FRG-7000, £220; both superb selectivity and in new condition.—Blackett, 16 Warneford Gardens, Exmouth, Devon.

**Offering:** Eddystone EA-12 amateur bands receiver in excellent condition. Cash offers only. (Worthing). — Box No. 5757, Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

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**Sale:** C4 vertical dipole, tri-band 10-15-20m., as new, full maker's instructions, £30. — Middleton, G4EJH, QTHR. (Tel: Portishead (0272) 843897 evenings).

**Sale:** Yaesu FRG-7700, mint condition, with 144 MHz converter, £230. — Ring Townsend, Bognor Regis (0243) 864021.

**Wanted:** SSB unit for Satellit 1000. — Gott, 296 Huntington Road, York.

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**Sale:** SX-200 scanning monitor receiver, as new, boxed, £199. Discone antenna, £10. — Ring Timson, 061-456 3405.

**Sale:** Ex-Air Ministry Type F Morse code key, new, £4 post paid. ARRL "The Radio Amateurs Handbook", 1957, £4. "Admiralty Handbook", 1931, £6. **Wanted:** B.28 receiver manual. — Ring Edwards, G3MBL, 01-445 4321.

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**Wanted:** Eddystone S.640 Rx; FT-243 7 MHz band crystals; HF GDO. Details and price please. (Berks.). — Box No. 5758, Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

**Sale:** Icom IC-251 with matching speaker, £395. IC-25M VHF marine, £190. — Mansi, G8VVK, QTHR. (Tel: Great Yarmouth 67597 after 6 p.m.)

**Selling:** Yaesu FT-707 transceiver with FP-707 power supply, 11m. fitted, three weeks old, £550. — Ring Newport, Orpington 26435.

**January issue: due to appear December 28th. Single copies at 80p post paid will be sent by first-class mail for orders received by Wednesday, December 23rd, as available. — Circulation Dept., Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.**

**Offering:** IBM Model 72 golfball typewriter, motor s/c. Cossor Model 1035 'scope. Avo CT-537 transistor tester. Offers? Buyers collect. — Ring Edwards, 0308-89625.

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**Sale:** Yaesu FR-101S digital receiver, little used, immaculate, £325 or near offer. — Lawton, 36 Doctors Hill, Stourbridge, (Tel: Brierley Hill 70180, office hours).

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**Sale:** FRG-7, mint, with Joymatch antenna system, £130. Avometer 8 Mk.IV, £70. — Ring Murray, 01-928 4668.

**Selling:** Sony ICF-2001 book-size receiver, FM/AM, AM/SSB/CW, LCD keyboard entry, memories, 76-108 MHz, 150 kHz to 30 MHz continuous. — Wadcock, 95 Runshaw Avenue, Appley Bridge (2001), Wigan WN6 9JP.

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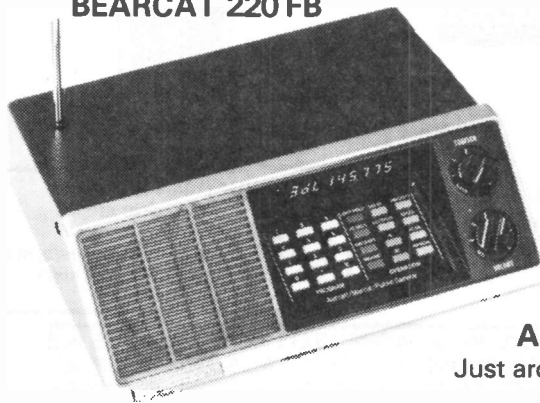
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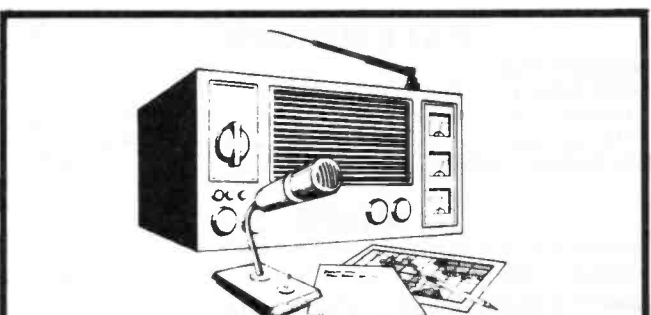
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